

30V P-Channel Power MOSFET

DESCRIPTION

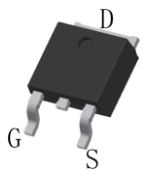
The BLM10P03 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge. It can be used in a wide variety of applications.

Application

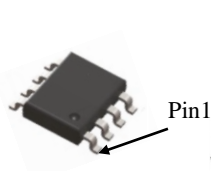
- Power switching application
- Hard switched and High frequency circuits
- Battery Protection

KEY CHARACTERISTICS

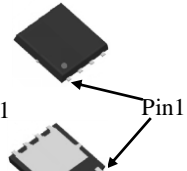
- $V_{DS} = -30V, I_D = -24A$ (PDFN3.3*3.3)
 $I_D = -30A$ (PDFN5*6)
 $I_D = -15A$ (SOP8)
 $I_D = -40A$ (TO-252)
- $R_{DS(ON)} < 10m\Omega$ @ $V_{GS} = -10V$
 $R_{DS(ON)} < 15m\Omega$ @ $V_{GS} = -4.5V$
- High density cell design for lower R_{dson}
- Excellent package for good heat dissipation



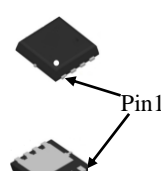
TO-252-2L



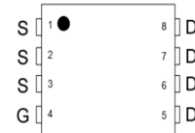
SOP8



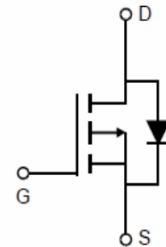
PDFN 5*6



PDFN 3.3*3.3



Package Top View



Schematic diagram

Package Marking And Ordering Information

Device Marking	Ordering Codes	Package	Product Code	Packing
M10P03	BLM10P03-D	TO-252-2L	BLM10P03	Tape Reel
M10P03	BLM10P03-R	PDFN3.3*3.3	BLM10P03	Tape Reel
M10P03	BLM10P03-E	SOP8	BLM10P03	Tape Reel
M10P03	BLM10P03-Q	PDFN5*6	BLM10P03	Tape Reel

Absolute Maximum Ratings ($T_A = 25^\circ C$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	-30	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D (PDFN3.3*3.3)	-24	A
	I_D (PDFN5*6)	-30	A
	I_D (SOP8)	-15	A
	I_D (TO-252)	-40	A
Drain Current-Pulsed ^(Note 1)	I_{DM} (PDFN3.3*3.3)	-96	A
	I_{DM} (PDFN5*6)	-120	A
	I_{DM} (SOP8)	-60	A
	I_{DM} (TO-252)	-160	A

Maximum Power Dissipation($T_c=25^{\circ}\text{C}$)	P_D (PDFN3.3*3.3)	8.4	W
	P_D (PDFN5*6)	13	W
	P_D (SOP8)	3.3	W
	P_D (TO-252)	23.2	W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	$^{\circ}\text{C}$

Thermal Characteristic

Thermal Resistance, Junction-to-Ambient	$R_{\theta JC}$ (PDFN3.3*3.3)	15.0	$^{\circ}\text{C/W}$
	$R_{\theta JC}$ (PDFN5*6)	9.6	$^{\circ}\text{C/W}$
	$R_{\theta JC}$ (SOP8)	38.3	$^{\circ}\text{C/W}$
	$R_{\theta JC}$ (TO-252)	5.4	$^{\circ}\text{C/W}$

Electrical Characteristics ($T_A=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=-250\mu\text{A}$	-30	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=-30V, V_{GS}=0V$	-	-	-1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
On Characteristics						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu\text{A}$	-1.0	-1.5	-2.4	V
Drain-Source On-State Resistance ^(Note 2)	$R_{DS(on)}$	$V_{GS}=-10V, I_D=-17A$	-	8	10	m Ω
		$V_{GS}=-4.5V, I_D=-13A$	-	12	15	m Ω
Forward Transconductance	g_{FS}	$V_{DS}=-5V, I_D=-17A$	-	43	-	S
Dynamic Characteristics						
Input Capacitance	C_{iss}	$V_{DS}=-15V, V_{GS}=0V,$ $f=1.0\text{MHz}$	-	2000	-	pF
Output Capacitance	C_{oss}		-	290	-	pF
Reverse Transfer Capacitance	C_{rss}		-	270	-	pF
Switching Characteristics ^(Note 3)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=-15V, I_D=-17A,$ $V_{GS}=-10V, R_{GEN}=3\Omega$	-	10	-	nS
Turn-on Rise Time	t_r		-	8	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	43	-	nS
Turn-Off Fall Time	t_f		-	18	-	nS
Total Gate Charge	Q_g	$V_{DS}=-15V, I_D=-17A$ $V_{GS}=-10V$	-	36	-	nC
Gate-Source Charge	Q_{gs}		-	5.3	-	nC
Gate-Drain Charge	Q_{gd}		-	8.8	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_S=-1A$	-	-	-1.2	V

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2\%$.
3. Guaranteed by design, not subject to production.

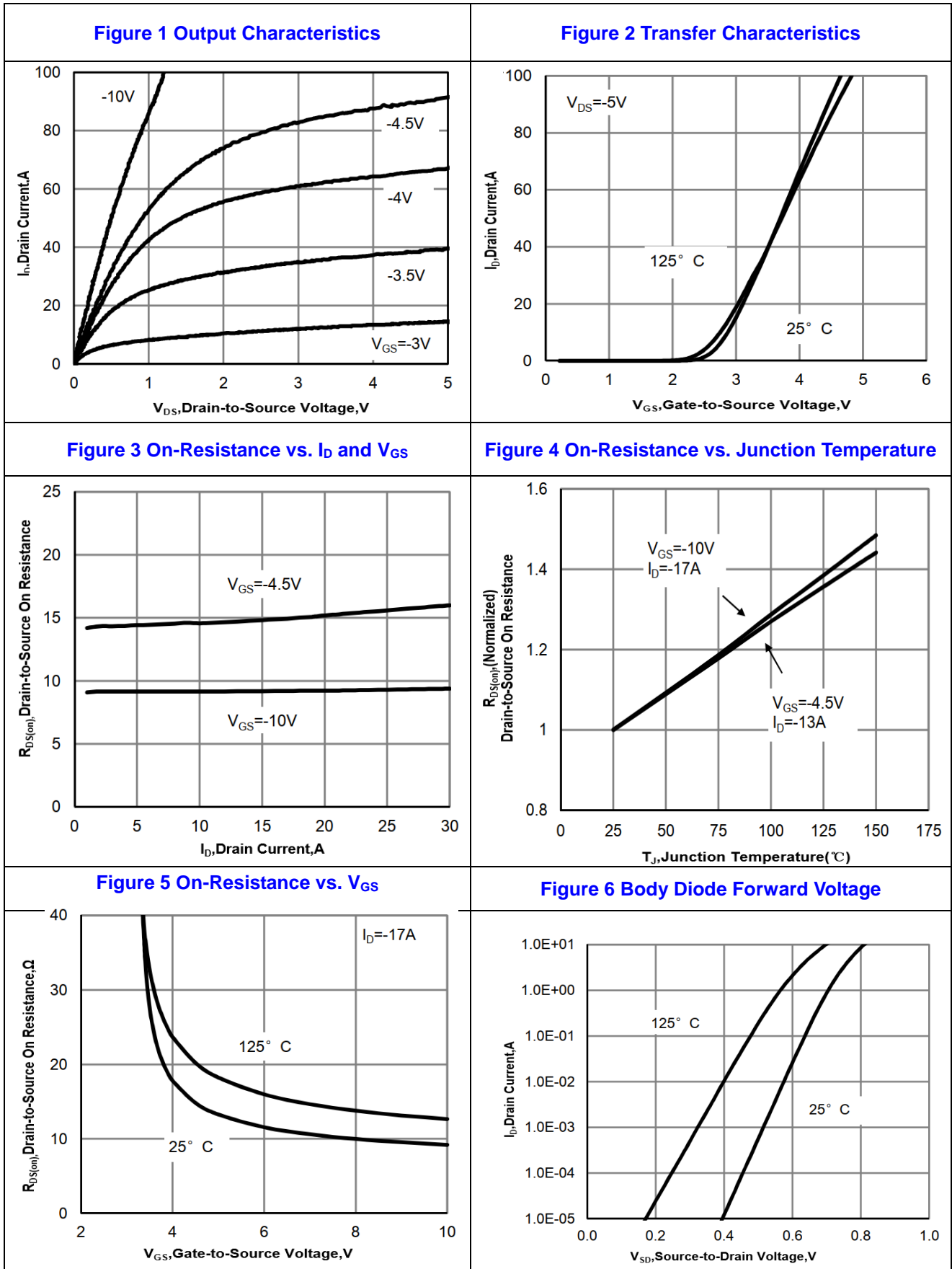
Characteristics Curves


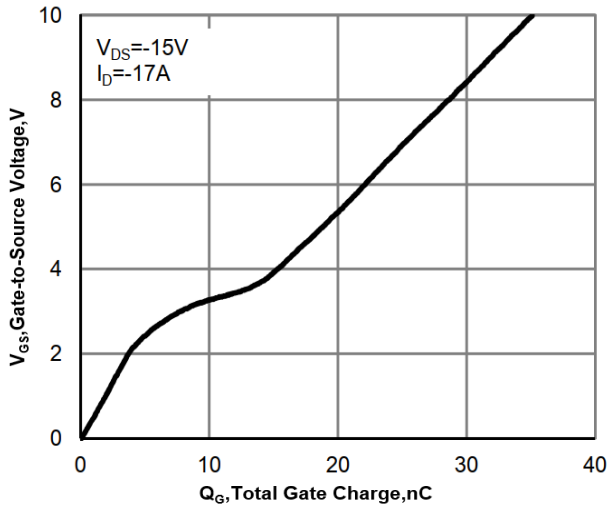
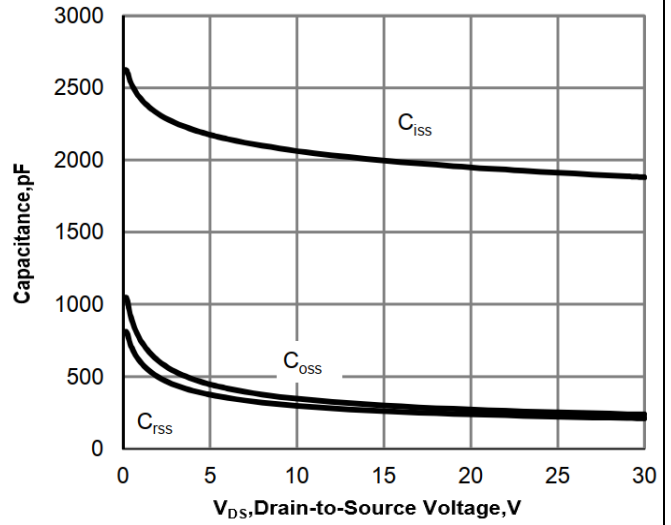
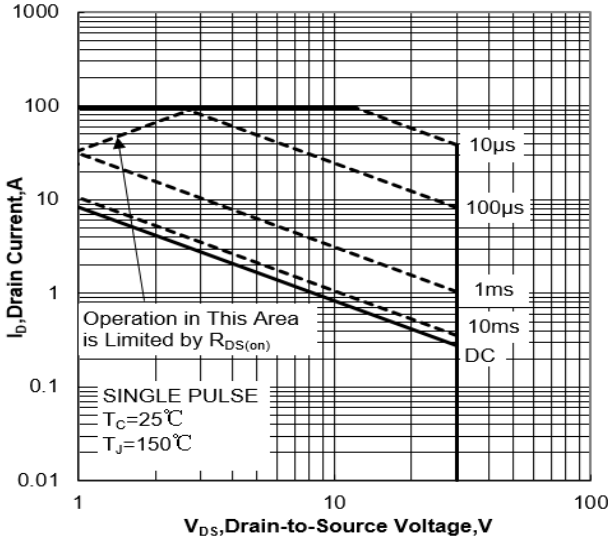
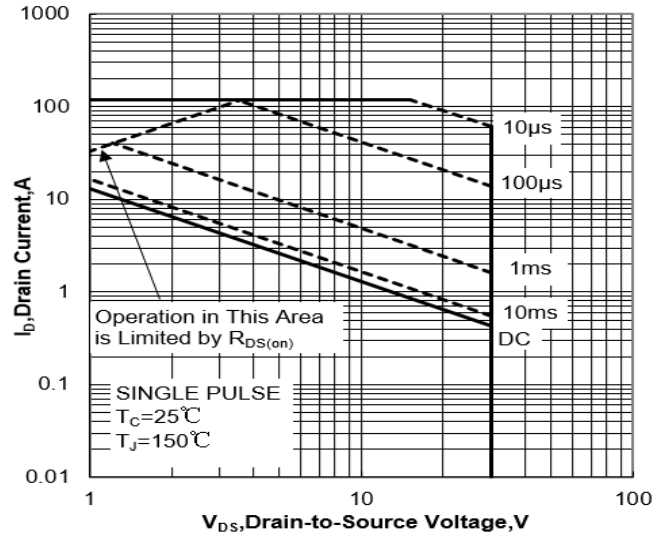
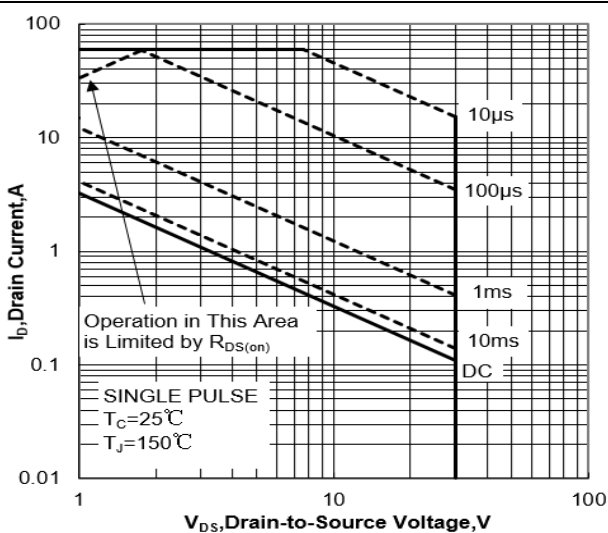
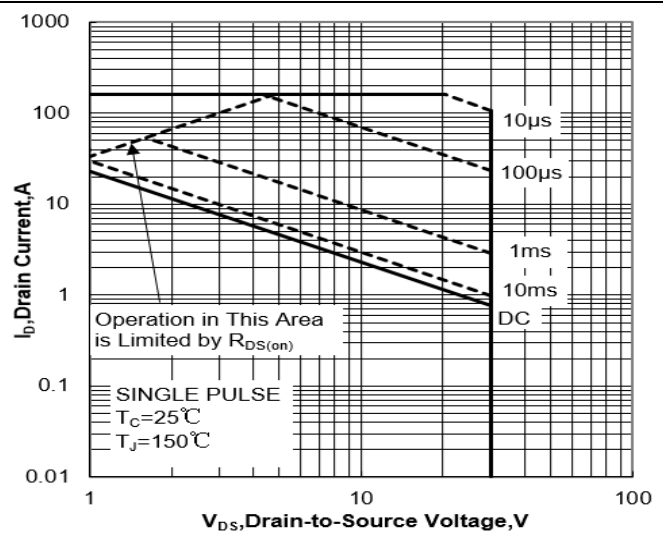
Figure 7 Gate-Charge Characteristics

Figure 8 Capacitance Characteristics

Figure 9a Maximum Forward Biased Safe Operation Area (PDFN3.3*3.3)

Figure 9b Maximum Forward Biased Safe Operation Area (PDFN5*6)

Figure 9c Maximum Forward Biased Safe Operation Area (SOP8)

Figure 9d Maximum Forward Biased Safe Operation Area (TO-252)


Figure 10a Single Pulse Power Rating Junction-to-Ambient (PDFN3.3*3.3)

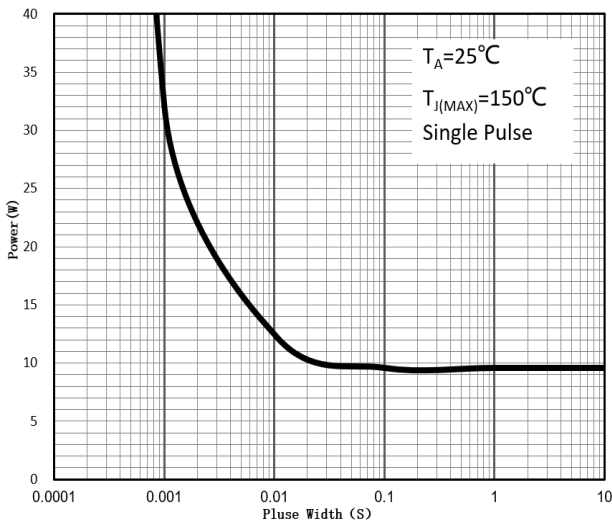


Figure 10b Single Pulse Power Rating Junction-to-Ambient (PDFN5*6)

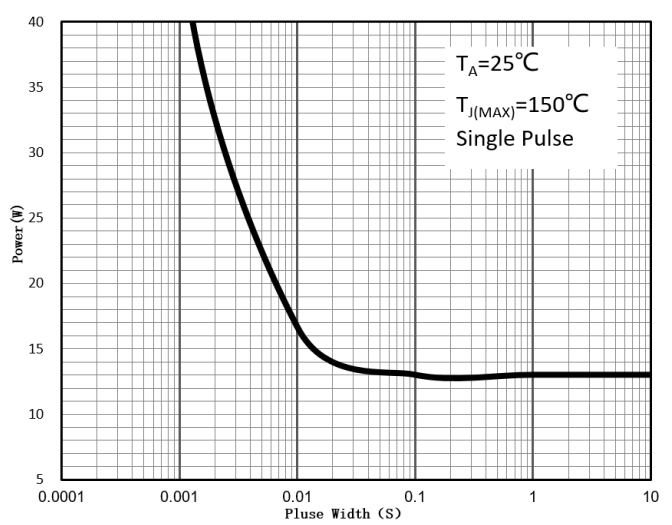


Figure 10c Single Pulse Power Rating Junction-to-Ambient (SOP8)

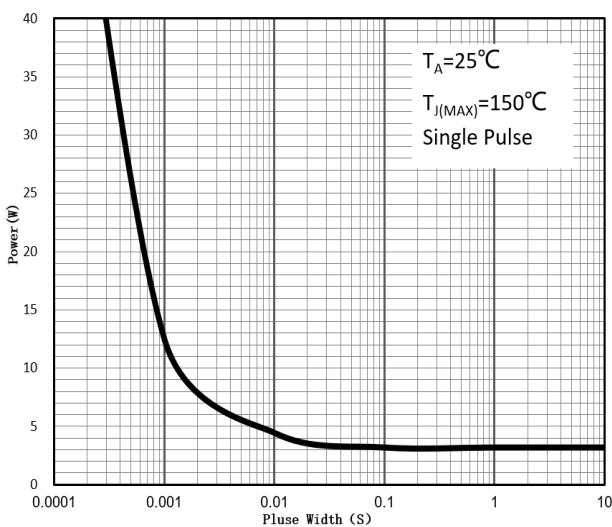


Figure 10d Single Pulse Power Rating Junction-to-Ambient (TO-252)

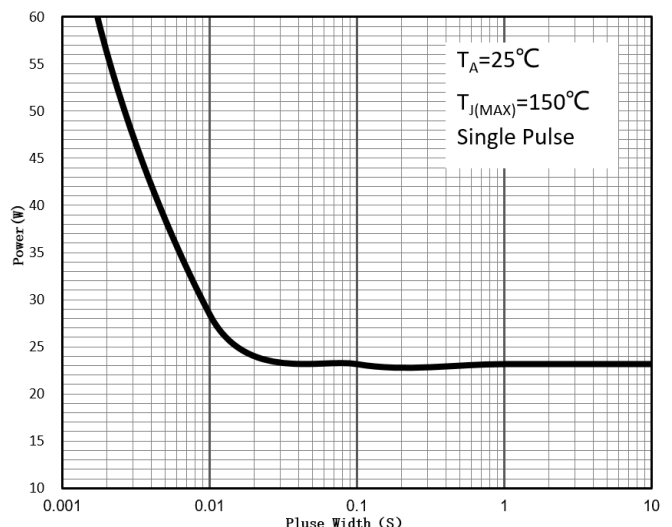


Figure 11a Normalized Maximum Transient Thermal Impedance (PDFN3.3*3.3)

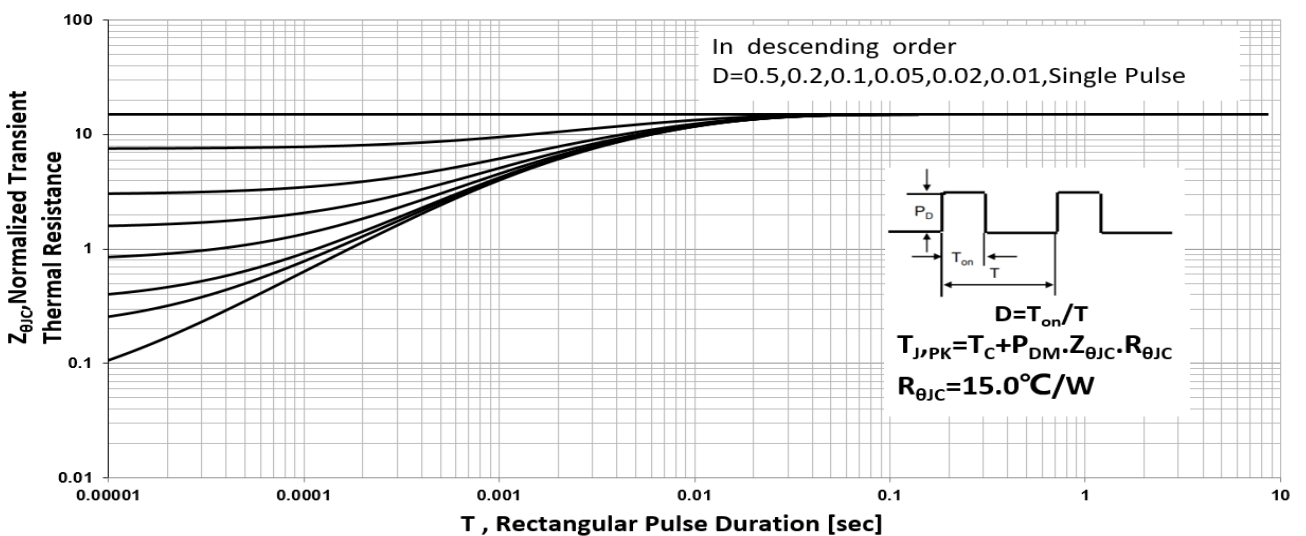


Figure 11b Normalized Maximum Transient Thermal Impedance (PDFN 5*6)

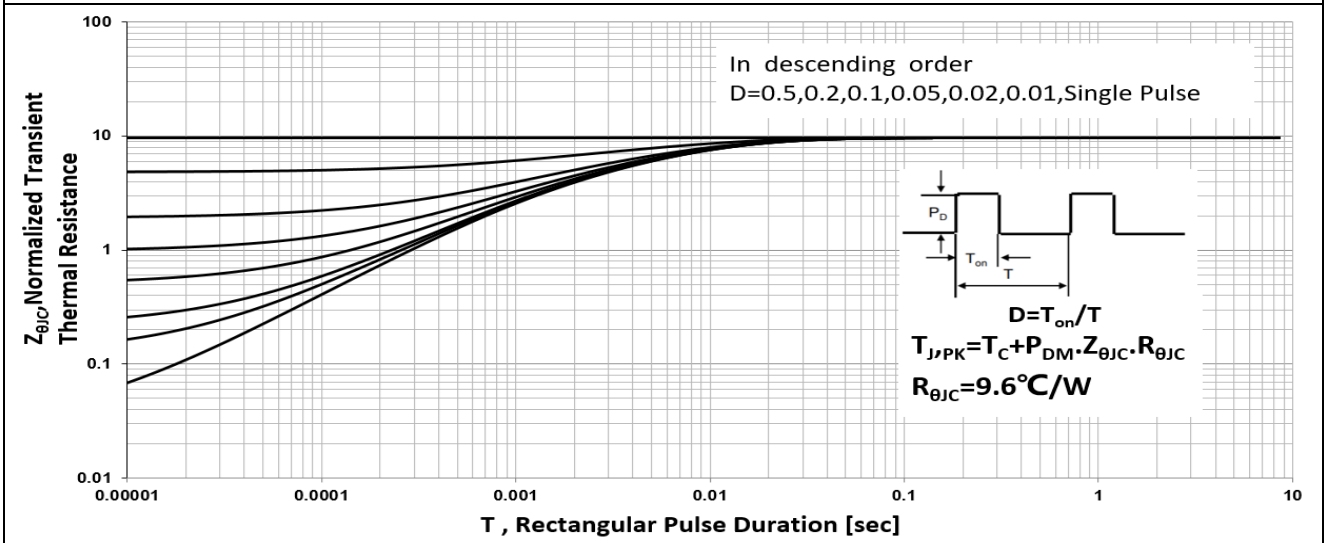


Figure 11c Normalized Maximum Transient Thermal Impedance (SOP8)

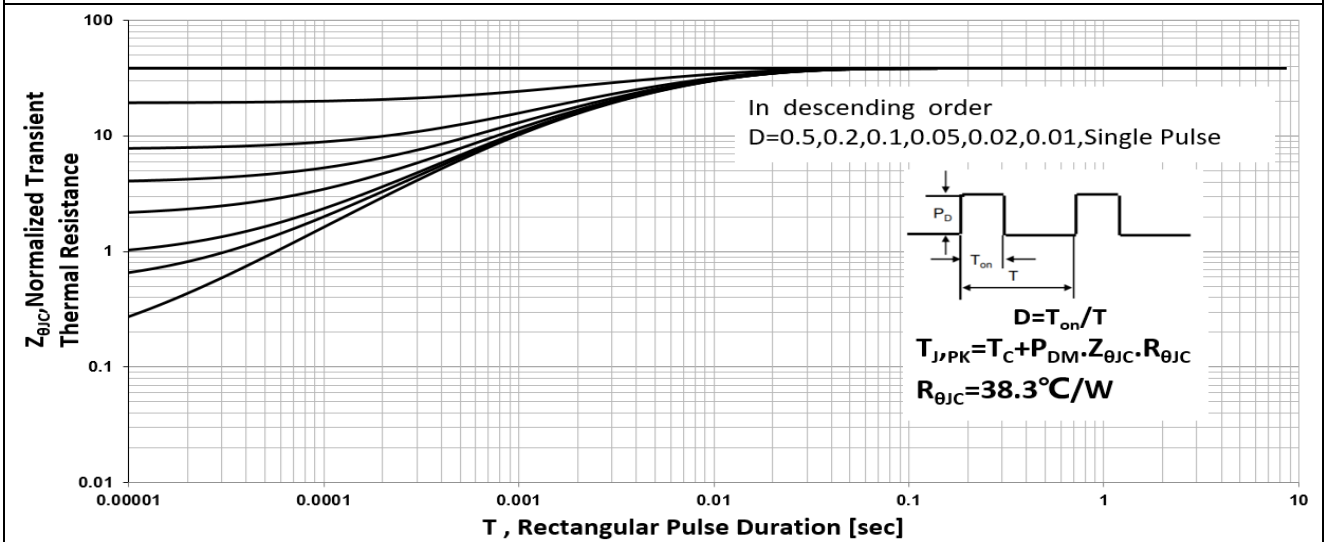
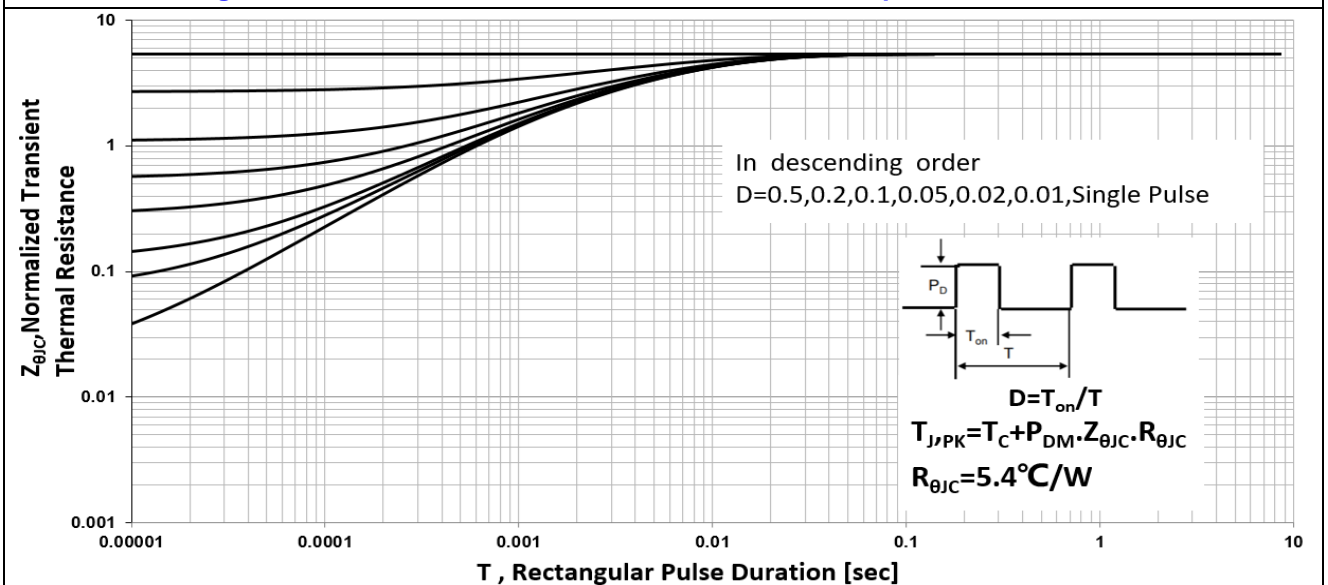
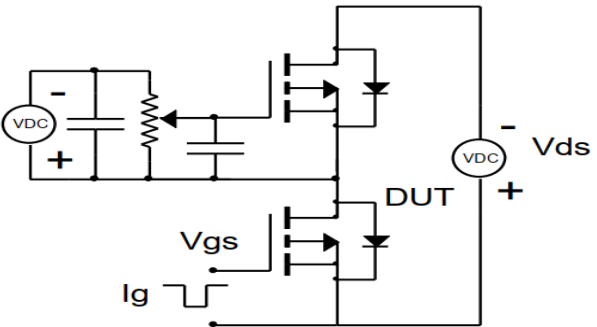
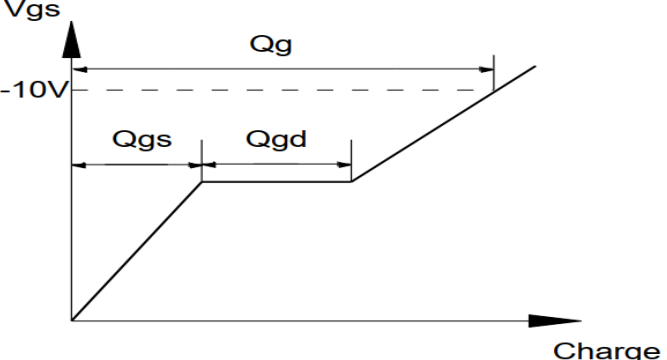
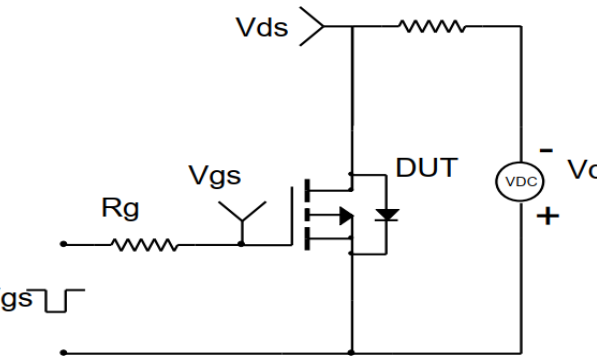
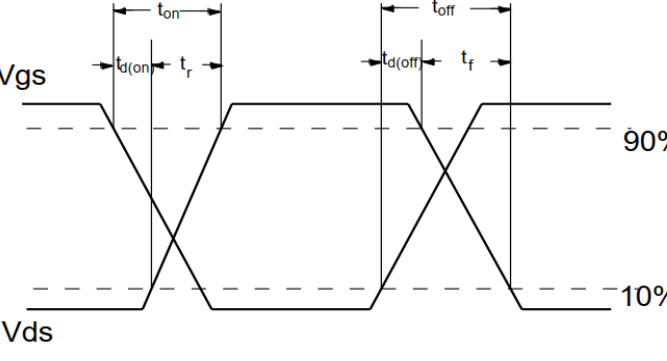
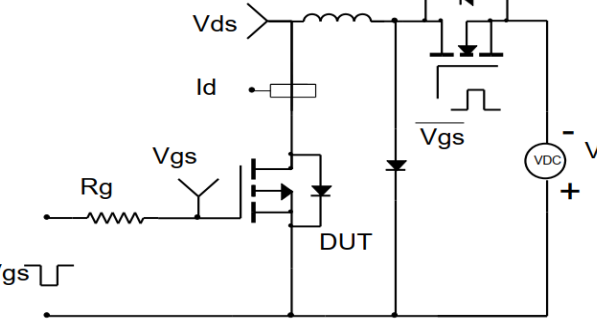
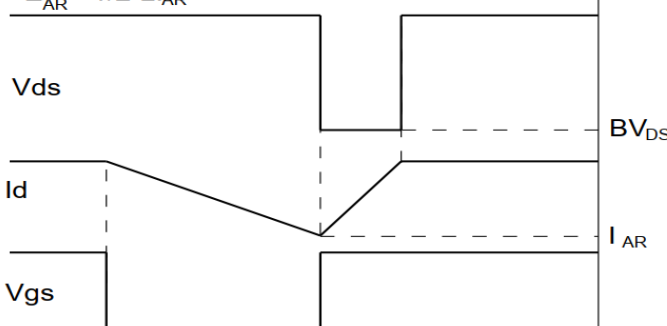
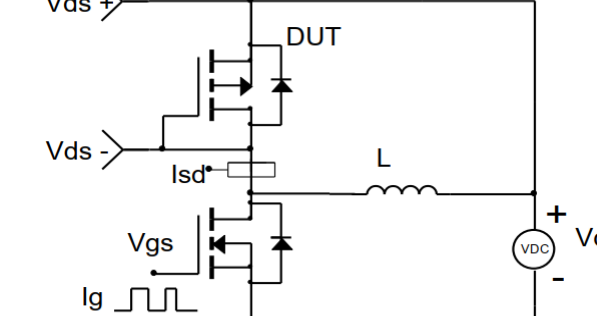
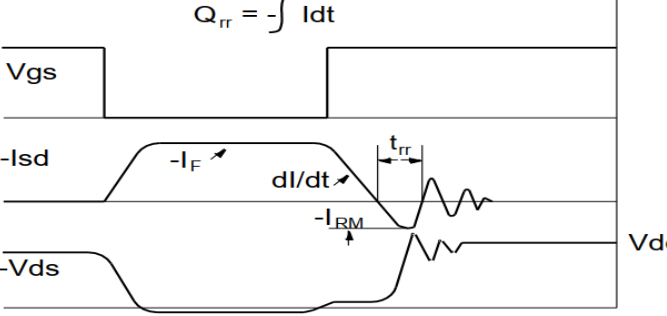
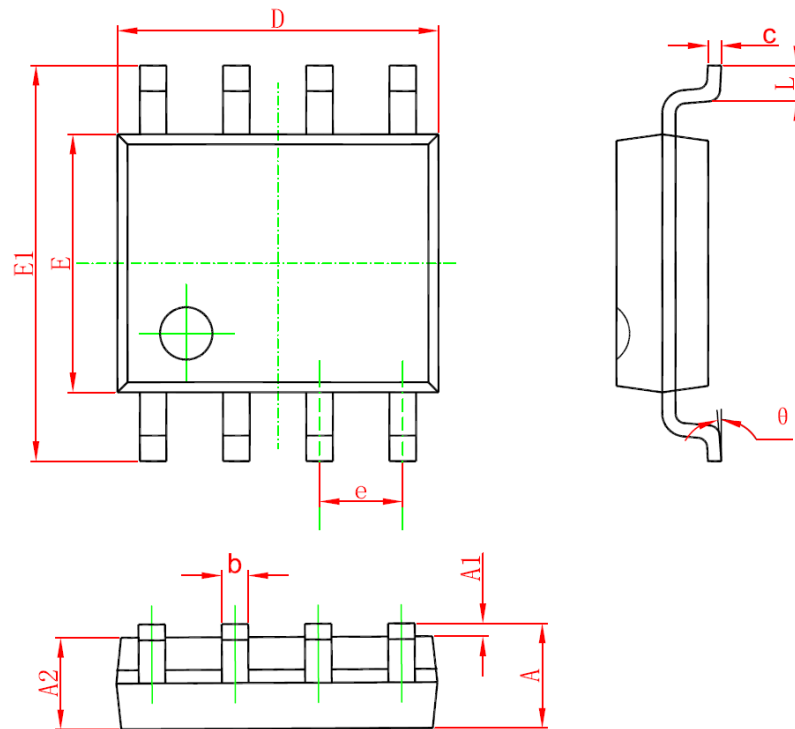


Figure 11d Normalized Maximum Transient Thermal Impedance (TO-252)



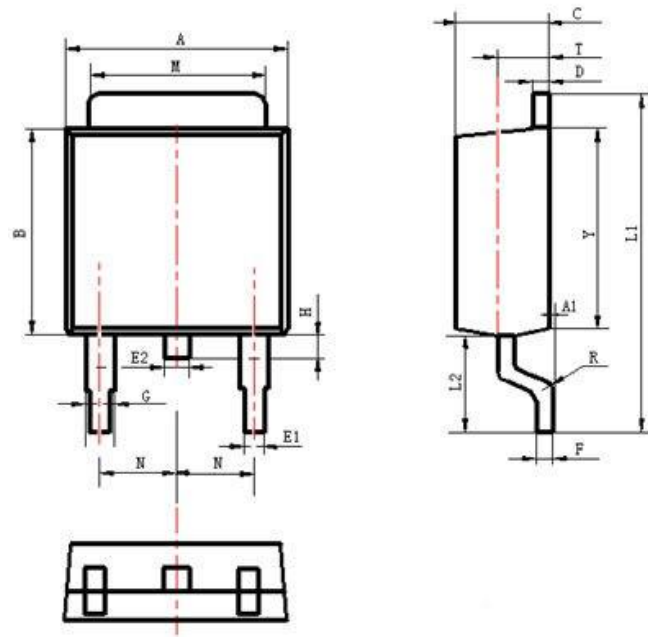
Test Circuit and Waveform

Gate Charge Test Circuit	Gate Charge Test Waveform
 <p>The diagram shows a MOSFET (DUT) with its gate connected to a pulse generator (Vgs) through a resistor (Rg). The drain is connected to a DC source (VDC) through a resistor (Rd). The source is connected to ground. A current source (Ig) is connected to the gate. The drain current (Id) is measured.</p>	 <p>The graph shows the gate voltage (Vgs) versus charge. The gate voltage starts at -10V, rises linearly to a plateau, stays constant for a duration (Qgs), then falls linearly to -10V (Qgd). The total gate charge is Qg.</p>
Resistive Switching Test Circuit	Resistive Switching Test Waveforms
 <p>The diagram shows a MOSFET (DUT) with its gate connected to a pulse generator (Vgs) through a resistor (Rg). The drain is connected to a load resistor (RL) and a DC source (VDD). The source is connected to ground.</p>	 <p>The graph shows the gate voltage (Vgs) and drain voltage (Vds) versus time. The gate voltage is a square wave. The drain voltage shows a trapezoidal shape during the on-time (ton) and a similar shape during the off-time (toff). The rise and fall times (tr, tf) are indicated. The 90% and 10% levels are marked on the Vds waveform.</p>
Unclamped Inductive Switching (UIS) Test Circuit	Unclamped Inductive Switching (UIS) Test Waveforms
 <p>The diagram shows a MOSFET (DUT) with its gate connected to a pulse generator (Vgs) through a resistor (Rg). The drain is connected to an inductor (L) and a diode. The source is connected to ground. A DC source (VDD) is connected to the diode's cathode.</p>	 <p>The graph shows the drain voltage (Vds), drain current (Id), and gate voltage (Vgs) versus time. The gate voltage is a square wave. The drain current (Id) is a trapezoidal pulse. The drain voltage (Vds) shows a sharp rise to a peak value (BV_{DSS}) during the off-time. The equation $E_{AR} = 1/2 L I_{AR}^2$ is shown.</p>
Diode Recovery Test Circuit	Diode Recovery Test Waveforms
 <p>The diagram shows a MOSFET (DUT) with its gate connected to a pulse generator (Vgs) through a resistor (Rg). The drain is connected to a diode and an inductor (L). The source is connected to ground. A DC source (VDD) is connected to the diode's anode.</p>	 <p>The graph shows the gate voltage (Vgs), drain current (Id), and drain voltage (Vds) versus time. The gate voltage is a square wave. The drain current (Id) is a trapezoidal pulse. The drain voltage (Vds) shows a sharp rise to a peak value (-V_{RM}) during the off-time. The equation $Q_{rr} = \int Idt$ is shown.</p>

Package Description


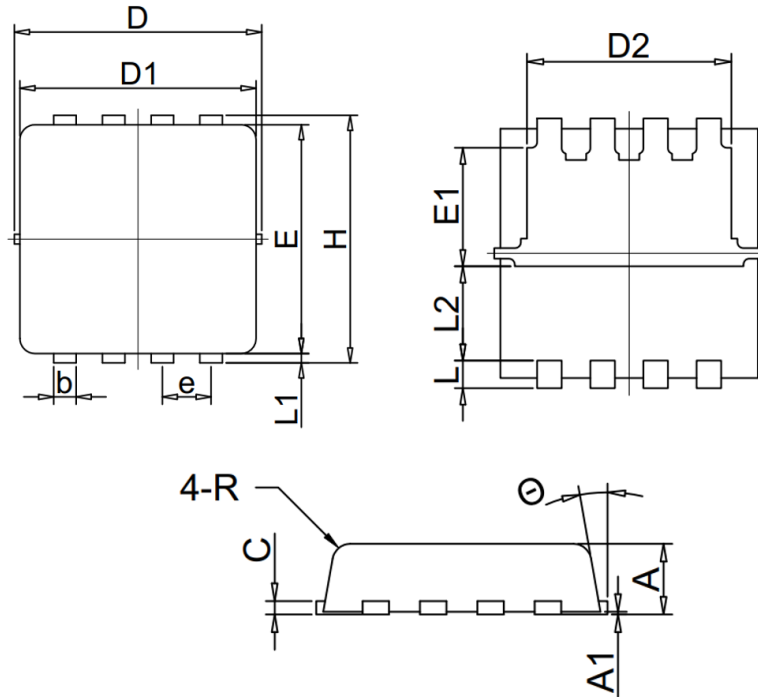
Symbol	Dimensions Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270 (BSC)		0.050 (BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

SOP8 Package



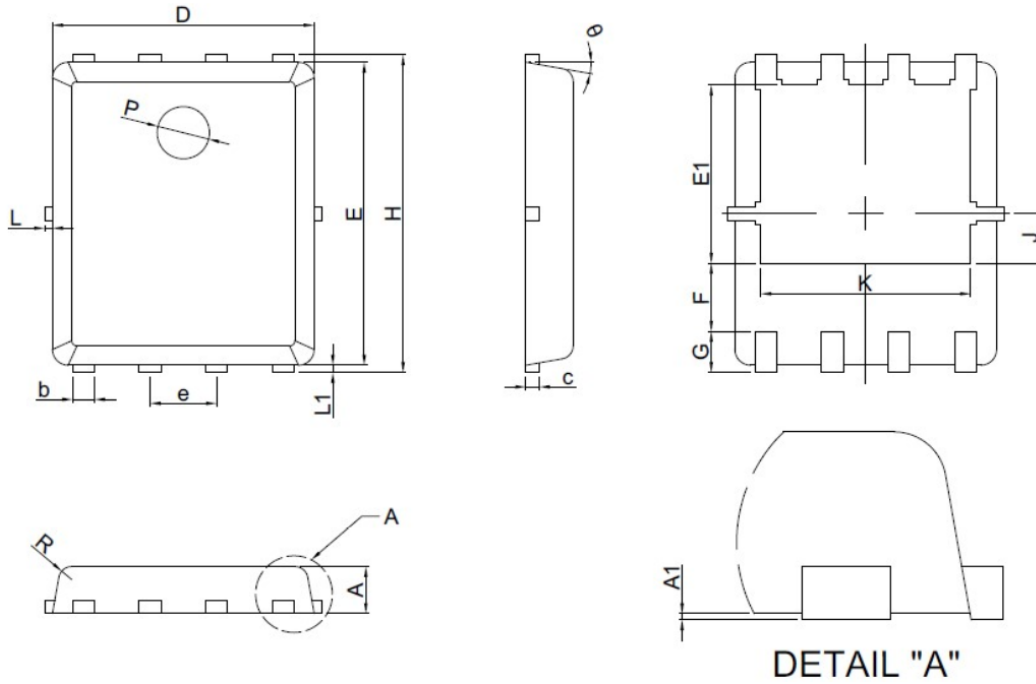
Items	Values(mm)	
	MIN	MAX
A	6.30	6.90
A1	0	0.13
B	5.70	6.30
C	2.10	2.50
D	0.30	0.60
E1	0.60	0.90
E2	0.70	1.00
F	0.30	0.60
G	0.70	1.20
L1	9.60	10.50
L2	2.70	3.10
H	0.60	1.00
M	5.10	5.50
N	2.09	2.49
R	0.3	
T	1.40	1.60
Y	5.10	6.30

TO-252-2L Package



SYMBOL	MIN	NOM	MAX
A	0.70	0.80	0.90
A1	0.00	0.03	0.05
b	0.24	0.30	0.35
c	0.152REF		
D	3.25	3.32	3.40
D1	3.05	3.15	3.25
D2	2.40	2.50	2.60
E	3.00	3.10	3.20
E1	1.35	1.45	1.55
e	0.65BSC		
H	3.20	3.30	3.40
L	0.30	0.40	0.15
L1	0.10	0.15	0.20
L2	1.13REF		
R	0.20REF		
θ	6°	10°	14°

PDFN3.3*3.3 Package



SYMBOL	MIN	NORMAL	MAX
A	0.8	0.9	1.0
A1	0.00	0.03	0.05
b	0.35	0.42	0.49
c	0.254REF		
D	4.9	5.0	5.1
F	1.40REF		
E	5.7	5.8	5.9
e	1.27BSC		
H	5.95	6.08	6.20
L1	0.10	0.14	0.18
G	0.60REF		
K	4.00REF		
L	-----	-----	0.15
J	0.95BSC		
P	1.00REF		
E1	3.35	3.40	3.65
θ	6°	10°	14°
R	0.25REF		

PDFN 5*6 Package

NOTE:

1. Exceeding the maximum ratings of the device in performance may cause damage to the device, even the permanent failure, which may affect the dependability of the machine. Please do not exceed the absolute maximum ratings of the device when circuit designing.
2. When installing the heat sink, please pay attention to the torsional moment and the smoothness of the heat sink.
3. MOSFETs is the device which is sensitive to the static electricity, it is necessary to protect the device from being damaged by the static electricity when using it.
4. Shanghai Belling reserves the right to make changes in this specification sheet and is subject to change without prior notice.

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