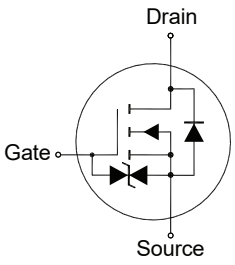
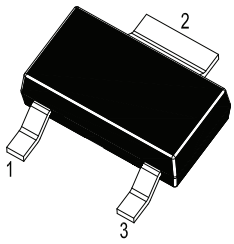
N-Channel Enhancement Mode MOSFET

Features

- Low Gate Charge
- Built-in G-S Protection Diode
- Surface-mounted package
- Halogen and Antimony Free(HAF), RoHS compliant
- Typical ESD Protection HBM Class 3A

Classification	Voltage Range(V)
0A	< 125
0B	125 to < 250
1A	250 to < 500
1B	500 to < 1000
1C	1000 to < 2000
2	2000 to < 4000
3A	4000 to < 8000
3B	≥ 8000





1.Gate 2.Drain 3.Source
SOT-223-2 Plastic Package

Key Parameters

Parameter	Value	Unit
B_{VDSS}	600	V
$R_{DS(ON)}$ Max	600 @ V_{GS} = 10 V	mΩ
$V_{GS(th)}$ typ	4.1	V
Q_g typ	12 @ V_{GS} = 10 V	nC

Application

- Lighting
- Motor drive

Absolute Maximum Ratings (at T_a = 25℃ unless otherwise specified)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	600	V
Gate-Source Voltage	V_{GS}	± 30	V
Drain Current T_c = 25℃ T_c = 100℃	I_D	4 2.5	A
Peak Drain Current, Pulsed [1]	I_{DM}	15	A
Avalanche Current	I_{AS}	1.75	A
Single-Pulsed Avalanche Energy [2]	E_{AS}	120.9	mJ
Total Power Dissipation T_c = 25℃	P_{tot}	19.2	W
Operating Junction and Storage Temperature Range	T_j, T_{stg}	- 55 to + 150	℃

Thermal Characteristics

Parameter	Symbol	Max.	Unit
Thermal Resistance from Junction to Case	$R_{\theta JC}$	6.5	℃/W
Thermal Resistance from Junction to Ambient [3]	$R_{\theta JA}$	62.5	℃/W

[1] Pulse Test: Pulse Width ≤ 100 μs, Duty Cycle ≤ 2%, Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$ = 150°C.
[2] Limited by $T_{J(MAX)}$, starting T_J = 25℃, L = 79 mH, R_g = 25 Ω, I_{AS} = 1.75 A, V_{GS} = 10 V.
[3] Device Surface Mounted on FR-4 substrate PC board, 2oz copper, with 1-inch square copper plate, in a still air.

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Characteristics at T_a = 25℃ unless otherwise specified

Parameter	Symbol	Min.	Typ.	Max.	Unit
STATIC PARAMETERS					
Drain-Source Breakdown Voltage at I_D = 1 mA	BV_{DSS}	600	-	-	V
Drain-Source On-State Current at V_{DS} = 600 V	I_{DSS}	-	-	1	µA
Gate-Source Leakage Current at V_{GS} = ± 30 V	I_{GSS}	-	-	± 10	µA
Gate-Source Threshold Voltage at V_{DS} = V_{GS}, I_D = 250 µA	$V_{GS(th)}$	3.5	-	4.5	V
Drain-Source On-State Resistance at V_{GS} = 10 V, I_D = 2.5 A	$R_{DS(ON)}$	-	507	600	mΩ
DYNAMIC PARAMETERS					
Forward Transconductance at V_{DS} = 10 V, I_D = 2.5 A	g_{fs}	-	4.3	-	S
Gate Resistance at V_{GS} = 0 V, V_{DS} = 0 V, f = 1 MHz	R_g	-	14	-	Ω
Input Capacitance at V_{GS} = 0 V, V_{DS} = 300 V, f = 1 MHz	C_{iss}	-	528	-	pF
Output Capacitance at V_{GS} = 0 V, V_{DS} = 300 V, f = 1 MHz	C_{oss}	-	18	-	pF
Reverse Transfer Capacitance at V_{GS} = 0 V, V_{DS} = 300 V, f = 1 MHz	C_{rss}	-	5	-	pF
Total Gate Charge at V_{DS} = 300 V, V_{GS} = 10 V, I_D = 2.5 A	Q_g	-	12	-	nC
Gate-Source Charge at V_{DS} = 300 V, V_{GS} = 10 V, I_D = 2.5 A	Q_{gs}	-	4	-	nC
Gate-Drain Charge at V_{DS} = 300 V, V_{GS} = 10 V, I_D = 2.5 A	Q_{gd}	-	4	-	nC
Turn-On Delay Time at V_{DS} = 300 V, V_{GS} = 10 V, I_D = 2.5 A, R_g = 10 Ω	$t_{d(on)}$	-	36	-	ns
Turn-On Rise Time at V_{DS} = 300 V, V_{GS} = 10 V, I_D = 2.5 A, R_g = 10 Ω	t_r	-	14	-	ns
Turn-Off Delay Time at V_{DS} = 300 V, V_{GS} = 10 V, I_D = 2.5 A, R_g = 10 Ω	$t_{d(off)}$	-	31	-	ns
Turn-Off Fall Time at V_{DS} = 300 V, V_{GS} = 10 V, I_D = 2.5 A, R_g = 10 Ω	t_f	-	64.4	-	ns
Body-Diode PARAMETERS					
Drain-Source Diode Forward Voltage at I_S = 1 A, V_{GS} = 0 V	V_{SD}	-	-	1.2	V
Body-Diode Continuous Current	I_S	-	-	4	A
Body-Diode Continuous Current, Pulsed	I_{SM}	-	-	15	A
Body Diode Reverse Recovery Time at I_S = 2.5 A, di/dt = 100 A / µs	t_{rr}	-	80	-	ns
Body Diode Reverse Recovery Charge at I_S = 2.5 A, di/dt = 100 A / µs	Q_{rr}	-	304	-	nC

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Electrical Characteristics Curves

Fig. 1 Typical Output Characteristics

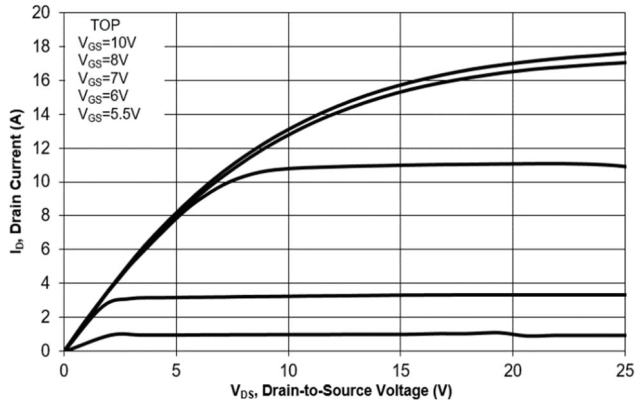


Fig. 2 Typical Transfer Characteristics

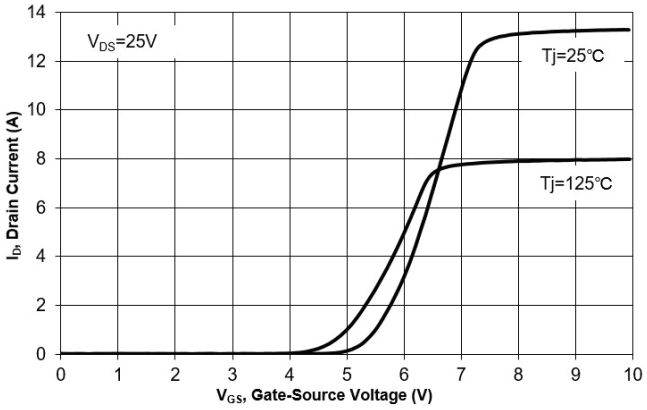


Fig. 3 On-Resistance vs. Drain Current

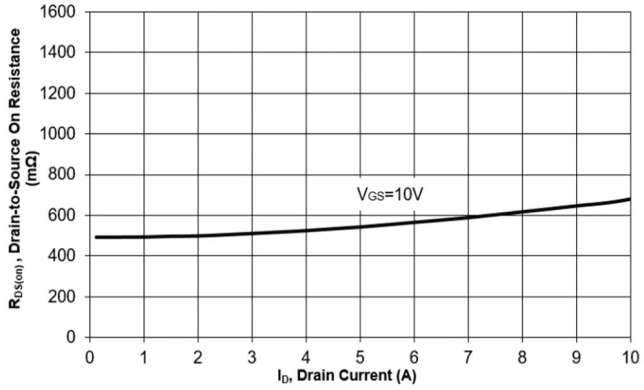


Fig. 4 On-Resistance vs. Gate to Source Voltage

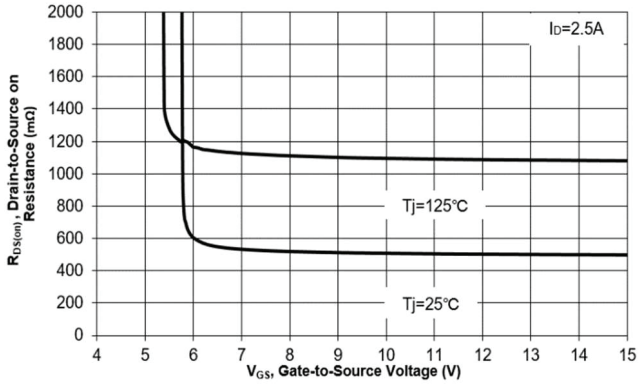


Fig. 5 On-Resistance vs.T_j

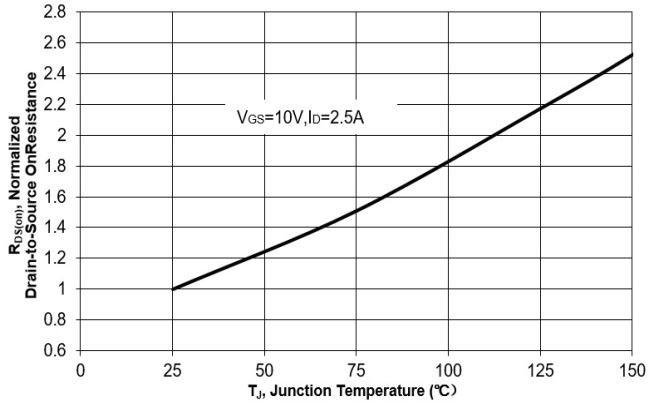
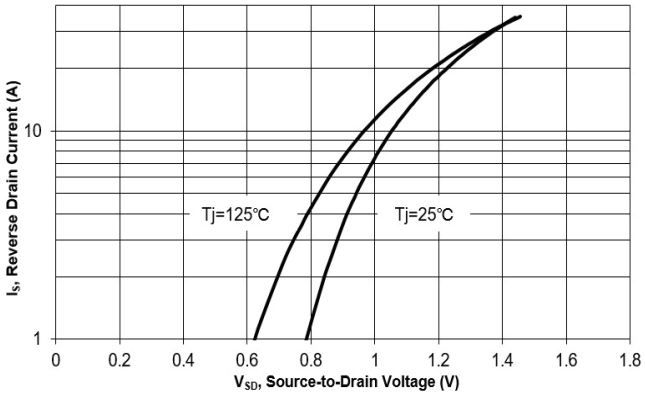


Fig. 6 Typical Body-Diode Forward Characteristics



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Electrical Characteristics Curves

Fig. 7 Typical Junction Capacitance

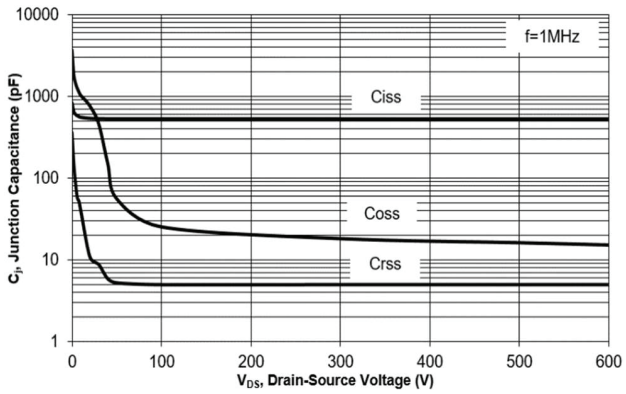

Fig. 8 Drain-Source Leakage Current vs. T_j

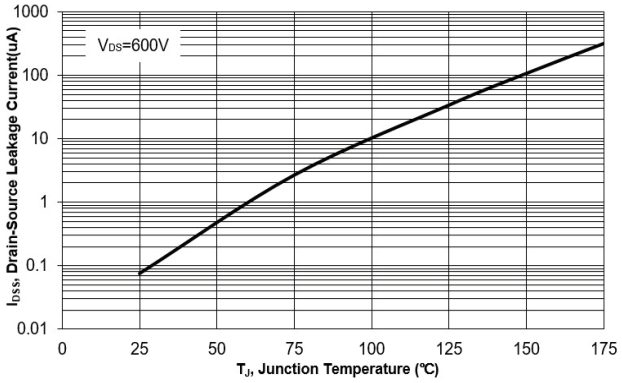

Fig. 9 $V_{(BR)DSS}$ vs. Junction Temperature

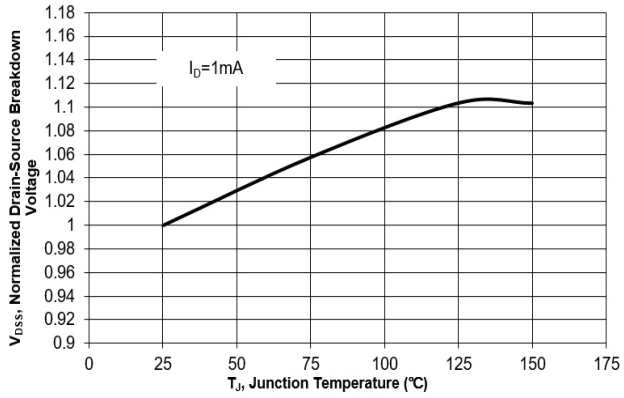

Fig. 10 Gate Threshold Variation vs. T_j

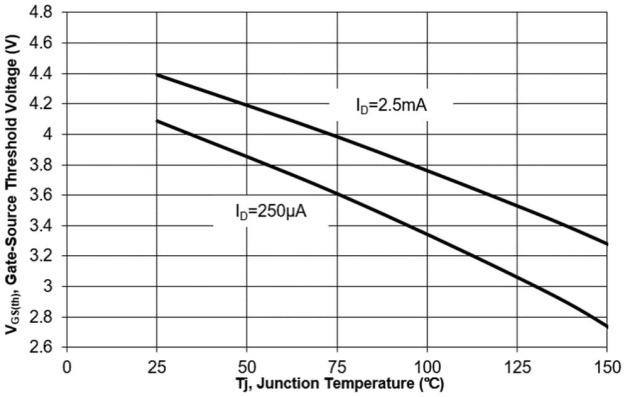

Fig. 11 Gate Charge

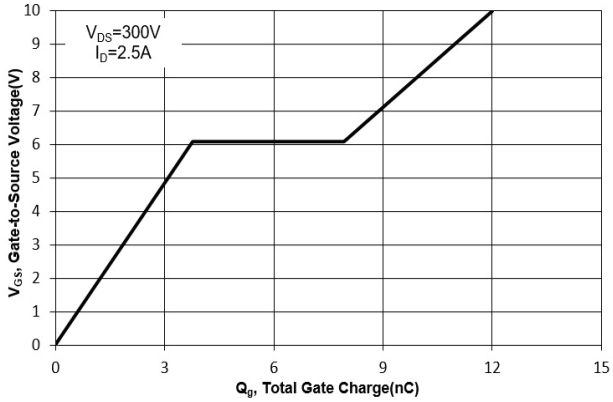

Fig. 12 Safe Operation Area

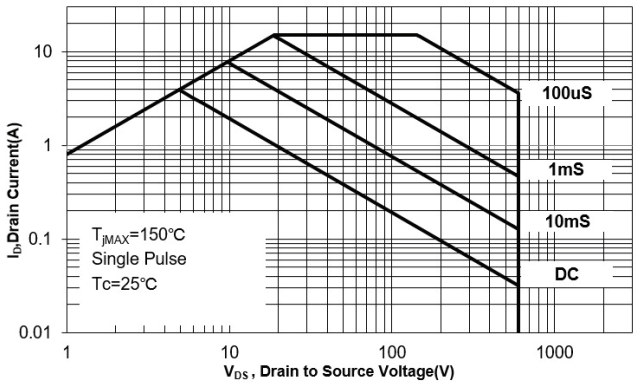

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Fig. 13 Normalized Maximum Transient Thermal Impedance($z_{\theta JC}$)

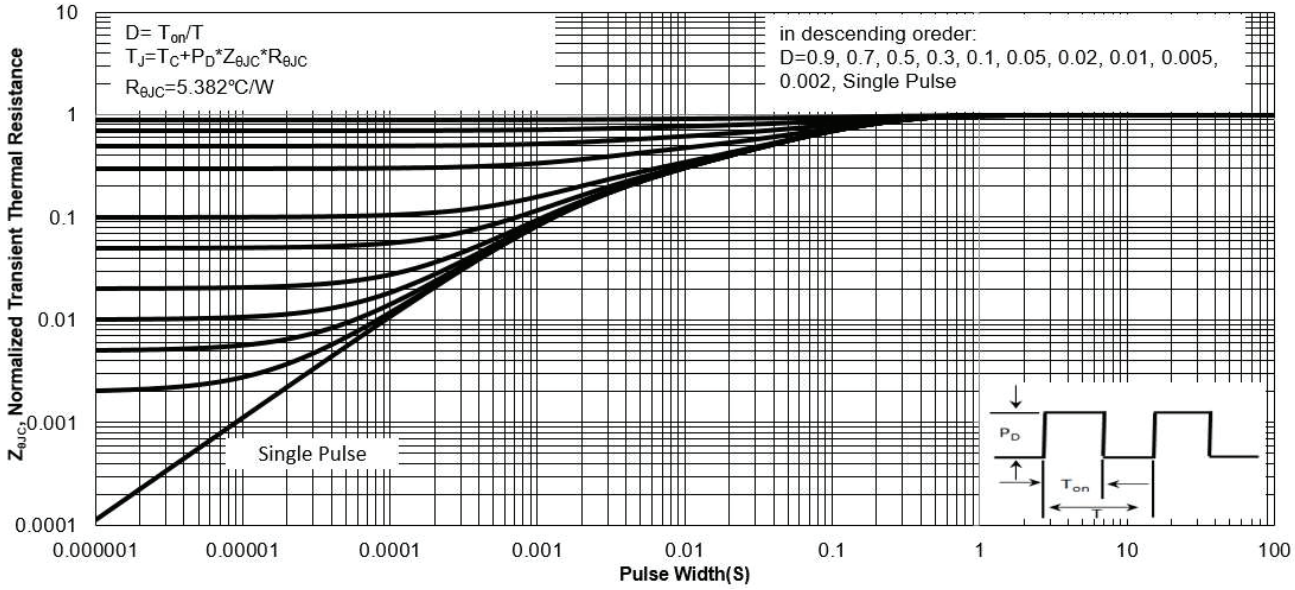
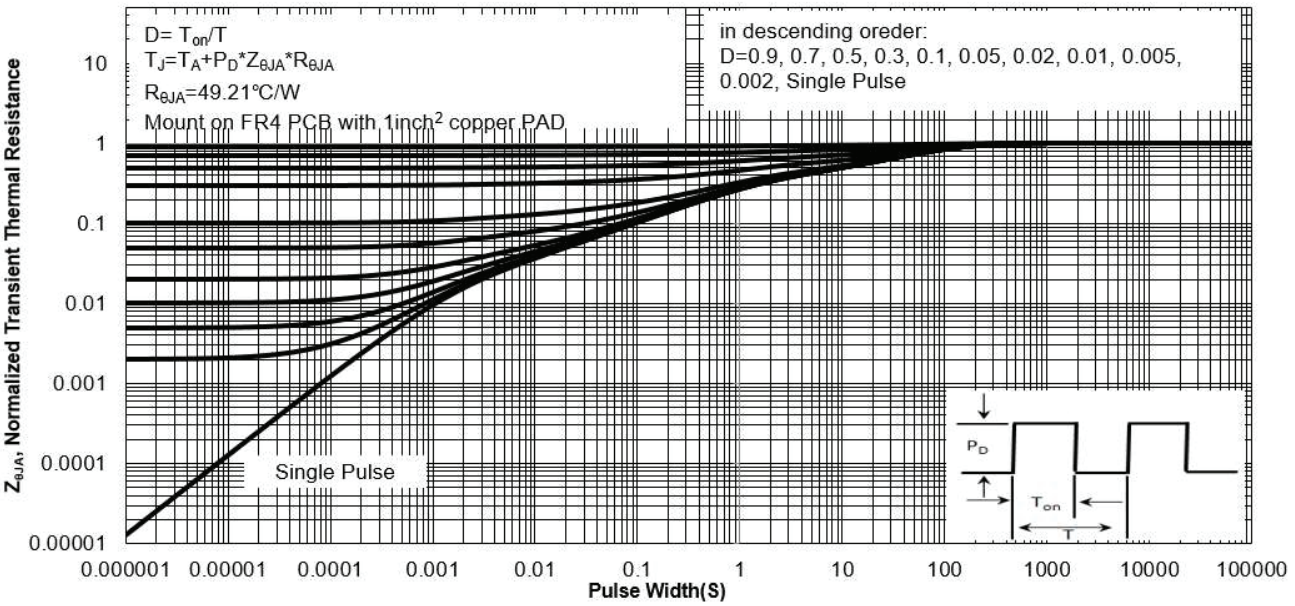


Fig. 14 Normalized Maximum Transient Thermal Impedance($z_{\theta JA}$)



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Test Circuits

Fig.1-1 Switching times test circuit

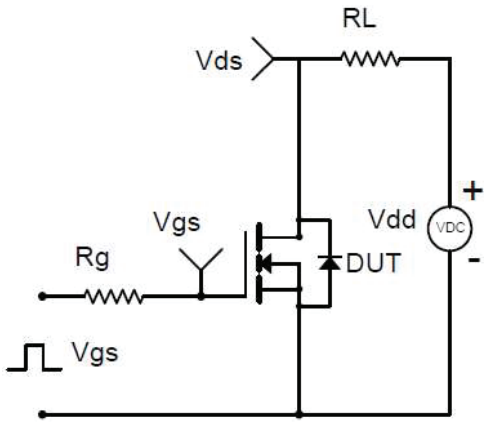


Fig.1-2 Switching Waveform

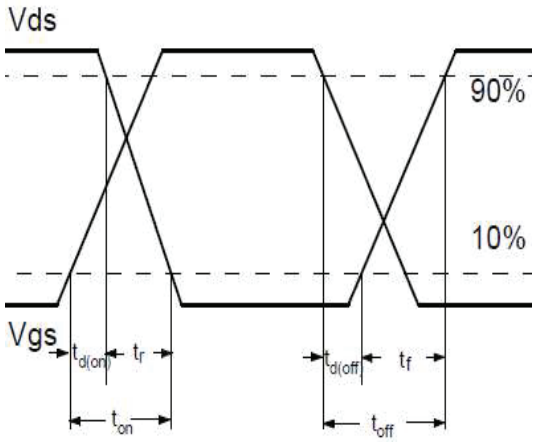


Fig.2-1 Gate charge test circuit

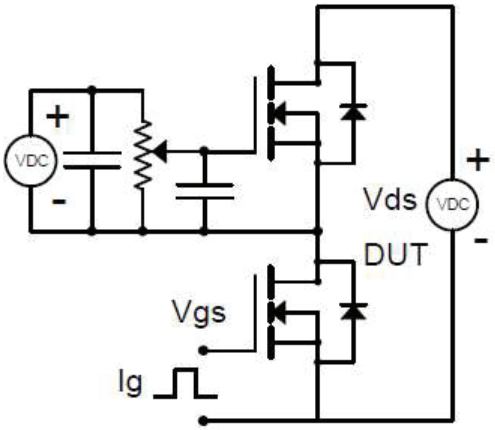


Fig.2-2 Gate charge waveform

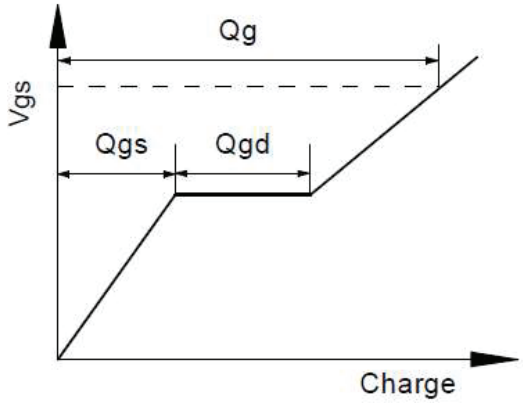


Fig.3-1 Avalanche test circuit

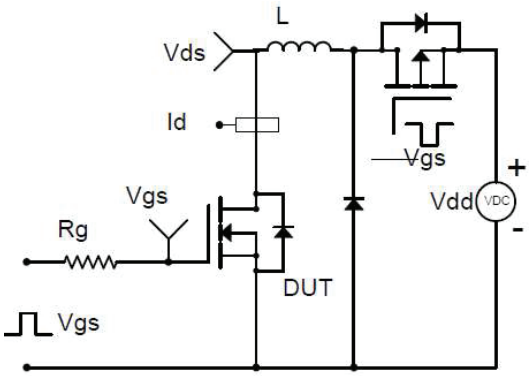
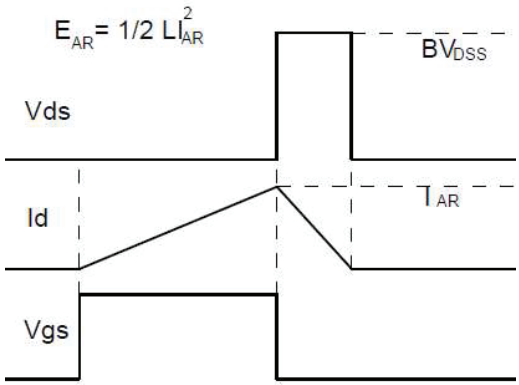


Fig.3-2 Avalanche waveform



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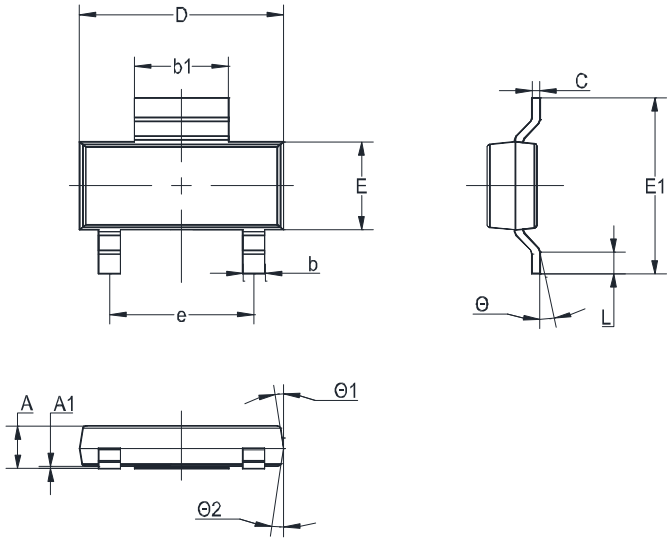
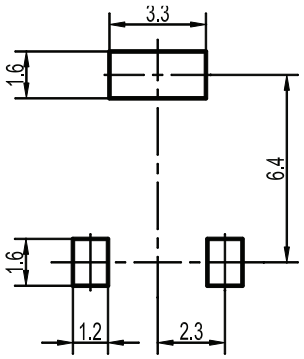
PACKAGE OUTLINE (Dimensions in mm)

SOT-223-2



Unit	A	A1	b	b1	C	D	E	E1	e	L	Θ	Θ1	Θ2
mm	1.8	0.1	0.8	3.1	0.32	6.7	3.7	7.3	4.6	1.1	10°	7°	7°
	1.5	MAX	0.6	2.9	0.22	6.3	3.3	6.7	TYP	0.7	0°	0°	0°

Recommended Soldering Footprint



Packing information

Package	Tape Width (mm)	Pitch		Reel Size		Per Reel Packing Quantity
		mm	inch	mm	inch	
SOT-223-2	12	8 ± 0.1	0.315 ± 0.004	330	13	3,000

Marking information

" PDQ60N600KR " = Part No

" ****** " = Date Code Marking

Font type: Arial

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