

PRODUCT GUIDE

MOSFETs



Toshiba's MOSFET devices meet the needs of a wide range of ultra-high-density applications.

POWER-MOSFETS CONTENTS

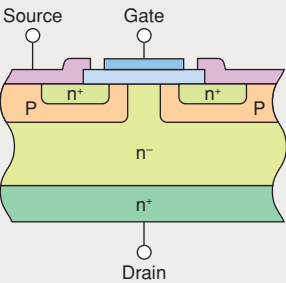
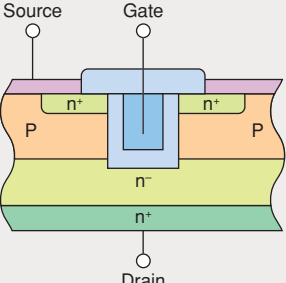
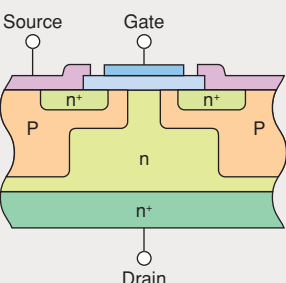
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• PS-8 Series ... [Part Number: TPCP8xxx]	
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• STP2 Series ... [Part Number: TPCT4xxx]	
• TSON Advance Series ... [Part Number: TPCC8xxx]	
• TSSOP Advance Series ... [Part Number: TPCM8xxx]	
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- 1) No carrier storage effect; superior frequency and switching characteristics
- 2) Rugged and no current concentration
- 3) Voltage-controlled device, hence low drive power
- 4) Easy parallel connection

■ Toshiba MOSFETs have the following additional features:

- 1) Guaranteed avalanche capability..... Allows an absorber circuit to be simplified
- 2) Improved functioning of built-in diodes Enhanced circuit design flexibility
- 3) High ruggedness Increased margin for circuit design
- 4) High-speed switching Higher speed in end-product's operation
- 5) Low $R_{(DS)ON}$ Reduced end-product's power consumption
- 6) Smaller packages Reduced end-product size
- 7) Low drive loss Reduced end product's power

■ Structures of Toshiba MOSFETs

<p>Double-Diffusion Structure</p> 	<p>● π-MOS</p> <p>Toshiba Power MOSFETs use a double-diffusion MOS (D-MOS) structure, which produces high-withstand voltage, to form channels. This structure is especially well suited to high-withstand voltage and high-current devices. A high level of integration yields a high-performance Power MOSFET with low ON-resistance and low power loss.</p>
<p>Trench Structure</p> 	<p>● U-MOS</p> <p>Higher channel density is achieved by connecting channels vertically to form a U-groove at the gate region, a structure that yields a lower ON-resistance than other MOSFET structures.</p>
<p>Super-Junction Structure</p> 	<p>● DTMOS</p> <p>The super-junction structure, which has P-type pillar layers as shown left, realizes high withstand voltage and ON-resistance lower than the conventional theoretical limit of silicon.</p>

2-1 MOSFET Product Lines

SSM Series ($V_{DS} = 12\text{ V to }60\text{ V}$)

Very compact and thin, the SSM Series is suitable for use in various electronic devices. The SSM Series is available in a wide range of packages and features low voltage drive.

- Applications
- Cell phones ● Notebook PCs
- Portable electronic devices ● Small-signal switching

VS and PS Series ($V_{DS} = 12\text{ V to }40\text{ V}$)

Very compact and thin, the VS and PS Series are suitable for use in various electronic devices.

- Applications
- Cell phones ● Notebook PCs
- Portable electronic devices

Chip LGA and STP Series ($V_{DS} = 20\text{ V to }30\text{ V}$)

The LGA and STP Series are housed in an ultra-small and thin package and are suitable for use in lithium-ion secondary battery protection circuits in various portable electronic devices.

- Applications
- Lithium-ion secondary battery protection circuits

SOP and TSON Series ($V_{DS} = 20\text{ V to }250\text{ V}$)

The SOP and TSON Series are compact and thin, and require only a small mounting area. They are suitable for lithium-ion secondary battery protection circuits and notebook PCs.

- Applications
- Lithium-ion secondary battery protection circuits
- Notebook PCs ● Portable electronic devices
- DC-DC converters

TO-220SM(W) Series ($V_{DS} = 40\text{ V to }150\text{ V}$)

The TO-220SM package, which uses Cu connectors and a wide source terminal, realizes low ON-resistance and a high current-carrying capability.

- Applications
- Motor drivers ● Switching power supplies

Low- V_{DS} , High- Q_g U-MOS Series ($V_{DS} = 40\text{ V to }100\text{ V}$)

High integration is achieved using a trench technology. Low-voltage drive ($V_{GS} = 4\text{ V}$) is possible due to ultra-low ON-resistance.

- Applications
- Motor drivers ● Solenoids and lamp drivers

U-MOS Series for Synchronous Rectification ($V_{DS} = 60\text{ V to }150\text{ V}$)

Fabricated using a trench technology, the U-MOS Series is ideal for synchronous rectification on the secondary side of power supply circuits.

- Applications
- Switching power supplies ● AC adapters
- Motor drivers

New π -MOSVII Series ($V_{DS} = 450\text{ V to }650\text{ V}$)

The latest addition to the π -MOS portfolio, the π -MOSVII Series offers reduced capacitances due to optimized chip design and is available with a greatly wider range of electrical characteristics.

- Applications
- Switching power supplies ● AC adapters

Super-Junction DTMOS Series ($V_{DS} = 600, 650\text{ V}$)

The super-junction DTMOS Series achieves low ON-resistance and low gate charge (Q_g) due to the use of the latest super-junction structure.

- Applications
- Switching power supplies ● AC adapters
- Motor drivers

High-Speed π -MOS Series ($V_{DS} = 450\text{ V to }600\text{ V}$)

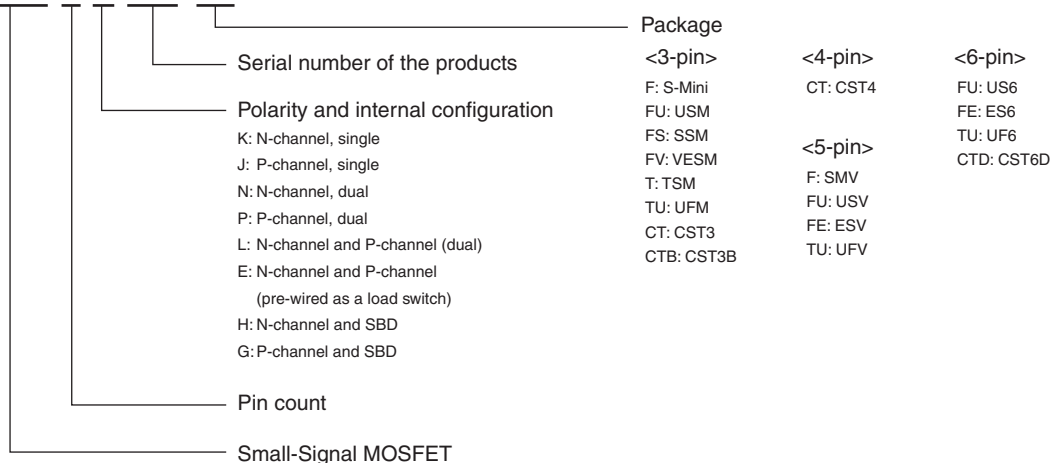
The new High-Speed π -MOS Series achieves higher switching speed than the well-proven π -MOS Series. Two series are available: high-speed switching series and high-speed diode series.

- Applications
- Inverters ● Switching power supplies
- Motor drivers ● AC adapters

2-2 Part Numbering Schemes

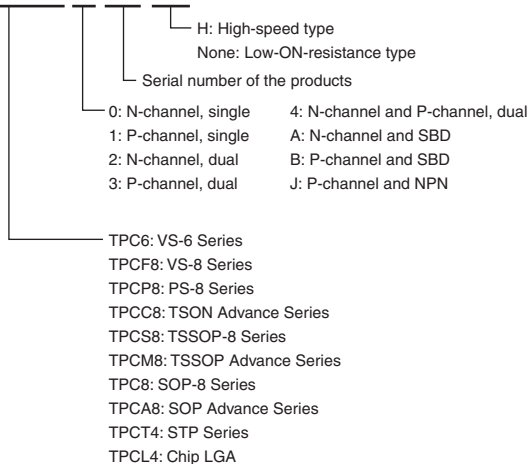
Small-Signal MOSFET (SSM) Series

SSM 3 K 101 TU



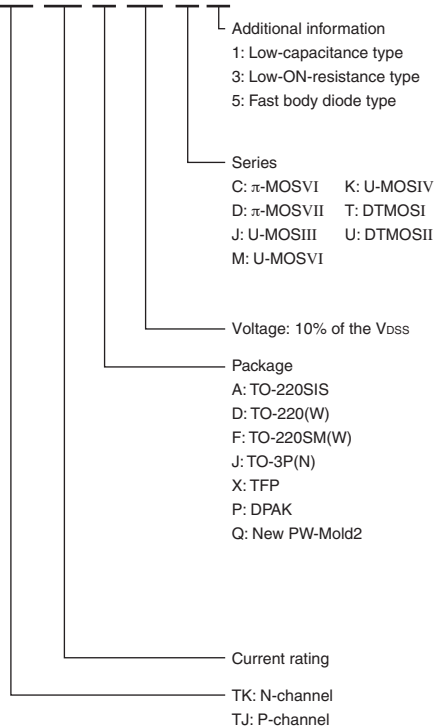
Multi-Pin Series

TPCM8 0 01 -H



New Series

TK 55 A 10 J 1



Conventional Series

2SK****

N-channel MOS

2SJ****

P-channel MOS

V _{DSS} (V) I _D (A)	12	20	24	30	40	50	60	100	150
0.05						*2SJ343(50)① *2SJ344(50)①			
0.1		* SSM3K04FU(12)③ * SSM3K16FU(15)③ * SSM3J16FU(45)③ ☆ SSM3K04FS(12)③ ☆ SSM3K16FS(15)③ ☆ SSM3J16FS(45)③ ☆ SSM3J35FS(44)⑥ + SSM3K03FV(12)③ + SSM3K04FV(12)③ + SSM3K16FV(15)③ + SSM3J16FV(45)③ + SSM3J35MFV(44)⑥ + SSM3K16CT(15)③ + SSM3J16CT(45)③ + SSM3J35CT(44)⑥ △ SSM6N04FU(12)③ △ SSM6N16FU(15)③ △ SSM6P16FU(45)③ △ SSM6P35FU(44)⑥ + SSM6N03FE(12)③ + SSM6N16FE(15)③ + SSM6P16FE(45)③ + SSM6L16FE(15)③ + SSM6P35FE(45)⑥ △ SSM5N16FU(15)③ △ SSM5P16FU(45)③ ☆ SSM5N03FE(12)③ ☆ SSM5N16FE(15)③ ☆ SSM5P16FE(45)③		* SSM3K15F(7)③ * SSM3J15F(32)③ * SSM3K15FU(7)③ * SSM3J15FU(32)③ ☆ SSM3K15FS(7)③ ☆ SSM3J15FS(32)③ + SSM3K15FV(7)③ + SSM3J15FV(32)③ + SSM3K15CT(7)③ + SSM3J15CT(32)③ △ SSM6N15FU(7)③ △ SSM6P15FU(32)③ △ SSM5N15FU(7)③ △ SSM5P15FU(32)③ + SSM6N15FE(7)③ + SSM6P15FE(32)③ ☆ SSM5N15FE(7)③ ☆ SSM5P15FE(32)③ ☆ SSM3K44FS(7)⑥ + SSM3K44MFV(7)⑥ △ SSM6N44FU(7)⑥ + SSM6N44FE(7)⑥			* SSM3K17FU(40)② △ SSM6N17FU(40)②		
0.18		☆ SSM3K35FS(20)⑥ + SSM3K35MFV(20)⑥ + SSM3K35CT(20)⑥ △ SSM6N35FU(20)⑥ △ SSM6L35FU(20)⑥ + SSM6N35FE(20)⑥ + SSM6L35FE(20)⑥							
0.2		* SSM3J05FU(4)③ △ SSM6P05FU(4)③ △ SSM5P05FU(4)③		* 2SJ305(4)① * 2SK2009(2)① * SSM3J09FU(4.2)③ △ SSM6P09FU(4.2)③			* SSM3K7002BF(3.3)⑥ △ SSM6N7002BFU(3.3)⑥ ☆ SSM3K7002BFS(3.3)⑥ △ SSM6N7002AFU(3.3)③ * SSM3K7002AF(3.3)② △ SSM6N7002AFU(3.3)② * SSM3K7002AF(3.3)② * 2SJ168(2)① * SSM3K7002FU(3.3)③ * 2SK1062(1)① * SSM3K7002AFU(3.3)② + SSM6N7002BFE(3.3)⑥		
0.25		* SSM6N37CTD(5.6)⑥							
0.33		△ SSM3J36TU(3.6)⑥ ☆ SSM3J36FS(3.6)⑥ + SSM3J36MFV(3.6)⑥ ● SSM6P36TU(3.6)⑥ + SSM6P36FE(3.6)⑥							
0.4		△ SSM6L05FU(1.2)③ △ SSM6N05FU(1.2)③ * SSM3K05FU(1.2)③ △ SSM5N05FU(1.2)③		△ SSM6L09FU(1.2)③ △ SSM6N09FU(1.2)③ * SSM3K09FU(1.2)③					
0.5		☆ SSM4K27CT(0.205)⑥ ● SSM6L10TU(0.145)⑥ ● SSM6L11TU(0.145)⑥ ● SSM6L12TU(0.145)⑥ ● SSM6N25TU(0.145)⑥ ● SSM6N36TU(1.52)⑥ ● SSM6P25TU(0.26)⑥ ● SSM6P26TU(0.23)⑥ + SSM6J25FE(0.26)⑥ + SSM6J26FE(0.23)⑥ + SSM6K25FE(0.145)⑥ ● SSM6L36TU(1.52)⑥ ☆ SSM3K36FS(1.52)⑥ + SSM3K36MFV(1.52)⑥ △ SSM3K36TU(1.52)⑥ + SSM6N36FE(1.52)⑥ + SSM6L36FE(1.52)⑥ △ SSM6N43FU(1.52)⑥ ☆ SSM3K43FS(1.52)⑥		● SSM6N24TU(0.145)⑥ + SSM6K24FE(0.145)⑥					
0.65		△ SSM6J06FU(0.5)③							
0.72		+ SSM6P41FE(0.3)⑥							
0.77		+ SSM6N42FE(0.26)⑥							
0.8		● SSM6L13TU(0.143)⑥ ● SSM6N29TU(0.143)⑥ ● SSM6P28TU(0.234)⑥ + SSM6J205FE(0.234)⑥		△ SSM6J07FU(0.8)③					

Legend

Product series ① : π-MOSIII ② : π-MOSV ③ : π-MOSVI
 ④ : L²-π-MOSV ⑤ : L²-π-MOSVI ⑥ : U-MOS ⑦ : π-MOSVII
 ⑧ : π-MOSIV ⑨ : DTMOSI ⑩ : DTMOSII
Package ◇ PW-Mini ↗ VS-8 ♥ VS-6 ♣ PS-8 □ STP ▲ TO-92MOD ▼ PW-Mold J New PW-Mold ⊙ TSON Advance
 ⊙ SOP-8 Lead Clamp ▶ SOP Advance ◆ TO-220NIS ⊗ TO-220SIS ■ TO-220AB ⊞ TO-220(W) ⬢ TFP ○ TO-220FU/SM
 * S-Mini + TSM * USM △ UFM ☆ SSM + VESM + CST3 ☆ CST3B ☆ CST4 + SMV △ US6 ● UF6

V _{DSS} (V) I _D (A)	12	20	24	30	40	50	60	100	150	180
1	PS *SSM5G02TU (0.16)Ⓞ PS *SSM5G04TU (0.24)Ⓞ PD *SSM6E01TU (0.16)Ⓞ	△SSM3J111TU (0.48)Ⓞ		PS *SSM5G01TU (0.8)Ⓞ			◇2SJ360 (0.73)Ⓞ ▲2SJ507 (0.7)Ⓞ	◇2SK2963 (0.7)Ⓞ ▲2SK2962 (0.7)Ⓞ ◇2SJ508 (1.9)Ⓞ ▲2SJ509 (1.9)Ⓞ	▲2SK3670 (1.7)	◆2SJ313 (5.0) ▼2SJ338 (5.0) ◆2SK2013 (5.0) ▼2SK2162 (5.0)
1.1		△SSM6K06FU (0.16)Ⓞ		△SSM3J112TU (0.79)Ⓞ						
1.2	†SSM6J23FE (0.16)Ⓞ	△SSM3K106TU (0.53)Ⓞ *SSM6P54TU (0.228)Ⓞ NS *SSM5H07TU (0.54)Ⓞ †SSM6K31FE (0.54)Ⓞ †SSM6K30FE (0.42)Ⓞ								
1.3		△SSM6J08FU (0.18)Ⓞ PS *TPCP8BA1 (0.18)Ⓞ		†SSM6J207FE (0.491)Ⓞ						
1.4	NS *SSM5H03TU (0.3)Ⓞ	†SSM6K22FE (0.17)Ⓞ		△SSM3J118TU (0.48)Ⓞ *SSM6P40TU (0.403)Ⓞ PS *SSM5G11TU (0.403)Ⓞ NS *SSM5H01TU (0.45)Ⓞ †SSM6K210FE (0.371)Ⓞ						
1.5	PS *SSM5G09TU (0.13)Ⓞ	△SSM3K107TU (0.41)Ⓞ *SSM6P39TU (0.213)Ⓞ NS *SSM5H05TU (0.16)Ⓞ NS *SSM5H08TU (0.16)Ⓞ		†SSM3J02T (0.5)Ⓞ △SSM3K128TU (0.36)Ⓞ PS *SSM5G10TU (0.213)Ⓞ △SSM6K07FU (0.22)Ⓞ						
1.6		†SSM6N42FE (0.252)Ⓞ NS *SSM5H10TU (0.119)Ⓞ NS *TPCP8AA1 (0.105)Ⓞ *SSM6L39TU (0.119)Ⓞ *SSM6N39TU (0.119)Ⓞ △SSM6K08FU (0.105)Ⓞ		†SSM3J313T (0.268)Ⓞ NS *SSM5H11TU (0.182)Ⓞ *SSM6L40TU (0.182)Ⓞ *SSM6N40TU (0.182)Ⓞ						
1.7		△SSM3J113TU (0.169)Ⓞ		†SSM3J01T (0.4)Ⓞ †SSM3J305T (0.477)Ⓞ						
1.8	PD *SSM6E03TU (0.144)Ⓞ	△SSM3J108TU (0.158)Ⓞ △SSM3J114TU (0.149)Ⓞ PD *SSM6E02TU (0.136)Ⓞ †SSM6J53FE (0.136)Ⓞ								
1.9				NS *SSM5H12TU (0.133)Ⓞ †SSM6K208FE (0.133)Ⓞ						
2		△SSM3J109TU (0.13)Ⓞ △SSM3K122TU (0.123)Ⓞ *SSM6K405TU (0.126)Ⓞ †SSM6J206FE (0.13)Ⓞ †SSM6K204FE (0.126)Ⓞ ◇SSM3J46CTB (0.103)Ⓞ *SSM3J325F (0.155)Ⓞ		△SSM3J117TU (0.225)Ⓞ △SSM3K127TU (0.123)Ⓞ *SSM6J402TU (0.225)Ⓞ			◇2SK2615 (0.3)Ⓞ ▲2SK2961 (0.3)Ⓞ ◇2SK3658 (0.3)Ⓞ *SSM6K407TU (0.44)Ⓞ *SSM6K32TU (0.44)Ⓞ			
2.1				△SSM3K116TU (0.1)Ⓞ					N X TPC8009-H (0.35)Ⓞ	
2.2		△SSM3J115TU (0.098)Ⓞ △SSM3K101TU (0.103)Ⓞ		△SSM3K105TU (0.2)Ⓞ				▲TPCP8003-H (0.18)Ⓞ ★TPC8214-H (0.18)Ⓞ		
2.3	△SSM3J110TU (0.094)Ⓞ ◇SSM3J304T (0.127)Ⓞ			†SSM6K202FE (0.085)Ⓞ						
2.4				†SSM3J306T (0.225)Ⓞ △SSM3K124TU (0.12)Ⓞ						
2.5		*SSM6J50TU (0.064)Ⓞ		△SSM3K119TU (0.074)Ⓞ †SSM3K02T (0.2)Ⓞ *SSM6J401TU (0.145)Ⓞ			†SSM3K318T (0.145)Ⓞ			
2.6		△SSM3K102TU (0.071)Ⓞ								
2.7	†SSM3J312T (0.091)Ⓞ	P#♥TPC6105 (0.11)Ⓞ P*▷TPCF8301 (0.11)Ⓞ PS*▷TPCF8B01 (0.11)Ⓞ P*▷TPCF8103 (0.11)Ⓞ †SSM6K203FE (0.061)Ⓞ		†SSM3J14T (0.17)Ⓞ						
2.8										
2.9				†SSM3K303T (0.12)Ⓞ						
3	†SSM3J13T (0.07)Ⓞ *SSM6J21TU (0.05)Ⓞ	N#▷TPCF8201 (0.049)Ⓞ NS#▷TPCF8A01 (0.049)Ⓞ P#▷TPCF8302 (0.059)Ⓞ P*▷TPCF8303 (0.058)Ⓞ △SSM3K104TU (0.056)Ⓞ *SSM6K404TU (0.055)Ⓞ		†SSM3K12T (0.175)Ⓞ *SSM6K34TU (0.077)Ⓞ NS▷SSM5H14F (0.078)Ⓞ				☆2SK2200 (0.35)Ⓞ J 2SK2201 (0.35)Ⓞ J 2SK4018 (0.35)Ⓞ		
3.2		△SSM3K121TU (0.048)Ⓞ †SSM6K211FE (0.047)Ⓞ		CP▷TPCF8402 (0.077)Ⓞ P▷TPCF8304 (0.072)Ⓞ †SSM3K01T (0.12)Ⓞ						
3.3		†SSM6J212FE (0.0434)Ⓞ								
3.4				CP*TPCP8402 (0.072)Ⓞ	P*TPCP8403 (0.070)Ⓞ					
3.5		†SSM3K301T (0.056)Ⓞ *SSM3J327F (0.095)Ⓞ		†SSM3J314T (0.1)Ⓞ						
3.6		†SSM3J317T (0.107)Ⓞ								
3.8		P* TPCP8303 (0.04)Ⓞ					N★TPC8218-H (0.057)Ⓞ			
3.9					N♥TPC6006-H (0.075)Ⓞ					
4	*SSM6J51TU (0.054)Ⓞ	△SSM3J120TU (0.038)Ⓞ *SSM6K18TU (0.04)Ⓞ		CN▷TPCF8402 (0.05)Ⓞ CN* TPCP8404 (0.05)Ⓞ CP* TPCP8404 (0.05)Ⓞ †SSM3K316T (0.065)Ⓞ †SSM3K14T (0.067)Ⓞ						

Legend

Product series

- ① : π-MOSIII ② : π-MOSV ③ : π-MOSVI
- ④ : L²-π-MOSV ⑤ : L²-π-MOSVI ⑥ : U-MOS ⑦ : π-MOSVII
- ⑧ : π-MOSIV ⑨ : DTMOI ⑩ : DTMOII

Package

- ◇PW-Mini ▷VS-8 ♥VS-6 ♣PS-8 ⊕STP ▲TO-92MOD ▼PW-Mold J New PW-Mold ⊙TSON Advance
- ⊙SOP-8 Lead Clamp ▶SOP Advance ◆TO-220NIS ⊗TO-220SIS ■TO-220AB ⊞TO-220(W) †TFP ○TO-220FL/SM
- *S-Mini †TSM *USM △UFM ☆SSM †VESM †CST3 ◇CST3B ⊕CST4 †SMV △US6 *UF6

V _{DSS} (V) I _D (A)	12	20	24	30	40	50	60	100	150	180	200	
4.2		△SSM3K123TU (0.028)⑥ ●SSM6K403TU (0.028)⑥		N★TPCP8201 (0.05)⑥ CN★TPCP8402 (0.077)⑥ -:SSM3K320T (0.077)⑥								
4.4		△SSM3J130TU (0.0258)⑥		●SSM6K406TU (0.0385)⑥								
4.5		P#♥TPC6107 (0.055)⑥		P♥TPC6108 (0.06)⑥ CP★TPC8405 (0.033)⑥								
4.6		△SSM3J129TU (0.046)⑥										
4.7		+:SSM3K309T (0.031)⑥			N★TPCP8403 (0.040)⑥ N★TPCP8203 (0.040)⑥							
4.8					P★TPCP8103-H (0.040)⑥							
5	△SSM3J132TU (0.0178)⑥	★TPC8208 (0.05)⑥ XTPCS8209 (0.03)⑥ N#XTPCS8210 (0.03)⑥ P#XTPCS8303 (0.021)⑥ P#XTPCS8302 (0.035)⑥ P★TPCP8301 (0.031)⑥ P★TPCP8302 (0.033)⑥ -:SSM3J307T (0.031)⑥ -:SSM3K310T (0.028)⑥		XTPCS8209 (0.05)⑥ N▷TPCF8001 (0.032)⑥ P★TPC8104-H (0.065)⑥ N♥TPC6007-H (0.054)⑥ P♥TPC6109-H (0.059)⑥		▲2SK2989 (0.15)④ ▲2SJ537 (0.19)④	↓2SJ668 (0.17)⑥ ↓2SJ681 (0.17)⑥ ☆2SJ378 (0.19)② ☆2SJ669 (0.17)⑥ ◆2SJ438 (0.19)④ ☆2SK2229 (0.16)④ ↓2SK4017 (0.1)⑥ ↓2SK4033 (0.1)⑥ ★TPC8213-H (0.05)⑥	↓2SK2399 (0.23)④ ☆2SK2400 (0.23)④ ↓2SK4019 (0.23)④	▼2SK3205 (0.52)		◆2SJ407 (1.0)② ◆2SK2381 (0.8)② ☆2SK2835 (0.8)② ↓2SK2920 (0.8)② ↓2SK4020 (0.8)②	
5.2		-:SSM3J321T (0.046)⑥										
5.5	PD★TPC8401 (0.038)⑥ P♥TPC6103 (0.035)⑥	P★♥TPC6111 (0.04)⑥		N★TPC8211 (0.036)⑥ N★TPC8202 (0.023)⑥							N▷TPCA8010-H (0.45)②	
5.6		P#★TPCP8101 (0.030)⑥		-:SSM3J326T (0.0457)⑥								
6	P#▷TPCF8101 (0.026)⑥	N▷TPCT4201 (0.031)⑥ N▷TPCT4203 (0.031)⑥ N#♥TPC6004 (0.024)⑥ P#▷TPCF8102 (0.030)⑥ ★TPC8207 (0.02)⑥ XTPCS8211 (0.024)⑥ XTPCS8204 (0.017)⑥ P#XTPCS8102 (0.02)⑥ P#XTPCS8302 (0.035)⑥ N#XTPCS8212 (0.024)⑥ N#XTPCS8208 (0.017)⑥ N#XTPCS8213 (0.013)⑥ N▷TPCL4201 (0.031)⑥	N▷TPCL4203 (0.036)⑥	N▷TPCT4202 (0.036)⑥ N▷TPCT4204 (0.038)⑥ N♥TPC6011 (0.020)⑥ N#♥TPC6005 (0.028)⑥ PD★TPC8401 (0.035)⑥ P▷TPCF8104 (0.028)⑥ N#XTPCS8214 (0.135)⑥ NS★TPC8A01 (0.025)⑥ ★TPC8212-H (0.021)⑥ CN★TPC8405 (0.026)⑥ -:SSM3K315T (0.0415)⑥ N▷TPCL4202 (0.04)⑥ △SSM3K131TU (0.0415)⑥								
6.5				N★TPC8216-H (0.020)⑥								
7				N▷TPCF8001 (0.023)⑥ N▷TPCF8002 (0.023)⑥	CNTPC8406-H (0.027)⑥ CPTPC8406-H (0.03)⑥				N▷TPCA8009-H (0.35)②			
7.2		P#★TPCP8102 (0.018)⑥		N★TPCP8001-H (0.016)⑥								
7.5					N▷TPCA8020-H (0.027)⑥ N★TPC8022-H (0.027)⑥ P★TPC8116-H (0.03)⑥ P▷TPCA8107-H (0.03)⑥							
8				N★TPC8210 (0.015)⑥ N★TPC8021-H (0.017)⑥	P★TPC8110 (0.025)⑥							
8.3				N★TPC8004 (0.009)⑥								
8.5				NS★TPC8A01 (0.018)⑤								
9		N★TPCP8006 (0.01)⑥					N▷TPC8053-H (0.0225)⑥				◆2SK2350 (0.4)②	
9.5		●SSM6J409TU (0.0221)⑥										
10		P★TPC8115 (0.01)⑥		P★TPC8109 (0.02)⑥ P★TPC8119 (0.012)⑥ NS▷TPC8A05-H (0.012)⑥				↓2SK3669 (0.125)⑦		□2SJ200 (0.83) □2SK1529 (0.83) □2SK3497 (0.15) □2SJ618 (0.37)		

Legend

Product series ① : π-MOSIII ② : π-MOSV ③ : π-MOSVI
 ④ : L²-π-MOSV ⑤ : L²-π-MOSVI ⑥ : U-MOS ⑦ : π-MOSVII
 ⑧ : π-MOSIV ⑨ : DTMOSI ⑩ : DTMOSII

Package ◊PW-Mini ↓VS-8 ♥VS-6 ♣PS-8 ⊕STP ▲TO-92MOD ▼PW-Mold ↓New PW-Mold ⊙TSON Advance
 ⊕SOP-8 Lead Clamp ▶SOP Advance ◆TO-220NIS ⊗TO-220SIS ■TO-220AB ▢TO-220(W) ♣TFP ○TO-220FUSM
 *S-Mini +TSM *USM △UFM ☆SSM +VESM +CST3 ⊕CST3B ⊕CST4 +SMV /US6 ●UF6

V _{DSS} (V) I _D (A)	20	30	40	50	60	75	80	100	150	
11		N★TPC8025 (0.009)Ⓢ N★TPC8021-H (0.017)Ⓢ N★TPC8014 (0.014)Ⓢ P★TPC8111 (0.012)Ⓢ P★TPC8113 (0.01)Ⓢ P⊚TPCS8105 (0.0135)Ⓢ P⊚TPCS8104 (0.012)Ⓢ N★TPC8030 (0.0095) N★TPC8031-H (0.0133)Ⓢ N▲TPC8005-H (0.0129)Ⓢ P★TPC8121 (0.012)Ⓢ P⊚TPC8123 (0.0090)Ⓢ				N⊚TPC8050-H (0.0145)Ⓢ				
12		N⊚TPC8037-H (0.0114)Ⓢ N⊚TPC8038-H (0.0114)Ⓢ NS⊚TPC8A06-H (0.0101)Ⓢ	N⊚TPC8052-H (0.0115)Ⓢ						◆2SJ380 (0.21)Ⓢ	
12.5										
13		N★TPC8041 (0.007)Ⓢ N★TPC8026 (0.0066)Ⓢ P★TPC8107 (0.007)Ⓢ P⊚TPC8112 (0.006)Ⓢ P⊚TPC8118 (0.007) N⊚TPC8003-H (0.0169)Ⓢ N⊚TPC8040-H (0.0097)Ⓢ				N⊚TPC8049-H (0.0107)Ⓢ		N⊚TPC8051-H (0.0097)Ⓢ		
14						◆2SJ304 (0.12) 2SJ312 (0.12)				
15		N⊚TPC8032-H (0.0065)Ⓢ P⊚TPC8102 (0.0189)Ⓢ				▶TPCA8053-H (0.0223)Ⓢ				
16		NS★TPC8A02-H (0.0056)Ⓢ	N⊚TPC8047-H (0.0076)Ⓢ			N⊚TPC8048-H (0.0069)Ⓢ			○2SJ412 (0.21)Ⓢ ♣2SJ619 (0.21)Ⓢ	
17		N⊚TPC8033-H (0.0053)Ⓢ NS⊚TPC8A03-H (0.0056)Ⓢ N⊚TPC8039-H (0.006)Ⓢ								
18		P⊚TPC8114 (0.0045)Ⓢ N★TPC8027 (0.0027)Ⓢ N★TPC8028 (0.0043)Ⓢ N★TPC8029 (0.0038)Ⓢ N⊚TPC8034-H (0.0035)Ⓢ N★TPC8042 (0.0034)Ⓢ P⊚TPC8117 (0.0039)Ⓢ N⊚TPC8036-H (0.0045)Ⓢ NS⊚TPC8A04-H (0.0036)Ⓢ P⊚TPC8120 (0.0032)Ⓢ P⊚TPCC8103 (0.012)Ⓢ N⊚TPC8035-H (0.0032)Ⓢ N⊚TPC8060-H (0.0037)Ⓢ	N⊚TPC8045-H (0.0039)Ⓢ N⊚TPC8046-H (0.0057)Ⓢ					◆2SJ464 (0.12)Ⓢ ◆2SJ620 (0.09)Ⓢ ▶TPCA8006-H (0.067)	◆2SK2882 (0.12)Ⓢ ◆2SK3387 (0.12)Ⓢ	
19										
20		NS◀TPC8A05-H (0.0129)Ⓢ NS▶TPC8A05-H (0.0129)Ⓢ N◀TPC8001-H (0.0095)Ⓢ	N▶TPCA8052-H (0.0115)Ⓢ	▽2SK2614 (0.046)Ⓢ		◆2SJ349 (0.045)Ⓢ ○2SJ401 (0.045)Ⓢ ▽2SK2782 (0.055)Ⓢ			◆2SK2391 (0.085)Ⓢ ⊗TJ20A10M3 (0.090)Ⓢ	
21		N◀TPC8003-H (0.0129)Ⓢ NS⊙TPCC8A01-H (0.0099)Ⓢ								
22		N⊙TPCC8001-H (0.0083)Ⓢ N⊙TPCC8002-H (0.0083)Ⓢ N⊙TPCC8006-H (0.008)Ⓢ							▶TPCA8022-H (0.026)Ⓢ	
23		N▶TPCA8040-H (0.0094)Ⓢ								

Legend

Product series ① : π-MOSIII ② : π-MOSV ③ : π-MOSVI
 ④ : L²-π-MOSV ⑤ : L²-π-MOSVII ⑥ : U-MOS ⑦ : π-MOSVII
 ⑧ : π-MOSIV ⑨ : DTMOSI ⑩ : DTMOSII

Package ◊PW-Mini ↵VS-8 ♥VS-6 ♣PS-8 ⊞STP ▲TO-92MOD ▼PW-Mold ↵New PW-Mold ⊕TSON Advance
 ⊙SOP-8 Lead Clamp ▶SOP Advance ◆TO-220NIS ⊗TO-220SIS ■TO-220AB ▨TO-220(W) ♣TFP ○TO-220FL/SM
 * S-Mini ⊕TSM ⊕USM △UFM ☆SSM ⊕VESM ⚡CST3 ⚡CST3B ⚡CST4 ⊕SMV △US6 ⚡UF6

V _{DSS} (V) I _D (A)	20	30	40	50	60	75	80	100	150
24		N ◀ TPCM8004-H (0.011)Ⓞ N ▶ TPCA8030-H (0.011)Ⓞ N ▶ TPCA8031-H (0.011)Ⓞ				N ▶ TPCA8050-H (0.0142)Ⓞ			
25		P ◀ TPCM8102 (0.0077)Ⓞ N ◀ TPCM8006 (0.0077)Ⓞ N ⊙ TPCC8008 (0.0068)Ⓞ		◆ 2SK2507 (0.046)Ⓞ	◆ 2SK2232 (0.046)Ⓞ ○ 2SK2311 (0.046)Ⓞ N ▶ TPCA8016-H (0.021)Ⓞ			⊙ TK25A10K3 (0.040)Ⓞ	
26		N ⊙ TPCC8005-H (0.0064)Ⓞ	◆ 2SK3846 (0.016)Ⓞ						
27	N ⊙ TPCC8007 (0.0046)Ⓞ							■ 2SK2314 (0.085)Ⓞ ○ 2SK2789 (0.085)Ⓞ	
28					N ▶ TPCA8049-H (0.0104)Ⓞ		N ▶ TPCA8051-H (0.0094)Ⓞ		
30		N ▶ TPCA8018-H (0.0062)Ⓞ N ◀ TPCM8002-H (0.0062)Ⓞ	N ▶ TPCA8014-H (0.009)Ⓞ N ▶ TPCA8027-H (0.010)Ⓞ		◆ 2SJ334 (0.038)Ⓞ ○ 2SJ402 (0.038)Ⓞ ⊙ TK30A06J3A (0.026)Ⓞ				◆ 2SK3443 (0.055)Ⓞ
32					○ 2SK3847 (0.016)Ⓞ N ▶ TPCA8047-H (0.0073)Ⓞ				
34		NS ▶ TPCA8A02-H (0.0053)Ⓞ N ▶ TPCA8039-H (0.0057)Ⓞ							
35		N ▶ TPCA8024 (0.0043)Ⓞ	N ▶ TPCA8015-H (0.0054)Ⓞ		◆ 2SK3662 (0.0125)Ⓞ N ▶ TPCA8048-H (0.0066)Ⓞ				
36					◆ 2SK2385 (0.03)Ⓞ				
38		NS ▶ TPCA8A08-H (0.0042)Ⓞ N ▶ TPCA8036-H (0.0038)Ⓞ	N ▶ TPCA8046-H (0.0054)Ⓞ						
40	N ▶ TPCA8011-H (0.0035)Ⓞ	P ▶ TPCA8102 (0.006)Ⓞ P ▶ TPCA8103 (0.0042)Ⓞ P ▶ TPCA8106 (0.0037)Ⓞ N ▶ TPCA8012-H (0.0049)Ⓞ N ▶ TPCA8025 (0.0036)Ⓞ N ▶ TK40P03M1 (0.0108)Ⓞ	P ▶ TPCA8108 (0.0095)Ⓞ N ▶ TK40P04M1 (0.011)Ⓞ		P ▶ TPCA8104 (0.016)Ⓞ	⊙ TK40A08K3 (0.009)Ⓞ		⊞ TK40D10J1 (0.015)Ⓞ ⊙ TK40A10J1 (0.015)Ⓞ ⊙ TK40A10K3 (0.015)Ⓞ ◆ TK40X10J1 (0.020)Ⓞ	
44		NS ▶ TPCA8A04-H (0.0032)Ⓞ							
45		□ 2SK3506 (0.02) N ▶ TPCA8019-H (0.0031)Ⓞ N ▶ TPCA8026 (0.0022)Ⓞ N ▶ TPCA8042 (0.0033)Ⓞ N ▶ TPCA8060-H (0.0034)Ⓞ		□ 2SK2550 (0.03)Ⓞ ◆ 2SK2886 (0.02)Ⓞ □ 2SK2744 (0.02)Ⓞ ○ 2SK3051 (0.03)Ⓞ	□ 2SK2233 (0.03)Ⓞ ○ 2SK2266 (0.03)Ⓞ ○ 2SK2376 (0.017)Ⓞ □ 2SK2398 (0.03)Ⓞ ◆ 2SK3844 (0.0058)Ⓞ				
46			N ▶ TPCA8045-H (0.0036)Ⓞ						
50		N ▶ TPCA8028-H (0.0028)Ⓞ N ▶ TK50P03M1 (0.0075)Ⓞ	N ▶ TK50P04M1 (0.0087)Ⓞ	□ 2SK2551 (0.011)Ⓞ □ 2SK2745 (0.0095)Ⓞ	□ 2SK2173 (0.017)Ⓞ □ 2SK2445 (0.018)Ⓞ			□ 2SK1381 (0.032)	◆ TK50X15J1 (0.03)Ⓞ ◆ TK50F15J1 (0.03)Ⓞ
55								⊞ TK55D10J1 (0.0105)Ⓞ ⊙ TK55A10J1 (0.0105)Ⓞ	
60					● 2SK2267 (0.011)Ⓞ □ 2SK2313 (0.011)Ⓞ	⊞ TK60D08J1 (0.0078)Ⓞ ⊙ TK60A08J1 (0.0078)Ⓞ		● 2SK1382 (0.020)	
70			□ TK70J04J3 (0.0038)Ⓞ ◆ TK70X04K3 (0.0056)Ⓞ ◆ TK70X04K3L (0.0056)Ⓞ		□ 2SK3845 (0.0058)Ⓞ ⊞ TK70D06J1 (0.0064)Ⓞ ⊙ TK70A06J1 (0.0064)Ⓞ ⊙ TJ70A06J3 (0.008)Ⓞ ◆ TK70X06K3 (0.008)Ⓞ				
75			◆ 2SK3843 (0.0035)Ⓞ		◆ 2SK4034 (0.0058)Ⓞ ◆ 2SK3842 (0.0058)Ⓞ				
80			◆ TK80X04K3 (0.0035)Ⓞ			⊙ TK80A08K3 (0.0045)Ⓞ ⊞ TK80D08K3 (0.0045)Ⓞ			
100			◆ TK100F04K3 (0.003)Ⓞ ◆ TK100F04K3L (0.003)Ⓞ		◆ TK100F06K3 (0.005)Ⓞ				
120					◆ TJ120F06J3 (0.008)Ⓞ				
130					◆ TK130F06K3 (0.0034)Ⓞ				
150			◆ TK150F04K3 (0.0021)Ⓞ ◆ TK150F04K3L (0.0021)Ⓞ						

Legend

Product series ① : π-MOSIII ② : π-MOSV ③ : π-MOSVI
 ④ : L²-π-MOSV ⑤ : L²-π-MOSVI ⑥ : U-MOS ⑦ : π-MOSVII
 ⑧ : π-MOSIV ⑨ : DTMOSI ⑩ : DTMOSII

Package ◊ PW-Mini ↗ VS-8 ♥ VS-6 ♣ PS-8 ◻ STP ▲ TO-92MOD ▼ PW-Mold ↘ New PW-Mold ⊙ TSON Advance
 ◊ SOP-8 Lead Clamp ▶ SOP Advance ◆ TO-220NIS ⊙ TO-220SIS ■ TO-220AB ⊞ TO-220(W) ◆ TFP ○ TO-220FL/SM
 * S-Mini † TSM * USM △ UFM ☆ SSM † VESM † CST3 ◊ CST3B ⊙ CST4 † SMV ∠ US6 ● UF6

4-1 Packaging Options

SSM Series

The SSM Series comes in small, thin packages suitable for portable devices. Chip-scale packages (1006 size) help reduce system size.

CST3 Chip-Scale Package, Transfer Molded, 3-Pin Typical product: SSM3K35CT Thickness: 0.38 typ. Unit: mm	CST3B Chip-Scale Package, Transfer Molded, 3-Pin, B-Type Typical product: SSM3J46CTB Thickness: 0.48 typ. Unit: mm	VESM (SOT-723) Very Extreme Super-Mini Typical product: SSM3K35MFV Thickness: 0.5 typ. Unit: mm	SSM (SOT-416)(SC-75) Small Super-Mini Typical product: SSM3K35FS Thickness: 0.7 typ. Unit: mm	USM (SOT-323)(SC-70) Ultra-Super-Mini Typical product: SSM3K15FU Thickness: 0.9 typ. Unit: mm
UFM Ultra-super-Mini Flat lead Typical product: SSM3J130TU Thickness: 0.7 typ. Unit: mm	S-Mini (SOT-346)(SC-59) Super-Mini Typical product: SSM3K15F Thickness: 1.1 typ. Unit: mm	TSM Thin Super-Mini Typical product: SSM3J304T Thickness: 0.7 typ. Unit: mm	CST4 Chip-Scale Package, Transfer Molded, 4-Pin Typical product: SSM4K27CT Thickness: 0.38 typ. Unit: mm	ESV (SOT-553) Extreme Super-mini, 5-pin Typical product: SSM5N15FE Thickness: 0.55 typ. Unit: mm
USV (SOT-353)(SC-88A) Ultra-Super-mini, 5-pin Typical product: SSM5N15FU Thickness: 0.9 typ. Unit: mm	UFV Ultra-super-mini, Flat lead, 5-pin Typical product: SSM5H12TU Thickness: 0.7 typ. Unit: mm	SMV (SOT-25)(SC-74A) Super-Mini, 5-pin Typical product: SSM5H14F Thickness: 1.1 typ. Unit: mm	CST6D Chip-Scale Package, Transfer Molded, 6-Pin, D-Type Typical product: SSM6N37CTD Thickness: 0.38 typ. Unit: mm	ES6 (SOT-563) Extreme Super-mini, 6-pin Typical product: SSM6N36FE Thickness: 0.55 typ. Unit: mm
US6 (SOT-353)(SC-88A) Ultra-Super-mini, 6-pin Typical product: SSM6N15FU Thickness: 0.9 typ. Unit: mm	UF6 Ultra Super mini Flat lead 6-pin Typical product: SSM6J409TU Thickness: 0.7 typ. Unit: mm			

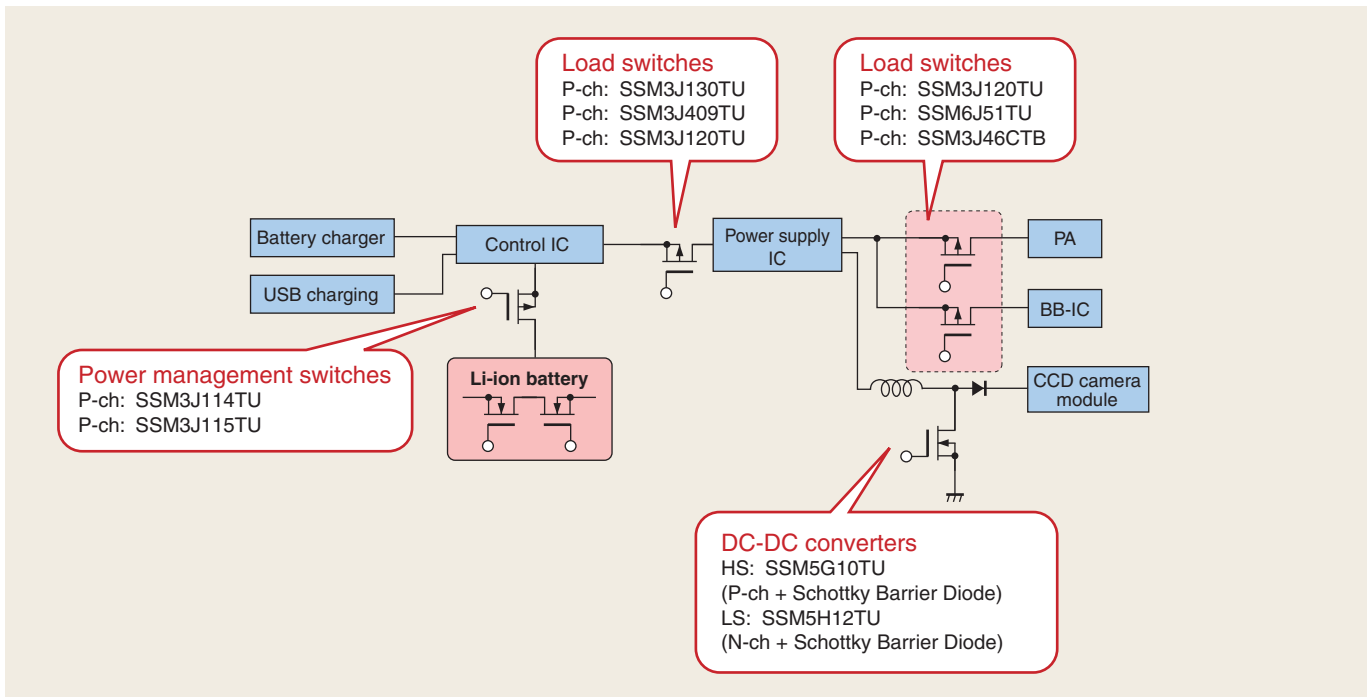
TPC Series

The TPC Series comes in small, thin packages suitable for portable devices. The latest TSON Advance package allows the maximum permissible power dissipation equivalent to SOP-8, but occupies 64% less board space.

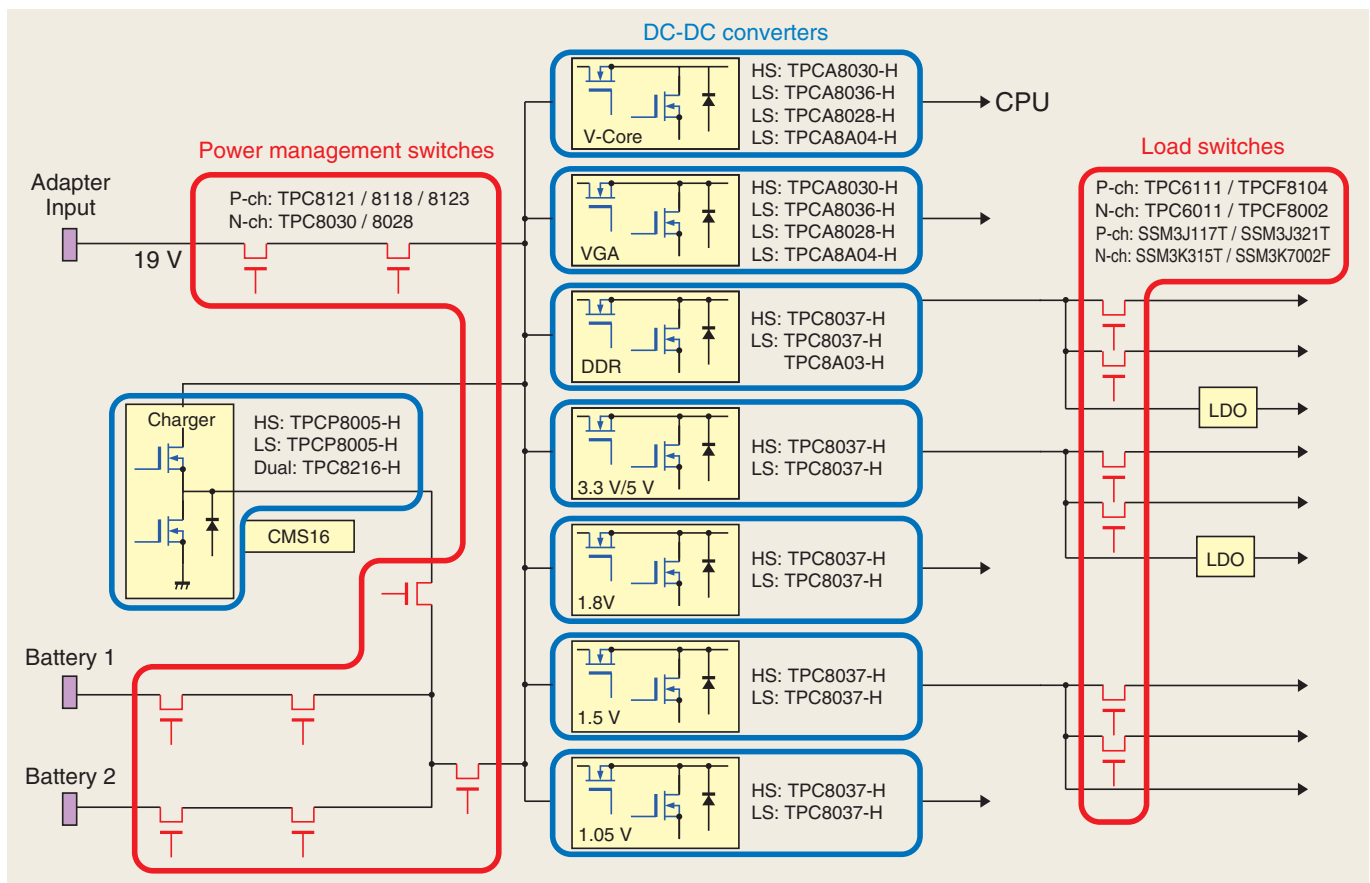
VS-6 Very Thin & Small, 6-pin Typical product: TPC6003 Thickness: 0.75 typ. Unit: mm	VS-8 Very Thin & Small, 8-pin Typical product: TPCF8101 Thickness: 0.8 typ. Unit: mm	PS-8 Progressive & Small 8-pin Series Typical product: TPCP8402 Thickness: 0.8 typ. Unit: mm	Chip LGA Land Grid Array Typical product: TPCL4201 Thickness: 0.25 typ. Unit: mm	STP2 Small Thin Package Typical product: TPCT4204 Thickness: 0.65 typ. Unit: mm
TSON Advance Typical product: TPCC8005-H Thickness: 0.85 typ. Unit: mm	TSSOP-8 Typical product: TPCS8208 Thickness: 0.9 typ. Unit: mm	TSSOP Advance Typical product: TPCM8001-H Thickness: 0.75 typ. Unit: mm	SOP-8 Typical product: TPC8035-H Thickness: 1.6 typ. Unit: mm	SOP Advance Typical product: TPCA8028-H Thickness: 0.95 typ. Unit: mm

4-2 Application Examples and Block Diagrams

Cell Phone (Power Supply Circuit)

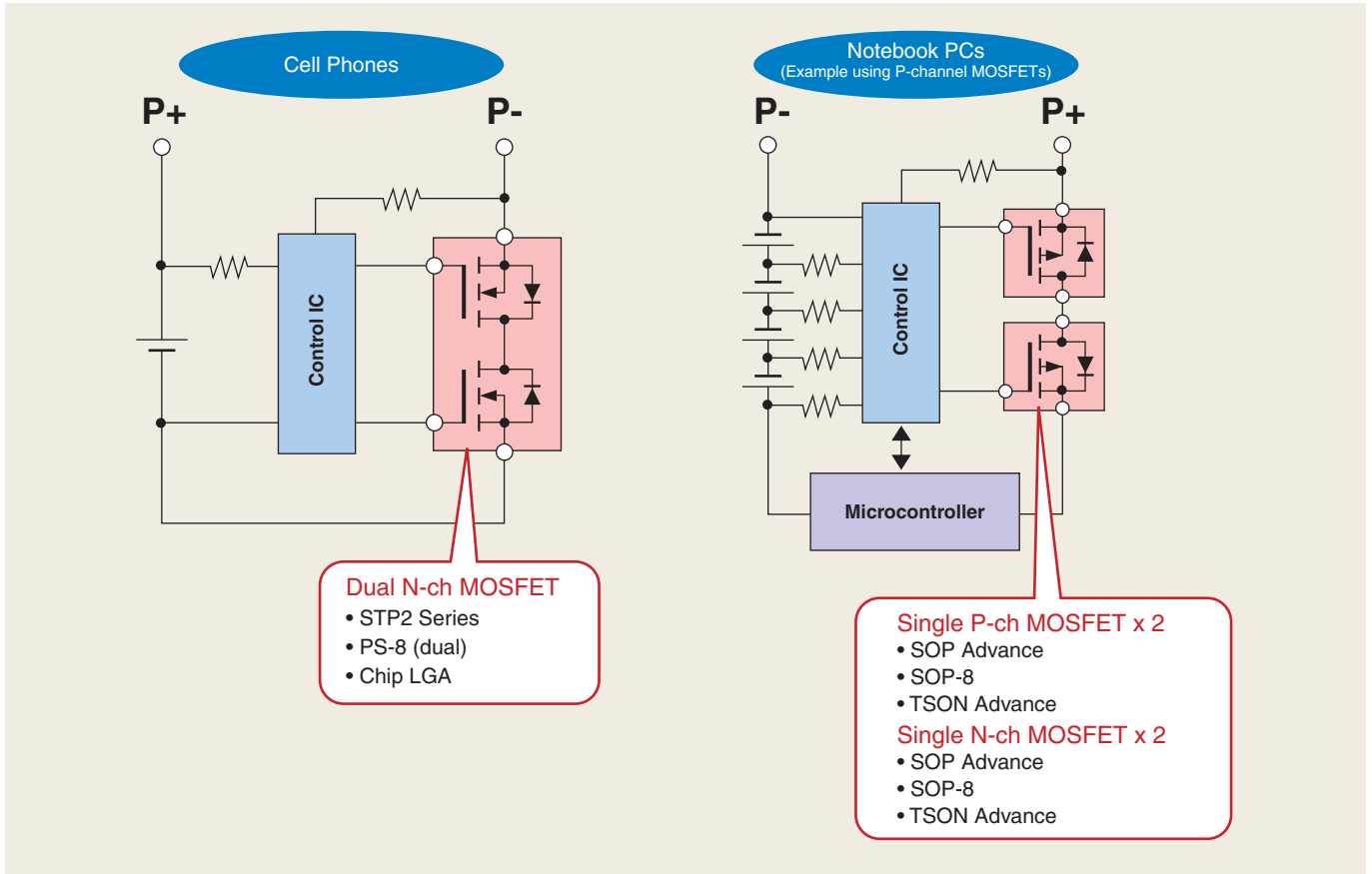


Notebook PC (Power Supply Circuit)

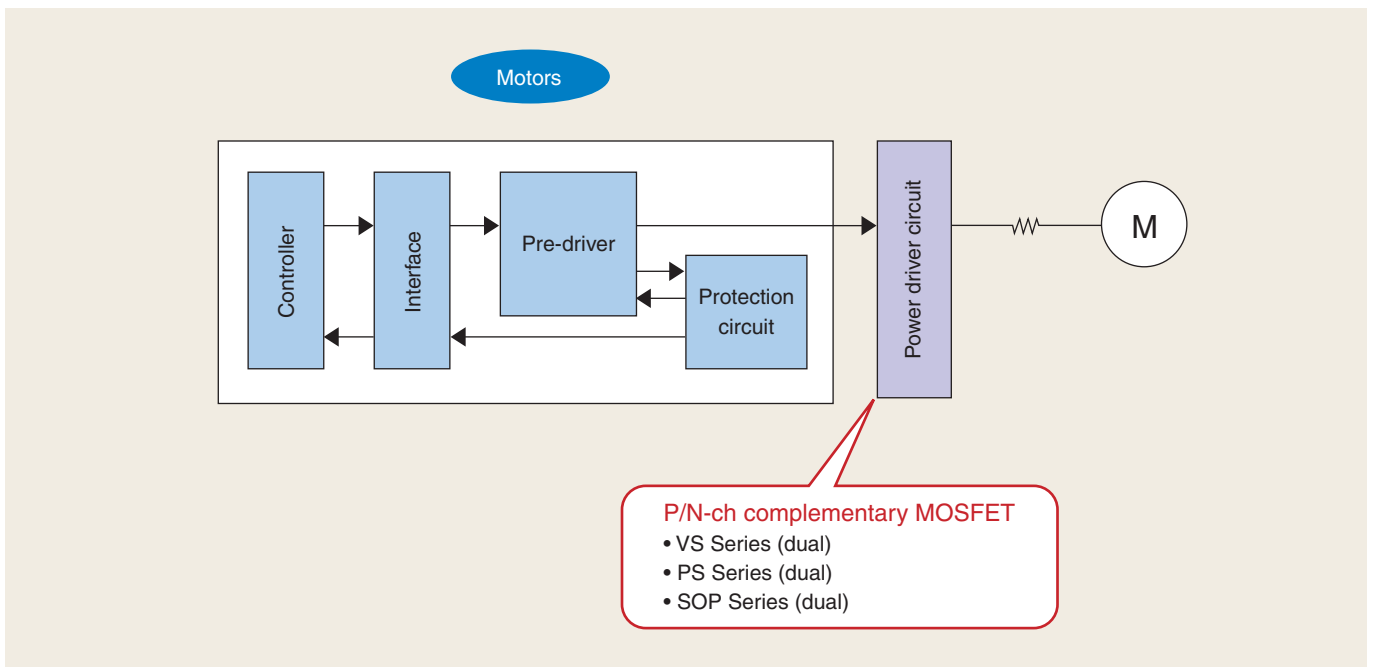


4-2 Application Examples and Block Diagrams

Lithium-Ion Secondary Battery (Battery Protection Circuits)



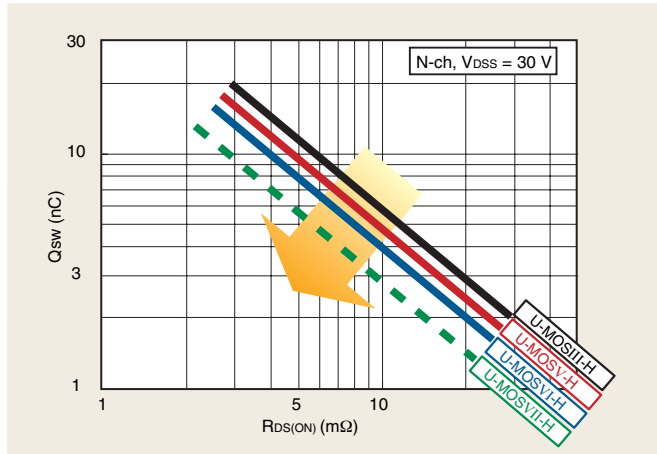
Motor Driver (Power Driver Circuit)



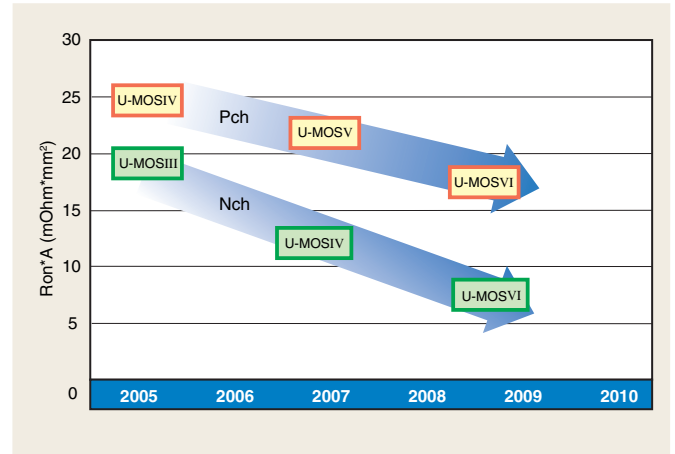
4-3 Low- V_{DSS} MOSFET Roadmaps

Roadmap for Trench MOSFETs

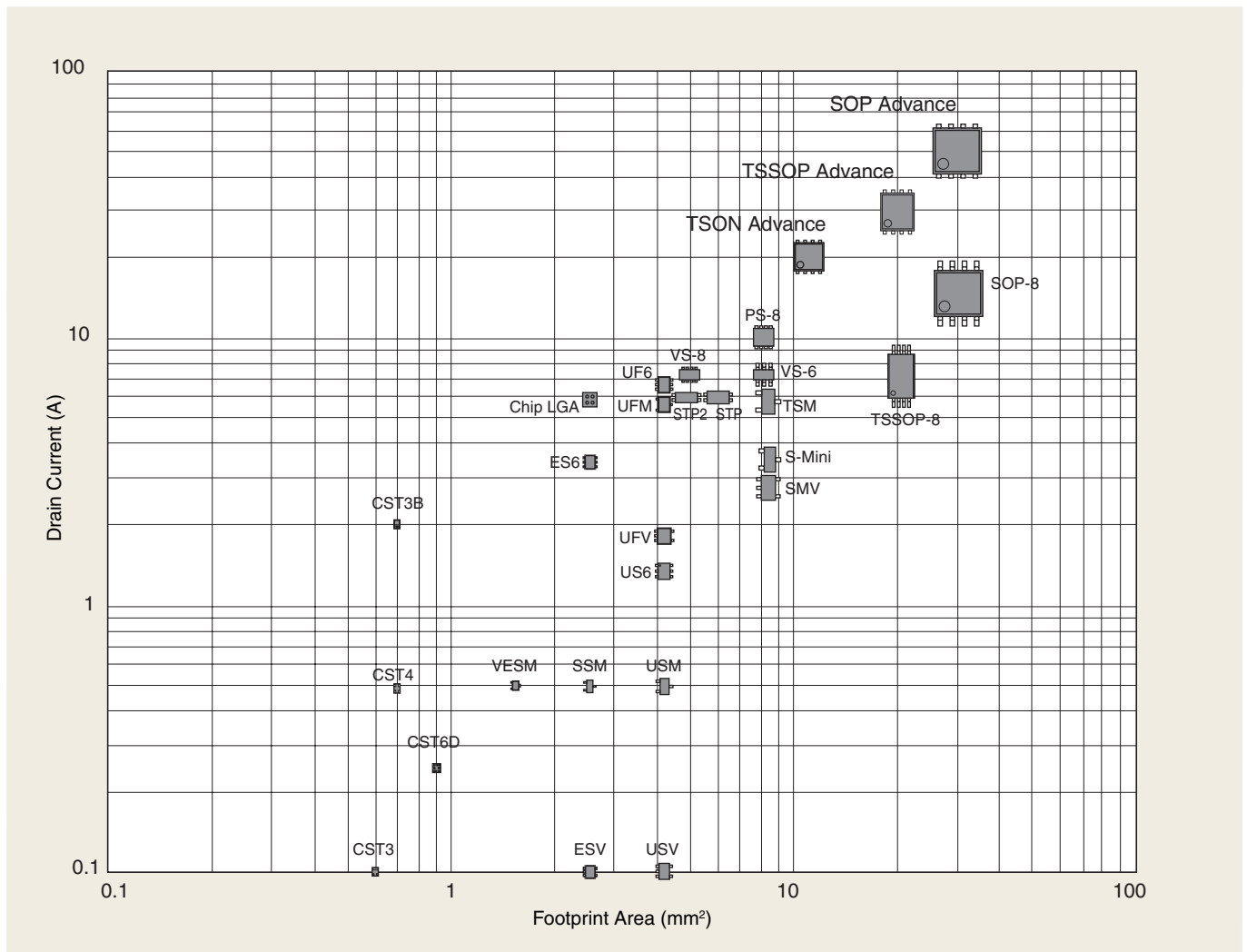
■ High-Speed, Low- V_{DSS} U-MOS



■ Low-Ron Trench MOSFETs



Package Options



■ Ultra-Small Packages

	S-Mini	USM	SSM	VESM	CST3	US6	USV	ESV	CST6D
Footprint Area	7.3 mm ²	4.2 mm ²	2.6 mm ²	1.4 mm ²	0.6 mm ²	4.2 mm ²	4.2 mm ²	2.6 mm ²	0.9 mm ²
Permissible Power Dissipation (Note)	0.2 W	0.2 W	0.1 W	0.15 W	0.1 W	0.2 W	0.2 W	0.15 W	0.14 W
Height (MAX)	1.4 mm	1.1 mm	0.9 mm	0.55 mm	0.4 mm	1.1 mm	1.1 mm	0.6 mm	0.4 mm

Note: Mounted on FR4 Board (25.4 x 25.4 mm)

■ Thermally-Enhanced Compact Packages

	TSM	UF6	SMV	UFV	UFM	ES6	CST3B	CST4
Footprint Area	8.1 mm ²	4.2 mm ²	8.1 mm ²	4.2 mm ²	4.2 mm ²	2.6 mm ²	1.0 mm ²	1.0 mm ²
Permissible Power Dissipation (Note)	0.7 W	0.5 W	0.75 W	0.5 W	0.5 W	0.5 W	1.0 W	0.4 W
Height (MAX)	0.85 mm	0.75 mm	1.4 mm	0.75 mm	0.75 mm	0.6 mm	0.5 mm	0.4 mm

Note: Mounted on FR4 Board (25.4 x 25.4 mm)

■ Thermally Enhanced Packages

	SOP Adv.	SOP-8	TSSOP Adv.	TSON Adv.
Footprint Area	30 mm ²	30 mm ²	16.3 mm ² (-46%)	10.9 mm ² (-64%)
Permissible Power Dissipation	2.8 W (+47%)	1.9 W	2.3 W (+21%)	1.9 W
Height	1.0 mm (-47%)	1.9 mm	0.8 mm (-58%)	0.9 mm (-53%)

(Percentage relative to SOP-8)

■ Compact Packages

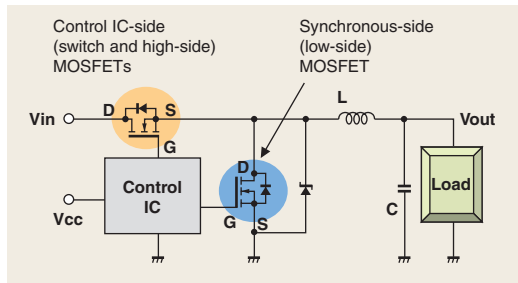
	VS-8	VS-6	PS-8	Chip LGA
Footprint Area	5.5 mm ² (-32%)	8.1 mm ²	8.1 mm ²	2.56 mm ² (-68%)
Permissible Power Dissipation	2.5 W (+14%)	2.2 W	1.68 W (-24%)	—
Height	0.85 mm	0.85 mm	0.85 mm	0.25 mm (-71%)

(Percentage relative to VS-6)

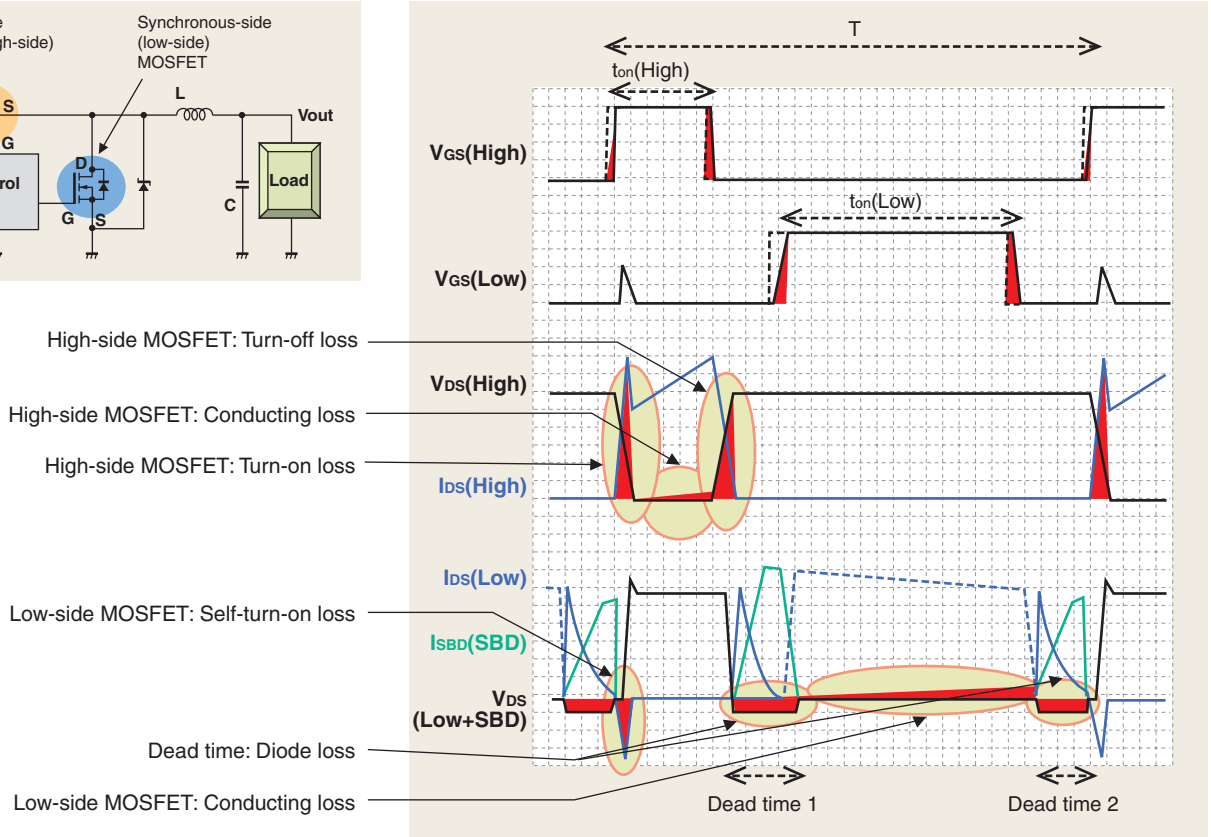
4-4 Low- V_{DS} , High-Speed MOSFETs

Synchronous Rectification DC-DC Converters – Block Diagram, Timing Chart and Power Loss Factors

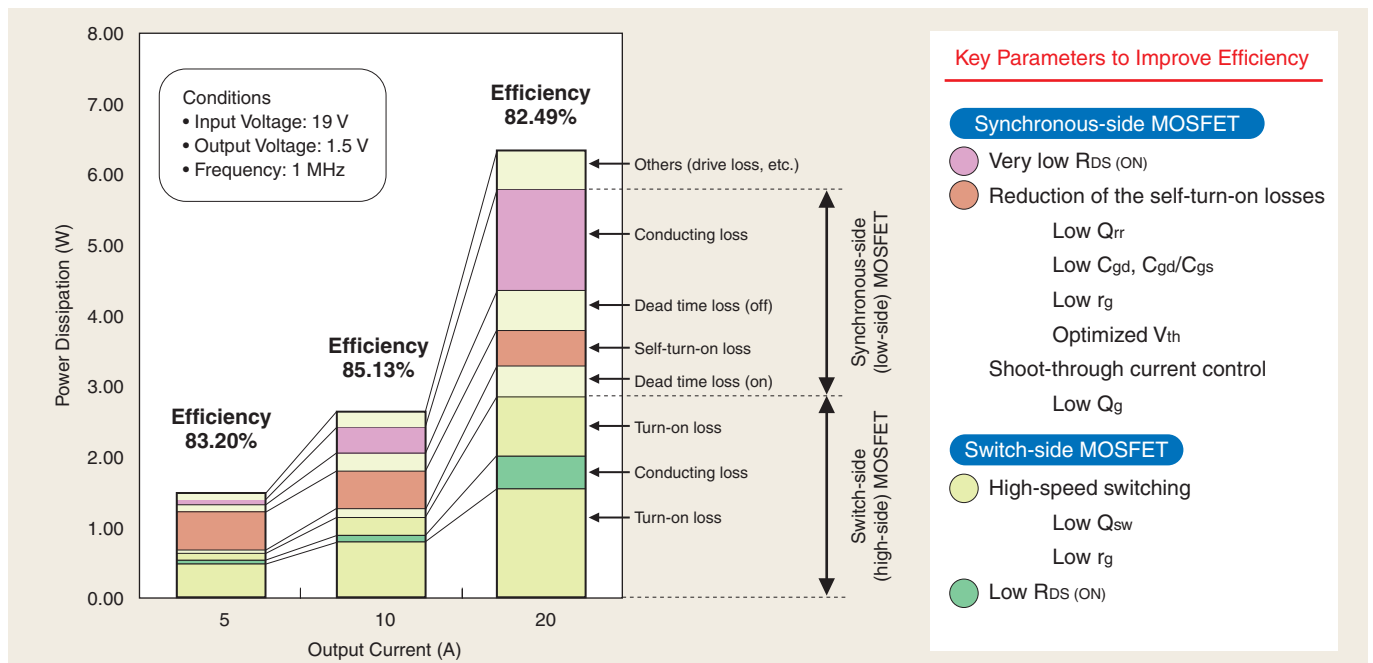
Block Diagram



Timing Chart



Synchronous Rectification DC-DC Converters – Summary Results of Power Loss Simulation and Key Parameters for MOSFETs

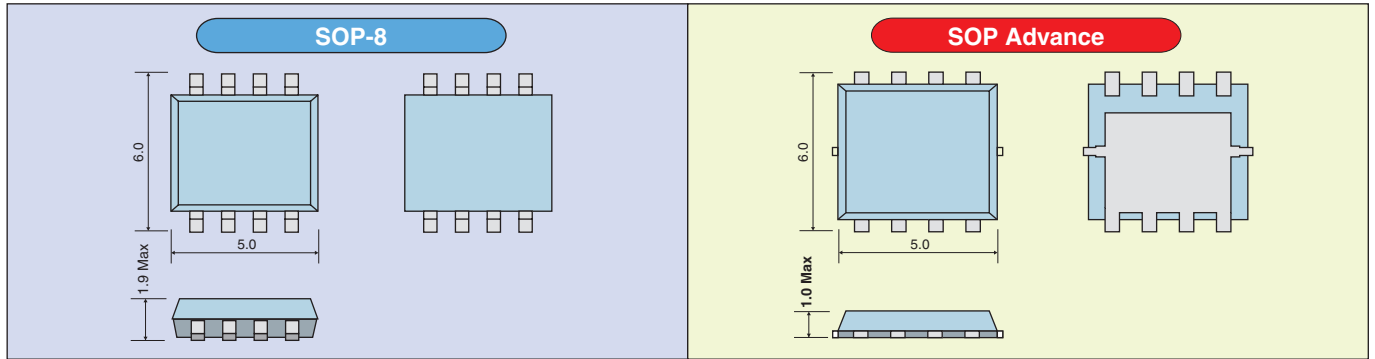


Synchronous Rectification DC-DC Converters – Efficiency Improvement by Thermally Enhanced Package and New Process Technology

Thermally Enhanced Package

Toshiba has developed the SOP Advance package with the same footprint area as the standard SOP-8 package. With an external heatsink on the bottom, the SOP Advance package offers enhanced thermal characteristics, realizing a high power dissipation and thus high-current capability.

Unit: mm



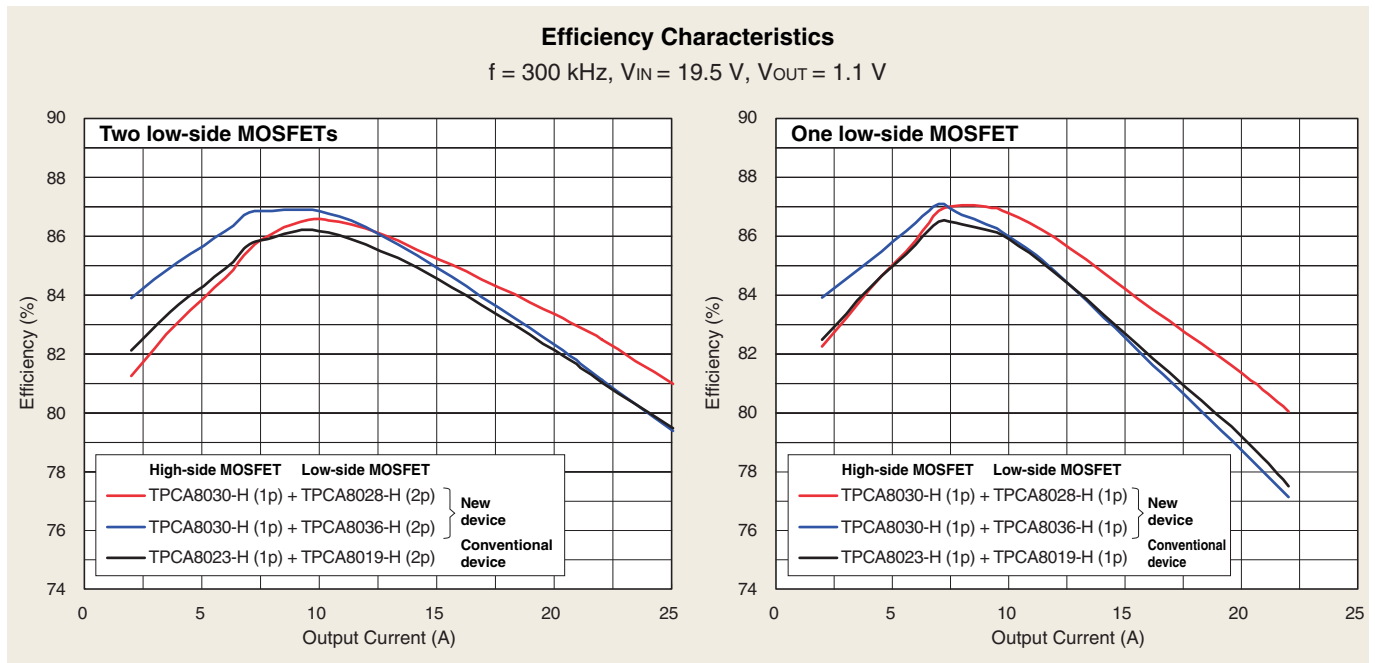
		SOP-8	SOP Advance	Features of the SOP Advance
Footprint Area	(mm ²)	30	30	Same footprint area as the SOP-8
Total height (max)	(mm)	1.9	1.0	Low profile, Thinner by 0.9 mm
R _{th(ch-a)} (t = 10 s) ^(Note 1)	(°C / W)	65.8	44.6	High power dissipation
Current rating	(A)	18	40	High current-carrying capacity
Package resistance ^(Note 2)	(mΩ)	1.6	0.5	Low package resistance

Note 1: When mounted on a glass-epoxy board (25.4 mm x 25.4 mm x 0.8 mm) Note 2: Without chip resistance

New Process Technology

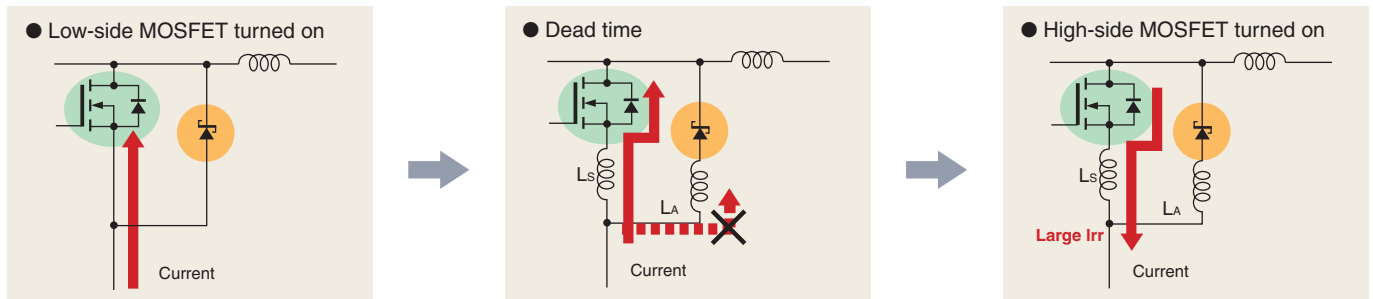
Toshiba has developed a new process technology to further reduce an internal gate resistance (r_g) and gate capacitance ratio (C_{gd}/C_{gs}) for minimizing the self-turn-on loss while maintaining both the low ON-resistance and low gate charge characteristics.

	R _{DS(ON)} Typ. @4.5 V (mΩ)	r_g Typ. (Ω)	C _{gd} /C _{gs} Typ. (%)
TPCA8028-H (New generation)	2.3	1.0	6.8
TPCA8019-H (One gen. ago)	3.1	1.0	6.6
TPCA8004-H (Two gen. ago)	4.8	2.4	12.7



Synchronous Rectification DC-DC Converters – MOSBD (MOSFET with SBD)

External SBD



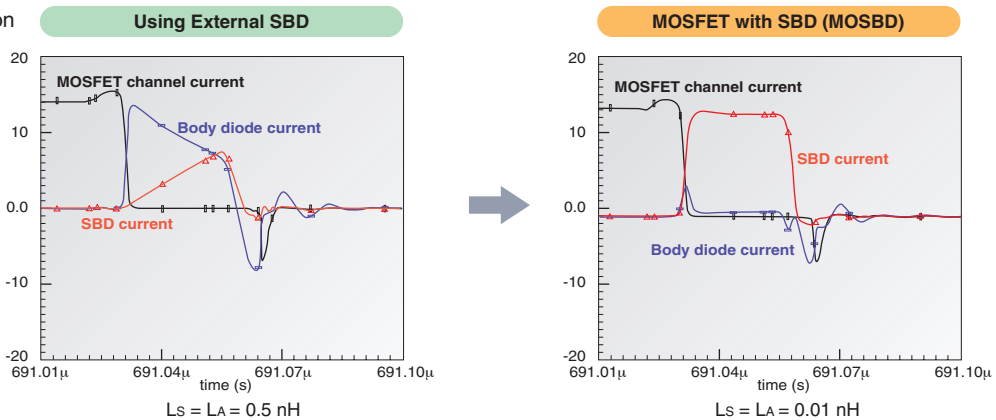
When an SBD is added externally, the SBD can't function fully due to the influence of wire inductances (L_s and L_A); thus a body diode current during the dead time becomes larger and causes the following penalties.

- 1: Increase in the conducting loss of the body diode.
- 2: Increase in the reverse recovery loss due to high di/dt .
- 3: Induces a self-turn-on phenomenon.

MOSFET with SBD (MOSBD)

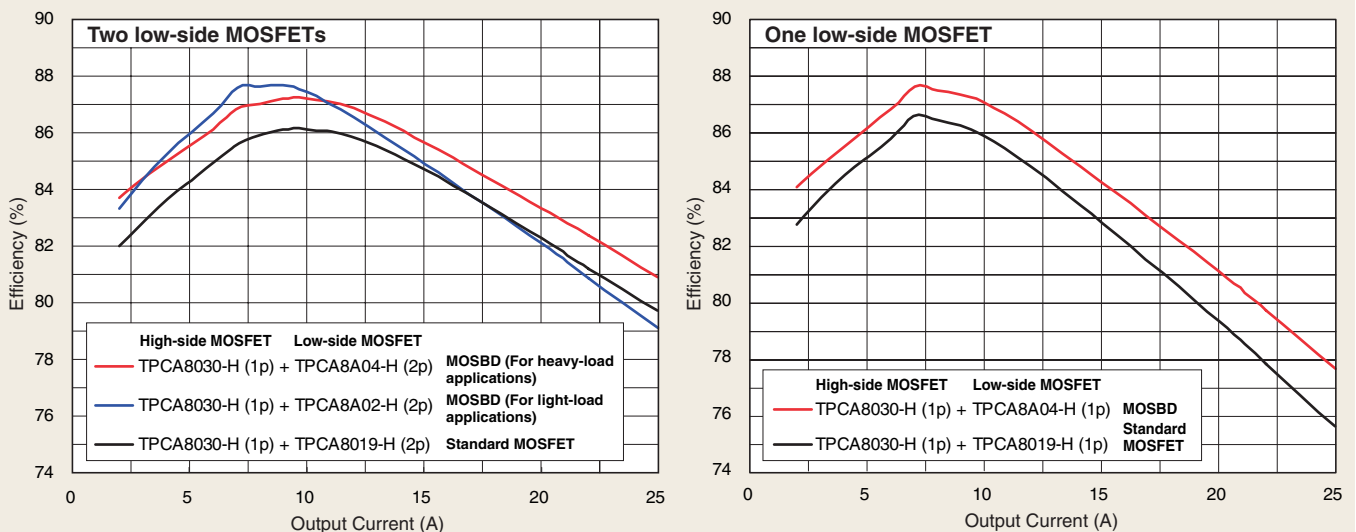
A MOSFET with SBD using a monolithic structure reduces a wire inductance (L_A) and a parasitic inductance (L_s). This structure makes it possible for the SBD to function fully and to reduce losses.

Current Waveform Simulation



Efficiency Characteristics

$f = 300 \text{ kHz}$, $V_{IN} = 19.5 \text{ V}$, $V_{OUT} = 1.1 \text{ V}$



High-Speed MOSFET Offerings

Part Number	Absolute Maximum Ratings			Circuit Configuration	Package	$R_{DS(ON)}$ Max (m Ω)			Qsw Typ.(nC) @ $V_{DS} = V_{DSS} \times 0.8$	Series	
	V_{DSS} (V)	V_{GSS} (V)	I_D (A)			2.5 V	4.5 V	10 V			
TPCA8011-H	20	± 12	40	N-ch Single	SOP Advance	7.5	3.5	—	16	U-MOSIII-H	
TPC6007-H	30		5		VS-6	—	79	54	1.8	U-MOSIII-H	
TPC6109-H	-30		-5	P-ch Single		—	83	59	4.8	U-MOSIII-H	
TPC8216-H ☆			6.4	N-ch Dual	SOP-8	—	23.0	20	3.4	U-MOSVI-H	
TPCP8005-H ☆			11	N-ch Single	PS-8	—	15.7	12.9	5.0	U-MOSV-H	
TPCC8003-H ☆			13		TSON Advance	—	19.3	16.9	4.2	U-MOSVI-H	
TPCC8001-H ☆			22			—	10.6	8.3	7.1	U-MOSV-H	
TPCC8002-H ☆			22			—	10.6	8.3	7.1	U-MOSV-H	
TPCC8006-H ☆			22			—	9.3	8.0	7.4	U-MOSVI-H	
TPCC8005-H ☆			26			—	7.4	6.4	9.1	U-MOSVI-H	
TPCM8003-H ☆			21			TSSOP Advance	—	15.7	12.9	5.0	U-MOSV-H
TPCM8004-H ☆			24		—		13.4	11	5	U-MOSV-H	
TPCM8002-H ☆			30		—		8.2	6.2	9.3	U-MOSV-H	
TPC8021-H			11		SOP-8		—	25	17	3.6	U-MOSIII-H
TPC8031-H ☆			11			—	16.1	13.3	5.0	U-MOSV-H	
TPC8037-H ☆			12			—	13.9	11.4	5	U-MOSV-H	
TPC8038-H ☆			12			—	13.9	11.4	5	U-MOSV-H	
TPC8040-H ☆			13			—	11.1	9.7	5.1	U-MOSVI-H	
TPC8032-H ☆	30		15	—		8.6	6.5	8.4	U-MOSV-H		
TPC8033-H ☆			17	—		7.2	5.3	9.6	U-MOSV-H		
TPC8039-H ☆			17	—		6.9	6.0	8.5	U-MOSVI-H		
TPC8034-H ☆			18	—		4.5	3.5	16	U-MOSV-H		
TPC8036-H ☆			18	—		5.1	4.5	13	U-MOSVI-H		
TPC8035-H ☆			18	—		3.6	3.2	17	U-MOSVI-H		
TPCA8023-H ☆		± 20	21	N-ch Single		SOP Advance	—	15.7	12.9	5.0	U-MOSV-H
TPCA8040-H ☆			23				—	10.8	9.4	5.7	U-MOSVI-H
TPCA8030-H ☆			24				—	13.4	11.0	5	U-MOSV-H
TPCA8031-H ☆			24				—	13.4	11.0	5	U-MOSV-H
TPCA8018-H ☆			30				—	8.2	6.2	9.3	U-MOSV-H
TPCA8039-H ☆			34				—	6.6	5.7	8.6	U-MOSVI-H
TPCA8036-H ☆			38				—	4.8	4.2	13	U-MOSVI-H
TPCA8012-H ☆			40		—		6.8	4.9	11.0	U-MOSV-H	
TPCA8060-H ☆			45		—		3.9	3.4	17	U-MOSVI-H	
TPCA8019-H ☆			45		—		4.1	3.1	15.5	U-MOSV-H	
TPCA8028-H ☆			50		—		3.2	2.8	20	U-MOSVI-H	
TPC6006-H			3.9				VS-6	—	100	75	1.3
TPC8022-H			7.5	N-ch Single	SOP-8	—	35	27	3.5	U-MOSIII-H	
TPC8052-H ☆			12			—	13.3	11.5	6.6	U-MOSVI-H	
TPC8047-H ☆			16			—	8.8	7.6	11	U-MOSVI-H	
TPC8046-H ☆			18			—	6.6	5.7	15	U-MOSVI-H	
TPC8045-H ☆			18			—	4.4	3.9	23	U-MOSVI-H	
TPCA8020-H			7.5			N-ch Single	SOP Advance	—	35	27	3.5
TPCA8052-H ☆	40		20	—	13.1			11.3	6.6	U-MOSVI-H	
TPCA8014-H			30	—	14			9	7.4	U-MOSIII-H	
TPCA8027-H			30	—	—			10	8.1	U-MOSIII-H	
TPCA8047-H ☆			32	—	8.5			7.3	13	U-MOSVI-H	
TPCA8015-H			35	—	7.9			5.4	13	U-MOSIII-H	
TPCA8046-H ☆			38	—	6.3			5.4	15	U-MOSVI-H	
TPCA8045-H ☆			46	—	4.1			3.6	23	U-MOSVI-H	

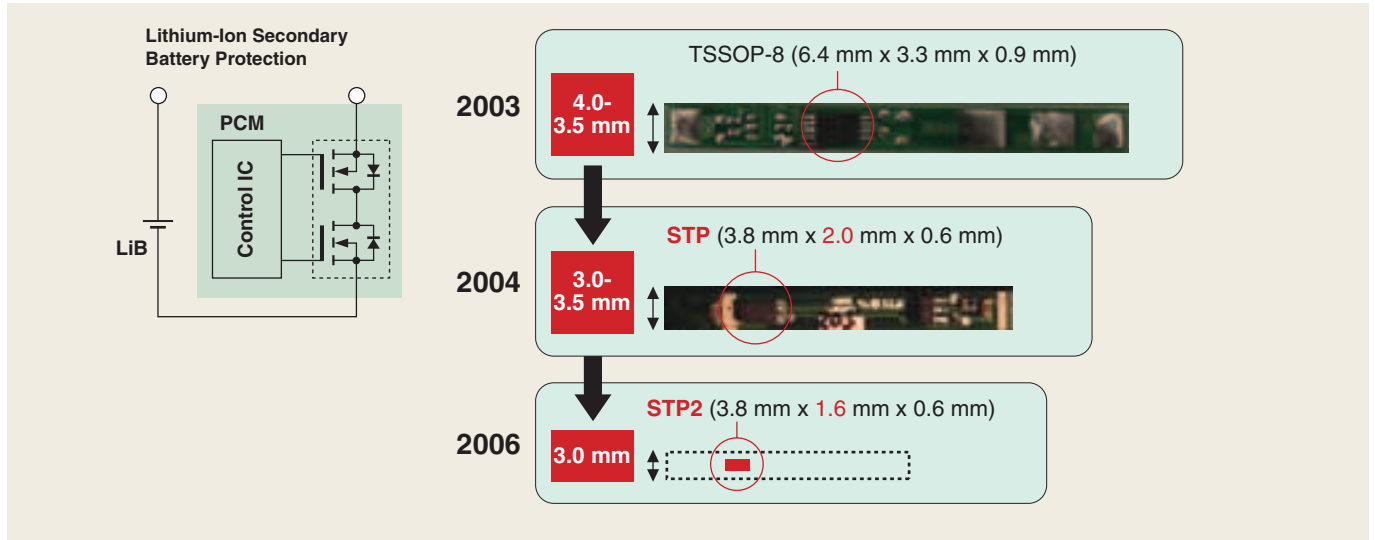
☆: No protection Zener diode between gate and source

Part Number	Absolute Maximum Ratings			Circuit Configuration	Package	R _{DS(ON)} Max (mΩ)		Q _{sw} Typ. (nC) @ V _{DS} = V _{DS} x 0.8	Series		
	V _{DSS} (V)	V _{GSS} (V)	I _D (A)			4.5 V	10 V				
TPC8218-H ☆	60	±20	3.8	N-ch Dual	SOP-8	64	57	2.6	U-MOSVI-H		
TPC8213-H			5			56	50	2.9	U-MOSIII-H		
TPC8053-H ☆			9	N-ch Single		SOP Advance	24.2	22.5	6.7	U-MOSVI-H	
TPC8050-H ☆			11				15.6	14.5	9.2	U-MOSVI-H	
TPC8049-H ☆			13				11.5	10.7	13	U-MOSVI-H	
TPC8048-H ☆			16				7.4	6.9	17	U-MOSVI-H	
TPCA8053-H ☆			15		24		22.3	6.9	U-MOSVI-H		
TPCA8050-H ☆			24		15.3		14.2	10	U-MOSVI-H		
TPCA8016-H			25		26		21	6.6	U-MOSIII-H		
TPCA8049-H ☆			28		11.2		10.4	13	U-MOSVI-H		
TPCA8048-H ☆			35		7.1		6.6	19	U-MOSVI-H		
TPC8051-H ☆			80		13		SOP-8	10.1	9.7	16	U-MOSVI-H
TPCA8051-H ☆				28	SOP Advance	9.8	9.4	18	U-MOSVI-H		
TPCP8003-H			100	2.2	PS-8	190	180	2.0	U-MOSIII-H		
TPC8214-H	2.2	N-ch Dual		SOP-8	190	180	2.0	U-MOSIII-H			
TPCA8022-H	150	±20	22	N-ch Single	SOP Advance	—	26	14	U-MOSIII-H		
TPCA8009-H			7		SOP Advance	—	350	3.7	π-MOSV		
TPCA8010-H			200		5.5	SOP Advance	—	450	3.7	π-MOSV	
TPCA8008-H			250		4	SOP Advance	—	580	3.7	π-MOSV	
TPCP8A05-H ☆			30		8	MOSBD	PS-8	21.9	17.5	2.7	U-MOSV-H
TPCC8A01-H ☆					21		TSON Advance	12.6	9.9	4.1	U-MOSV-H
TPCM8A05-H ☆	20	TSSOP Advance		17.2	12.9		3.7	U-MOSV-H			
TPC8A05-H ☆	10	SOP-8		17.6	13.3		3.7	U-MOSV-H			
TPC8A06-H ☆	12			12.9	10.1		4.5	U-MOSV-H			
TPC8A03-H ☆	17			7.0	5.6		8.4	U-MOSV-H			
TPC8A04-H ☆	18			4.5	3.6		13.4	U-MOSV-H			
TPCA8A05-H ☆	20			SOP Advance	17.2		12.9	3.7	U-MOSV-H		
TPCA8A02-H ☆	34				6.7		5.3	8.6	U-MOSV-H		
TPCA8A08-H ☆	38	5.1			3.9		11	U-MOSV-H			
TPCA8A04-H ☆	44	4.1	3.2		13.4	U-MOSV-H					
TPCP8103-H	-40	±20	-4.8	P-ch Single	PS-8	54	40	6.5	U-MOSIII-H		
TPC8116-H			-7.5		SOP-8	37	30	9.7	U-MOSIII-H		
TPCA8107-H			-7.5		SOP Advance	37	30	9.7	U-MOSIII-H		
TPC8406-H			40		6.5	N-ch/P-ch Dual	SOP-8	35	27	3.5	U-MOSIII-H
	-40	-6.5	37	30	9.7			U-MOSIII-H			

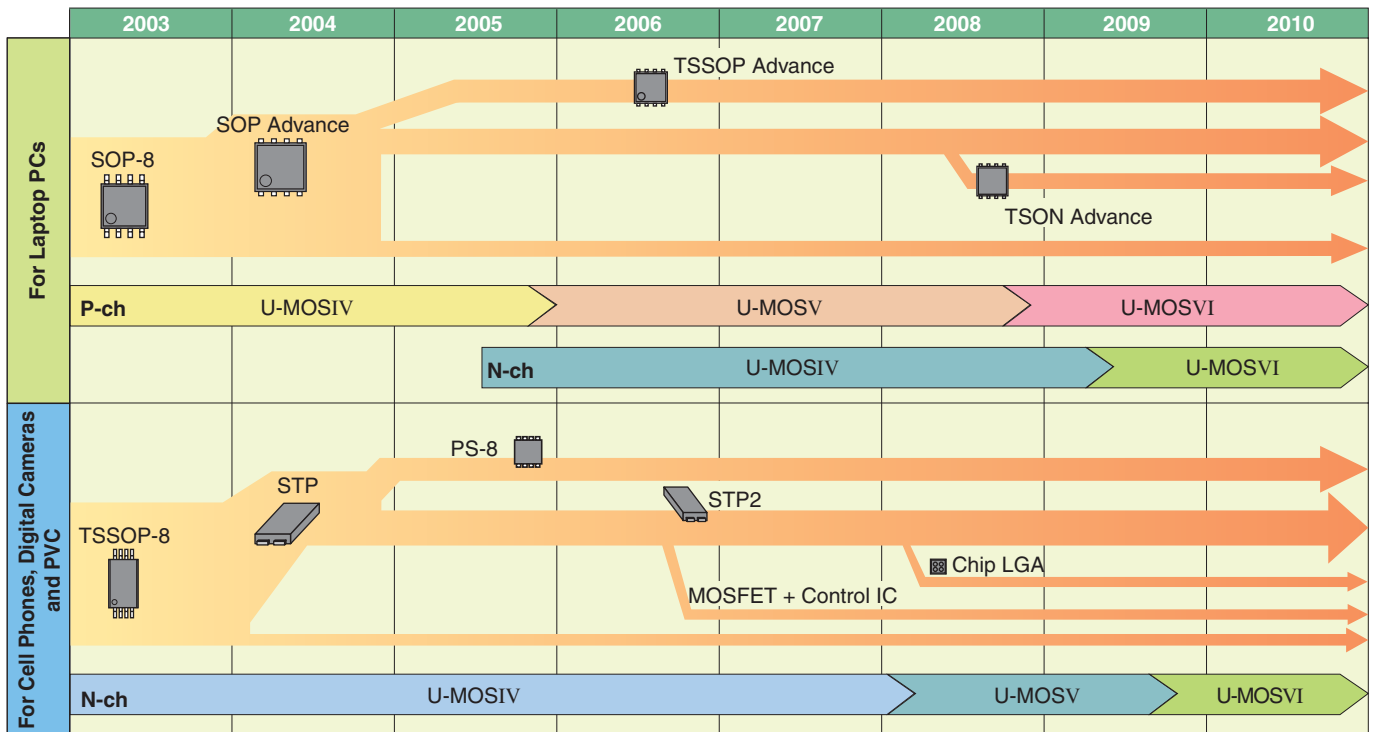
☆: No protection Zener diode between gate and source

4-5 Low- V_{DSS} , Low- $R_{DS(ON)}$ MOSFETs (for Lithium-Ion Battery Protection)

Lithium-Ion Battery Protection Circuit Trend



MOSFET Roadmap



Low-ON-resistance N-Channel Power MOSFETs

Part Number	Absolute Maximum Ratings			Circuit Configuration	Package	R _{DS(ON)} Max (mΩ)				Series		
	V _{bss} (V)	V _{gss} (V)	I _d (A)			2.5 V	4 V	4.5 V	10 V			
TPCT4203 ☆	20	±12	6	STP2	N-ch Dual	49	32	—	—	U-MOSIV		
TPCT4204 ☆	30	±12	6			52	39	—	—	U-MOSIV		
TPCL4201 ☆	20	±12	6	Chip LGA		52	—	31	—	U-MOSV		
TPCL4203 ☆*	24	±12	6			55	—	36	—	U-MOSV		
TPCL4202 ☆*	30	±12	6	PS-8	N-ch Single	64	—	40	—	U-MOSV		
TPCP8006 ☆	20	±12	9.1		13.7	—	10	—	U-MOSIV			
TPCP8004 ☆	30	±20	8.3	PS-8	N-ch Dual	—	—	14	8.5	U-MOSIV		
TPCP8202	30	±12	5.5		39	24	23	—	U-MOSIV			
TPCC8007 ☆*	20	±12	27	TSON Advance	N-ch Single	(8.7)	—	(4.6)	—	U-MOSIV		
TPCC8008 ☆	30	±25	25			—	—	12.8	6.8	U-MOSIV		
TPC8025 ☆	30	±20	11	—		—	14.5	9	U-MOSIV			
TPC8030 ☆	30	±25	11	—		—	17	9	U-MOSIV			
TPC8041 ☆	30	±20	13	SOP-8	N-ch Single	—	—	13.5	7	U-MOSIV		
TPC8026 ☆	30	±20	13			—	—	10	6.6	U-MOSIV		
TPC8028 ☆	30	±20	18			—	—	8	4.3	U-MOSIV		
TPC8029 ☆	30	±20	18			—	—	7	3.8	U-MOSIV		
TPC8042 ☆	30	±20	18			—	—	6.5	3.4	U-MOSIV		
TPC8027 ☆	30	±20	18			—	—	5.5	2.7	U-MOSIV		
TPC8208	20	±12	5			N-ch Dual	N-ch Dual	70	50	—	—	U-MOSIII
TPC8207	20	±12	6					30	20	—	—	U-MOSIII
TPC8211	30	±20	5.5					—	—	44	36	U-MOSIII
TPC8210	30	±20	8					—	—	20	15	U-MOSIII
TPCA8024 ☆	30	±20	35	SOP Advance	N-ch Single	—	—	7.8	4.3	U-MOSIV		
TPCA8025 ☆	30	±20	40			—	—	6.0	3.5	U-MOSIV		
TPCA8042 ☆	30	±20	45			—	—	5.7	3.3	U-MOSIV		
TPCA8026 ☆	30	±20	45			—	—	4.5	2.2	U-MOSIV		

☆: No protection Zener diode between gate and source * : Under development

Low-ON-resistance P-Channel Power MOSFETs

Part Number	Absolute Maximum Ratings			Circuit Configuration	Package	R _{DS(ON)} Max (mΩ)				Series
	V _{bss} (V)	V _{gss} (V)	I _d (A)			2.5 V	4 V	4.5 V	10 V	
TPCC8102 ☆	-30	±20	-15	TSON Advance	P-ch Single	—	33.2	—	18.9	U-MOSV
TPCC8103 ☆	-30	±20	-18			—	22	—	12	U-MOSV
TPC8115	-20	±8	-10	SOP-8		14	—	10	—	U-MOSIV
TPC8119 ☆	-30	±20	-10			—	28	—	13	U-MOSV
TPC8121 ☆	-30	±20	-11			—	24	—	12	U-MOSV
TPC8111	-30	±20	-11			—	18	—	12	U-MOSIV
TPC8113	-30	±20	-11			—	18	—	10	U-MOSIV
TPC8123 ☆	-30	-25/+20	-11			—	—	12.5	9	U-MOSVI
TPC8122 ☆	-30	±20	-12			—	16.5	—	8	U-MOSV
TPC8118 ☆	-30	±20	-13			—	15	—	7	U-MOSV
TPC8114	-30	±20	-18			—	6.8	—	4.5	U-MOSIV
TPC8117 ☆	-30	±20	-18			—	7.9	—	3.9	U-MOSV
TPC8120 ☆	-30	-25/+20	-18	—		—	4.2	3.2	U-MOSVI	
TPC8405	30	±20	6	N-ch/P-ch Dual		—	—	33	26	U-MOSIII
	-30	±20	-4.5			—	—	42	33	U-MOSIV
TPCM8102 ☆	-30	±20	-25	TSSOP Advance		P-ch Single	—	16	—	7.7
TPCA8105	-12	±8	-6	SOP Advance	51		33	—	—	U-MOSIV
TPCA8103	-30	±20	-40		—		6.8	—	4.2	U-MOSIV
TPCA8106 ☆	-30	±20	-40		—		7.8	—	3.7	U-MOSV

☆: No protection Zener diode between gate and source

4-6 Semi-Power MOSFET Offerings

Semi-Power P-Channel Single MOSFETs

Unit: mm

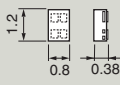
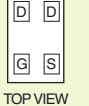
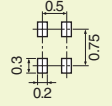
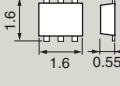
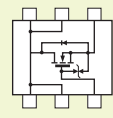
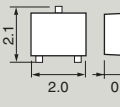
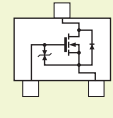
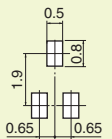
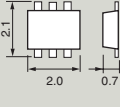
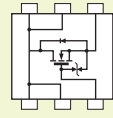
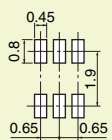
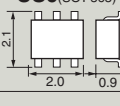

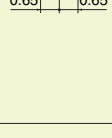
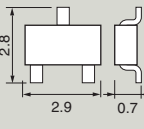
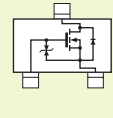
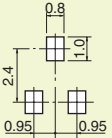
Package	Part Number	V_{DSS} (V)	V_{GS} (V)	I_D (A)	$R_{DS(ON)}$ Max (m Ω)				C_{iss} (pF)	Series	*Internal Connections	Land Pattern Example
					$V_{GS} = 1.5$ V	$V_{GS} = 1.8$ V	$V_{GS} = 2.5$ V	$V_{GS} = 4.0$ V				
CST3B 	SSM3J46CTB	-20	± 8	-2.0	250	178	133	103 (@4.5 V)	290	U-MOSVI		
ES6 (SOT-563) 	SSM6J212FE*	-20	± 8	-3.3	108	73.7	45.6	43.4(@4.5V)	834	U-MOSVI		
	SSM6J53FE	-20	± 8	-1.8	364	204	136	—	568	U-MOSIV		
	SSM6J206FE	-20	± 8	-2.0	—	320	186	130	335	U-MOSIII		
	SSM6J205FE	-20	± 8	-0.8	—	460	306	234	250	U-MOSIII		
	SSM6J26FE	-20	± 8	-0.5	—	980	330	230	250	U-MOSIII		
	SSM6J23FE	-12	± 8	-1.2	—	—	210	160	420	U-MOSIII		
	SSM6J25FE	-20	± 12	-0.5	—	—	430	260	218	U-MOSIII		
SSM6J207FE	-30	± 20	-1.4	—	—	—	491	137	U-MOSII			
UFM 	SSM3J132TU*	-12	± 5	-5.0	40.4	28.3	21.7	17.8(@4.5V)	2700	U-MOSVI		
	SSM3J130TU	-20	± 8	-4.4	63.2	41.1	31	25.8(@4.5V)	1800	U-MOSVI		
	SSM3J120TU	-20	± 8	-4.0	140	78	49	38	1484	U-MOSIV		
	SSM3J129TU	-20	± 8	-4.6	137	88	62	46(@4.5V)	640	U-MOSV		
	SSM3J115TU	-20	± 8	-2.2	353	193	125	98	568	U-MOSIV		
	SSM3J110TU	-12	± 8	-2.3	—	240	145	94	550	U-MOSIII		
	SSM3J109TU	-20	± 8	-2.0	—	300	172	130	335	U-MOSIII		
	SSM3J114TU	-20	± 8	-1.8	526	321	199	149	331	U-MOSIV		
	SSM3J108TU	-20	± 8	-1.8	—	363	230	158	250	U-MOSIII		
	SSM3J113TU	-20	± 12	-1.7	—	—	249	169	370	U-MOSIII		
	SSM3J111TU	-20	± 12	-1.0	—	—	680	480	160	U-MOSIII		
	SSM3J117TU	-30	± 20	-2.0	—	—	—	225	280	U-MOSII		
	SSM3J118TU	-30	± 20	-1.4	—	—	—	480	137	U-MOSII		
SSM3J112TU	-30	± 20	-1.1	—	—	—	790	86	U-MOSII			
UF6 	SSM6J409TU	-20	± 8	-9.5	72.3	46.3	30.2	22.1(@4.5V)	1100	U-MOSV		
	SSM6J51TU	-12	± 8	-4.0	150	85	54	—	1700	U-MOSIV		
	SSM6J50TU	-20	± 10	-2.5	—	205(@2.0V)	100	64(@4.5V)	800	U-MOSIV		
	SSM6J21TU	-12	± 12	-3.0	—	—	88	50	1300	U-MOSIII		
	SSM6J401TU	-30	± 20	-2.5	—	—	—	145	730	U-MOSIII		
SSM6J402TU	-30	± 20	-2.0	—	—	—	225	280	U-MOSIII			
US6(SOT-363) 	SSM6J08FU	-20	± 12	-1.3	—	460(@2.0V)	260	180	370	U-MOSII		
	SSM6J06FU	-20	± 12	-0.65	—	—	700	500	160	π -MOSVI		
	SSM6J07FU	-30	± 20	-0.8	—	—	—	800	130	π -MOSVI		
TSM 	SSM3J307T	-20	± 8	-5.0	83	56	40	31(@4.5V)	1170	U-MOSV		
	SSM3J321T	-20	± 8	-5.2	137	88	62	46(@4.5V)	640	U-MOSV		
	SSM3J326T*	-30	± 12	-5.6	—	115	62.5	45.7(@4.5V)	640	U-MOSVI		
	SSM3J13T	-12	± 8	-3.0	—	180(@2.0V)	95	70	890	U-MOSIII		
	SSM3J312T	-12	± 8	-2.7	—	237	142	91	550	U-MOSIII		
	SSM3J304T	-20	± 8	-2.3	—	297	169	127	335	U-MOSIII		
	SSM3J317T	-20	± 8	-3.6	—	306	144	107(@4.5V)	390	U-MOSIII		
	SSM3J313T	-20	± 8	-1.6	—	640	396	268	170	U-MOSIII		
	SSM3J01T	-30	± 10	-1.7	—	—	600	400	240	π -MOSVI		
	SSM3J02T	-30	± 10	-1.5	—	—	700	500	150	π -MOSVI		
	SSM3J314T	-30	± 20	-3.5	—	—	—	100	505	U-MOSIII-H		
	SSM3J14T	-30	± 20	-2.7	—	—	—	170	413	U-MOSII		
	SSM3J306T	-30	± 20	-2.4	—	—	—	225	280	U-MOSII		
SSM3J305T	-30	± 20	-1.7	—	—	—	477	137	U-MOSII			
S-Mini 	SSM3J327F*	-20	± 8	-3.5	242	170	125	95(@4.5V)	290	U-MOSVI		
	SSM3J325F*	-20	± 8	-2.0	362	252	191	155(@4.5V)	226	U-MOSVI		

*: Under development

* The internal connection diagrams only show the general configurations of the circuits.

Semi-Power N-Channel Single MOSFETs

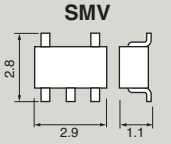
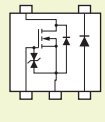
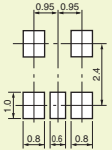
Unit: mm

Package	Part Number	V _{DSS} (V)	V _{GSS} (V)	I _b (A)	R _{DS(ON)} Max (mΩ)				C _{iss} (pF)	Series	*Internal Connections	Land Pattern Example
					V _{GS} = 1.5 V	V _{GS} = 1.8 V	V _{GS} = 2.5 V	V _{GS} = 4.0 V				
CST4 	SSM4K27CT	20	±12	0.5	—	390	260	205	174	U-MOSIII		
	ES6 (SOT-563) 	SSM6K211FE	20	±10	3.2	118	82	59	47(@4.5 V)	510	U-MOSIII	
SSM6K203FE		20	±10	2.8	153	106	76	61	400	U-MOSIII		
SSM6K202FE		30	±12	2.3	—	145	101	85	270	U-MOSIII		
SSM6K204FE		20	±10	2.0	307	214	164	126	195	U-MOSIII		
SSM6K208FE		30	±12	1.9	—	296	177	133	123	U-MOSIII		
SSM6K25FE		20	±12	0.5	—	395	190	145	268	U-MOSIII		
SSM6K24FE		30	±12	0.5	—	—	180	145	245	U-MOSIII		
SSM6K22FE		20	±12	1.4	—	—	230	170	125	U-MOSIII		
SSM6K210FE		30	±20	1.4	—	—	—	371	57	U-MOSIII		
SSM6K30FE		20	±20	1.2	—	—	—	420	60	π-MOSVII		
SSM6K31FE		20	±20	1.2	—	—	—	540	36	π-MOSVII		
UFM 	SSM3K123TU	20	±10	4.2	66	43	32	28	1010	U-MOSIII		
	SSM3K121TU	20	±10	3.2	140	93	63	48	400	U-MOSIII		
	SSM3K104TU	20	±12	3.0	—	110	74	56	320	U-MOSIII		
	SSM3K119TU	30	±12	2.5	—	134	90	74	270	U-MOSIII		
	SSM3K102TU	20	±12	2.6	—	154	99	71	268	U-MOSIII		
	SSM3K122TU	20	±10	2.0	304	211	161	123	195	U-MOSIII		
	SSM3K101TU	20	±12	2.2	—	230	138	103	125	U-MOSIII		
	SSM3K127TU	30	±12	2.0	—	286	167	123	123	U-MOSIII		
	SSM3K116TU	30	±12	2.2	—	—	135	100	245	U-MOSIII		
	SSM3K131TU	30	±20	6.0	—	—	—	41.5(@4.5 V)	450	U-MOSIV		
	SSM3K124TU	30	±20	2.4	—	—	—	120	180	π-MOSVII		
	SSM3K105TU	30	±20	2.1	—	—	—	200	102	π-MOSVI		
	SSM3K128TU	30	±20	1.5	—	—	—	360	57	U-MOSIII		
	SSM3K107TU	20	±20	1.5	—	—	—	410	60	π-MOSVII		
SSM3K106TU	20	±20	1.2	—	—	—	530	36	π-MOSVII			
UF6 	SSM6K403TU	20	±10	4.2	66	43	32	28	1050	U-MOSIII		
	SSM6K404TU	20	±10	3.0	147	100	70	55	400	U-MOSIII		
	SSM6K405TU	20	±10	2.0	307	214	164	126	195	U-MOSIII		
	SSM6K18TU	20	±12	4.0	—	—	54	40	1100	U-MOSIII		
	SSM6K406TU	30	±20	4.4	—	—	—	38.5(@4.5 V)	490	U-MOSIV		
	SSM6K34TU	30	±20	3.0	—	—	—	77(@4.5 V)	470	U-MOSIII		
	SSM6K407TU	60	±20	2.0	—	—	—	440	150	π-MOSV		
SSM6K32TU	60	±20	2.0	—	—	—	440	140	π-MOSV			
US6 (SOT-363) 	SSM6K08FU	20	±12	1.6	—	210(@2.0 V)	140	105	306	U-MOSII		
	SSM6K06FU	20	±12	1.1	—	—	210	160	125	π-MOSVI		
	SSM6K07FU	30	±20	1.5	—	—	—	220	102	π-MOSVI		
TSM 	SSM3K310T	20	±10	5.0	66	43	32	28	1120	U-MOSIII		
	SSM3K309T	20	±12	4.7	—	47	35	31	1020	U-MOSIII		
	SSM3K301T	20	±12	3.5	—	110	74	56	320	U-MOSIII		
	SSM3K316T	30	±12	4.0	—	131	87	65(@4.5 V)	270	U-MOSIII		
	SSM3K01T	30	±10	3.2	—	—	150	120	152	π-MOSVI		
	SSM3K02T	30	±10	2.5	—	—	250	200	115	π-MOSVI		
	SSM3K315T	30	±20	6.0	—	—	—	41.5(@4.5 V)	450	U-MOSIV		
	SSM3K14T	30	±20	4.0	—	—	—	67	460	U-MOSII		
	SSM3K320T	30	±20	4.2	—	—	—	77(@4.5 V)	190	U-MOSIV		
	SSM3K303T	30	±20	2.9	—	—	—	120	180	π-MOSVII		
	SSM3K12T	30	±20	3.0	—	—	—	175	120	π-MOSVII		
SSM3K318T	60	±20	2.5	—	—	—	145(@4.5 V)	235	U-MOSIV			

* The internal connection diagrams only show the general configurations of the circuits.

MOSFET with a Schottky Barrier Diode

Unit: mm

Package	Polarity	Part Number	MOSFET							SBD				*Internal Connections	Land Pattern Example		
			V _{DSS} (V)	V _{GSS} (V)	I _D (A)	R _{DS(ON)} Max (mΩ)				C _{iss} (pF)	Series	V _R (V)	I _O (A)			V _F Max (V)	
						V _{GS} = 1.5V	V _{GS} = 1.8V	V _{GS} = 2.5V	V _{GS} = 4.0V								
	N-ch+ SBD	SSM5H14F	30	±12	3.0	—	138	94	78	270	U-MOSIII	45	0.1	0.6	0.1		

* The internal connection diagrams only show the general configurations of the circuits.

VS-6 Series ... [Part Number: TPC6xxx]

Features

- Zener diode between gate and source for all products
- Thin package, with a board mounting height as low as 0.85 mm (max)



Product Offerings

Part Number	Absolute Maximum Ratings			Circuit Configuration	R _{DS(ON)} Max (mΩ)					Q _g Typ. (nC)	C _{iss} Typ. (pF)	Marking	Series
	V _{DSS} (V)	V _{GSS} (V)	I _D (A)		10 V	4.5 V	2.5 V	2.0 V	1.8 V				
TPC6004	20	±12	6	N-ch Single	—	24	32	37	—	17	1400	S2C	U-MOSIII
TPC6011 ☆*	30	±20	6		20	32	—	—	—	14	640	S2L	U-MOSIV
TPC6005	30	±12	6		—	28	35	41	—	19	1420	S2E	U-MOSIII
TPC6007-H	30	±20	5		54	79	—	—	—	2.8	240	S2G	U-MOSIII-H
TPC6006-H	40	±20	3.9		75	100	—	—	—	2.4	251	S2F	U-MOSIII-H
TPC6103	-12	±8	-5.5	P-ch Single	—	35	55	—	90	20	1520	S3C	U-MOSIII
TPC6105	-20	±8	-2.7		—	110	160	—	300	6	470	S3E	U-MOSIII
TPC6107	-20	±12	-4.5		—	55	100	180	—	9.8	680	S3G	U-MOSIV
TPC6111	-20	±8	-5.5		—	40	57	—	80	10	700	S3L	U-MOSV
TPC6108	-30	±20	-4.5		60	100	—	—	—	13	570	S3H	U-MOSIV
TPC6109-H	-30	±20	-5	59	83	—	—	—	7.2	471	S3J	U-MOSIII-H	

☆: No protection Zener diode between gate and source * : Under development

VS-8 Series ... [Part Number: TPCF8xxx]

Features

- Ultra-low ON-resistance achieved by employing the U-MOS process
- Thin package, with a board mounting height as low as 0.85 mm (max)
- 32% reduction in mounting area compared with the VS-6 (TSOP-6) Series, due to the use of a high-density flat package
- P_D = 2.5 W @ t = 5 s when the device is mounted on a glass epoxy board



Product Offerings

Part Number	Absolute Maximum Ratings			Circuit Configuration	R _{DS(ON)} Max (mΩ)					Q _g Typ. (nC)	C _{iss} Typ. (pF)	Marking	Series
	V _{DSS} (V)	V _{GSS} (V)	I _D (A)		10 V	4.5 V	2.5 V	2.0 V	1.8 V				
TPCF8002 ☆	30	±20	6	N-ch Single	23	31	—	—	—	TBD	TBD	F2B	U-MOSIV
TPCF8101	-12	±8	-6	P-ch Single	—	28	40	—	85	18	1600	F3A	U-MOSIII
TPCF8103	-20	±8	-2.7		—	110	160	—	300	6	470	F3C	U-MOSIII
TPCF8102	-20	±8	-6		—	30	41	—	90	19	1550	F3B	U-MOSIII
TPCF8104	-30	±20	-6		28	38	—	—	—	34	1760	F3D	U-MOSIV
TPCF8201	20	±12	3	N-ch Dual	—	49	66	100	—	7.5	590	F4A	U-MOSIII
TPCF8301	-20	±8	-2.7	P-ch Dual	—	110	160	—	300	6	470	F5A	U-MOSIII
TPCF8302	-20	±10	-3		—	59	95	200	—	11	800	F5B	U-MOSIV
TPCF8303	-20	±8	-3		—	58	87	—	250	11	860	F5C	U-MOSIV
TPCF8304	-30	±20	-3.2		72	105	—	—	—	14	600	F5D	U-MOSIV
TPCF8402	30	±20	4	N-ch + P-ch	50	77	—	—	—	10	470	F6B	U-MOSIII
	-30	±20	-3.2		72	105	—	—	—	14	600		U-MOSIV
TPCF8A01	20	±12	3.0	N-ch + SBD	—	49	66	100	—	7.5	590	F7A	U-MOSIII
TPCF8B01	-20	±8	-2.7	P-ch + SBD	—	110	160	—	300	6	470	F8A	U-MOSIII

☆: No protection Zener diode between gate and source

● PS-8 Series ... [Part Number: TPCP8xxx]

■ Features

- Same mounting area as for the VS-6 (TSOP-6) Series
- Using flat leads and the latest U-MOS process (U-MOSIV), the PS-8 Series offers a 70% reduction in $R_{DS(ON)}$ compared with the VS-6 Series.

■ Product Offerings

Part Number	Absolute Maximum Ratings			Circuit Configuration	$R_{DS(ON)}$ Max (m Ω)					Q_g Typ. (nC)	C_{iss} Typ. (pF)	Series
	V_{DSS} (V)	V_{GSS} (V)	I_D (A)		10 V	4.5 V	4 V	2.5 V	1.8 V			
TPCP8006 ☆	20	± 12	9.1	N-ch Single	—	10	—	13.7	—	22	1480	U-MOSIV
TPCP8001-H	30	± 20	7.2		16	25	—	—	—	11	640	U-MOSIII-H
TPCP8004 ☆	30	± 20	8.3		8.5	14.5	—	—	—	26	1270	U-MOSIV
TPCP8005-H ☆	30	± 20	11		12.9	15.7	—	—	—	20	1433	U-MOSV-H
TPCP8A05-H ☆	30	± 20	8	MOSBD	17.5	21.9	—	—	—	16	1300	U-MOSV-H
TPCP8003-H ☆	100	± 20	2.2	N-ch Single	180	190	—	—	—	7.5	360	U-MOSIII-H
TPCP8101	-20	± 8	-5.6	P-ch Single	—	30	—	41	90	19	1550	U-MOSIII
TPCP8102	-20	± 12	-7.2		—	18	—	30	—	33	2560	U-MOSIV
TPCP8103-H	-40	± 20	-4.8		40	54	—	—	—	19	800	U-MOSIII-H
TPCP8201	30	± 20	4.2	N-ch Dual	50	77	—	—	—	10	470	U-MOSIII
TPCP8202	30	± 12	5.5		—	23	—	39	—	28	2150	U-MOSIV
TPCP8203	40	± 20	4.7	P-ch Dual	40	60	—	—	—	16	770	U-MOSIII
TPCP8301	-20	± 12	-5		—	31	—	60	—	20	1500	U-MOSIV
TPCP8302	-20	± 12	-5		—	—	33	45	95	20	1500	U-MOSIV
TPCP8303	-20	± 8	-3.8		—	40	—	57	—	10	640	U-MOSV
TPCP8401	20	± 10	0.1		N-ch/P-ch Load Switch	—	—	3 Ω	4 Ω	—	—	—
TPCP8402	30	± 20	4.2	N-ch + P-ch	50	77	—	—	—	10	470	U-MOSIII
	-30	± 20	-3.4		72	105	—	—	—	14	600	U-MOSIV
TPCP8404 ☆	30	± 20	4	N-ch + P-ch	50	100	—	—	—	4.6	190	U-MOSIV
	-30	± 20	-4		50	100	—	—	—	13	510	U-MOSV
TPCP8403	40	± 20	4.7	N-ch + P-ch	40	60	—	—	—	16	770	U-MOSIII
	-40	± 20	-3.4		70	105	—	—	—	15	680	U-MOSIII
TPCP8BA1	-20	± 12	-1.3	MOSBD	—	—	180	260	—	—	—	U-MOSII
TPCP8AA1	20	± 12	1.6	—	—	—	105	140	—	—	—	U-MOSII
TPCP8J01	-32	± 20	-5.5	P-ch + NPN	35	—	49	—	—	34	1760	U-MOSIV
	50	—	0.1		—	—	—	—	—	—	—	—

☆: No protection Zener diode between gate and source

● Chip LGA Series ... [Part Number: TPCL4xxx]

■ Features

- Chip-scale package for high-density board assembly (58% reduction in mounting area compared with the STP2 package)

■ Product Offerings

Part Number	Absolute Maximum Ratings			Circuit Configuration	$R_{DS(ON)}$ Max (m Ω)				Q_g Typ. (nC)	C_{iss} Typ. (pF)	Series
	V_{DSS} (V)	V_{GSS} (V)	I_D (A)		4.5 V	4 V	3.1 V	2.5 V			
TPCL4201 ☆	20	± 12	6	N-ch Dual	31	33	44	52	11.5	720	U-MOSV
TPCL4203 ☆*	24	± 12	6		(36)	(38)	(46)	(55)	(10)	(685)	U-MOSV
TPCL4202 ☆*	30	± 12	6		(40)	(42)	(50)	(64)	(10)	(780)	U-MOSV

☆: No protection Zener diode between gate and source * : Under development

● STP2 Series ... [Part Number: TPCT4xxx]

■ Features

- The combination of a new chip design using Toshiba U-MOSIV process technology and a new small pump-structured package, offers low ON-resistance.

■ Product Offerings

Part Number	Absolute Maximum Ratings			Circuit Configuration	$R_{SS(ON)}$ Max (m Ω)			Q_g Typ. (nC)	C_{iss} Typ. (pF)	Series
	V_{SSS} (V)	V_{GSS} (V)	I_S (A)		2.5 V	4 V	4.5 V			
TPCT4203	20	± 12	6	N-ch Dual	49	32	31	11	790	U-MOSIV
TPCT4204	30	± 12	6		52	39	38	12	780	U-MOSIV

● TSON Advance Series ... [Part Number: TPCC8xxx]

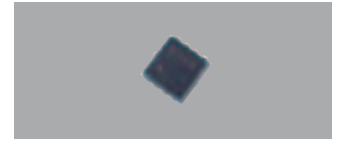
■ Features

- The small thermally enhanced package gives a 64% reduction in mounting area compared with SOP-8, yet an equivalent maximum permissible power dissipation.

■ Product Offerings

Part Number	Absolute Maximum Ratings			Circuit Configuration	R _{DS(ON)} Max (mΩ)				Q _g Typ. (nC)	C _{iss} Typ. (pF)	Series
	V _{DSS} (V)	V _{GSS} (V)	I _D (A)		10 V	4.5 V	4 V	2.5 V			
TPCC8007 ☆*	20	±12	27	N-ch Single	—	(4.6)	—	(8.7)	TBD	TBD	U-MOSIV
TPCC8008 ☆	30	±25	25		6.8	12.8	—	—	30	1600	U-MOSIV
TPCC8003-H ☆	30	±20	13		16.9	19.3	—	—	8.6	990	U-MOSVI-H
TPCC8001-H ☆	30	±20	22		8.3	10.6	—	—	14.3	1900	U-MOSV-H
TPCC8002-H ☆	30	±20	22		8.3	10.6	—	—	14.3	1900	U-MOSV-H, r _g =3.2Ω(Typ.)
TPCC8A01-H ☆	30	±20	21	MOSBD	9.9	12.6	—	—	10.1	1430	U-MOSV-H
TPCC8006-H ☆	30	±20	22	N-ch Single	8.0	9.3	—	—	15.0	1700	U-MOSVI-H
TPCC8005-H ☆	30	±20	26		6.4	7.4	—	—	19.0	2200	U-MOSVI-H
TPCC8102 ☆	-30	±20	-15	P-ch Single	18.9	—	33.2	—	26	1200	U-MOSV
TPCC8103 ☆	-30	±20	-18		12	—	22	—	38	1600	U-MOSV

☆: No protection Zener diode between gate and source * : Under development

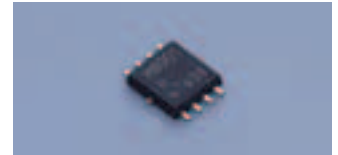


● TSSOP Advance Series ... [Part Number: TPCM8xxx]

■ Product Offerings

Part Number	Absolute Maximum Ratings			Circuit Configuration	R _{DS(ON)} Max (mΩ)			Q _g Typ. (nC)	C _{iss} Typ. (pF)	Series
	V _{DSS} (V)	V _{GSS} (V)	I _D (A)		10 V	4.5 V	4 V			
TPCM8001-H	30	±20	20	N-ch Single	9.5	14	—	19	1130	U-MOSIII-H
TPCM8003-H ☆	30	±20	21		12.9	15.7	—	11	1433	U-MOSV-H
TPCM8004-H ☆	30	±20	24		11	13.4	—	11	1433	U-MOSV-H
TPCM8006	30	±20	25		7.0	13.5	—	26	1270	U-MOSIV
TPCM8002-H ☆	30	±20	30		6.2	8.2	—	18	2270	U-MOSV-H
TPCM8A05-H ☆	30	±20	20	MOSBD	12.9	17.2	—	7.4	1300	U-MOSV-H
TPCM8102	-30	±20	-25	P-ch Single	7.7	—	16	60	2450	U-MOSV

☆: No protection Zener diode between gate and source



● SOP-8 Series ... [Part Number: TPC8xxx]

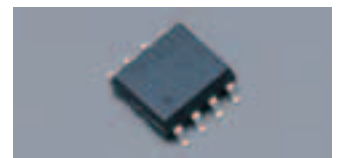
■ Features

- Low ON-resistance and high-speed-switching series are available.
Low ON-resistance series: U-MOSIV/V/VI
High-speed-switching series: U-MOSIII-H and U-MOSV-H
- ON-resistance reduction through the use of an Al strap structure

■ Product Offerings

Part Number	Absolute Maximum Ratings			Circuit Configuration	R _{DS(ON)} Max (mΩ)				Q _g Typ. (nC)	C _{iss} Typ. (pF)	Series
	V _{DSS} (V)	V _{GSS} (V)	I _D (A)		10 V	4.5 V	4 V	2.5 V			
TPC8021-H	30	±20	11	N-ch Single	17	25	—	—	11	640	U-MOSIII-H
TPC8025 ☆	30	±20	11		9	14.5	—	—	26	1270	U-MOSIV
TPC8030 ☆	30	±25	11		8.5	17	—	—	24	1140	U-MOSIV
TPC8037-H ☆	30	±20	12		11.4	13.9	—	—	11	1433	U-MOSV-H
TPC8038-H ☆	30	±20	12		11.4	13.9	—	—	11	1433	U-MOSV-H
TPC8040-H ☆	30	±20	13		9.7	11.1	—	—	12	1700	U-MOSVI-H
TPC8041 ☆	30	±20	13		7	13.5	—	—	27	1270	U-MOSIV
TPC8026 ☆	30	±20	13		6.6	10	—	—	42	1800	U-MOSIV
TPC8032-H ☆	30	±20	15		6.5	8.6	—	—	17	2270	U-MOSV-H
TPC8039-H ☆	30	±20	17		5.7	6.6	—	—	18	2600	U-MOSVI-H
TPC8033-H ☆	30	±20	17		5.3	7.2	—	—	22	2900	U-MOSV-H

☆: No protection Zener diode between gate and source



■ Product Offerings

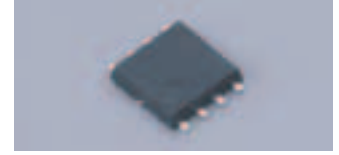
Part Number	Absolute Maximum Ratings			Circuit Configuration	$R_{DS(ON)}$ Max ($m\Omega$)				Q_g Typ. (nC)	C_{iss} Typ. (pF)	Series
	V_{DSS} (V)	V_{GS} (V)	I_D (A)		10 V	4.5 V	4 V	2.5 V			
TPC8028 ☆	30	±20	18	N-ch Single	4.3	8	—	—	45	1800	U-MOSIV
TPC8029 ☆	30	±20	18		3.8	7	—	—	49	2200	U-MOSIV
TPC8036-H ☆	30	±20	18		4.5	5.1	—	—	26	3500	U-MOSVI-H
TPC8034-H ☆	30	±20	18		3.5	4.5	—	—	35	4614	U-MOSV-H
TPC8035-H ☆	30	±20	18		3.2	3.6	—	—	44	6000	U-MOSVI-H
TPC8042 ☆	30	±20	18		3.4	6.5	—	—	56	2900	U-MOSIV
TPC8027 ☆	30	±20	18		2.7	5.5	—	—	113	4200	U-MOSIV
TPC8022-H	40	±20	7.5		27	35	—	—	11	650	U-MOSIII-H
TPC8052-H ☆	40	±20	12		11.5	13.3	—	—	13	1620	U-MOSVI-H
TPC8047-H ☆	40	±20	16		7.6	8.8	—	—	23	2590	U-MOSVI-H
TPC8046-H ☆	40	±20	18		5.7	6.6	—	—	31	3545	U-MOSVI-H
TPC8045-H ☆	40	±20	18		3.9	4.4	—	—	48	5800	U-MOSVI-H
TPC8053-H ☆	60	±20	9		22.5	24.2	—	—	13	1620	U-MOSVI-H
TPC8050-H ☆	60	±20	11		14.5	15.6	—	—	21	2590	U-MOSVI-H
TPC8049-H ☆	60	±20	13		10.7	11.5	—	—	29	3545	U-MOSVI-H
TPC8048-H ☆	60	±20	16		6.9	7.4	—	—	46	5800	U-MOSVI-H
TPC8051-H ☆	80	±20	13		9.7	10.1	—	—	43	5800	U-MOSVI-H
TPC8012-H	200	±20	1.8		400	—	—	—	11	440	π -MOSV
TPC8208	20	±12	5	N-ch Dual	—	—	50	70	9.5	780	U-MOSIII
TPC8207	20	±12	6		—	—	20	30	22	2010	U-MOSIII
TPC8211	30	±20	5.5		36	44	—	—	25	1250	U-MOSIII
TPC8212-H	30	±20	6		21	27	—	—	16	840	U-MOSIII-H
TPC8216-H ☆	30	±20	6.4		20	23	—	—	7.6	900	U-MOSVI-H
TPC8210	30	±20	8		15	20	—	—	75	3530	U-MOSIII
TPC8218-H ☆	60	±20	3.8		57	64	—	—	5.7	640	U-MOSVI-H
TPC8213-H	60	±20	5		50	56	—	—	6	625	U-MOSIII-H
TPC8214-H	100	±20	2.2	180	190	—	—	4.5	360	U-MOSIII-H	
TPC8115	-20	±8	-10	P-ch Single	—	10	—	14	115	9130	U-MOSIV
TPC8119 ☆	-30	±20	-10		13	—	28	—	40	1560	U-MOSV
TPC8121 ☆	-30	±20	-11		12	—	24	—	42	1770	U-MOSV
TPC8111	-30	±20	-11		12	—	18	—	107	5710	U-MOSIV
TPC8113	-30	±20	-11		10	—	18	—	107	4500	U-MOSIV
TPC8123 ☆	-30	-25/+20	-11		9	12.5	—	—	68	2940	U-MOSVI
TPC8122 ☆	-30	±20	-12		8	—	16.5	—	62	2450	U-MOSV
TPC8118 ☆	-30	±20	-13		7	—	15	—	65	2700	U-MOSV
TPC8114	-30	±20	-18		4.5	—	6.8	—	180	7480	U-MOSIV
TPC8117 ☆	-30	±20	-18		3.9	—	7.9	—	130	4600	U-MOSV
TPC8120 ☆	-30	-25/+20	-18		3.2	4.2	—	—	180	7420	U-MOSVI
TPC8116-H	-40	±20	-7.5		30	37	—	—	27	1190	U-MOSIII-H
TPC8110	-40	±20	-8	25	—	35	—	48	2180	U-MOSIII	
TPC8405	30	±20	6	N-ch/P-ch Dual	26	33	—	—	27	1240	U-MOSIII
	-30	±20	-4.5		33	42	—	—	40	1540	U-MOSIV
TPC8406-H	40	±20	6.5		27	35	—	—	11	650	U-MOSIII-H
	-40	±20	-6.5		30	37	—	—	27	1190	U-MOSIII-H
TPC8404	250	±20	1.1	1.7	—	—	—	10	267	π -MOSV	
	-250	±20	-0.9	2.55	—	—	—	12	381	π -MOSV	
TPC8A01	30	±20	6	N-ch/ N-ch + SBD	25	30	—	—	17	940	U-MOSIII
	30	±20	8.5/1		18	21	—	—	49	2295	U-MOSIII
TPC8A05-H ☆	30	±20	10/1	MOSBD	13.3	17.6	—	—	7.4	1300	U-MOSV-H
TPC8A06-H ☆	30	±20	12/1		10.1	12.9	—	—	9.6	1400	U-MOSV-H
TPC8A03-H ☆	30	±20	17/1		5.6	7	—	—	19	2640	U-MOSV-H
TPC8A04-H ☆	30	±20	18/1		3.6	4.5	—	—	29	4400	U-MOSV-H

☆: No protection Zener diode between gate and source

● SOP Advance Series ... [Part Number: TPCA8xxx]

■ Features

- Low ON-resistance and high-speed-switching series are available.
Low ON-resistance series: U-MOSIV/V
High-speed-switching series: U-MOSIII-H, U-MOSV-H and U-MOSVI-H
- High-current, thin and thermally enhanced package



■ Product Offerings

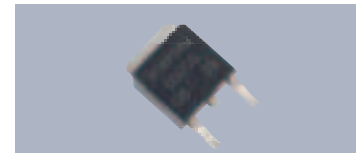
Part Number	Absolute Maximum Ratings			Circuit Configuration	R _{DS(ON)} Max (mΩ)					Q _g Typ. (nC)	C _{iss} Typ. (pF)	Series
	V _{DSS} (V)	V _{GSS} (V)	I _D (A)		10 V	4.5 V	4 V	2.5 V	1.8 V			
TPCA8011-H	20	±12	40	N-ch Single	—	3.5	—	7.5	—	32	2900	U-MOSIII-H
TPCA8040-H ☆	30	±20	23		9.4	10.8	—	—	—	11.7	1700	U-MOSVI-H
TPCA8030-H ☆	30	±20	24		11.0	13.4	—	—	—	83	1433	U-MOSV-H
TPCA8031-H ☆	30	±20	24		11.0	13.4	—	—	—	83	1433	U-MOSV-H
TPCA8018-H ☆	30	±20	30		6.2	8.2	—	—	—	18	2270	U-MOSV-H
TPCA8039-H ☆	30	±20	34		5.7	6.6	—	—	—	19	2600	U-MOSVI-H
TPCA8024 ☆	30	±20	35		4.3	7.8	—	—	—	45	1800	U-MOSIV
TPCA8036-H ☆	30	±20	38		4.2	4.8	—	—	—	26	3500	U-MOSVI-H
TPCA8012-H ☆	30	±20	40		4.9	6.8	—	—	—	22	2900	U-MOSV-H
TPCA8025 ☆	30	±20	40		3.5	6.0	—	—	—	49	2200	U-MOSIV
TPCA8060-H ☆	30	±20	45		3.4	3.9	—	—	—	34	4600	U-MOSVI-H
TPCA8042 ☆	30	±20	45		3.3	5.7	—	—	—	56	2900	U-MOSIV
TPCA8019-H ☆	30	±20	45		3.1	4.1	—	—	—	34	4614	U-MOSV-H
TPCA8026 ☆	30	±20	45		2.2	4.5	—	—	—	113	4200	U-MOSIV
TPCA8028-H ☆	30	±20	50		2.8	3.2	—	—	—	46	6000	U-MOSVI-H
TPCA8020-H	40	±20	7.5		27	35	—	—	—	11	650	U-MOSIII-H
TPCA8052-H ☆	40	±20	20		11.3	13.1	—	—	—	13	1620	U-MOSVI-H
TPCA8014-H	40	±20	30		9	14	—	—	—	22	1365	U-MOSIII-H
TPCA8027-H	40	±20	30		10	—	—	—	—	23	1430	U-MOSIII-H
TPCA8047-H ☆	40	±20	32		7.3	8.5	—	—	—	23	2590	U-MOSVI-H
TPCA8015-H	40	±20	35		5.4	7.9	—	—	—	37	2155	U-MOSIII-H
TPCA8046-H ☆	40	±20	38		5.4	6.3	—	—	—	29	3545	U-MOSVI-H
TPCA8045-H ☆	40	±20	46		3.6	4.1	—	—	—	47	5800	U-MOSVI-H
TPCA8053-H ☆	60	±20	15		22.3	24	—	—	—	13	1620	U-MOSVI-H
TPCA8050-H ☆	60	±20	24		14.2	15.3	—	—	—	21	2590	U-MOSVI-H
TPCA8016-H	60	±20	25		21	26	—	—	—	22	1375	U-MOSIII-H
TPCA8049-H ☆	60	±20	28		10.4	11.2	—	—	—	29	3545	U-MOSVI-H
TPCA8048-H ☆	60	±20	35		6.6	7.1	—	—	—	46	5800	U-MOSVI-H
TPCA8051-H ☆	80	±20	28		9.4	9.8	—	—	—	47	5800	U-MOSVI-H
TPCA8006-H	100	±20	18		67	—	—	—	—	12	780	π-MOSVII
TPCA8022-H	100	±20	22		26	—	—	—	—	38	2330	U-MOSIII-H
TPCA8009-H	150	±20	7		350	—	—	—	—	10	600	π-MOSV MACHII
TPCA8010-H	200	±20	5.5		450	—	—	—	—	10	600	π-MOSV MACHII
TPCA8008-H	250	±20	4		580	—	—	—	—	10	600	π-MOSV MACHII
TPCA8105	-12	±8	-6	—	33	—	51	92	18	1600	U-MOSIV	
TPCA8103	-30	±20	-40	4.2	—	6.8	—	—	184	7880	U-MOSIV	
TPCA8106 ☆	-30	±20	-40	3.7	—	7.8	—	—	120	4600	U-MOSV	
TPCA8107-H	-40	±20	-7.5	30	37	—	—	—	27	1190	U-MOSIII-H	
TPCA8108	-40	±20	-40	9.5	—	—	—	—	100	4820	U-MOSIII	
TPCA8104	-60	±20	-40	16	—	24	—	—	90	4300	U-MOSIII	
TPCA8A05-H ☆	30	±20	10	12.9	17.2	—	—	—	7.4	1300	U-MOSV-H	
TPCA8A02-H ☆	30	±20	34	5.3	6.7	—	—	—	19	2640	U-MOSV-H	
TPCA8A08-H ☆	30	±20	38	4.2	5.3	—	—	—	24	3500	U-MOSV-H	
TPCA8A04-H *☆	30	±20	42	3.2	4.1	—	—	—	30	4400	U-MOSV-H	

☆: No protection Zener diode between gate and source *☆: Under development

● DPAK Series ... [Part Number: TKxxPxxxM1]

■ Features

- High-current, thermally enhanced package



■ Product Offerings

Part Number	Absolute Maximum Ratings			Circuit Configuration	R _{DS(ON)} Max (mΩ)		Q _g Typ. (nC)	C _{iss} Typ. (pF)	Series
	V _{DSS} (V)	V _{GSS} (V)	I _D (A)		10 V	4.5 V			
TK40P03M1 ☆	30	±20	40	N-ch Single	10.8	14.4	9.4	1150	U-MOSVI-H
TK50P03M1 ☆	30	±20	50		7.5	9.8	13.3	1700	U-MOSVI-H
TK40P04M1 ☆	40	±20	40		10.3	13.4	29	1920	U-MOSVI-H
TK50P04M1 ☆	40	±20	50		8.7	10.2	38	2600	U-MOSVI-H

☆: No protection Zener diode between gate and source

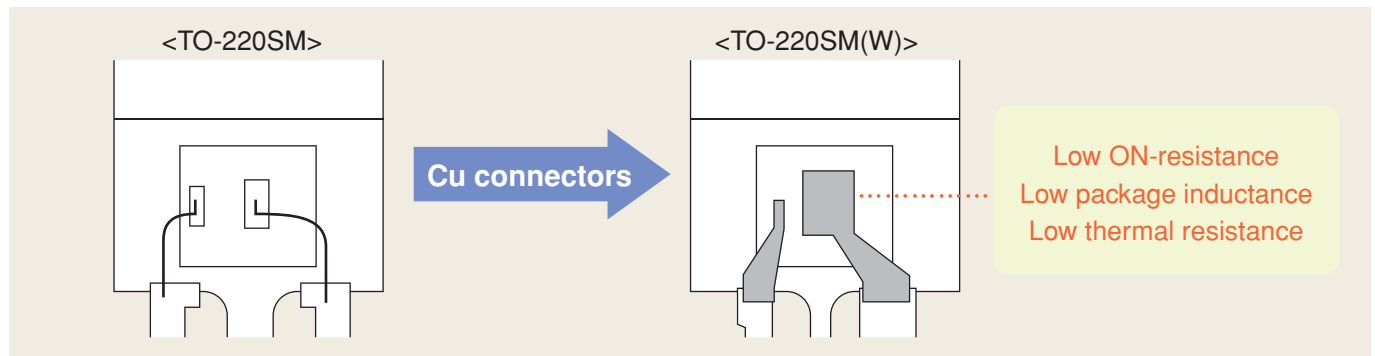
5-1 TO-220SM(W) Series

The TO-220SM(W) package, which uses Cu connectors and a wide source terminal, realizes low ON-resistance and a high current-carrying capability.

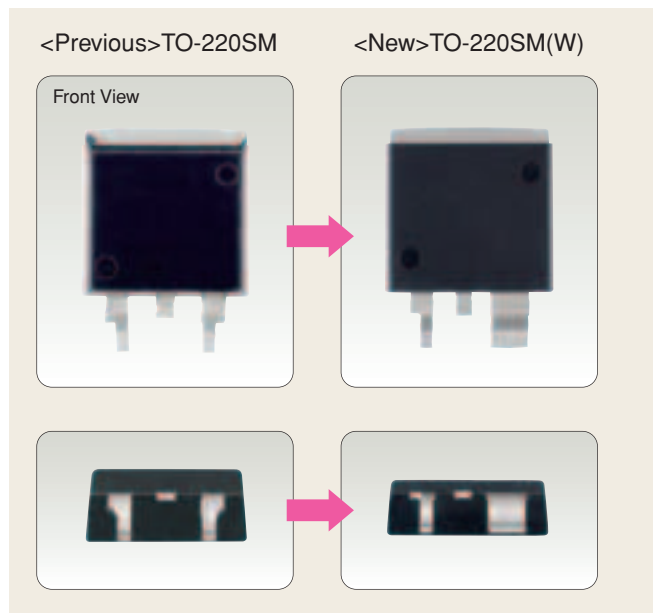
■ Features

- Achieves low ON-resistance, low package inductance and low thermal resistance due to the use of Cu connectors.
- Achieves a high current-carrying capability due to the use of a wide source terminal (I_D (DC) = 150 A max)
- AEC-Q101-qualified at a channel temperature (T_{ch}) of 175°C
- Thin package: 3.7-mm (max) thick, much thinner than the previous TO-220SM package with a thickness of 4.7 mm (max)

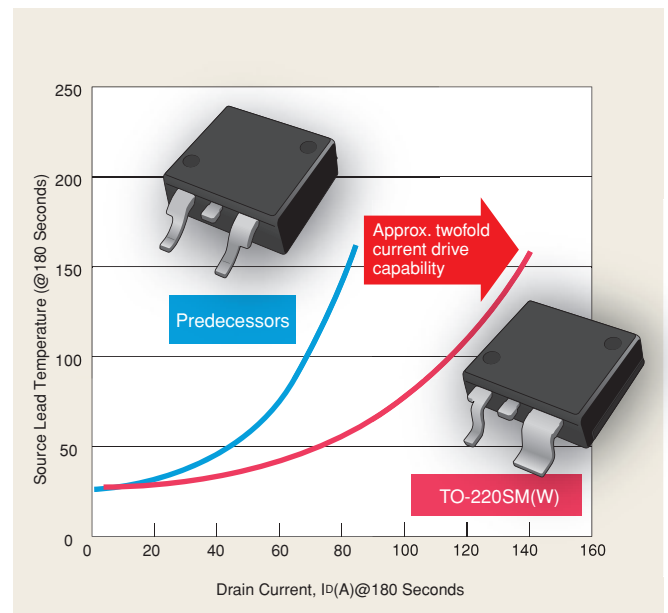
■ Characteristics of the WARP Series



■ Package



■ Comparison of the Source Lead Temperature

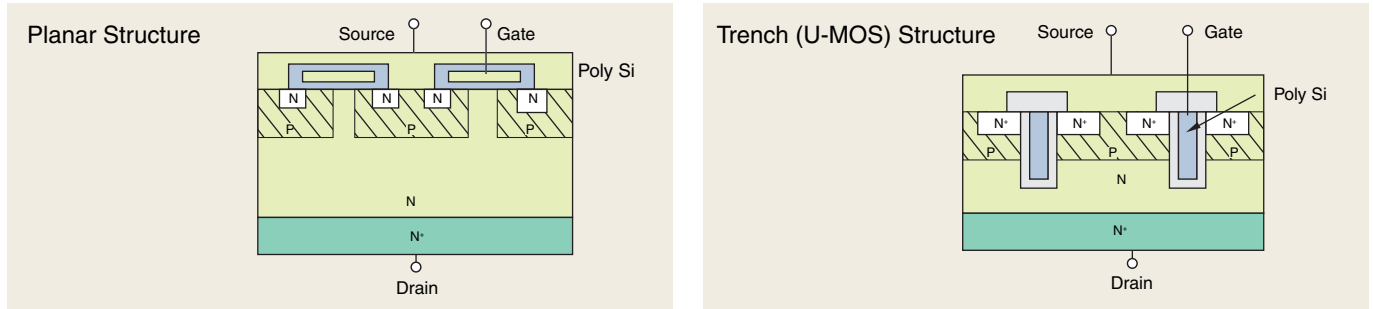


■ Product Offerings

Part Number	Absolute Maximum Ratings			$R_{DS(ON)}$ Max (m Ω)		C_{iss} Typ. (pF)	Q_g Typ. (nC)	Series
	V_{DSS} (V)	V_{GS} (V)	I_D (A)	$V_{GS} = 10$ V	$V_{GS} = 6$ V			
TJ120F06J3	-60	± 20	-120	8	—	11500	258	U-MOSIII
TK100F04K3	40	± 20	100	3	—	4500	102	U-MOSIV
TK100F04K3L	40	± 20	100	3	4.5	4980	105	U-MOSIV
TK150F04K3	40	± 20	150	2.1	—	7500	166	U-MOSIV
TK150F04K3L	40	± 20	150	2.1	3.2	9400	190	U-MOSIV
TK100F06K3	60	± 20	100	5	—	4500	98	U-MOSIV
TK130F06K3	60	± 20	130	3.4	—	8400	170	U-MOSIV
TK50F15J1	150	± 20	50	30	—	4300	75	U-MOSIII

5-2 U-MOS (Trench Type) Series

Fabricated using a trench structure, the U-MOS Series ultra-high integration density and thus



■ Features

- High density through the use of submicron technology
- 60% reduction in $R_{DS(ON)}$ by per unit area (as compared with the maximum $R_{DS(ON)}$ of L^2 - π -MOSV)
- Guaranteed avalanche capability and improved di/dt rate

■ Product Offerings

Applications	Part Number	Absolute Maximum Ratings				Package	$R_{DS(ON)}$ Max (m Ω)				Q_g Typ. (nC)	Series
		V_{DS} (V)	V_{GS} (V)	I_D (A)	P_D (W)		10 V	6 V	4.5 V	4 V		
motor drive Solenoids Lamp drivers DC-DC converters	2SJ668	-60	± 20	-5	20	PW-Mold	170	—	—	250	15	U-MOSIII
	2SJ681	-60	± 20	-5	20	New PW-Mold2	170	—	—	250	15	
	2SJ669	-60	± 20	-5	1.2	TPS	170	—	—	250	15	
	TPCA8104	-60	± 20	-40	45	SOP Advance	16	—	—	24	90	
	TJ70A06J3	-60	± 20	-70	54	TO-220SIS	8.0	—	10	—	246	
	TJ120F06J3	-60	± 20	-120	300	TO-220SM(W)	8.0	—	—	—	258	
LCD backlight inverter	TJ20A10M3 ☆	-100	± 20	-20	35	TO-220SIS	90	—	—	—	120	U-MOSVI
motor drive Solenoids Lamp drivers DC-DC converters	2SK3754	30	± 20	5	25	TO-220NIS	89	—	99	—	2.5	U-MOSIII
	2SK3846	40	± 20	26	25	TO-220NIS	16	—	28	—	40	
	2SK3847	40	± 20	32	30	TO-220SM	16	—	28	—	40	
	TK70J04J3	40	± 20	70	150	TO-3P(N)	3.8	—	8.3	—	210	U-MOSIV
	TK70X04K3 ☆	40	± 20	70	80	TFP	5.6	—	—	—	62	
	TK70X04K3Z	40	± 20	70	80	TFP	5.6	—	—	—	62	U-MOSIII
	2SK3843	40	± 20	75	125	TFP	3.5	—	8.0	—	210	
	TK80X04K3 ☆	40	± 20	80	125	TFP	3.5	—	—	—	100	U-MOSIV
	TK100F04K3 ☆	40	± 20	100	200	TO-220SM(W)	3.0	—	—	—	102	
	TK100F04K3L	40	± 20	100	200	TO-220SM(W)	3.0	4.5	—	—	105	U-MOSIV
	TK150F04K3 ☆	40	± 20	150	300	TO-220SM(W)	2.1	—	—	—	166	
	TK150F04K3L	40	± 20	150	300	TO-220SM(W)	2.1	3.2	—	—	190	
	2SK4017	60	± 20	5	20	New PW-Mold2	100	—	—	150	15	U-MOSIII
	2SK4033	60	± 20	5	20	New PW-Mold	100	—	—	150	15	
	TK30A06J3A	60	± 20	30	25	TO-220SIS	26	—	35	—	36	U-MOSIII
	2SK3662	60	± 20	35	35	TO-220NIS	12.5	—	—	19	91	
	2SK3844	60	± 20	45	45	TO-220NIS	5.8	—	—	—	196	U-MOSIV
	TK70X06K3 ☆	60	± 20	70	80	TFP	8.0	—	—	—	62	
	2SK3845	60	± 20	70	125	TO-3P(N)	5.8	—	—	—	196	U-MOSIII
	2SK3842	60	± 20	75	125	TFP	5.8	—	—	—	196	
	2SK4034	60	± 20	75	125	TFP	5.8	—	10	—	196	U-MOSIII
	2SK3940	75	± 20	70	150	TO-3P(N)	7.0	—	—	—	200	
	LCD backlight inverter	TK25A10K3 ☆	100	± 20	25	25	TO-220SIS	40	—	—	—	34
	TK40X10J1	100	± 20	40	125	TFP	20	—	—	—	59	U-MOSIII
	TK50F15J1	150	± 20	50	300	TO-220SM(W)	30	—	—	—	75	

☆: No protection Zener diode between gate and source

5-3 U-MOS Series for Synchronous Rectification ($V_{DS} = 60\text{ V to }150\text{ V}$)

■ Features

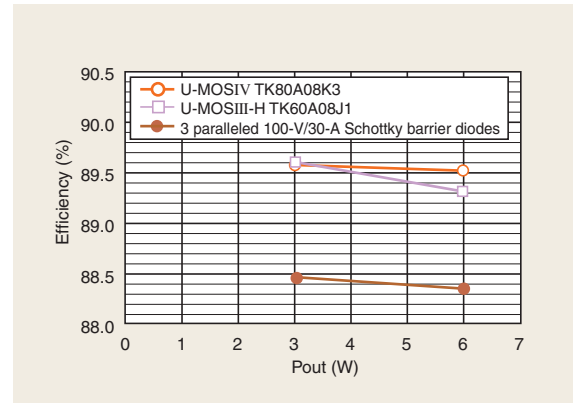
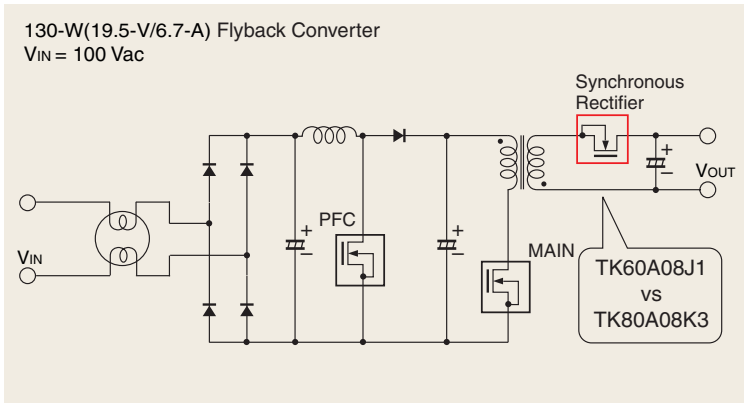
- Low ON-resistance achieved by high density through the use of submicron technology
- Guaranteed avalanche capability
- High power dissipation achieved by having the series housed in the TO-220(W) package with an exposed heatsink on the bottom of the package

■ Comparisons Between Synchronous Rectification MOSFETs

Characteristic	Symbol	Test Conditions	TK80A08K3			TK60A08J1			Unit
			Min	Typ.	Max	Min	Typ.	Max	
Gate leakage current	+I _{GSS}	V _{GS} condition*, V _{DS} = 0 V	—	—	1	—	—	10	μA
	-I _{GSS}	V _{GS} condition*, V _{DS} = 0 V	—	—	-1	—	—	-10	μA
Drain cut-off current	I _{DSS}	V _{DS} = 75 V, V _{GS} = 0 V	—	—	10	—	—	10	μA
Drain-source breakdown voltage	V _{(BR) DSS}	I _D = 10 mA, V _{GS} = 0 V	75	—	—	75	—	—	V
	V _{(BR) DSX}	I _D = 10 mA, V _{GS} = -20 V	50	—	—	60	—	—	V
Gate threshold voltage	V _{th}	V _{DS} = 10 V, I _D = 1 mA	2.0	—	4.0	1.1	—	2.3	V
Drain-source ON-resistance	R _{DS(ON)}	V _{GS} = 10 V, I _D = 40 A	—	3.6	4.5	—	6.2	7.8	mΩ
Input capacitance	C _{iss}	V _{DS} = 10 V, V _{GS} = 0 V f = 1 MHz	—	8200	—	—	5450	—	pF
Reverse transfer capacitance	C _{rss}		—	770	—	—	320	—	pF
Forward voltage	V _{DSF}	I _{DR} = 80 A, V _{GS} = 0 V	—	-0.9	-1.2	—	-0.9	-1.2	V

*: Test conditions: TK80A08K3: V_{GS} = ±20 V, TK60A08J1: V_{GS} = ±16 V

■ Efficiency Test Circuit



Efficiency approx. 1% higher than Schottky barrier diodes

■ Product Offerings

Part Number	Absolute Maximum Ratings				R _{DS(ON)} (mΩ) @ V _{GS} = 10 V		Q _g (nC) Typ.	Q _{sw} (nC) Typ.	Package	Series
	V _{DS} (V)	V _{GSS} (V)	I _D (A)	P _D (W)	Typ.	Max				
TK70D06J1	60	±20	70	140	5.1	6.4	87	30	TO-220(W)	U-MOSIII-H
TK70A06J1	60	±20	70	45	5.1	6.4	87	30	TO-220SIS	U-MOSIII-H
TK60D08J1	75	±20	60	140	6.2	7.8	86	27	TO-220(W)	U-MOSIII-H
TK60A08J1	75	±20	60	45	6.2	7.8	86	27	TO-220SIS	U-MOSIII-H
TK40A08K3	75	±20	40	42	7.0	9.0	80	—	TO-220SIS	U-MOSIV
TK80D08K3	75	±20	80	100	3.6	4.5	175	80	TO-220(W)	U-MOSIV
TK80A08K3	75	±20	80	40	3.6	4.5	175	80	TO-220SIS	U-MOSIV
TK40A10K3	100	±20	40	40	11.5	15	85	40	TO-220SIS	U-MOSIV
TK40D10J1	100	±20	40	100	11.5	15	76	25	TO-220(W)	U-MOSIII-H
TK40A10J1	100	±20	40	40	11.5	15	76	25	TO-220SIS	U-MOSIII-H
TK40X10J1	100	±20	40	125	15	20	59	25	TFP	U-MOSIII-H
TK55D10J1	100	±20	55	140	8.4	10.5	110	33	TO-220(W)	U-MOSIII-H
TK55A10J1	100	±20	55	45	8.4	10.5	110	33	TO-220SIS	U-MOSIII-H
TK50X15J1	150	±20	50	125	22	30	75	33	TFP	U-MOSIII-H

6-1 π -MOSVII Series ($V_{DSS} = 450\text{ V to }650\text{ V}$)

The latest addition to the π -MOS portfolio, the π -MOSVII Series offers reduced capacitances due to optimized chip design and is available with a greatly wider range of electrical characteristics.

■ Features

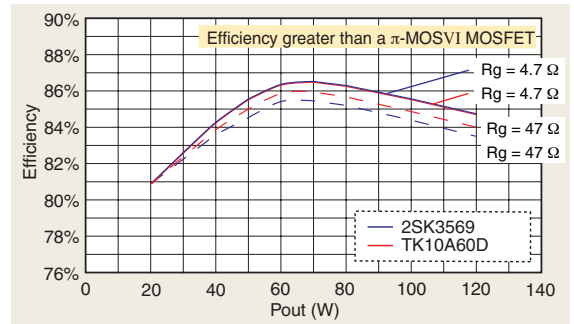
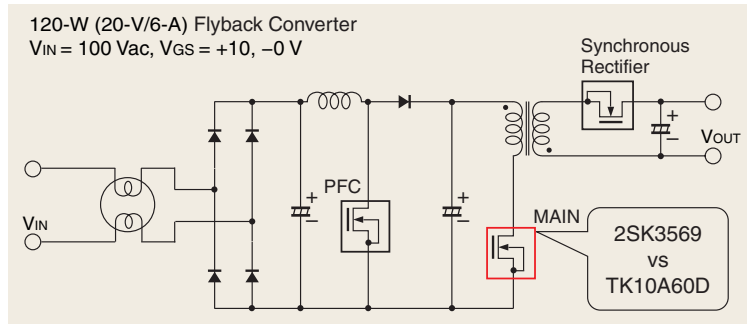
- 40% reduction in Q_g from π -MOSVI due to optimized chip design
- Available in 50-V steps of V_{DSS} and in finer steps of $R_{DS(ON)}$.
- Rated avalanche and reverse recovery current capabilities

■ Performance Comparisons Between π -MOSVII and π -MOSVI Devices (600 V/10 A)

Characteristic	Symbol	Test Conditions	π -MOSVII			π -MOSVI			Unit
			Min	Typ.	Max	Min	Typ.	Max	
Gate leakage current	$\pm I_{GSS}$	V_{GS} condition*, $V_{DS} = 0\text{ V}$	—	—	± 1	—	—	± 10	μA
Drain cut-off current	I_{DSS}	$V_{DS} = 600\text{ V}, V_{GS} = 0\text{ V}$	—	—	100	—	—	100	μA
Drain-source breakdown voltage	$V_{(BR)DSS}$	$I_D = +10\text{ mA}, V_{GS} = 0\text{ V}$	600	—	—	600	—	—	V
Gate threshold voltage	V_{th}	$V_{DS} = 10\text{ V}, I_D = 1\text{ mA}$	2.0	—	4.0	2.0	—	4.0	V
Drain-source ON-resistance	$R_{DS(ON)}$	$V_{GS} = 10\text{ V}, I_D = 5\text{ A}$	—	—	0.75	—	—	0.75	Ω
Total gate charge	Q_g	$V_{DD} = 400\text{ V}, V_{GS} = 10\text{ V}, I_D = 10\text{ A}$	—	25	—	—	42	—	nC
Diode forward voltage	V_{DSF}	$I_{DR} = 10\text{ A}, V_{GS} = 0\text{ V}$	—	—	-1.7	—	—	-1.7	V

*: Test conditions: TK10A60D: $V_{GS} = \pm 30\text{ V}$, 2SK3569: $V_{GS} = \pm 25\text{ V}$

■ Efficiency Test Circuit



■ Product Offerings

Part Number	Absolute Maximum Ratings		$R_{DS(ON)}$ (Ω)	Equivalent π -MOSVI Part	Package	
	V_{DSS} (V)	I_D (A)				
TK13A45D	450	13	0.46	2SK3743	TO-220SIS	
TK4A50D		4	2.0	—	TO-220SIS	
TK5A50D		5	1.5	2SK3563	TO-220SIS	
TK6A50D		6	1.4	—	TO-220SIS	
TK7A50D		7	1.2	—	TO-220SIS	
TK8A50DA		7.5	1.0	—	TO-220SIS	
TK8A50D		8	0.85	2SK3561	TO-220SIS	
TK10A50D		10	0.72	—	TO-220SIS	
TK11A50D		500	11	0.6	—	TO-220SIS
TK12A50D			12	0.52	2SK3568	TO-220SIS
TK13A50DA			12.5	0.47	—	TO-220SIS
TK13A50D			13	0.4	2SK4012	TO-220SIS
TK15J50D			15	0.4	2SK4107	TO-3P(N)
TK15A50D			15	0.3	2SK3934	TO-220SIS
TK18A50D	18		0.27	—	TO-220SIS	
TK20J50D	20		0.27	2SK4108	TO-3P(N)	
TK4A53D	525		4	1.7	—	TO-220SIS
TK5A53D			5	1.5	2SK3563	TO-220SIS
TK6A53D		6	1.3	—	TO-220SIS	
TK6P53D		6	1.3	—	D-PAK	
TK12A53D		12	0.58	—	TO-220SIS	
TK12X53D		12	0.58	2SK3398	TFP	
TK4A55DA	550	3.5	2.45	—	TO-220SIS	
TK4A55D		4	1.9	—	TO-220SIS	
TK5A55D		5	1.7	—	TO-220SIS	
TK6A55DA		5.5	1.48	—	TO-220SIS	

Part Number	Absolute Maximum Ratings		$R_{DS(ON)}$ (Ω)	Equivalent π -MOSVI Part	Package	
	V_{DSS} (V)	I_D (A)				
TK8A55DA	550	7.5	1.07	—	TO-220SIS	
TK9A55DA		8.5	0.86	—	TO-220SIS	
TK11A55D		11	0.63	—	TO-220SIS	
TK12A55D		12	0.57	—	TO-220SIS	
TK12J55D		12	0.57	—	TO-3P(N)	
TK13A55DA		12.5	0.48	—	TO-220SIS	
TK14A55D		14	0.37	—	TO-220SIS	
TK16A55D *		16	0.33	—	TO-220SIS	
TK16J55D		16	0.37	—	TO-3P(N)	
TK2Q60D		2	5.0	2SK4002	New PW-Mold 2	
TK3A60DA		2.5	2.8	—	TO-220SIS	
TK4A60DA		3.5	2.2	2SK3567	TO-220SIS	
TK4A60DB		3.7	2	—	TO-220SIS	
TK4A60D		4	1.7	—	TO-220SIS	
TK6A60D		600	6	1.25	2SK3562	TO-220SIS
TK8A60DA			7.5	1	2SK3667	TO-220SIS
TK10A60D	10		0.75	2SK3569	TO-220SIS	
TK11A60D	11		0.65	—	TO-220SIS	
TK12A60D	12		0.55	—	TO-220SIS	
TK13A60D	13		0.43	2SK3797	TO-220SIS	
TK15A60D	15	0.37	—	TO-220SIS		
TK5A65D	650	5	1.43	—	TO-220SIS	
TK6A65D		6	1.11	—	TO-220SIS	
TK8A65D		8	0.84	—	TO-220SIS	
TK12A65D *		12	0.50	—	TO-220SIS	

*: Under development

6-2 Super-Junction DT MOS Series ($V_{DSS} = 600\text{ V}, 650\text{ V}$)

The DT MOS devices employ a new super-junction structure that enables an ultra-low ON-resistance with the maximum V_{DSS} rating of 600 V. The DT MOS Series helps reduce the power consumption and size of electronic equipment.

■ Features

- Low ON-resistance TK40J60T: $80\text{ m}\Omega$ (max) @ $V_{GS} = 10\text{ V}, I_D = 20\text{ A}$
- Low gate charge TK20A60U: $Q_g = 27\text{ nC}$ typ., $600\text{ V} / 20\text{ A}$
- The rugged internal drain-source diode is not damaged at $di/dt = 500\text{ A}/\mu\text{s}$ ($@V_{DS} = 400\text{ V}, 150^\circ\text{C}$).

■ Product Offerings

Part Number	Absolute Maximum Ratings		$R_{DS(ON)}$ Max (Ω)	Q_g Typ. (nC)	C_{iss} Typ. (pF)	Package	Series
	V_{DSS} (V)	I_D (A)	$V_{GS} = 10\text{ V}$				
TK12A60U	600	12	0.4	14	720	TO-220SIS	DTMOSII
TK12D60U						TO-220(W)	
TK12J60U						TO-3P(N)	
TK15J60T		15	0.3	21	1200	TO-3P(N)	DTMOSI
TK15A60U		15	0.3	17	950	TO-220SIS	DTMOSII
TK15D60U						TO-220(W)	
TK15J60U						TO-3P(N)	
TK20A60T		20	0.19	30	1580	TO-220SIS	DTMOSI
TK20D60T						TO-220(W)	
TK20J60T						TO-3P(N)	
TK20A60U		20	0.19	27	1470	TO-220SIS	DTMOSII
TK20D60U						TO-220(W)	
TK20J60U						TO-3P(N)	
TK40J60T		40	0.08	67	3900	TO-3P(N)	DTMOSI
TK50J60U *	50	0.065	70	4300	TO-3P(N)	DTMOSII	
TK13A65U	650	13	0.38	17	950	TO-220SIS	DTMOSII

*: Under development

■ Performance Comparisons Between the New DT MOS and Conventional MOSFET (π -MOSVI) Devices (600 V/20 A)

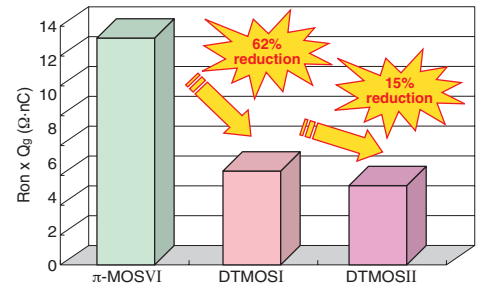
Characteristic	Symbol	Test Conditions	Series			Series			Unit
			DTMOSII			π -MOSVI			
			Min	Typ.	Max	Min	Typ.	Max	
Gate leakage current	$\pm I_{GSS}$	V_{GS} condition*, $V_{DS} = 0\text{ V}$	—	—	± 1	—	—	± 10	μA
Drain cut-off current	I_{DSS}	$V_{DS} = 600\text{ V}, V_{GS} = 0\text{ V}$	—	—	100	—	—	100	μA
Drain-source breakdown voltage	$V_{(BR)DSS}$	$I_D = 10\text{ mA}, V_{GS} = 0\text{ V}$	600	—	—	600	—	—	V
Gate threshold voltage	V_{th}	$V_{DS} = 10\text{ V}, I_D = 1\text{ mA}$	3.0	—	5.0	2.0	—	4.0	V
Drain-source ON-resistance	$R_{DS(ON)}$	$V_{GS} = 10\text{ V}, I_D = 10\text{ A}$	—	0.165	0.19	—	0.22	0.32	Ω
Total gate charge	Q_g	$V_{DD} = 400\text{ V}, V_{GS} = 10\text{ V}$ $I_D = 20\text{ A}$	—	27	—	—	60	—	nC
Diode forward voltage	V_{DSF}	$I_{DR} = 20\text{ A}, V_{GS} = 0\text{ V}$	—	—	-1.7	—	—	-1.7	V

*: Test conditions: TK20J60U: $V_{GS} = \pm 30\text{ V}$, 2SK3911: $V_{GS} = \pm 25\text{ V}$

■ Figure-of-Merit (FOM) Comparison

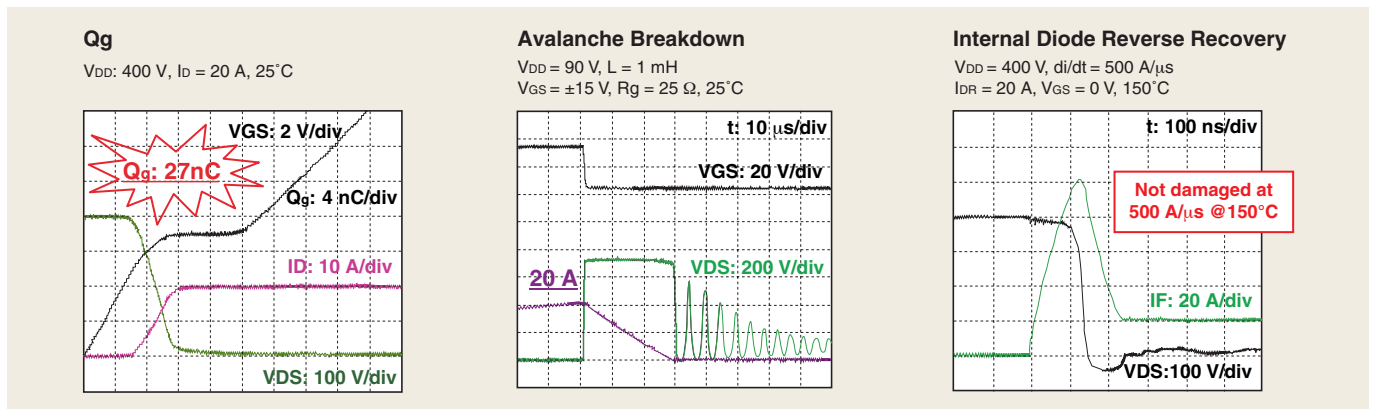
$R_{on} \times Q_g$, the product of ON-resistance and total gate charge, is reduced by 62%, compared with the conventional MOSFETs with the same chip size.

* $R_{on} \times Q_g$ is a figure-of-merit index for the switching speed of MOSFETs.



■ Performance Characteristics of the New DT MOS Series

TK20A60U Electrical Characteristics



6-3 High-speed π -MOS Series ($V_{DSS} = 450\text{ V to }600\text{ V}$)

To support the development of high-efficiency equipment, Toshiba has developed two series of high-speed power MOSFETs: a high-speed switching series for AC adapters and switching power supplies; and a high-speed diode series for motor controllers and inverter circuits.

- MACH Series: Achieves a higher switching speed than the existing π -MOS Series, which is currently well established in the market.
- High-Speed Diode Series: Achieves a higher internal diode speed by using lifetime control.

■ Product Offerings

- MACH Series

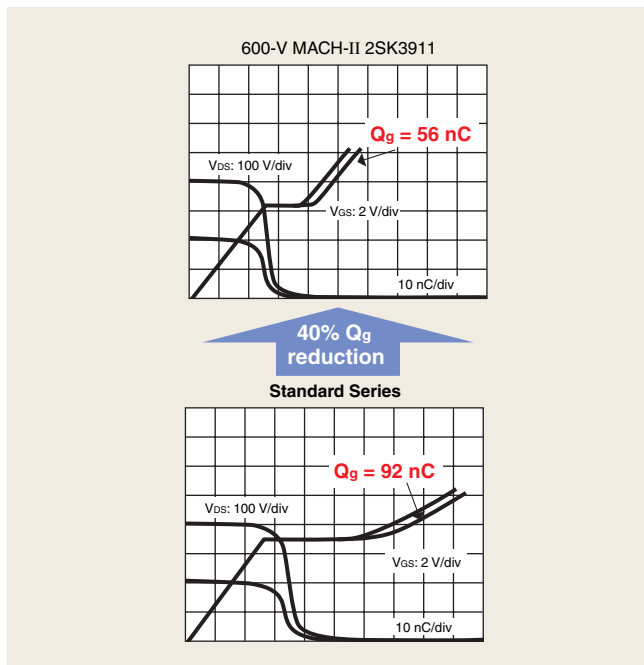
Applications	Part Number	Absolute Maximum Ratings			Package	$R_{DS(ON)}$ Max (Ω)	V_{GS} (V)	I_D (A)	Q_g Typ. (nC)	Standard Type	Series
		V_{DSS} (V)	I_D (A)	P_D (W)							
AC adapters Switching power supplies	2SK3310	450	10	40	TO-220NIS	0.65	10	5	23	2SK3126	MACH-I
	2SK3309	450	10	65	TO-220FL/SM	0.65	10	5	23	—	
	2SK3743	450	13	40	TO-220NIS	0.4	10	6	34	—	
	2SK3403	450	13	100	TO-220FL/SM	0.4	10	6	34	—	
	2SK3312	600	6	65	TO-220FL/SM	1.25	10	3	25	2SK2777	
	2SK3437	600	10	80	TO-220FL/SM	1	10	5	28	2SK2996	
	2SK3399	600	10	100	TO-220FL/SM	0.75	10	5	35	2SK2866	
	2SK3907	500	23	150	TO-3P(N)	0.23	10	11.5	60	—	
2SK3911	600	20	150	TO-3P(N)	0.32	10	10	60	—	MACH-II	

- High-Speed Diode Series (HSD Series)

Applications	Part Number	Absolute Maximum Ratings			Package	$R_{DS(ON)}$ Max (Ω)	V_{GS} (V)	I_D (A)	trr Typ. (ns)	Standard Type
		V_{DSS} (V)	I_D (A)	P_D (W)						
Motor control Inverters Switching power supplies	2SK3868	500	5	35	TO-220SIS	1.7	10	2.5	150	2SK3563
	2SK3417	500	5	50	TO-220FL/SM	1.8	10	2.5	60	2SK2991
	2SK4042	500	8	40	TO-220SIS	0.97	10	4	185	2SK3561
	2SK3313	500	12	40	TO-220NIS	0.62	10	6	90	2SK2842
	2SK3314	500	15	150	TO-3P(N)	0.49	10	7	105	2SK2698
	2SK3131	500	50	250	TO-3P(L)	0.11	10	25	105	2SK3132
	2SK3936	500	23	150	TO-3P(N)	0.25	10	11.5	380	2SK3907
	2SK3947	600	6	40	TO-220SIS	1.4	10	3	150	2SK3562
	2SK4015	600	10	45	TO-220SIS	0.86	10	5	170	2SK3569
	2SK4016	600	13	50	TO-220SIS	0.50	10	6.5	160	2SK3911
	2SK3906	600	20	150	TO-3P(N)	0.33	10	10	400	2SK3797

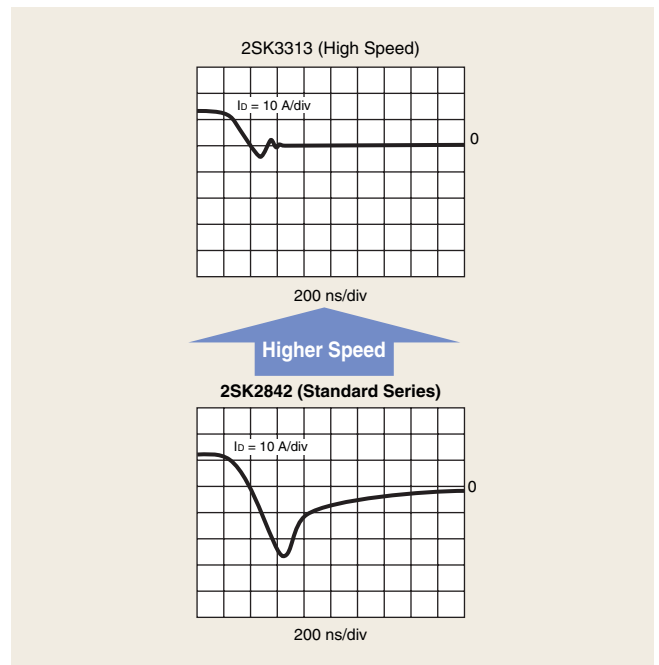
■ Characteristics of the MACHII Series

40% reduction in Q_g losses



■ Characteristics of the High-Speed Diode Series

Faster internal diode



■ π-MOSV Series (V_{DSS} = 400 V to 700 V)

Applications	Part Number	Absolute Maximum Ratings			Package	R _{DS(ON)}				Qg Typ. (nC)
		V _{DSS} (V)	I _D (A)	P _D (W)		R _{DS(ON)} (Ω)		V _{GS} (V)	I _D (A)	
						Typ.	Max			
115-Vac switching power supplies Ballast inverters Motor controllers	2SK3498	400	1	20	PW-Mold	4.2	5.5	10	0.5	5.7
	2SK2838	400	5.5	40	TO-220FL/SM	0.84	1.2	10	3	17
	2SK2679	400	5.5	35	TO-220NIS	0.84	1.2	10	3	17
	2SK2952	400	8.5	40	TO-220NIS	0.4	0.55	10	5	34
	2SK2841	400	10	80	TO-220AB	0.4	0.55	10	5	34
	2SK2949	400	10	80	TO-220FL/SM	0.4	0.55	10	5	34
	2SK3499	400	10	80	TFP	0.4	0.55	10	5	34
	2SK3472	450	1	20	New PW-Mold	4.0	4.6	10	0.5	5
	2SK3374	450	1	20	TPS	3.7	4.6	10	5	5
	2SK4023	450	1	20	New PW-Mold2	4.0	4.6	10	0.5	5
	2SK3544	450	13	100	TFP	0.29	0.4	10	6	34
	2SK2998	500	0.5	0.9	LSTM	10	18	10	0.25	3.8
	2SK3302	500	0.5	1.3	TPS	10	18	10	0.25	3.8
	2SK3471	500	0.5	0.5	PW-Mini	10	18	10	0.25	3.8
	2SK2599	500	2	1.3	TPS	2.9	3.2	10	1	9
	2SK3373	500	2	20	New PW-Mold	2.9	3.2	10	1	9
	2SK2862	500	3	25	TO-220NIS	2.9	3.2	10	1	9
	2SK2991	500	5	50	TO-220FL/SM	1.35	1.5	10	2.5	17
	2SK3466	500	5	50	TO-220FL/SM	1.35	1.5	10	2.5	17
	2SK2542	500	8	80	TO-220AB	0.75	0.85	10	4	30
	2SK2776	500	8	65	TO-220FL/SM	0.75	0.85	10	4	30
	2SK3538	500	8	65	TFP	0.75	0.85	10	4	30
	2SK2601	500	10	125	TO-3P(N)	0.56	1.0	10	5	30
	2SK3068	500	12	100	TO-220FL/SM	0.4	0.52	10	6	45
	2SK3398	500	12	100	TFP	0.4	0.52	10	6	45
	2SK2916	500	14	80	TO-3P(N)IS	0.35	0.4	10	7	58
	2SK2917	500	18	90	TO-3P(N)IS	0.21	0.27	10	10	80
	2SK3132	500	50	250	TO-3P(L)	0.07	0.095	10	25	280
	2SK3371	600	1	20	New PW-Mold	6.4	9.0	10	0.5	9
	2SK4026	600	1	20	New PW-Mold2	6.4	9	10	0.5	9
	2SK2846	600	2	1.3	TPS	4.2	5.0	10	1	9
	2SK2865	600	2	20	New PW-Mold	4.2	5.0	10	1	9
	2SK4002	600	2	20	New PW-Mold2	4.2	5	10	1	9
	2SK4003	600	3	20	New PW-Mold2	1.7	2.2	10	1.5	20
	2SK3975	600	3	20	New PW-Mold	1.7	2.2	10	1.5	20
	2SK3085	600	3.5	75	TO-220AB	1.7	2.2	10	1.8	20
	2SK3130	600	6	40	TO-220NIS	1.26	1.55	10	3	30
	2SK2777	600	6	65	TO-220FL/SM	0.9	1.25	10	3	30
	2SK2602	600	6	125	TO-3P(N)	0.9	1.25	10	3	30
	2SK3312	600	6	65	TO-220FL/SM	0.95	1.25	10	3	22
	2SK3438	600	10	80	TFP	0.78	1.0	10	5	28
	2SK2889	600	10	100	TO-220FL/SM	0.54	0.75	10	5	45
	2SK2866	600	10	125	TO-220AB	0.54	0.75	10	5	45
	2SK2699	600	10	150	TO-3P(N)	0.5	0.65	10	6	58
	2SK2953	600	12	90	TO-3P(N)IS	0.31	0.4	10	8	80
2SK3265	700	10	45	TO-220NIS	0.72	1.0	10	5	53	
2SK3453	700	10	80	TO-3P(N)IS	0.72	1.0	10	5	53	

■ π-MOSIII Series (V_{BSS} = 800 V to 1000 V)

Applications	Absolute Maximum Ratings			Package	R _{DS(ON)} (Ω)				Qg Typ. (nC)
	V _{BSS} (V)	I _D (A)	P _D (W)		Typ.	Max	V _{GS} (V)	I _D (A)	
2SK2603	800	3	100	TO-220AB	3.0	3.6	10	1.5	25
2SK2883	800	3	75	TO-220FL/SM	3.0	3.6	10	1.5	25
2SK2884	800	5	100	TO-220FL/SM	1.9	2.2	10	3.0	34
2SK2746	800	7	150	TO-3P(N)	1.3	1.7	10	3.5	55
2SK2606	800	8	85	TO-3P(N)IS	1.0	1.2	10	4.0	68
2SK2607	800	9	150	TO-3P(N)	1.0	1.2	10	4.0	68
2SK3301	900	1	20	PW-Mold	15	20	10	0.5	6
2SK2845	900	1	40	DP	8.0	9.0	10	0.5	15
2SK2733	900	1	60	TO-220AB	8.0	9.0	10	0.5	15
2SK2608	900	3	100	TO-220AB	3.73	4.3	10	1.5	25
2SK2719	900	3	125	TO-3P(N)	3.7	4.3	10	1.5	25
2SK2847	900	8	85	TO-3P(N)IS	1.05	1.25	10	4.0	58
2SK3017	900	8.5	90	TO-3P(N)IS	1.2	1.4	10	4.0	70
2SK2968	900	10	150	TO-3P(N)	1.05	1.25	10	4	70
2SK2613	1000	8	150	TO-3P(N)	1.4	1.7	10	8.0	65

8-1 End-of-Life Products

The part numbers in the left-hand column below are end-of-life or obsolete products. When ordering, please choose from the replacement products in the right-hand column.

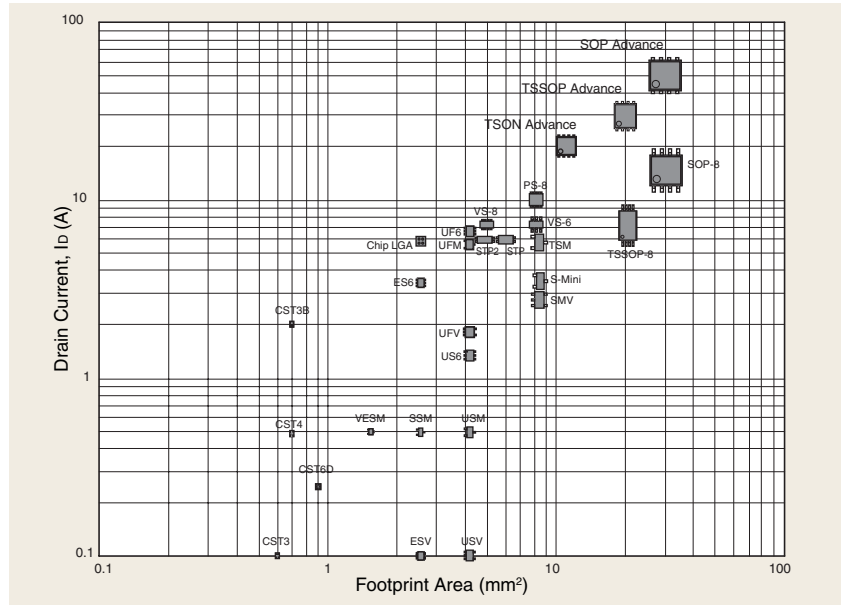
End-of-Life Products					Replacement Products				
Part Number	Electrical Characteristics			Package	Part Number	Electrical Characteristics			Package
	V _{DSS} (V)	I _D (A)	R _{DS(ON)} Max(Ω)			V _{DSS} (V)	I _D (A)	R _{DS(ON)} Max(Ω)	
2SJ148	-60	-0.2	2	TO-92	2SJ168	-60	-0.2	2	S-MINI
2SJ167	-60	-0.2	2	N-MINI	2SJ168	-60	-0.2	2	S-MINI
2SJ200	-16	-2	0.71	PW-Mini	TPC6105	-20	-2.7	0.11	VS-6
2SJ342	-50	-0.05	50	N-MINI	2SJ343	-50	-0.05	50	S-MINI
2SJ345	-20	-0.05	40	S-MINI	SSM3J16FU	-20	-0.1	45	USM
2SJ346	-20	-0.05	40	USM	SSM3J16FU	-20	-0.1	45	USM
2SJ347	-20	-0.05	40	SSM	SSM3J16FS	-20	-0.1	45	SSM
2SJ511	-30	-2	0.76	PW-Mini	TPC6108	-30	-4.5	0.006	VS-6
2SJ525	-30	-5	0.12	TPS	TPCF8104	-30	-6	0.028	VS-8
2SK1061	60	0.2	1	N-MINI	SSM3K7002BF	60	0.2	2.1	S-MINI
2SK1120	1000	8	1.8	TO-3P (N)	2SK2613	1000	8	1.7	TO-3P (N)
2SK1825	50	0.05	50	N-MINI	SSM3K7002BF	60	0.2	2.1	S-MINI
2SK1826	50	0.05	50	S-MINI	SSM3K7002BF	60	0.2	2.1	S-MINI
2SK1827	50	0.05	50	USM	SSM3K7002BFU	60	0.2	2.1	USM
2SK1828	20	0.05	40	S-MINI	SSM3K15F	30	0.1	7	S-MINI
2SK1829	20	0.05	40	USM	SSM3K15FU	30	0.1	7	USM
2SK1830	20	0.05	40	SSM	SSM3K15FS	30	0.1	7	SSM
2SK2033	20	0.1	12	S-MINI	SSM3K15F	30	0.1	7	S-MINI
2SK2034	20	0.1	12	USM	SSM3K15FU	30	0.1	7	USM
2SK2035	20	0.1	12	SSM	SSM3K15FS	30	0.1	7	SSM
2SK2036	20	0.1	6	S-MINI	SSM3K15F	30	0.1	7	S-MINI
2SK2037	20	0.1	6	USM	SSM3K15FU	30	0.1	7	USM
2SK2312	60	45	0.017	TO-220NIS	2SK3844	60	45	0.0058	TO-220NIS
2SK2466	100	30	0.046	TO-220NIS	TK40A10K3	100	40	0.015	TO-220SIS
2SK2543	500	8	0.85	TO-220NIS	TK8A50D	500	8	0.85	TO-220SIS
2SK2544	600	6	1.25	TO-220AB	2SK3761	600	6	1.25	TO-220AB
2SK2545	600	6	1.25	TO-220NIS	TK6A60D	600	6	1.25	TO-220SIS
2SK2549	16	2	0.29	PW-Mini	TPC6004	20	6	0.024	VS-6
2SK2604	800	5	2.2	TO-3P (N)	2SK3633	800	7	1.7	TO-3P (N)
2SK2605	800	5	2.2	TO-220NIS	2SK4013	800	6	1.7	TO-220SIS
2SK2610	900	5	2.5	TO-3P (N)	2SK3700	900	5	2.5	TO-3P (N)
2SK2611	900	9	1.4	TO-3P (N)	2SK3878	900	9	1.3	TO-3P (N)
2SK2661	500	5	1.5	TO-220AB	2SK3758	500	5	1.5	TO-220AB
2SK2662	500	5	1.5	TO-220NIS	TK5A50D	500	5	1.5	TO-220SIS
2SK2698	500	15	0.4	TO-3P (N)	TK15J50D	500	15	0.4	TO-3P (N)
2SK2700	900	3	4.3	TO-220NIS	2SK3564	900	3	4.3	TO-220SIS
2SK2717	900	5	2.5	TO-220NIS	2SK3565	900	5	2.5	TO-220SIS
2SK2718	900	2.5	6.4	TO-220NIS	2SK3566	900	2.5	6.4	TO-220SIS
2SK2746	800	7	1.7	TO-3P (N)	2SK3633	800	7	1.7	TO-3P (N)
2SK2749	900	7	2	TO-3P (N)	2SK4115	900	7	2	TO-3P (N)
2SK2750	600	3.5	2.2	TO-220NIS	TK4A60DA	600	3.5	2.2	TO-220SIS
2SK2823	20	0.1	40	S-MINI	SSM3K35FS	20	0.18	20	SSM
2SK2824	20	0.1	40	USM	SSM3K35FS	20	0.18	20	SSM
2SK2825	20	0.1	40	SSM	SSM3K35FS	20	0.18	20	SSM
2SK2837	500	20	0.27	TO-3P (N)	TK20J50D	500	20	0.27	TO-3P (N)
2SK2842	500	12	0.52	TO-220NIS	TK12A50D	500	12	0.52	TO-220SIS
2SK2843	600	10	0.75	TO-220NIS	TK10A60D	600	10	0.75	TO-220SIS
2SK2844	30	35	0.02	TO-220AB	TK70D06J1	60	70	0.0064	TO-220 (W)
2SK2915	600	16	0.4	TO-3P (N)	2SK3903	600	14	0.44	TO-3P (N)
2SK2996	600	10	1	TO-220NIS	2SK4112	600	10	1	TO-220HIS

End-of-Life Products					Replacement Products				
Part Number	Electrical Characteristics			Package	Part Number	Electrical Characteristics			Package
	V _{DSS} (V)	I _D (A)	R _{DS(ON)} Max(Ω)			V _{DSS} (V)	I _D (A)	R _{DS(ON)} Max(Ω)	
2SK2964	30	2	0.18	PW-Mini	TPC6003	30	6	0.024	VS-6
2SK3067	600	2	5	TO-220NIS	2SK3767	600	2	4.5	TO-220SIS
2SK3084	100	30	0.046	TO-220FL/SM	-	-	-	-	-
2SK3089	30	40	0.03	TO-220FL/SM	2SK3847	40	32	0.018	TO-220SM
2SK3090	30	45	0.02	TO-220FL/SM	2SK3847	40	32	0.018	TO-220SM
2SK3125	30	70	0.007	TO-3PSM	2SK3843	40	75	0.0035	TFP
2SK3126	450	10	0.65	TO-220NIS	2SK3869	450	10	0.68	TO-220SIS
2SK3127	30	45	0.012	TO-220FL/SM	2SK3847	40	32	0.018	TO-220SM
2SK3128	30	60	0.012	TO-3P (N)	2SK3843	40	75	0.0035	TFP
2SK3129	50	60	0.007	TO-3P (N)	2SK3845	60	70	0.0058	TO-3P (N)
2SK3130	600	6	1.55	TO-220NIS	2SK3947	600	6	1.4	TO-220SIS
2SK3236	60	35	0.02	TO-220NIS	2SK3662	60	35	0.0125	TO-220NIS
2SK3316	500	5	1.8	TO-220NIS	2SK3868	500	5	1.7	TO-220NIS
2SK3389	30	75	0.005	TFP	2SK3843	40	75	0.008	TFP
2SK3397	30	75	0.006	TFP	2SK3843	40	75	0.0035	TFP
2SK3407	450	10	0.65	TO-220NIS	2SK3869	450	10	0.68	TO-220SIS
2SK3439	30	75	0.005	TFP	2SK3843	40	75	0.0035	TFP
2SK3440	60	50	0.008	TFP	2SK3842	60	75	0.0058	TFP
2SK3441	60	75	0.0058	TFP	2SK4034	60	75	0.0058	TFP
2SK3442	100	45	0.02	TFP	TK40D10J1	100	40	0.015	TO-220 (W)
2SK3443	150	30	0.055	TFP	TK50X15J1	150	50	0.03	TFP
2SK3499	400	10	0.55	TFP	TK10X40D*	400	10	0.55	TFP
2SK3543	450	2	2.45	TO-220NIS	2SK3757	450	2	2.45	TO-220SIS
2SK982	60	0.2	1	TO-92	SSM3K7002BF	60	0.2	2.1	S-MINI
HN1J02FU	-20	-0.05	40	US6	SSM6P16FU	-20	-0.1	45	US6
HN1K02FU	20	0.05	40	US6	SSM6N16FU	20	0.1	15	US6
HN1K03FU	20	0.1	12	US6	SSM6N16FU	20	0.1	15	US6
HN1K04FU	50	0.05	50	US6	SSM6K7002BFU	60	0.2	2.1	US6
HN1K05FU	20	0.1	40	US6	SSM6N35FU	20	0.18	20	US6
HN1K06FU	20	0.1	6	US6	SSM6N15FU	30	0.1	7	US6
HN1L02FU	20	0.05	40	US6	SSM6L35FU	20	0.18	20	US6
HN1L03FU	50	0.05	50	US6	-	-	-	-	-
HN4K03JU	20	0.1	12	UFV	SSM5N15FU	30	0.1	7	USV
SSM3J01F	-30	-0.7	0.6	S-MINI	SSM3J01T	-30	-1.7	0.6	TSM
SSM3J02F	-30	-0.6	0.7	S-MINI	SSM3J02T	-30	-1.6	0.7	TSM
SSM3J15TE	-30	-0.1	32	TESM	SSM3J15FV	-30	-0.1	32	VESM
SSM3J16TE	-20	-0.1	45	TESM	SSM3J16FV	-20	-0.1	45	VESM
SSM3K01F	30	1.3	0.15	S-MINI	SSM3K01T	30	3.2	0.15	TSM
SSM3K02F	30	1	0.25	S-MINI	SSM3K02T	30	2.5	0.25	TSM
SSM3K03C	20	0.1	12	SS-CSP	SSM3K16CT	20	0.1	15	CST3
SSM3K03FE	20	0.1	12	ESM	SSM3K16FS	20	0.1	15	SSM
SSM3K03TE	20	0.1	12	TESM	SSM3K16FV	20	0.1	15	VESM
SSM3K04FE	20	0.1	12	ESM	SSM3K04FS	20	0.1	12	SSM
SSM3K126TU	30	3.9	0.043	UFM	SSM3K131TU	30	6	0.0415	UFM
SSM3K15TE	30	0.1	7	TESM	SSM3K15FV	30	0.1	7	VESM
SSM3K16TE	20	0.1	15	TESM	SSM3K16FV	20	0.1	15	VESM
SSM3K302T	30	3	0.071	TSM	SSM3K316T	30	4	0.065	TSM
SSM3K311T	30	4.6	0.043	TSM	SSM3K315T	30	6	0.0415	TSM
SSM6G06FE	-20	-0.1	45	ES6	-	-	-	-	-
SSM6H06FE	20	0.1	15	ES6	-	-	-	-	-
TPC6106	-40	-3.9	0.08	VS-6	-	-	-	-	-
TPCT4201	20	6	0.031	STP	TPCT4203	20	6	0.031	STP2
TPCT4202	30	6	0.038	STP	TPCT4204	30	6	0.038	STP2
TPC6201	30	2.5	0.095	VS-6	TPCP8202	30	5.5	0.023	PS-8
TPC8301	-30	-3.5	0.12	SOP-8	TPCF8304	-30	3.2	0.105	SOP-8
TPC8303	-30	-4.5	0.035	SOP-8	-	-	-	-	-

*: Under development

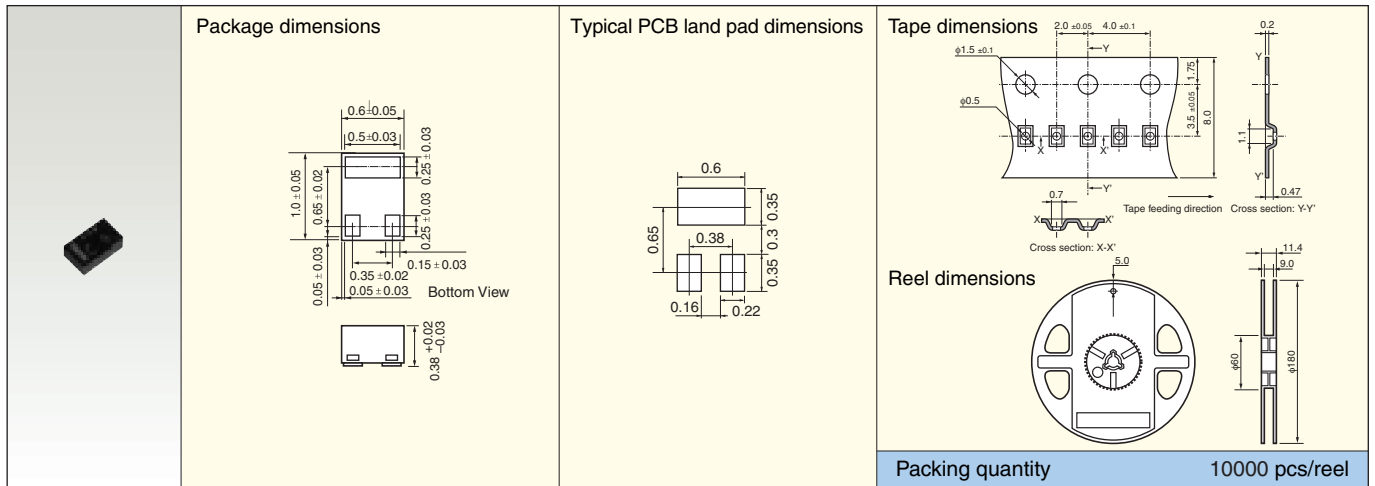
9-1 Compact Surface-Mount Packages

Toshiba offers a broad range of packaging options suitable for various mobile applications, including ultra-small, thin packages; those specifically designed for lithium-ion battery protection circuits; high-current packages with a thermal fin on the bottom.



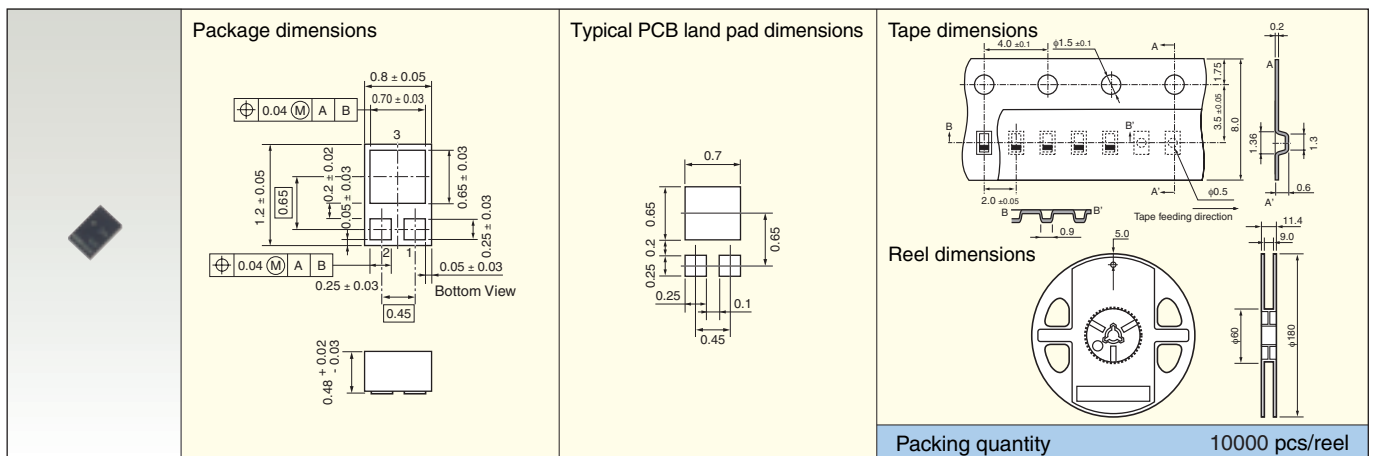
■ CST3

Unit: mm



■ CST3B

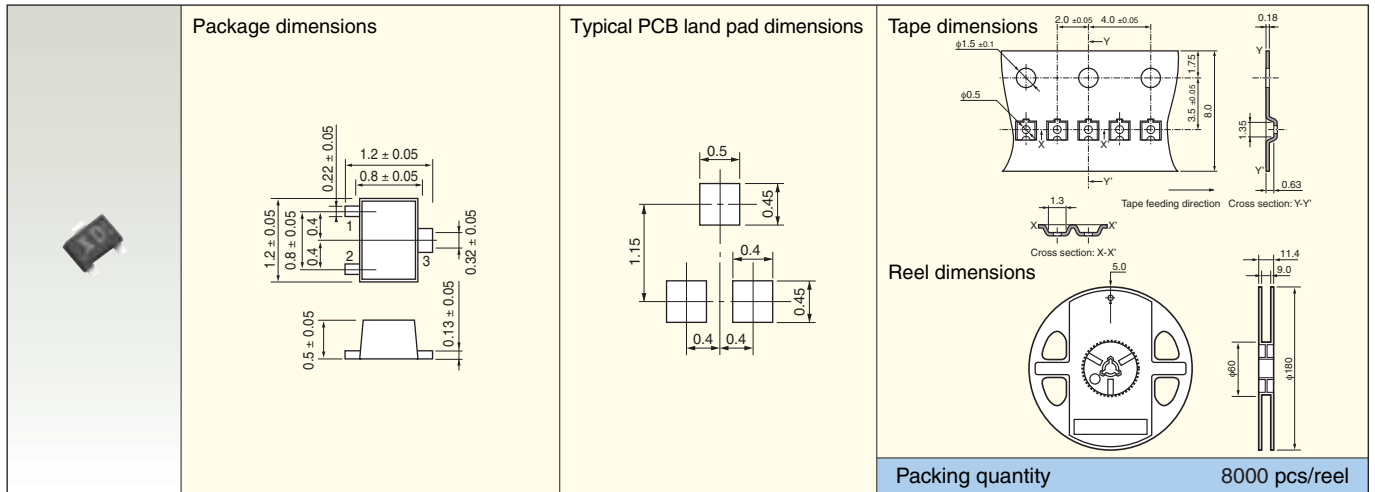
Unit: mm



9-1 Compact Surface-Mount Packages

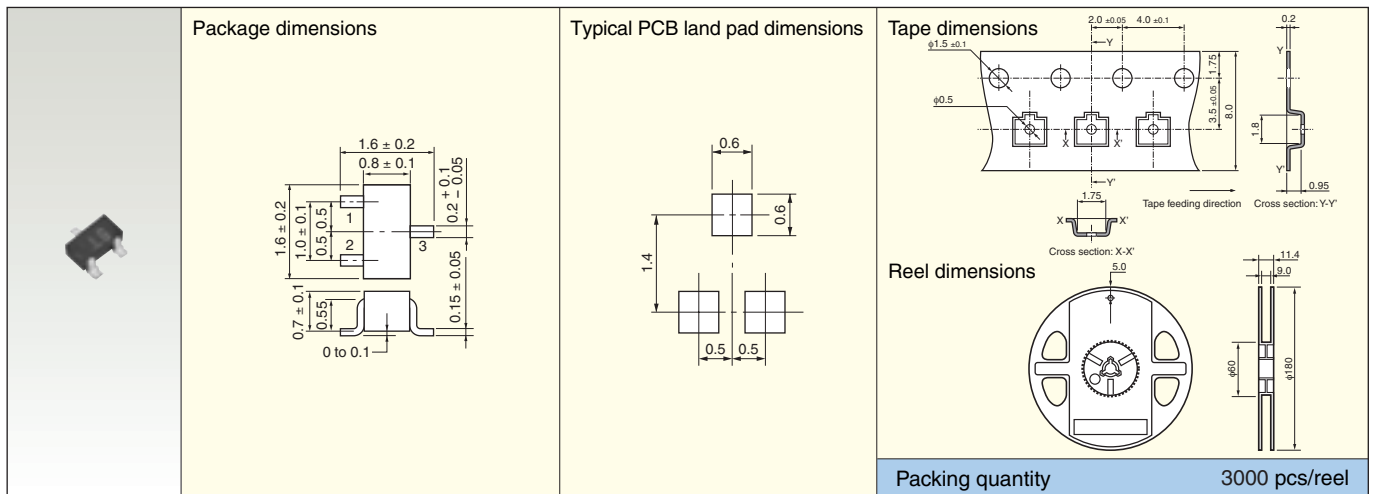
■ VESM (SOT-723)

Unit: mm



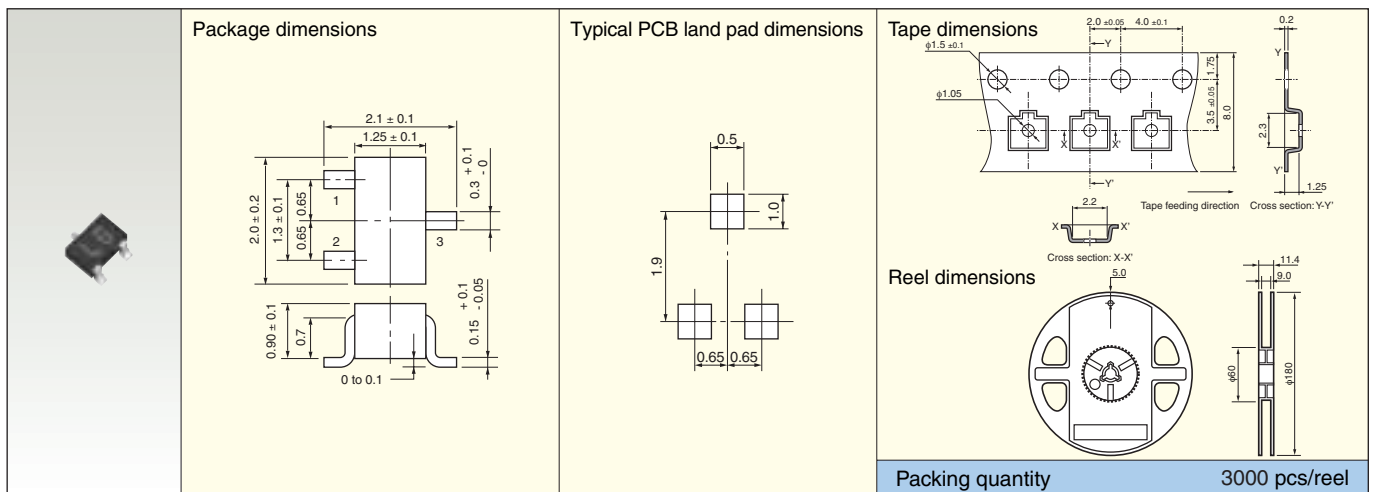
■ SSM (SOT-416)(SC-75)

Unit: mm



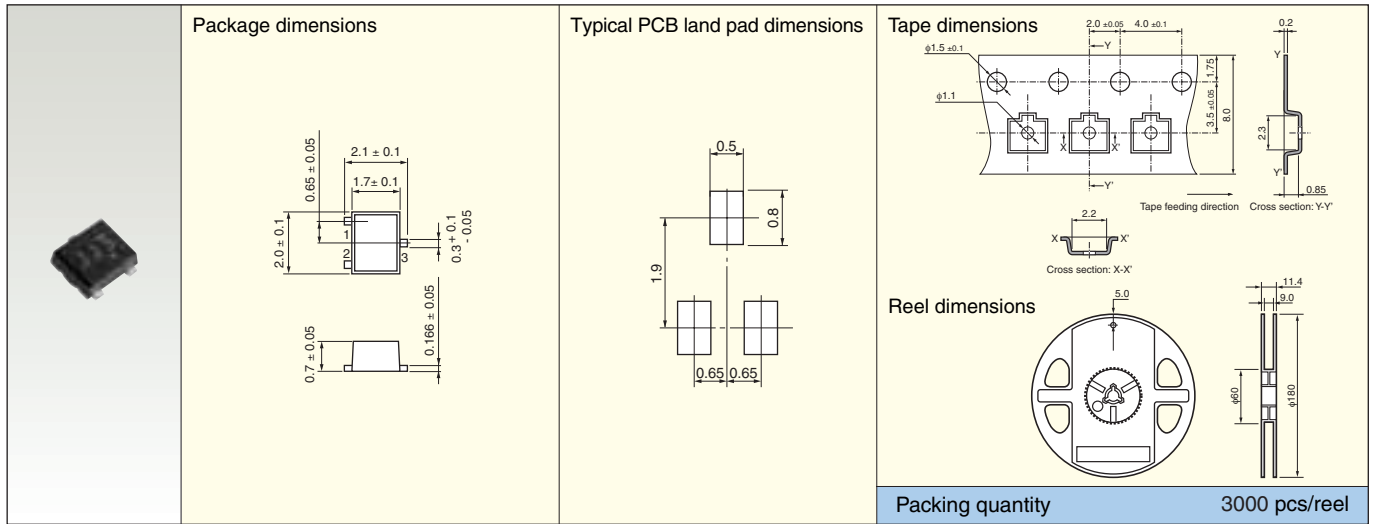
■ USM (SOT-323)(SC-70)

Unit: mm



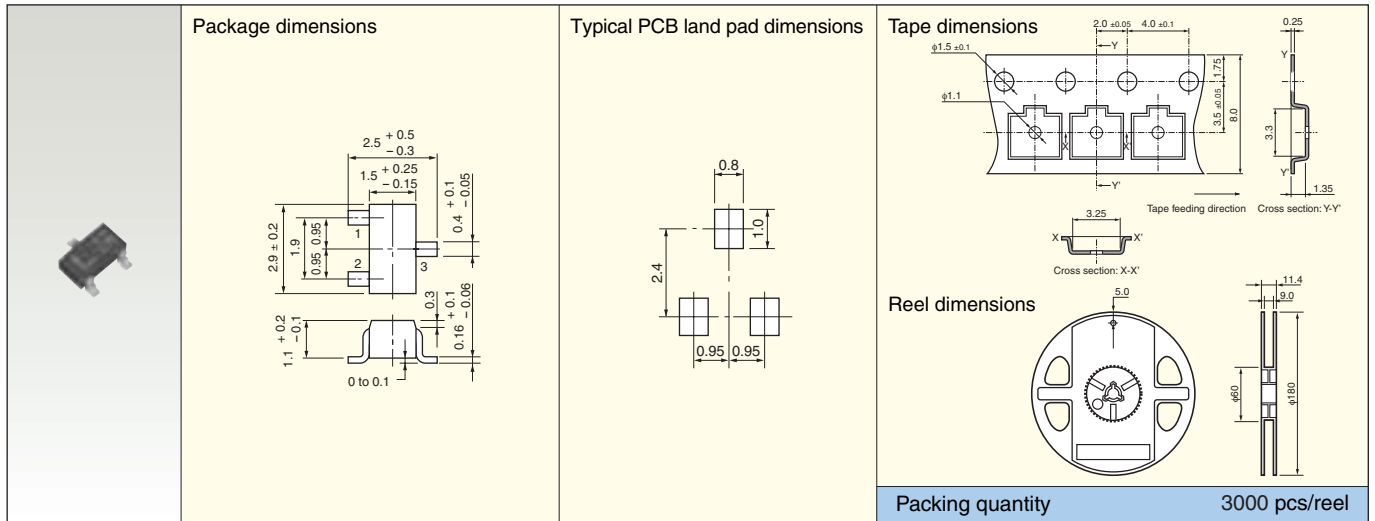
■ UFM

Unit: mm



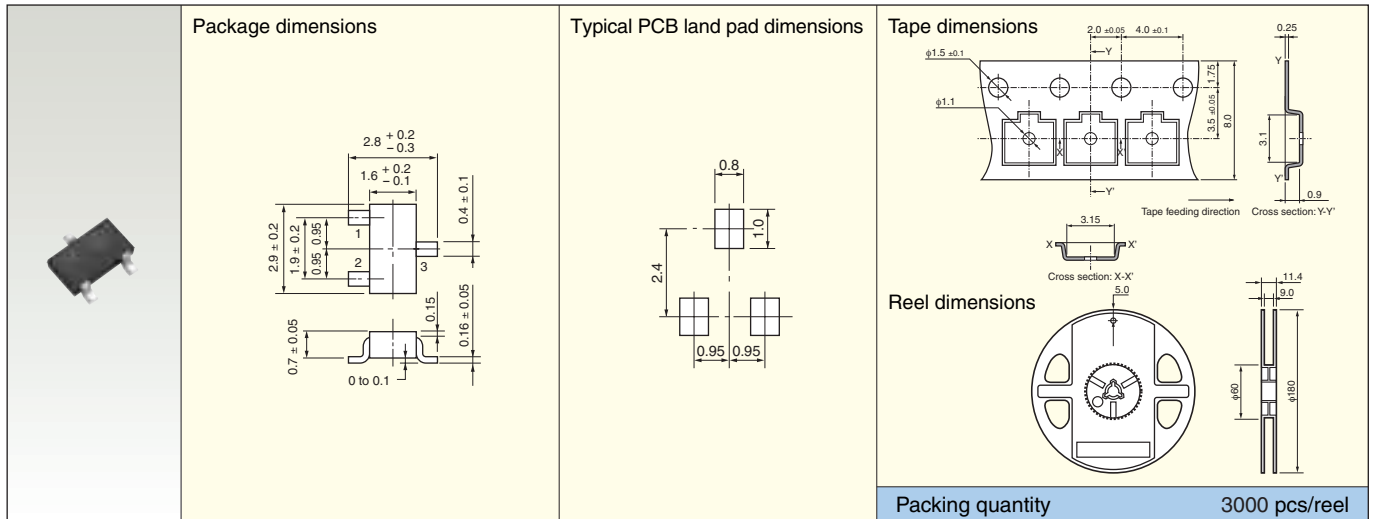
■ S-Mini (SOT-346)(SC-59)

Unit: mm



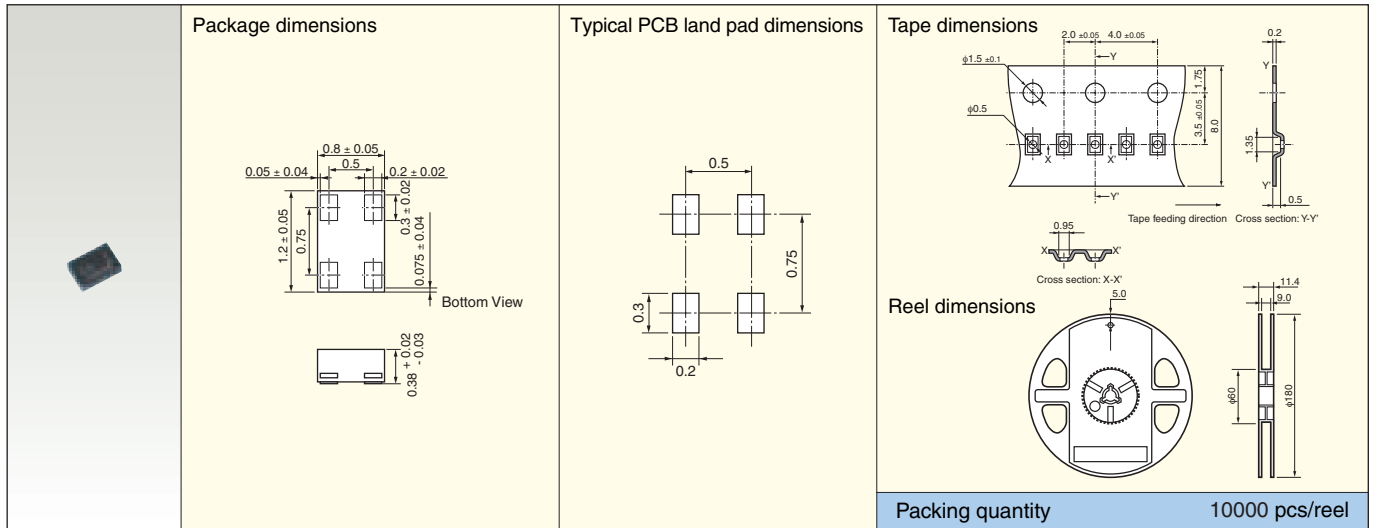
■ TSM

Unit: mm



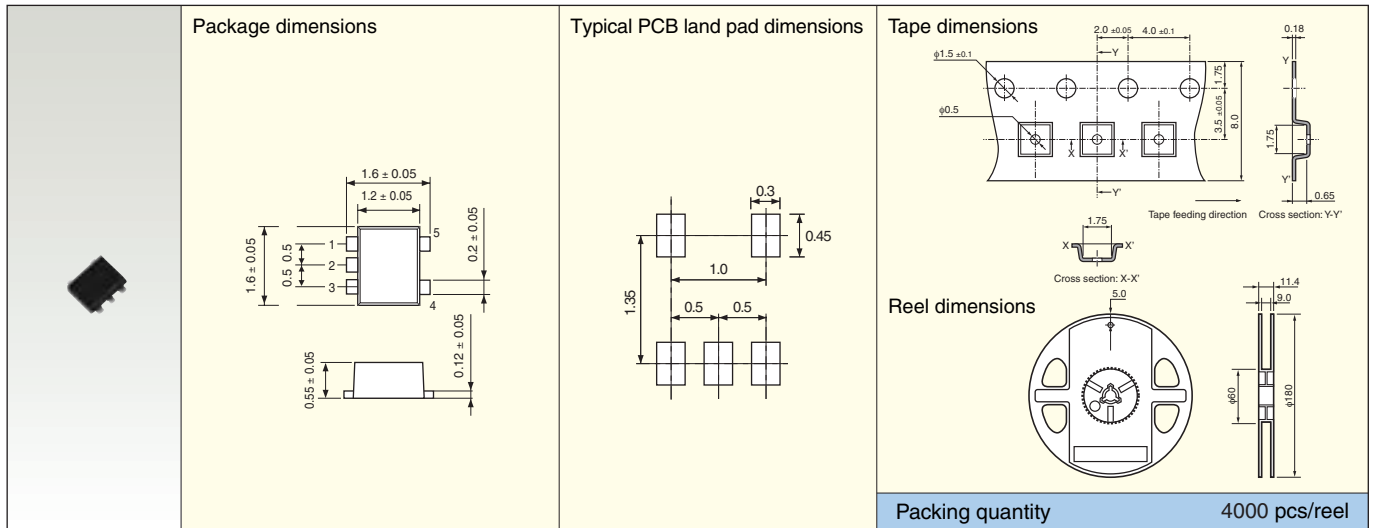
■ CST4

Unit: mm



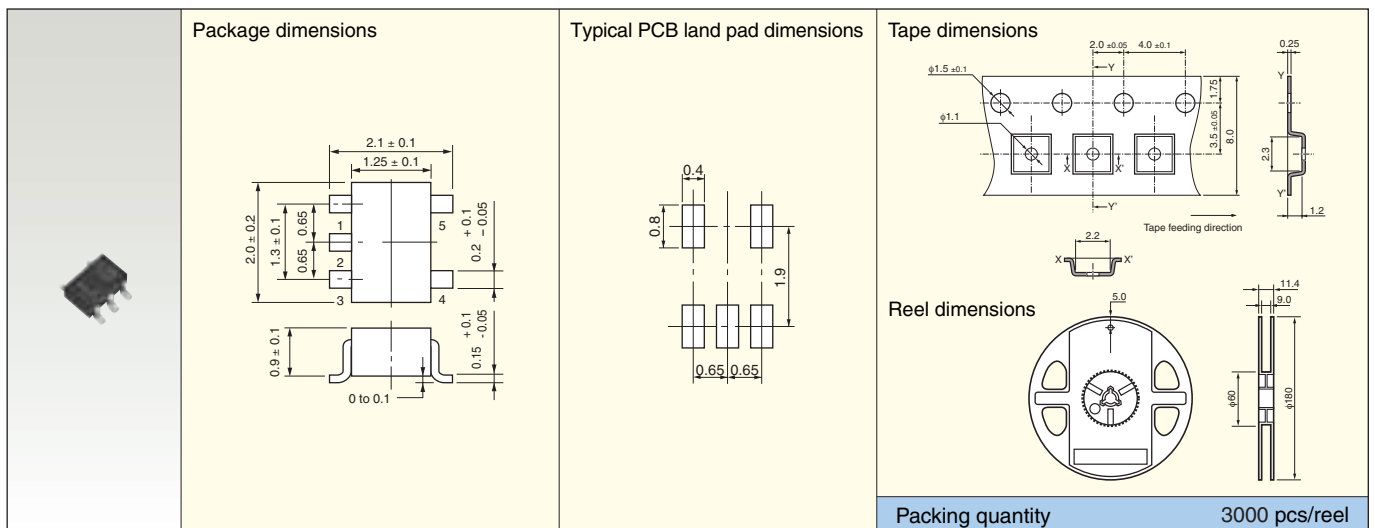
■ ESV (SOT-553)

Unit: mm



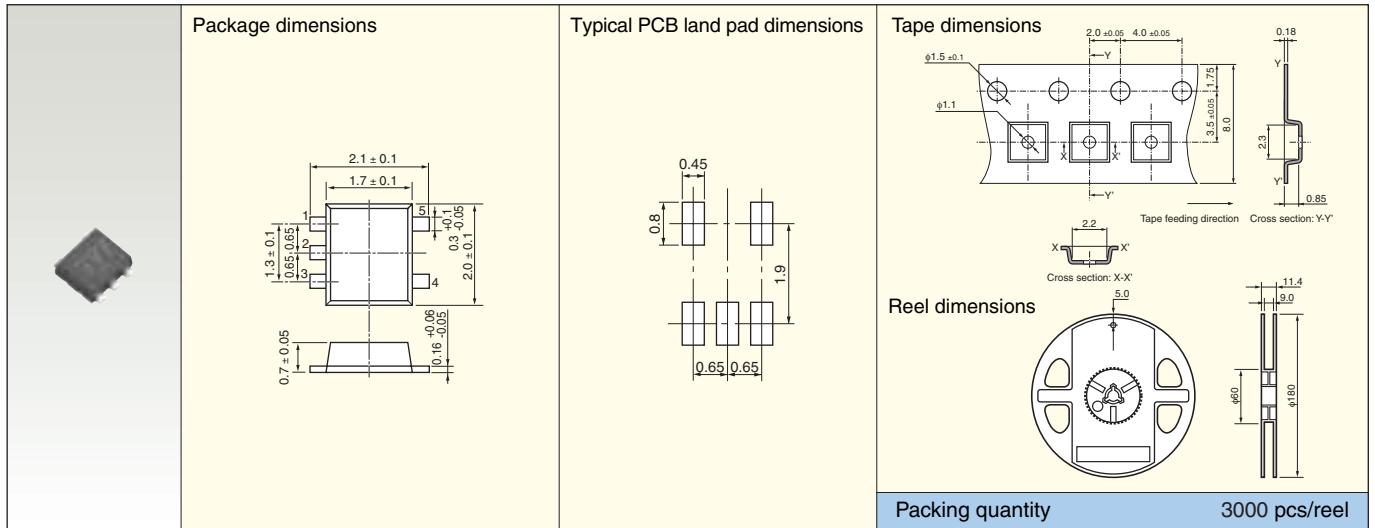
■ USV (SOT-353)(SC-88A)

Unit: mm



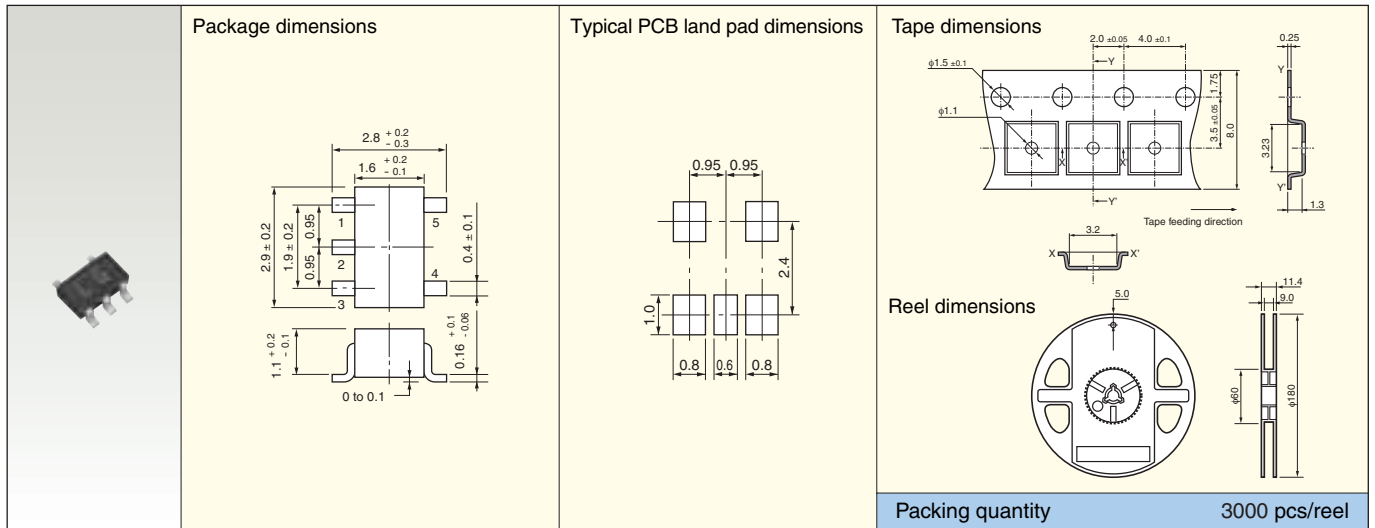
■ UFV

Unit: mm



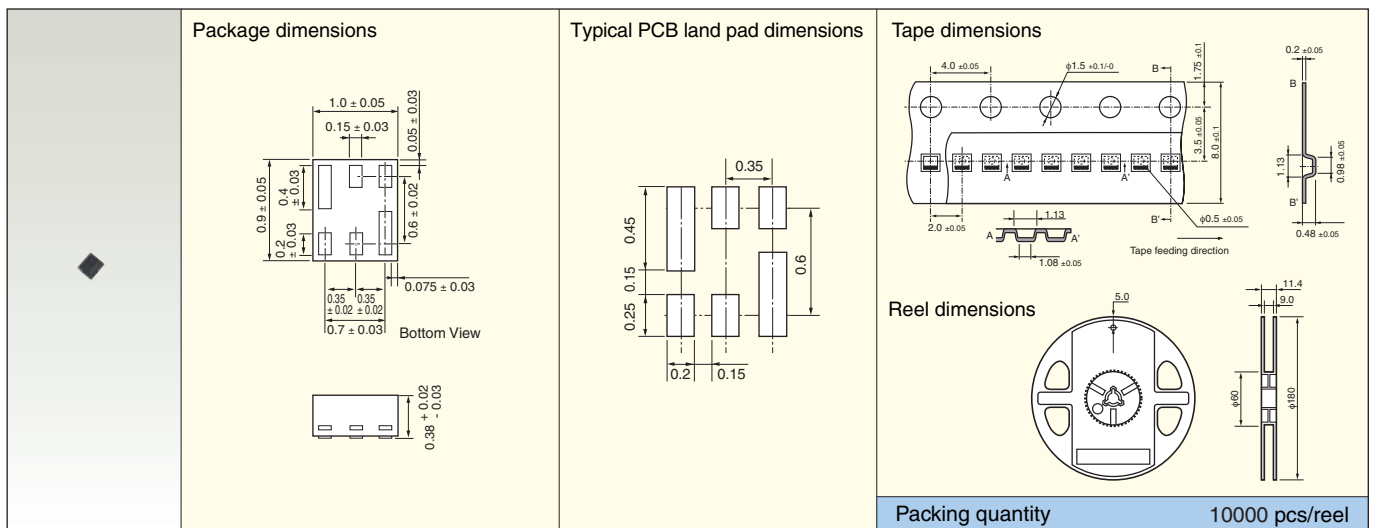
■ SMV (SOT-25)(SC-74A)

Unit: mm



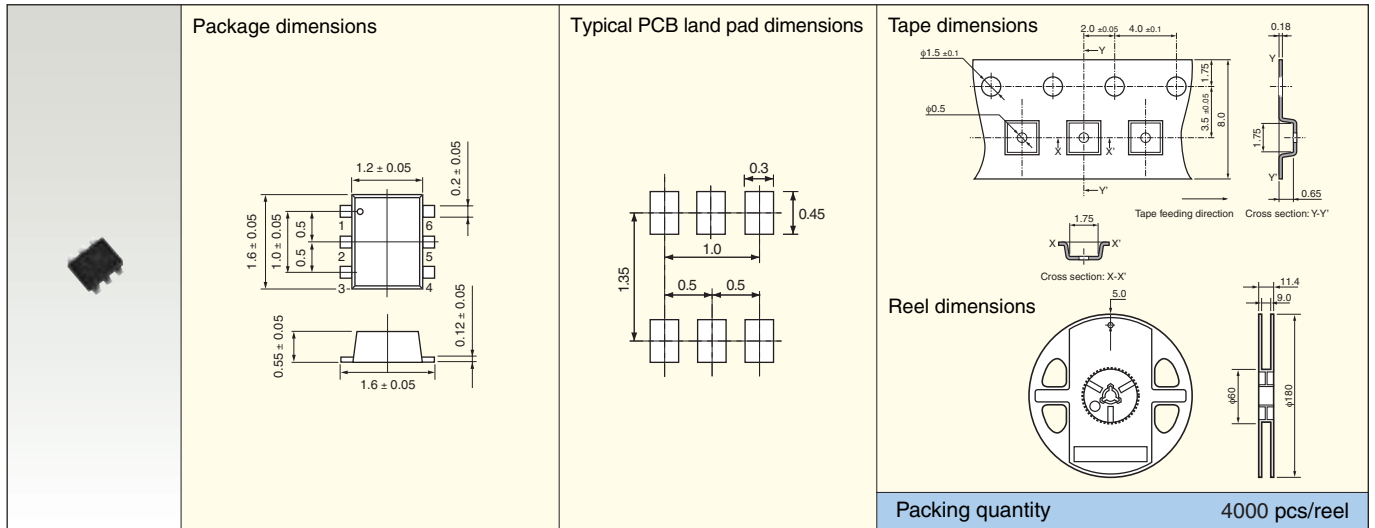
■ CST6D

Unit: mm



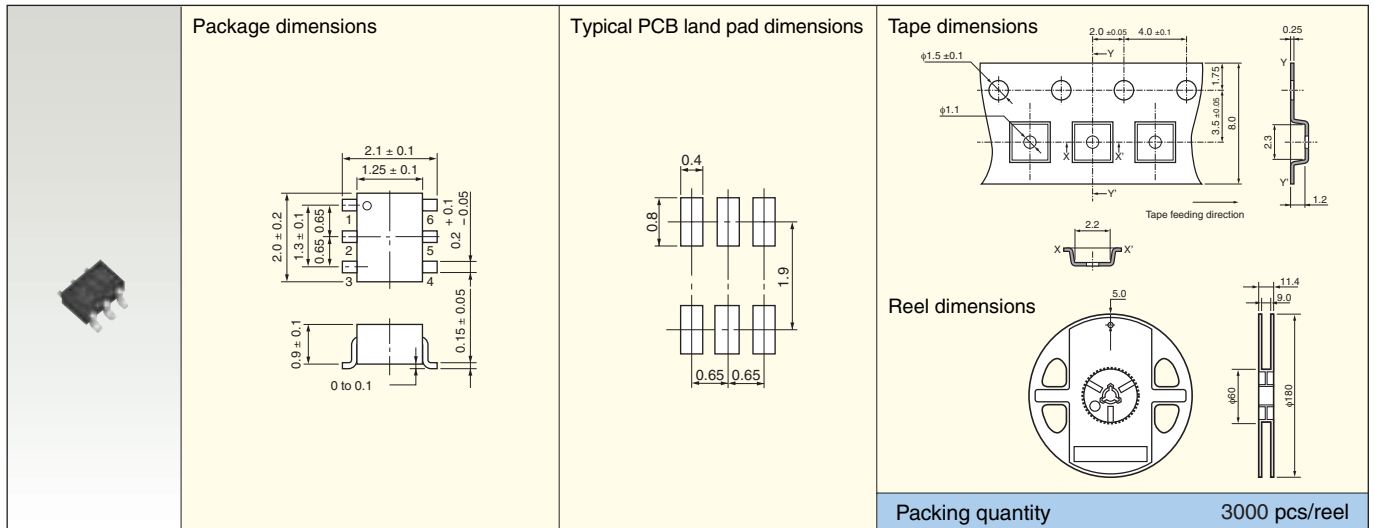
■ ES6 (SOT-563)

Unit: mm



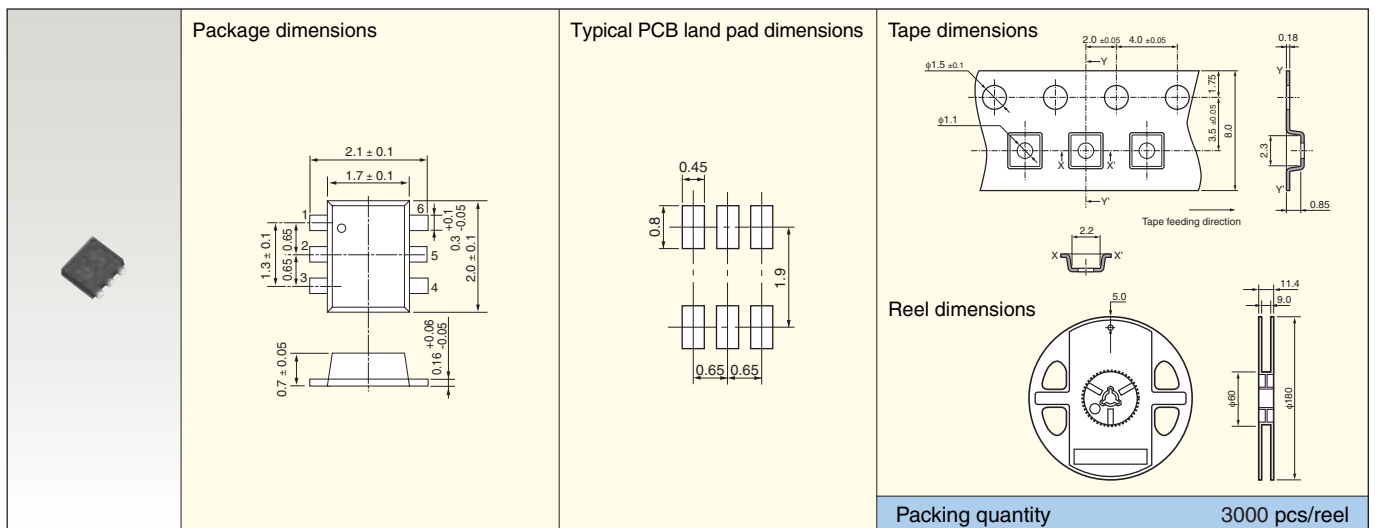
■ US6 (SOT-363)(SC-88)

Unit: mm



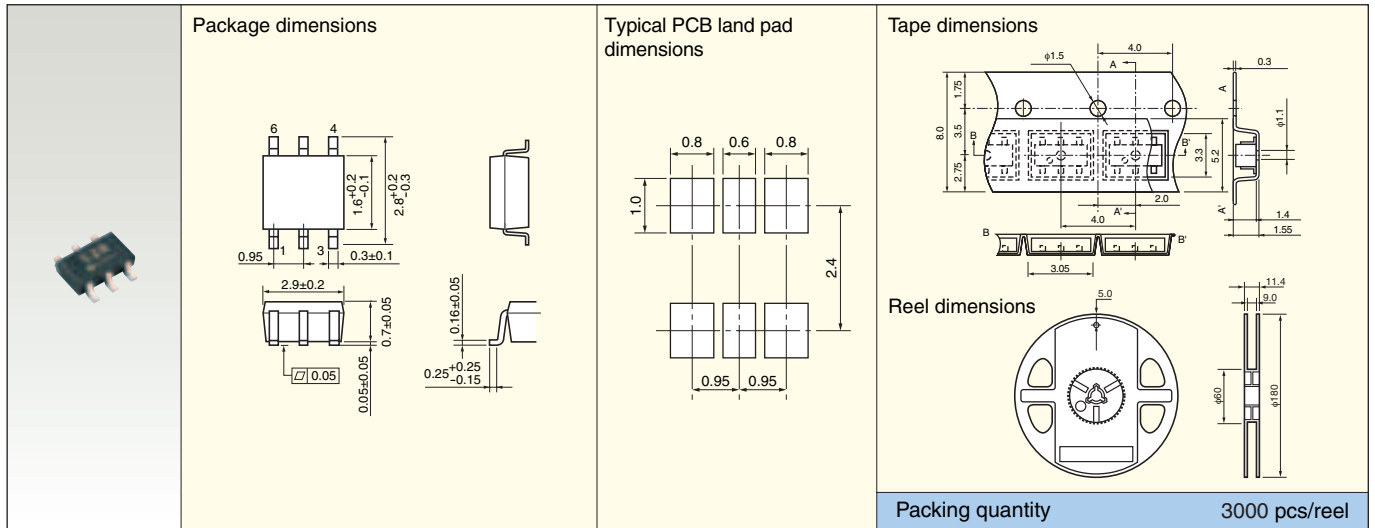
■ UF6

Unit: mm



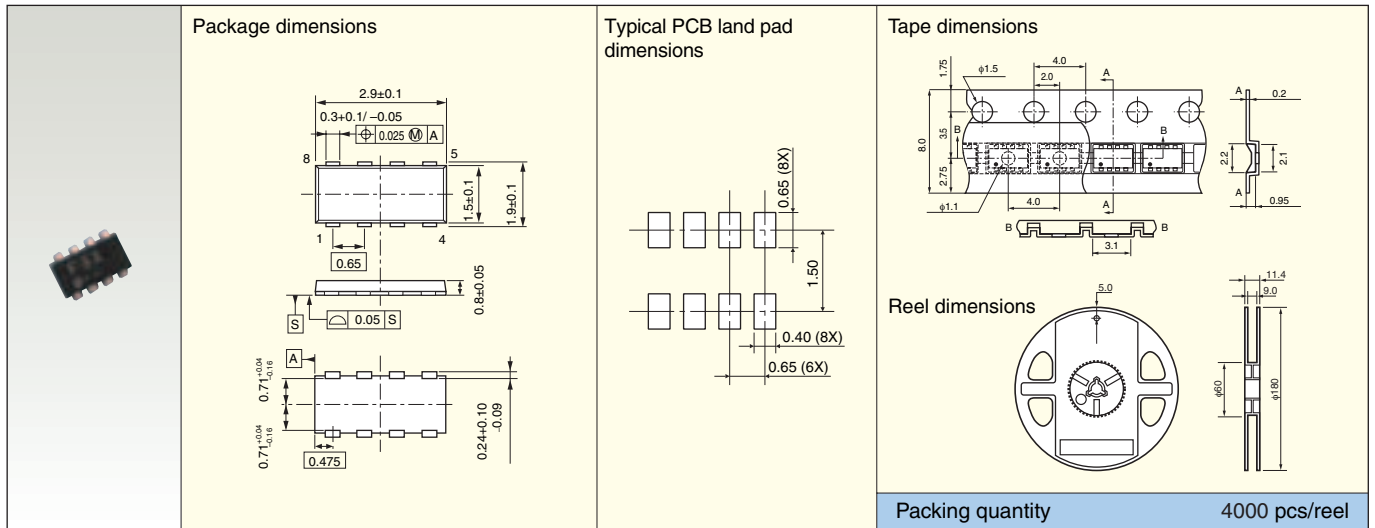
■ VS-6

Unit: mm



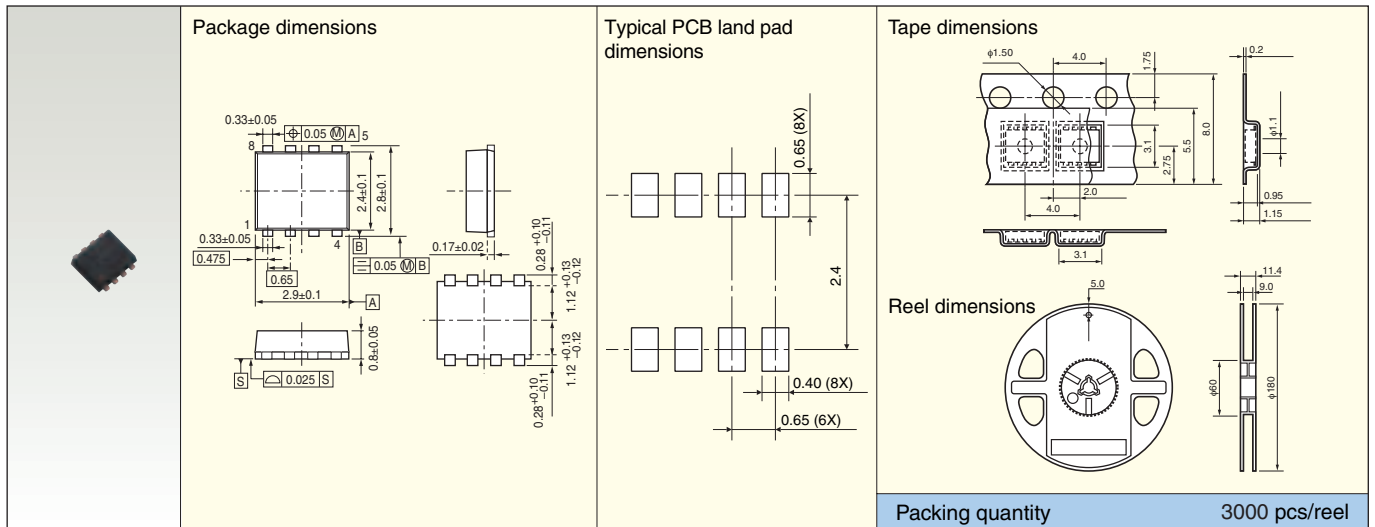
■ VS-8

Unit: mm



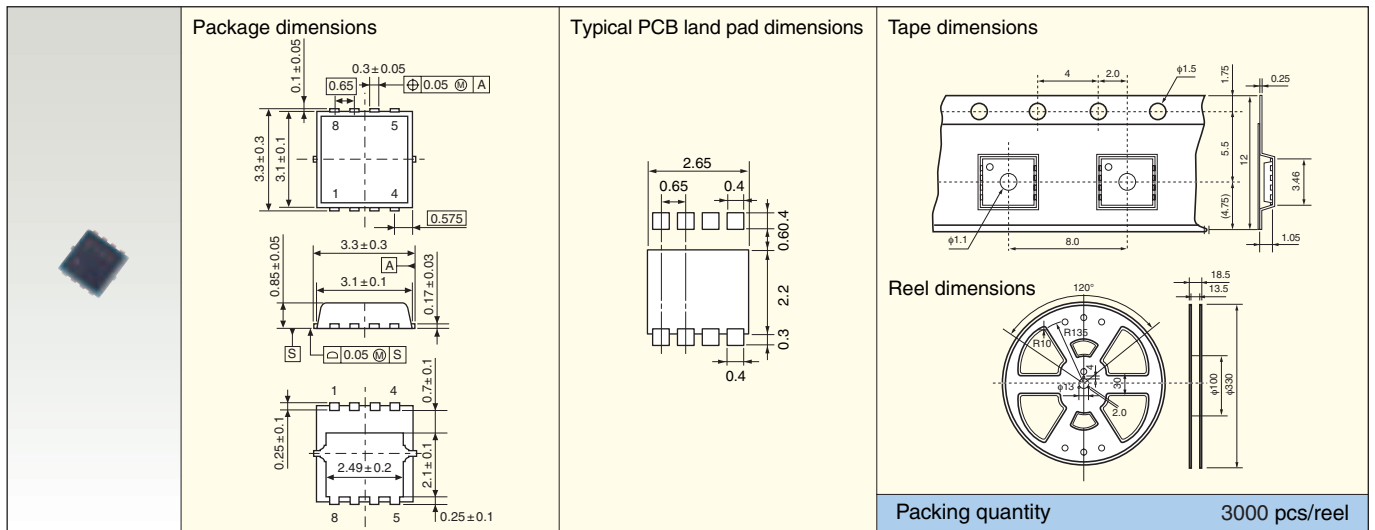
■ PS-8

Unit: mm



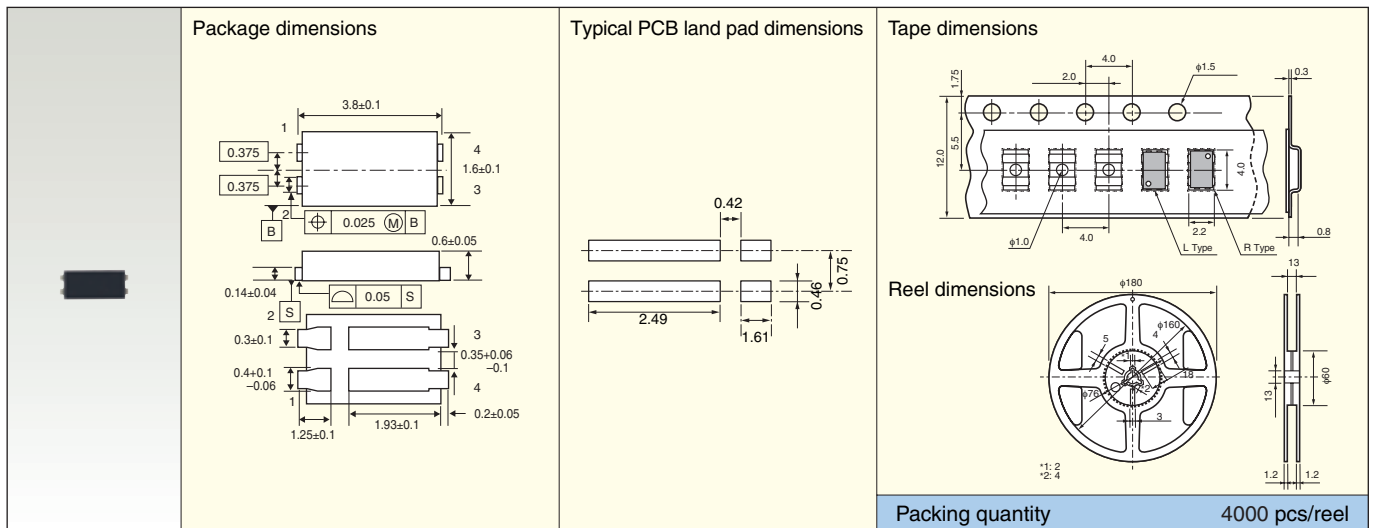
■ TSON

Unit: mm



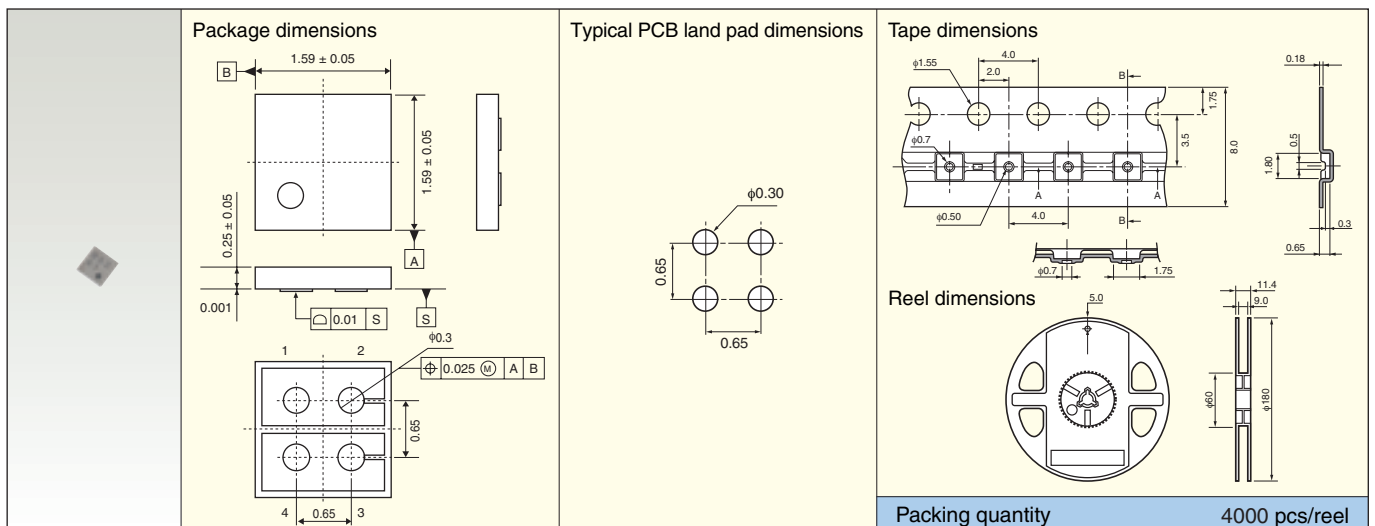
■ STP2

Unit: mm



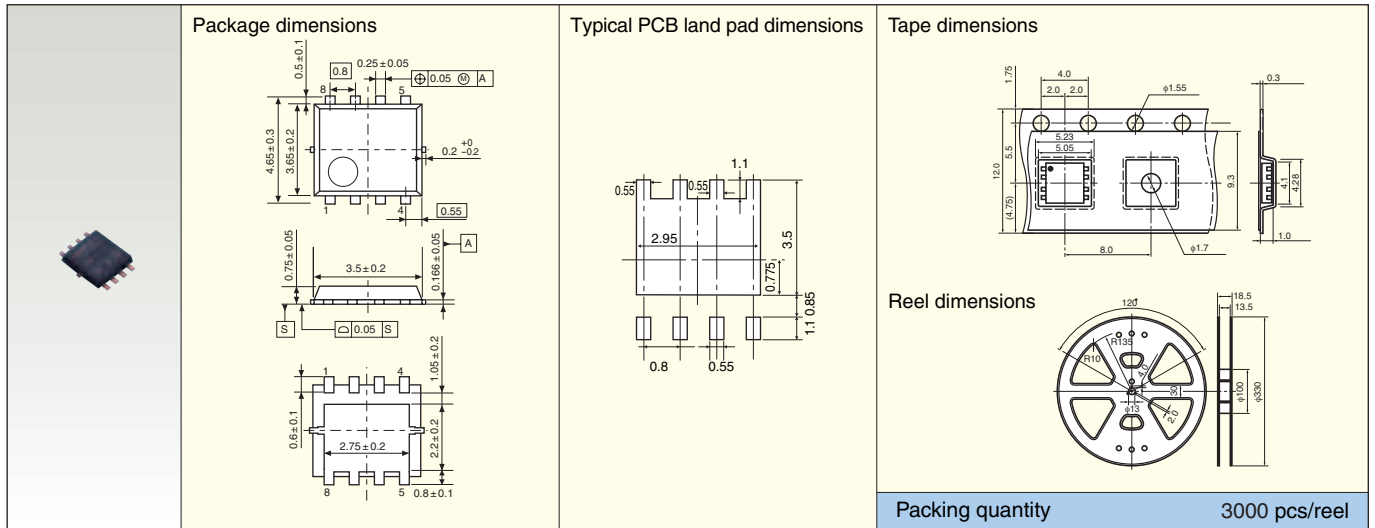
■ Chip LGA

Unit: mm



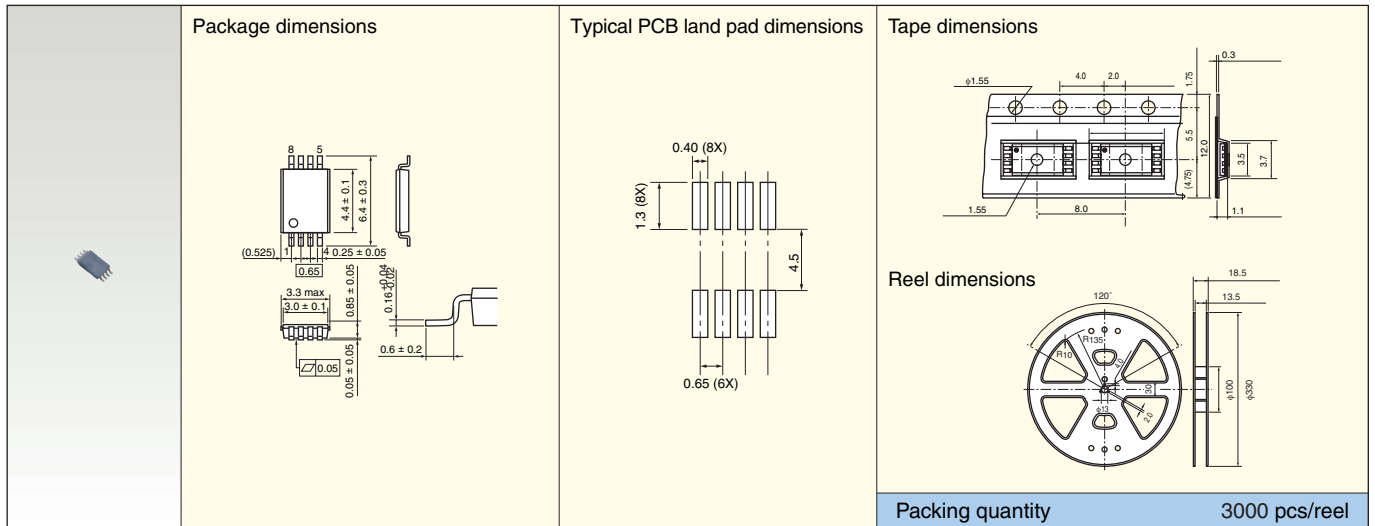
■ TSSOP Advance

Unit: mm



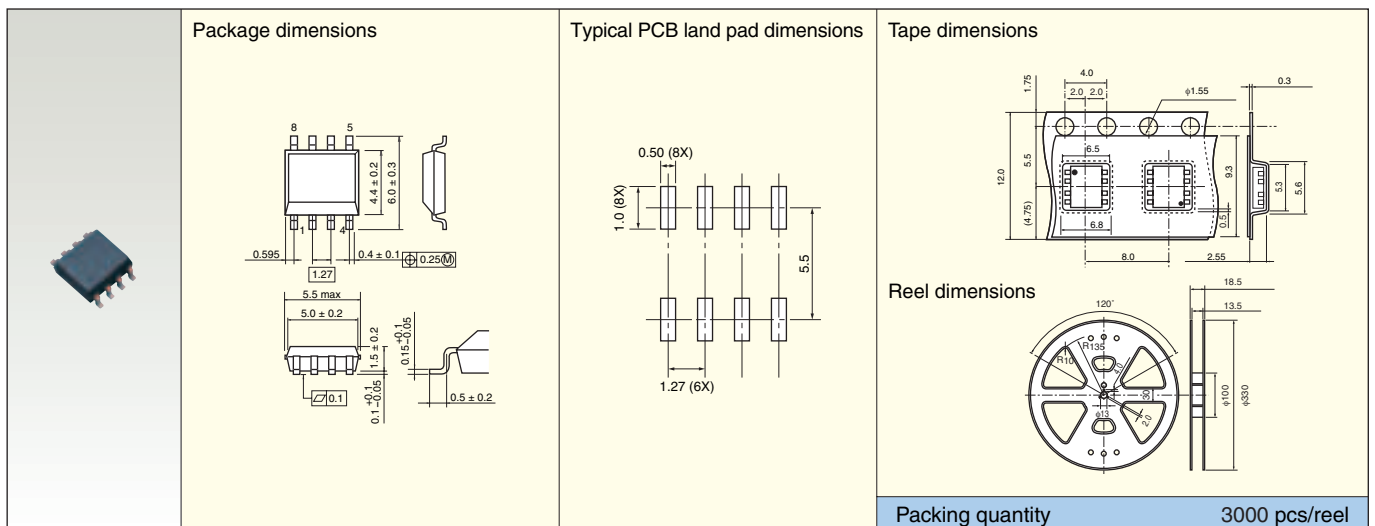
■ TSSOP-8

Unit: mm



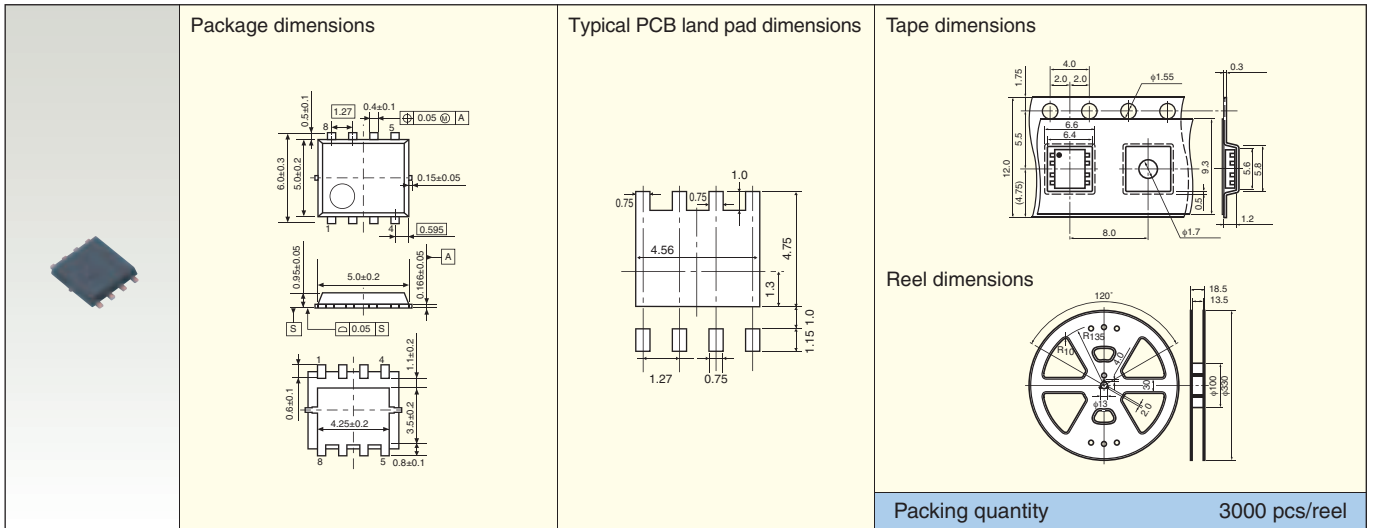
■ SOP-8

Unit: mm



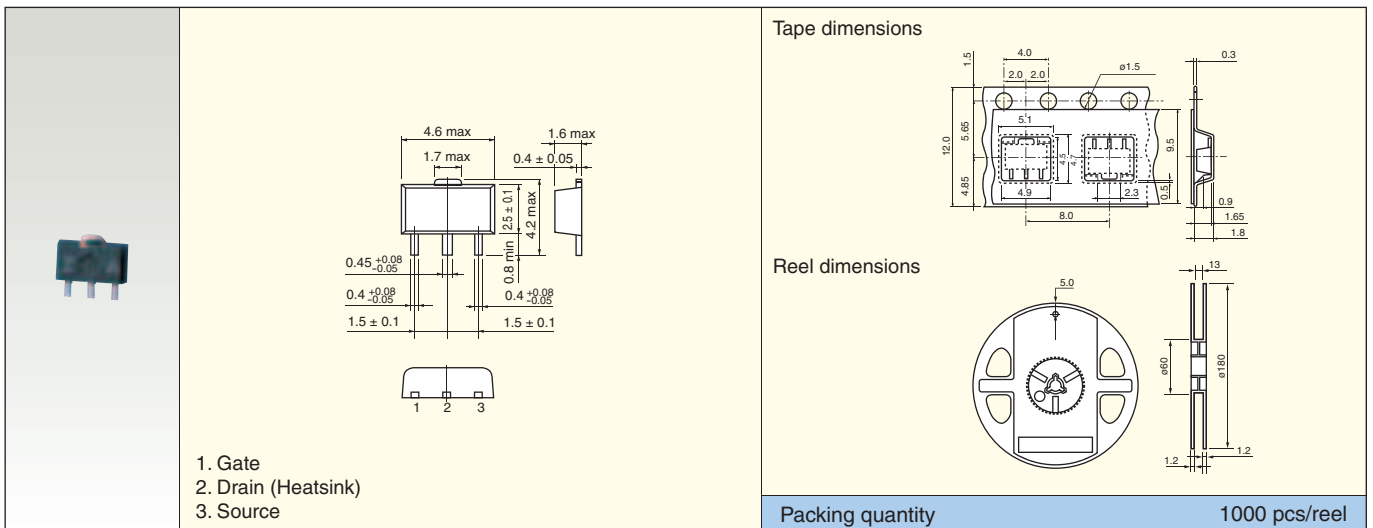
■ SOP Advance

Unit: mm



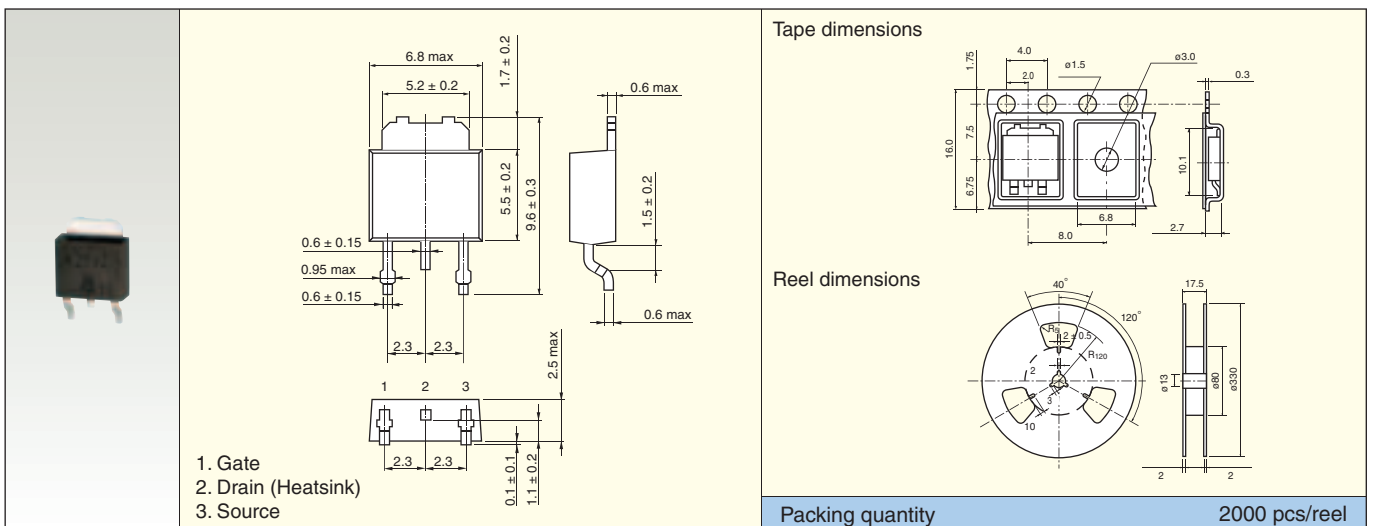
■ PW-Mini

Unit: mm



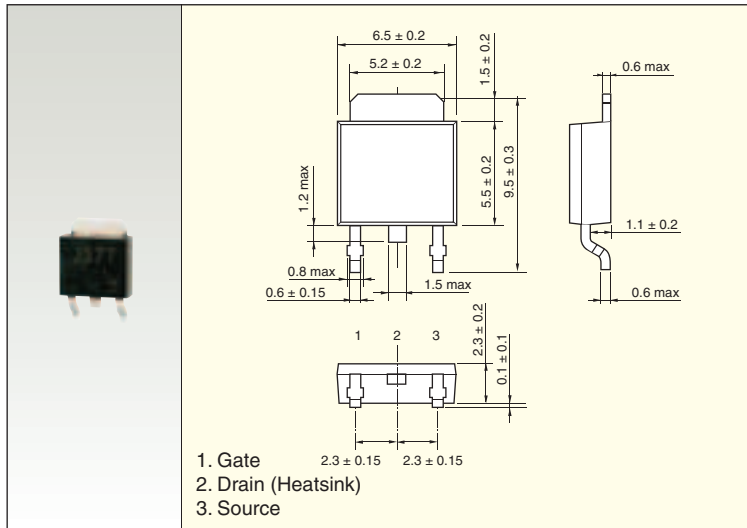
■ DP

Unit: mm

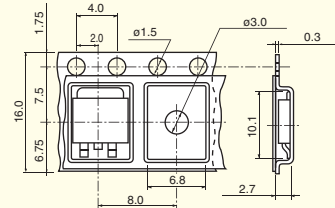


■ New PW-Mold

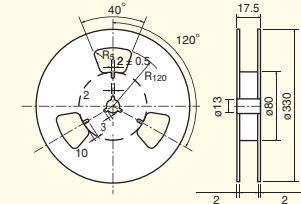
Unit: mm



Tape dimensions



Reel dimensions

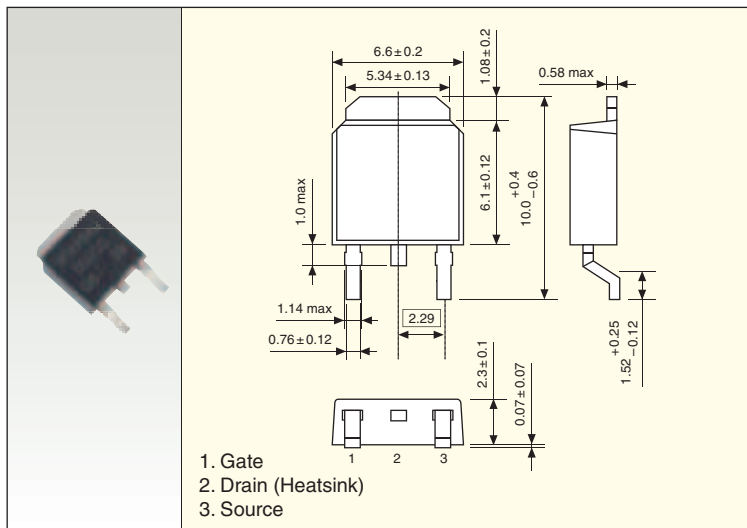


Packing quantity

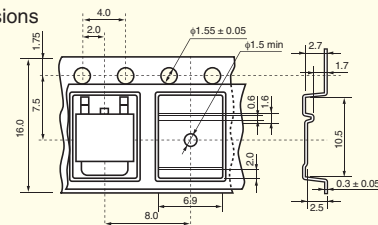
2000 pcs/reel

■ DPAK

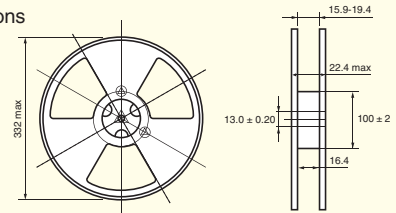
Unit: mm



Tape dimensions



Reel dimensions

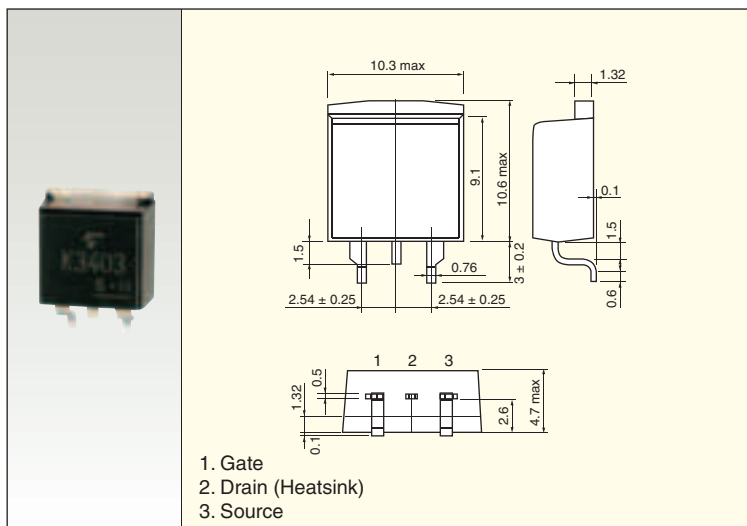


Packing quantity

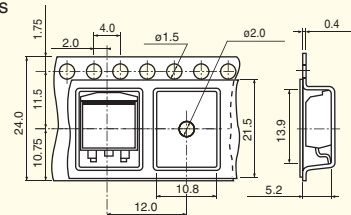
2000 pcs/reel

■ TO-220SM

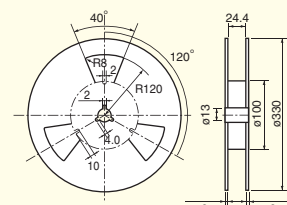
Unit: mm



Tape dimensions



Reel dimensions

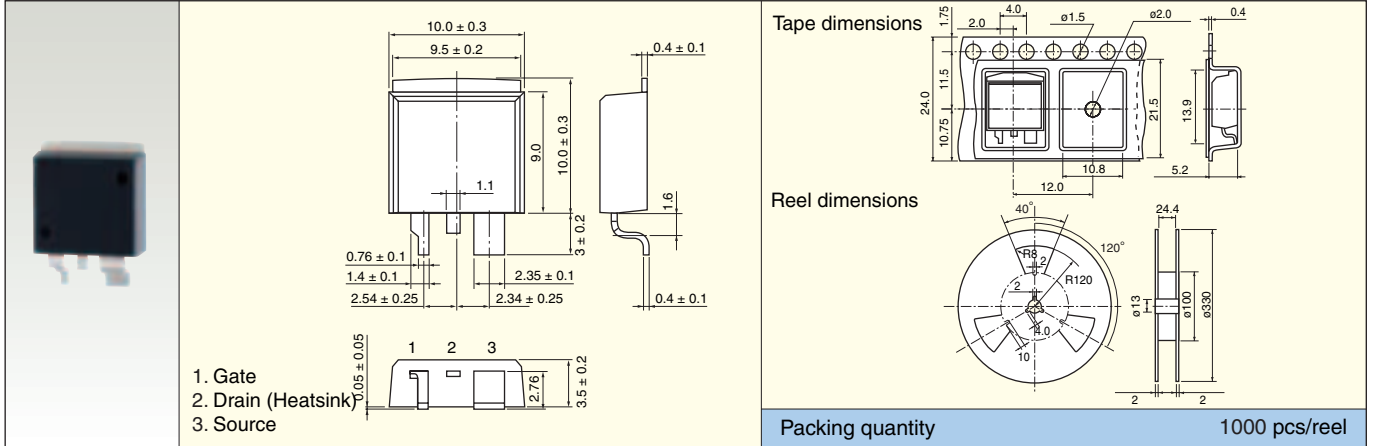


Packing quantity

1000 pcs/reel

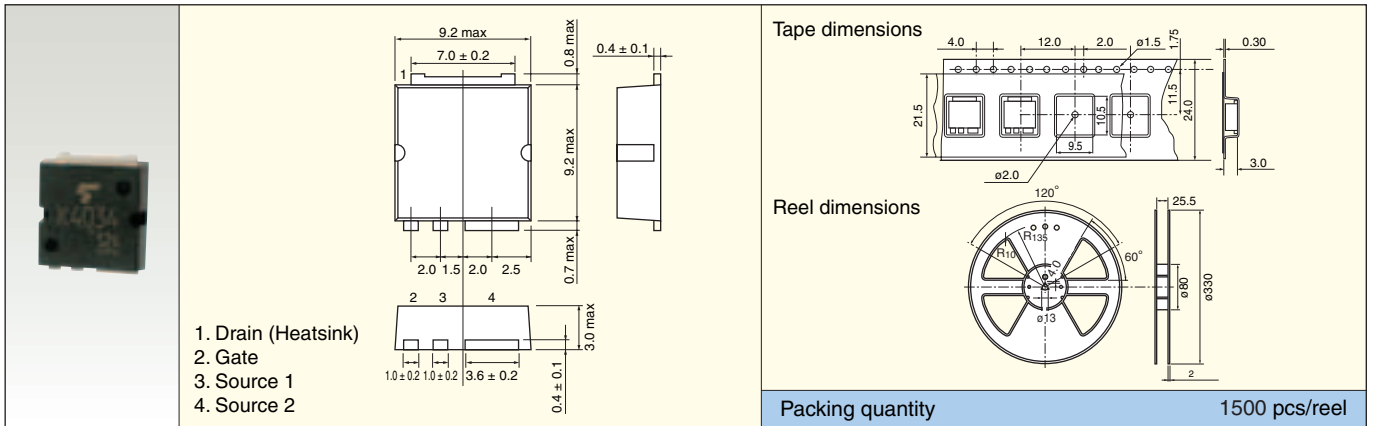
TO-220SM(W)

Unit: mm



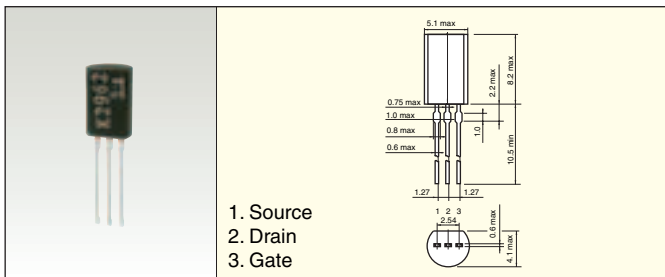
TFP

Unit: mm



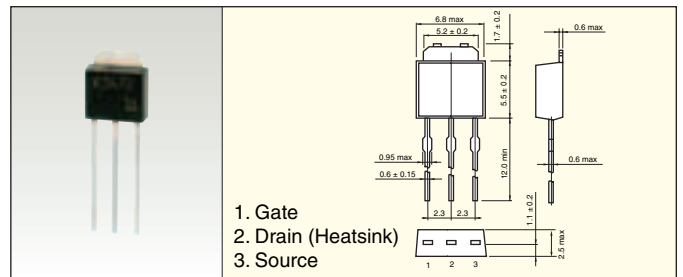
9-2 Through-Hole Packages

LSTM

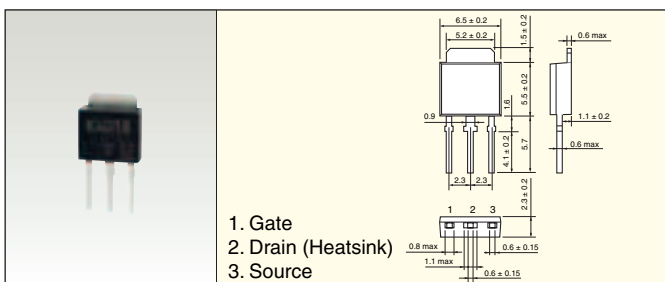


PW-Mold (Straight)

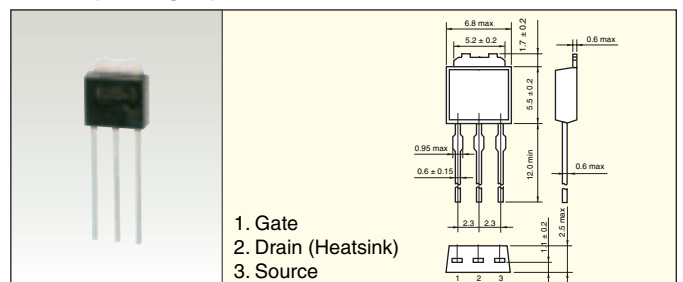
Unit: mm



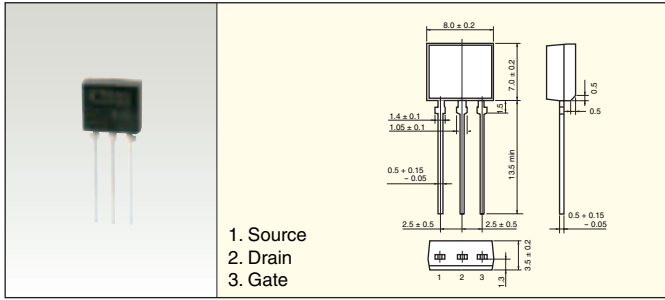
New PW-Mold2



DP (Straight)

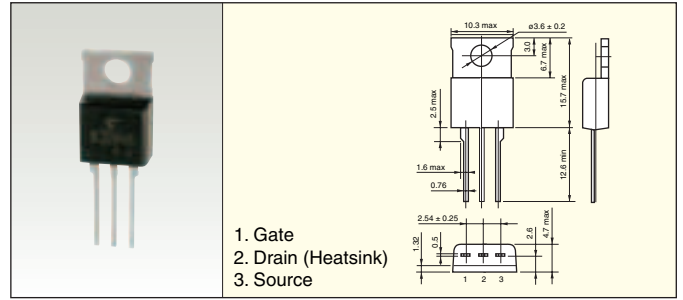


■ TPS

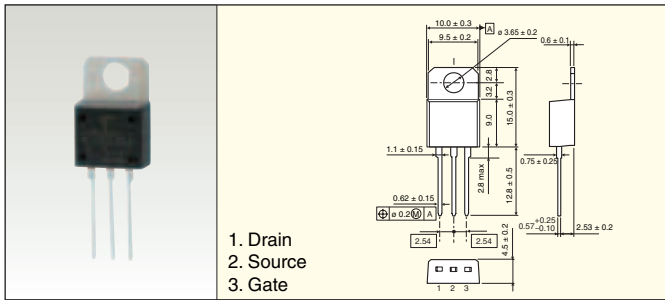


■ TO-220AB

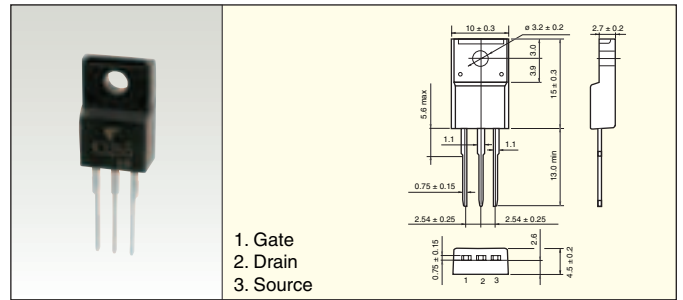
Unit: mm



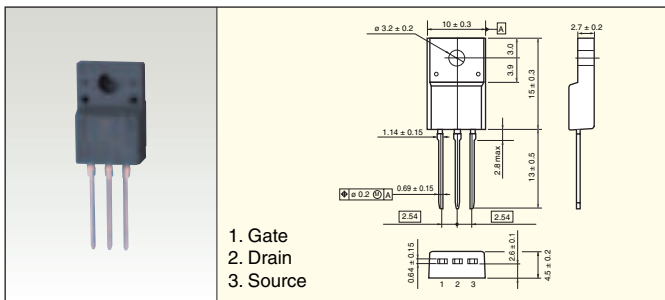
■ TO-220(W)



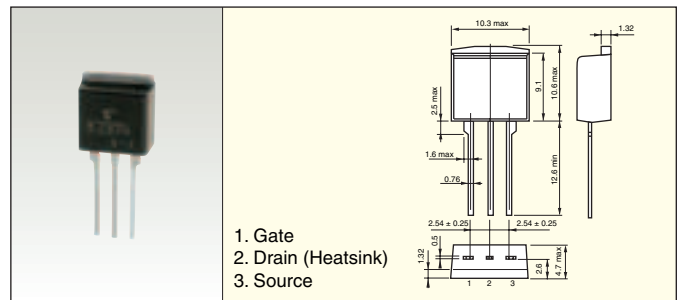
■ TO-220NIS



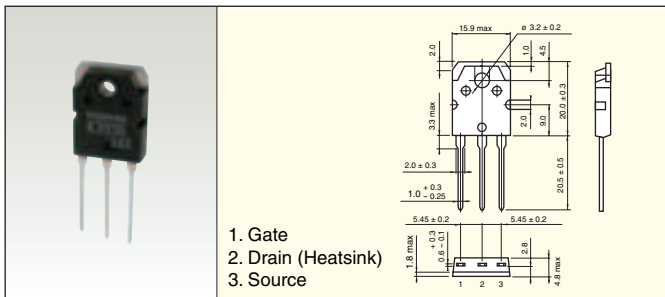
■ TO-220SIS



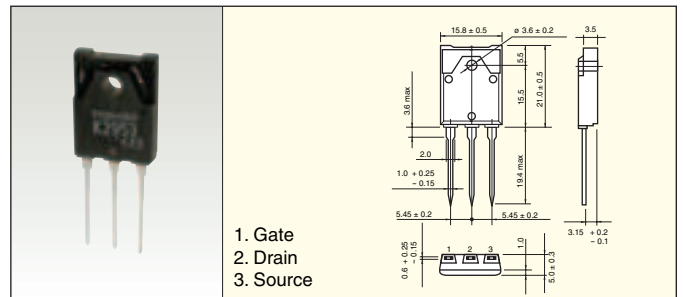
■ TO-220FL



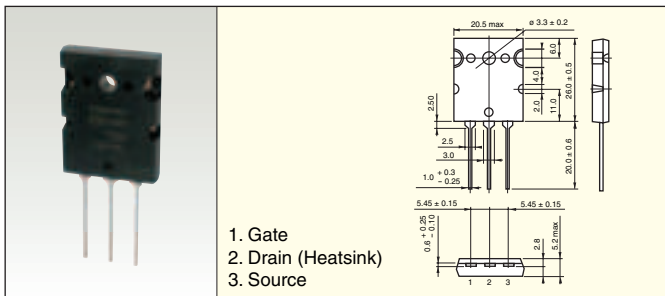
■ TO-3P(N)



■ TO-3P(N)IS



■ TO-3P(L)



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