

## 30V P-Channel Power MOSFET

### DESCRIPTION

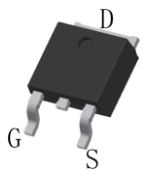
The BLM10P03 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge. It can be used in a wide variety of applications.

### Application

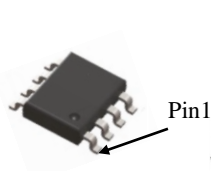
- Power switching application
- Hard switched and High frequency circuits
- Battery Protection

### KEY CHARACTERISTICS

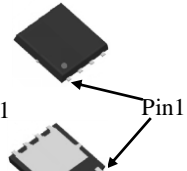
- $V_{DS} = -30V, I_D = -24A$  (PDFN3.3\*3.3)  
 $I_D = -30A$  (PDFN5\*6)  
 $I_D = -15A$  (SOP8)  
 $I_D = -40A$  (TO-252)
- $R_{DS(ON)} < 10m\Omega @ V_{GS} = -10V$   
 $R_{DS(ON)} < 15m\Omega @ V_{GS} = -4.5V$
- High density cell design for lower  $R_{dson}$
- Excellent package for good heat dissipation



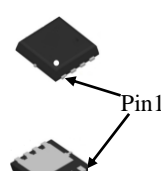
TO-252-2L



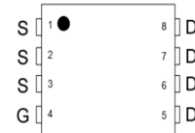
SOP8



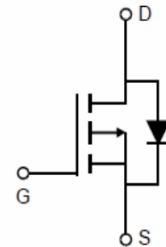
PDFN 5\*6



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	$V_{GS}$	$\pm 20$	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 <sup>(Note 1)</sup>	$I_{DM}$ (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

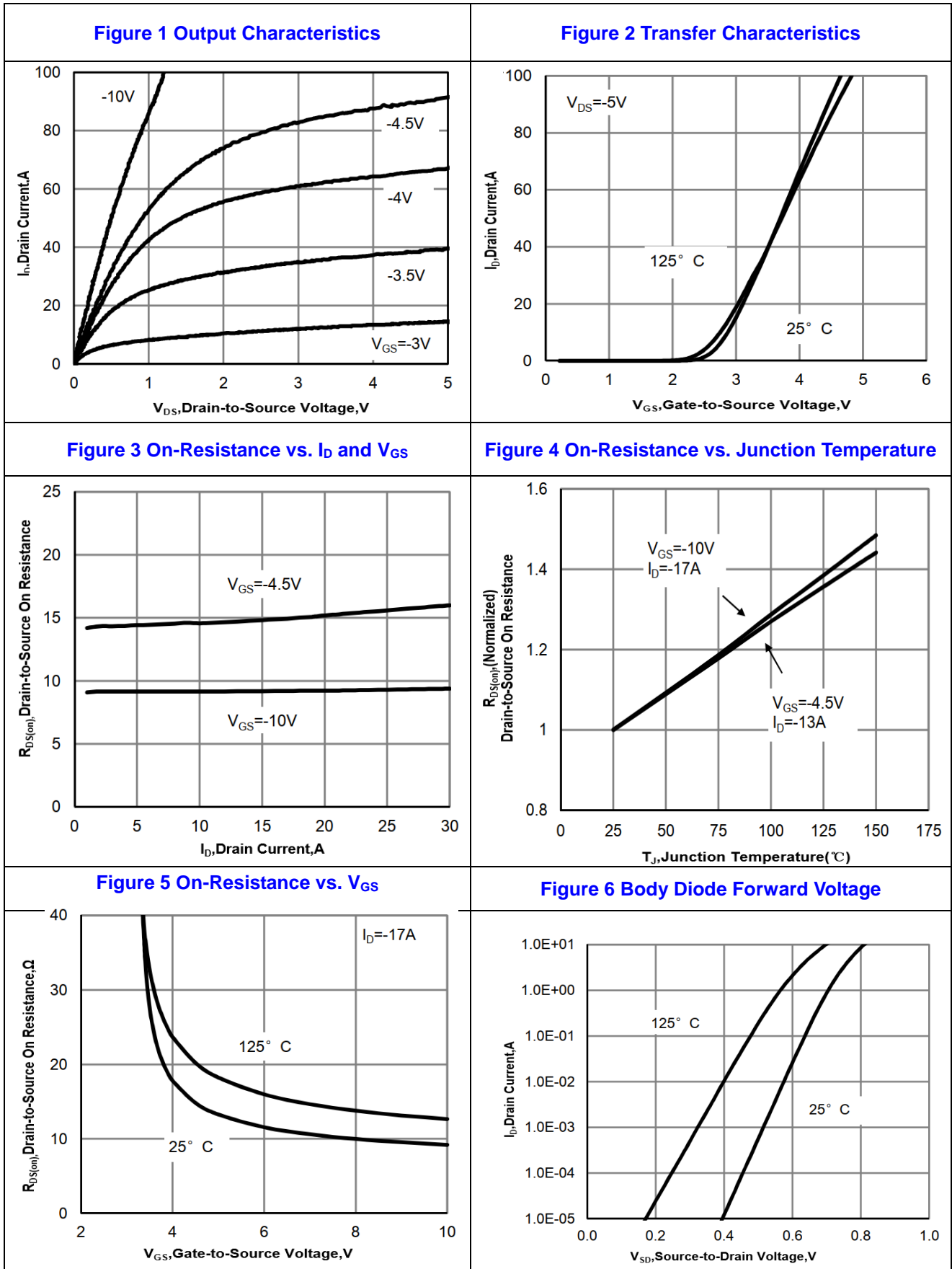
Thermal Resistance, Junction-to-Ambient	$R_{\theta JC}$ (PDFN3.3*3.3)	15.0	$^{\circ}\text{C/W}$
	$R_{\theta JC}$ (PDFN5*6)	9.6	$^{\circ}\text{C/W}$
	$R_{\theta JC}$ (SOP8)	38.3	$^{\circ}\text{C/W}$
	$R_{\theta JC}$ (TO-252)	5.4	$^{\circ}\text{C/W}$

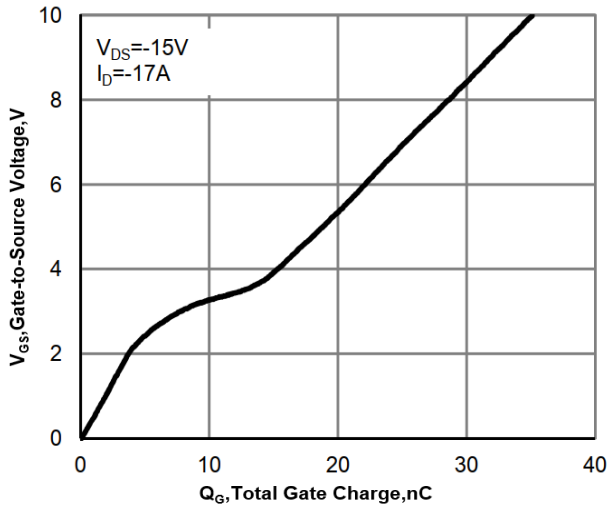
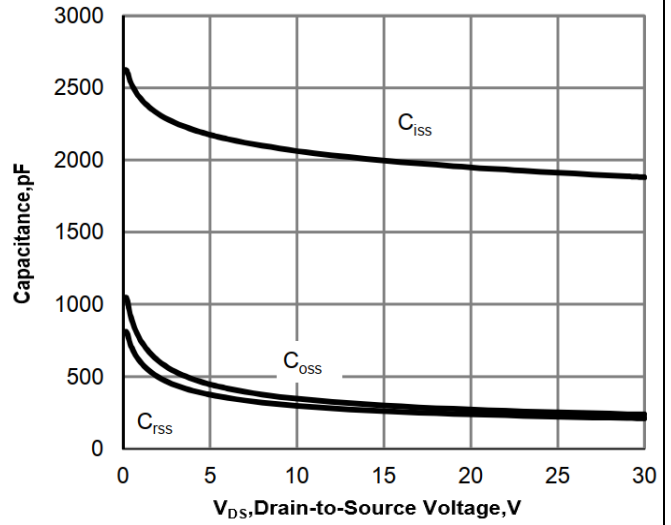
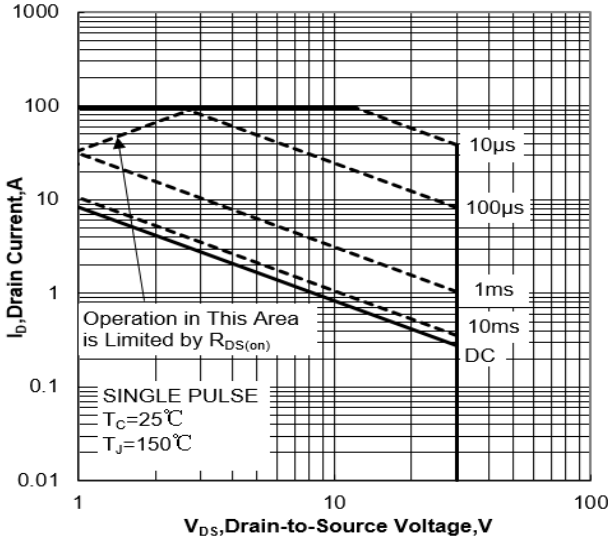
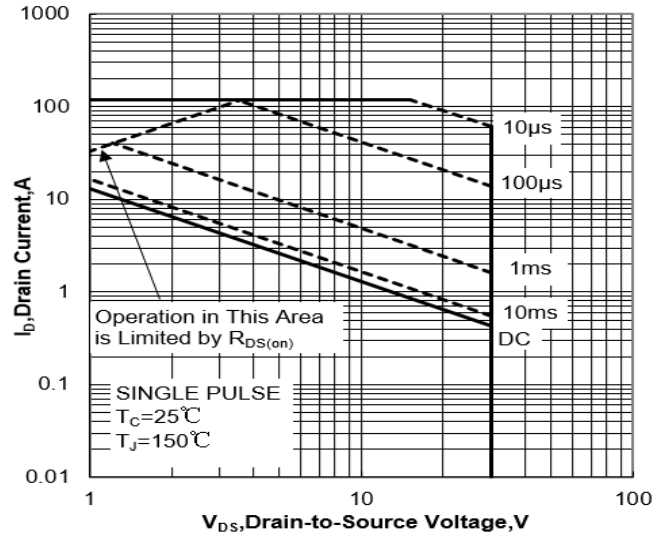
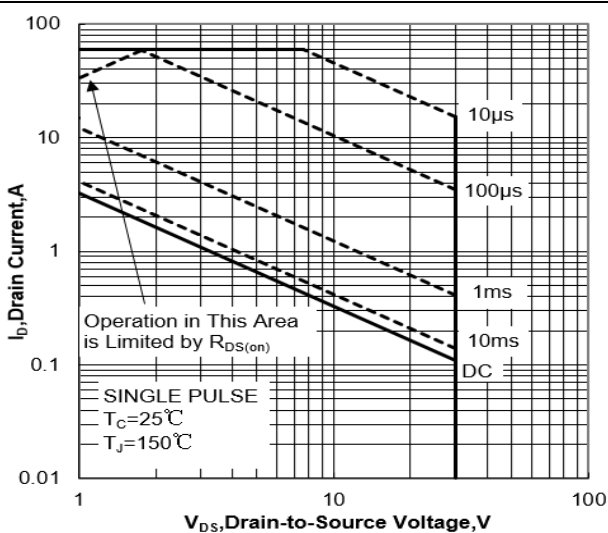
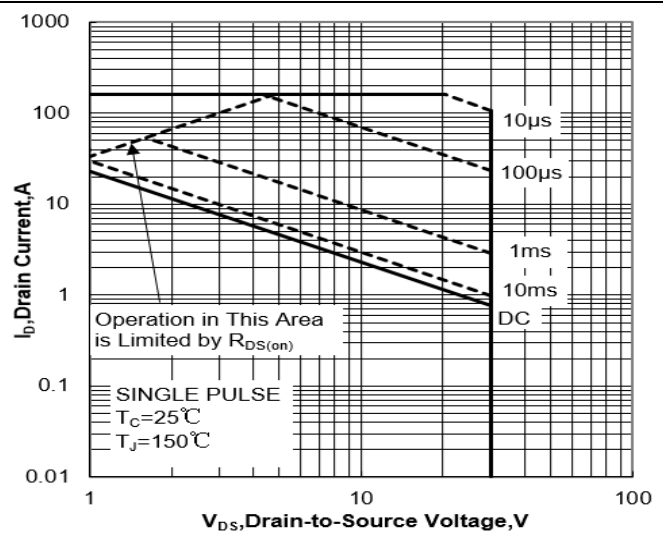
### Electrical Characteristics ( $T_A=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
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	$\mu\text{A}$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
<b>On Characteristics</b>						
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 <sup>(Note 2)</sup>	$R_{DS(on)}$	$V_{GS}=-10V, I_D=-17A$	-	8	10	m $\Omega$
		$V_{GS}=-4.5V, I_D=-13A$	-	12	15	m $\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS}=-5V, I_D=-17A$	-	43	-	S
<b>Dynamic Characteristics</b>						
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
<b>Switching Characteristics</b> <sup>(Note 3)</sup>						
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
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage	$V_{SD}$	$V_{GS}=0V, I_S=-1A$	-	-	-1.2	V

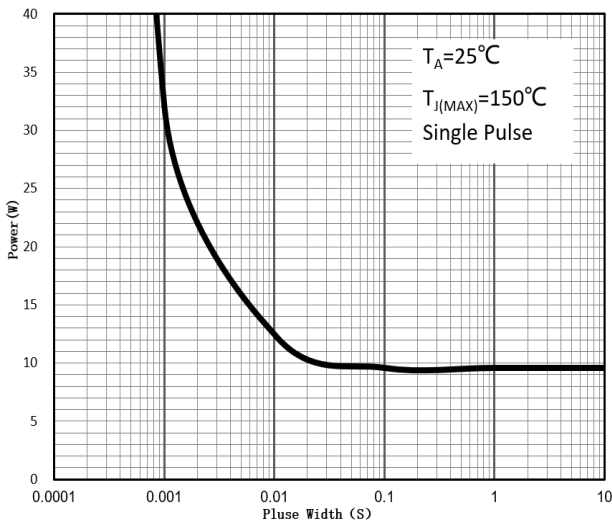
### Notes:

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.

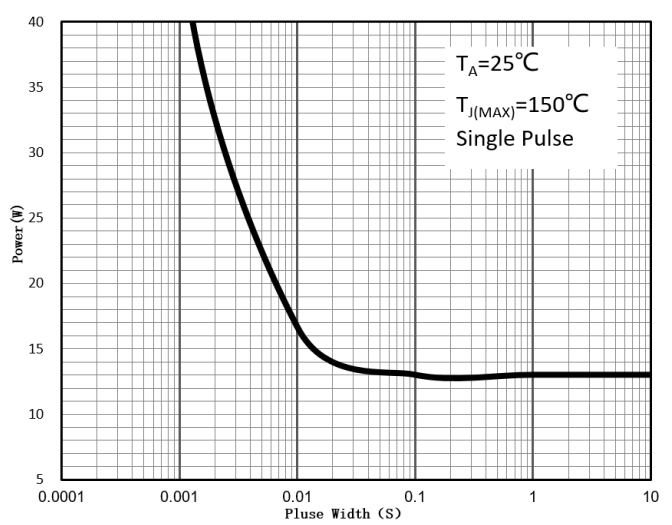
**Characteristics Curves**


**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)**


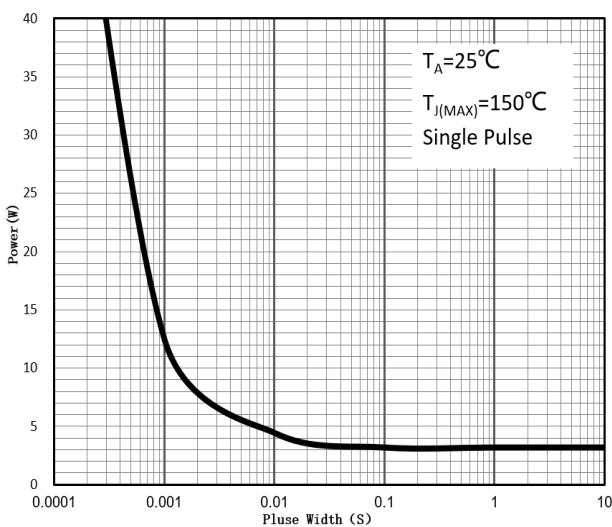
**Figure 10a Single Pulse Power Rating Junction-to-Ambient (PDFN3.3\*3.3)**



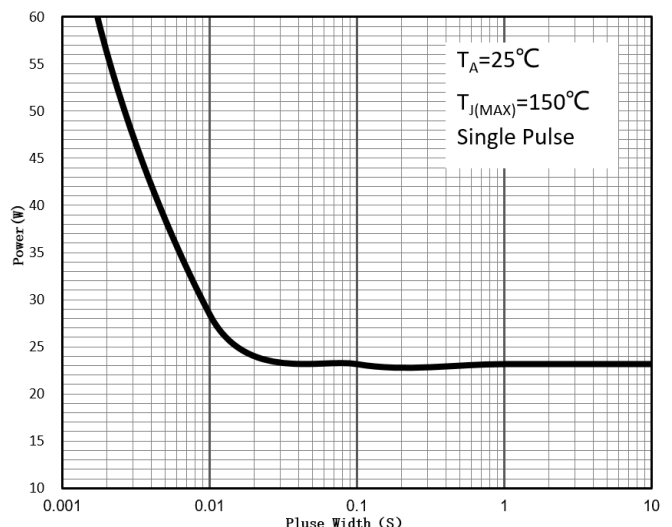
**Figure 10b Single Pulse Power Rating Junction-to-Ambient (PDFN5\*6)**



**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)**

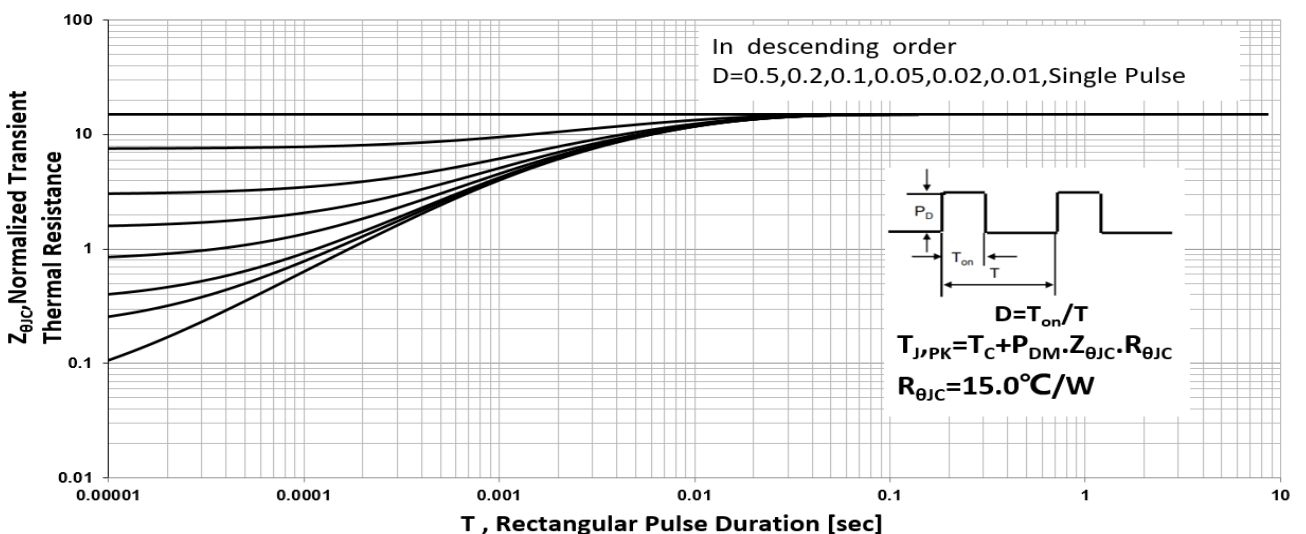


Figure 11b Normalized Maximum Transient Thermal Impedance (PDFN 5\*6)

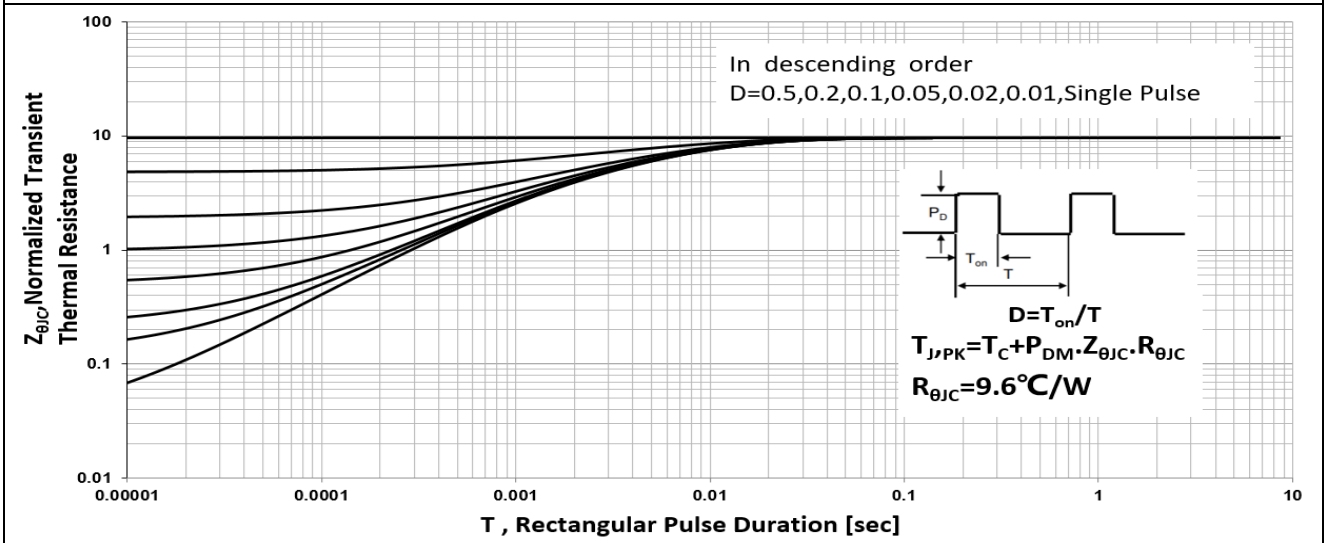


Figure 11c Normalized Maximum Transient Thermal Impedance (SOP8)

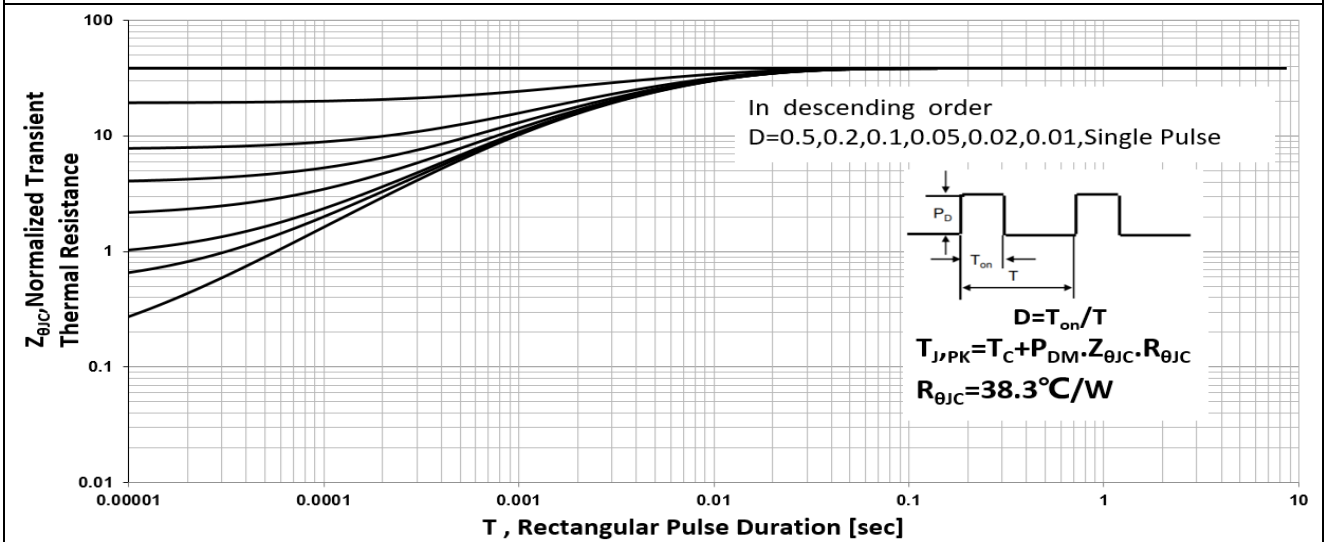
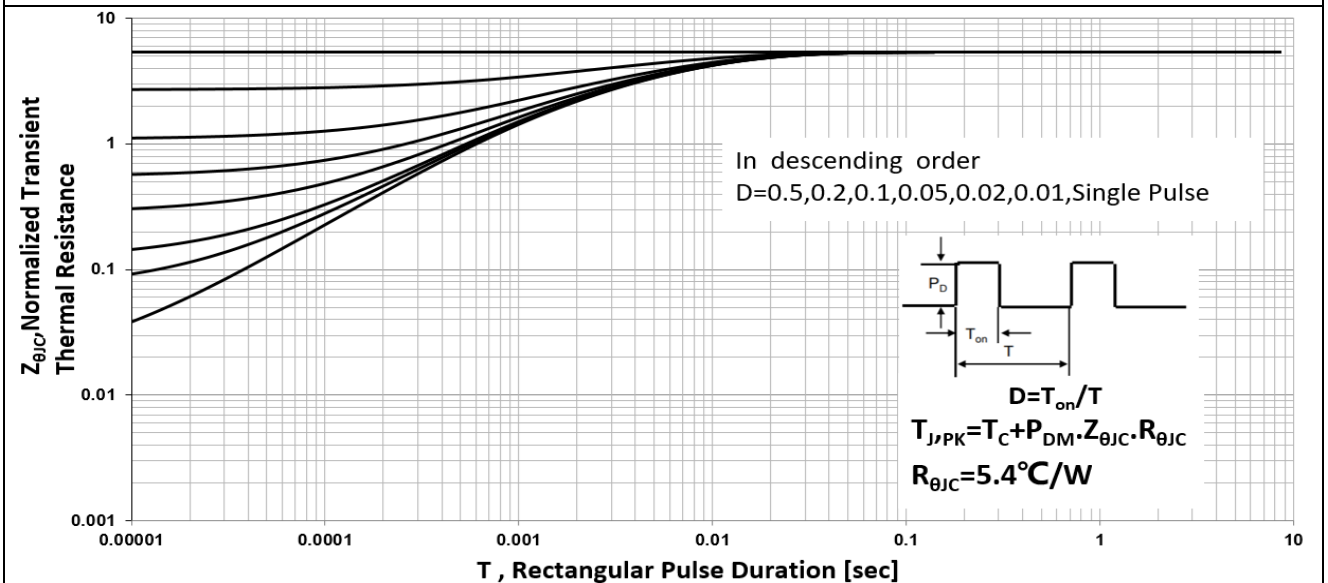
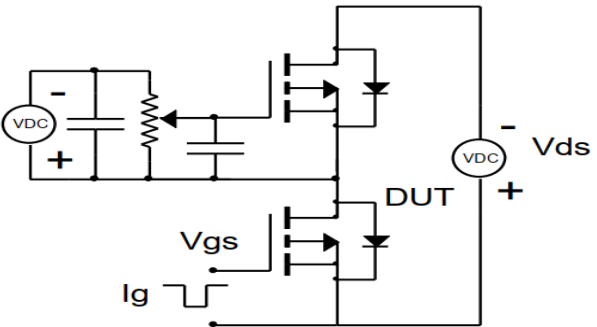
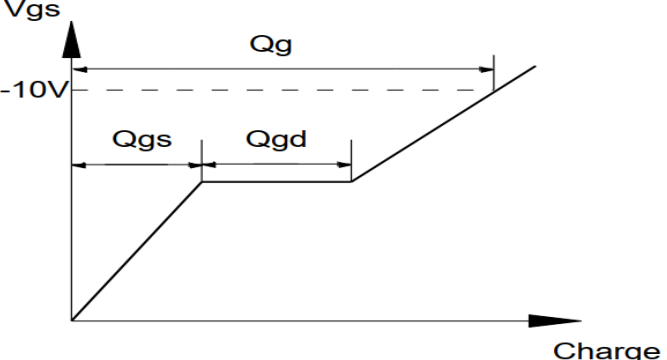
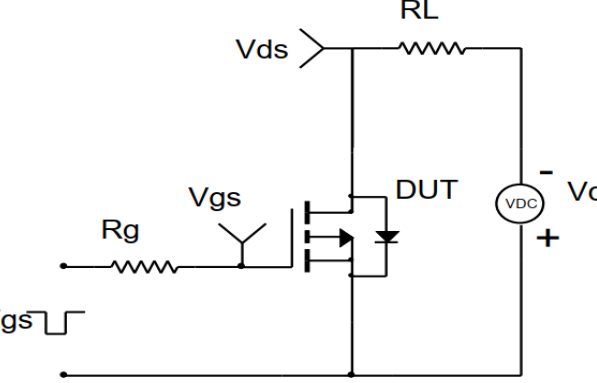
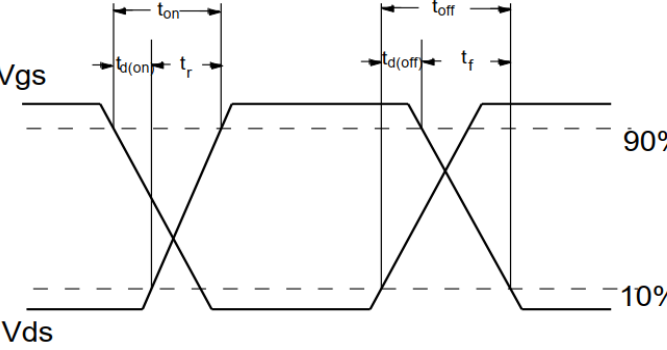
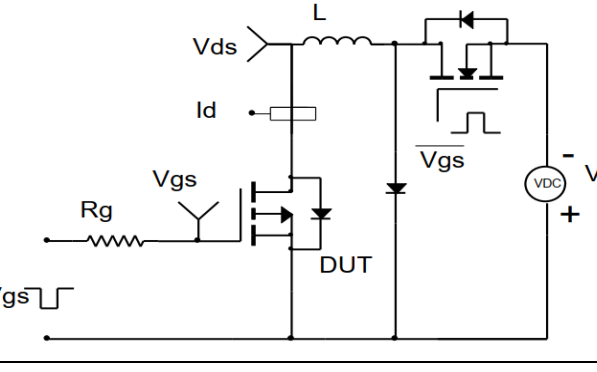
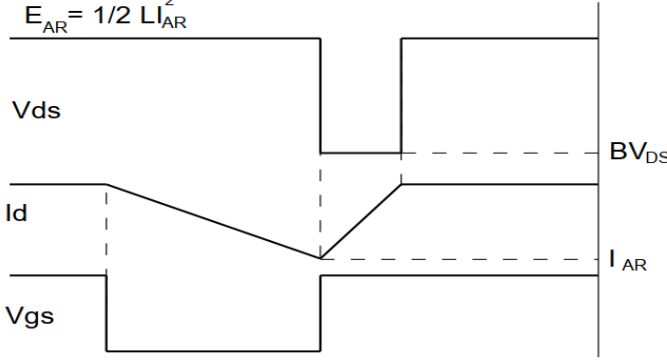
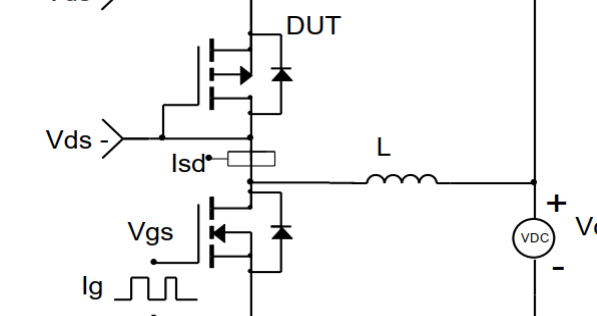
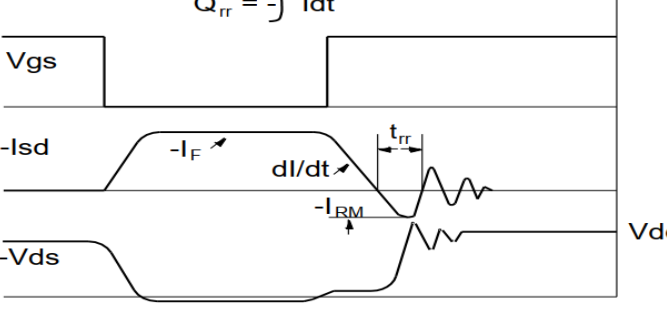
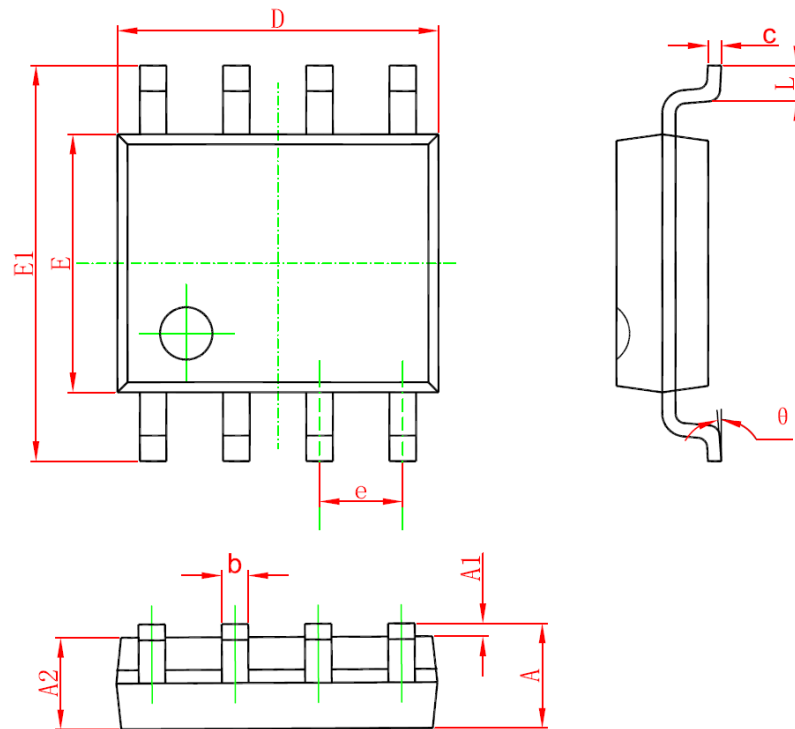


Figure 11d Normalized Maximum Transient Thermal Impedance (TO-252)



**Test Circuit and Waveform**

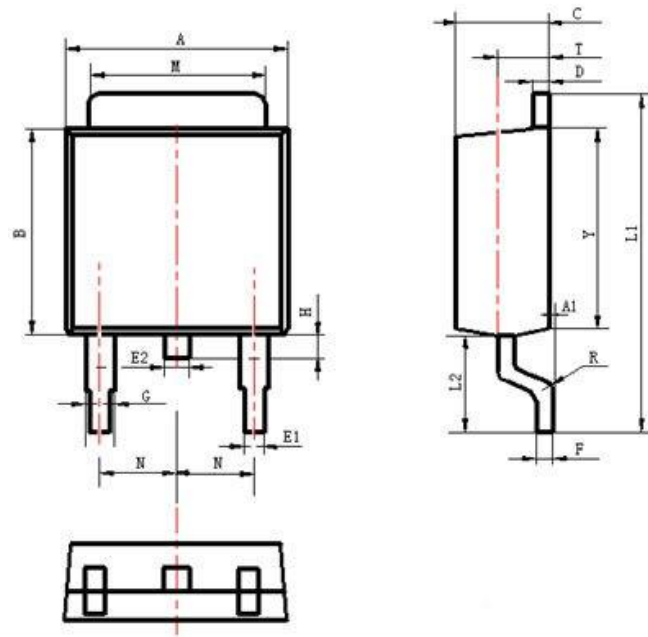
Gate Charge Test Circuit	Gate Charge Test Waveform
 <p>The diagram shows a MOSFET circuit for gate charge testing. A VDC source is connected to the drain through a resistor. The gate is driven by a pulse source Vgs through a resistor Rg. The drain current Id is measured. The device under test (DUT) is a MOSFET.</p>	 <p>The waveform shows Vgs on the y-axis and Charge on the x-axis. The gate voltage rises linearly from 0V to -10V. The total gate charge is Qg. The gate-to-source charge is Qgs, and the gate-to-drain charge is Qgd.</p>
Resistive Switching Test Circuit	Resistive Switching Test Waveforms
 <p>The diagram shows a MOSFET circuit for resistive switching testing. A VDC source is connected to the drain through a load resistor RL. The gate is driven by a pulse source Vgs through a resistor Rg. The drain current Id is measured. The device under test (DUT) is a MOSFET.</p>	 <p>The waveforms show Vgs and Vds on the y-axis and time on the x-axis. Vgs is a square wave. Vds is a trapezoidal wave. Key timing parameters are labeled: ton (turn-on delay), tr (rise time), toff (turn-off delay), and tf (fall time). The Vds levels are marked at 90% and 10%.</p>
Unclamped Inductive Switching (UIS) Test Circuit	Unclamped Inductive Switching (UIS) Test Waveforms
 <p>The diagram shows a MOSFET circuit for UIS testing. A VDC source is connected to the drain through an inductor L. The gate is driven by a pulse source Vgs through a resistor Rg. The drain current Id is measured. The device under test (DUT) is a MOSFET.</p>	 <p>The waveforms show Vds, Id, and Vgs on the y-axis and time on the x-axis. Vgs is a square wave. Id is a trapezoidal wave. Vds shows a sharp spike during the turn-off phase. The energy stored in the inductor is given by <math>E_{AR} = 1/2 L I_{AR}^2</math>. The Vds spike level is labeled BV<sub>DSS</sub> and the Id level is labeled I<sub>AR</sub>.</p>
Diode Recovery Test Circuit	Diode Recovery Test Waveforms
 <p>The diagram shows a MOSFET circuit for diode recovery testing. A VDC source is connected to the drain through an inductor L. The gate is driven by a pulse source Vgs through a resistor Rg. The drain current Id is measured. The device under test (DUT) is a MOSFET.</p>	 <p>The waveforms show Vgs, -Isd, dI/dt, -I<sub>RM</sub>, and -Vds on the y-axis and time on the x-axis. Vgs is a square wave. -Isd is a trapezoidal wave. dI/dt is the derivative of the current. -I<sub>RM</sub> is the reverse current during recovery. -Vds shows a spike during the turn-off phase. The reverse recovery charge is given by <math>Q_{rr} = \int Idt</math>.</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°

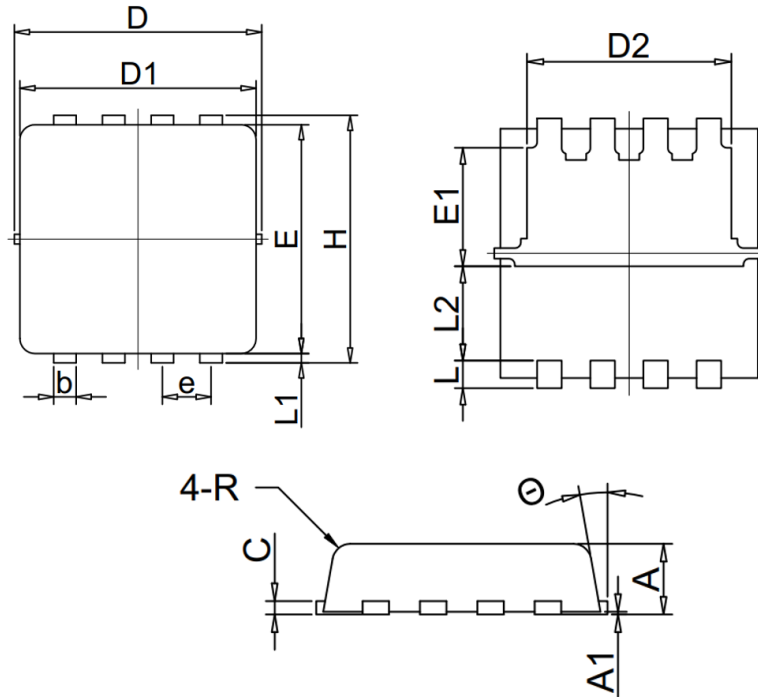
**SOP8 Package**





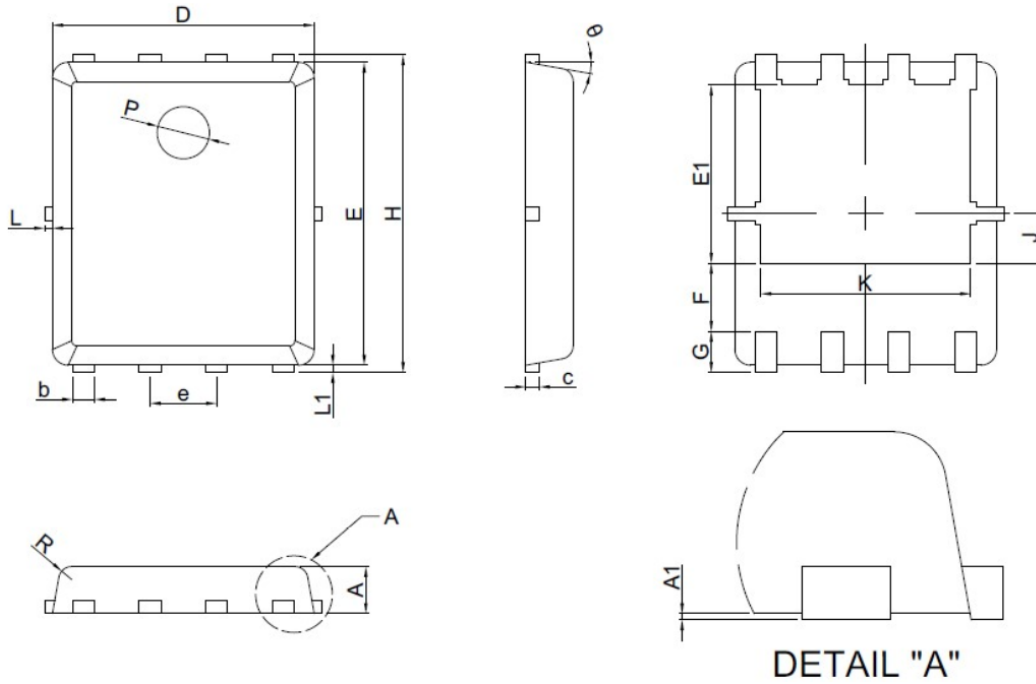
Items	Values(mm)	
	MIN	MAX
A	6.30	6.90
A1	0	0.13
B	5.70	6.30
C	2.10	2.50
D	0.30	0.60
E1	0.60	0.90
E2	0.70	1.00
F	0.30	0.60
G	0.70	1.20
L1	9.60	10.50
L2	2.70	3.10
H	0.60	1.00
M	5.10	5.50
N	2.09	2.49
R	0.3	
T	1.40	1.60
Y	5.10	6.30

**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		
$\theta$	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
$\theta$	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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