

ASR320N650MD56

650V N-Channel MOSFET

Description

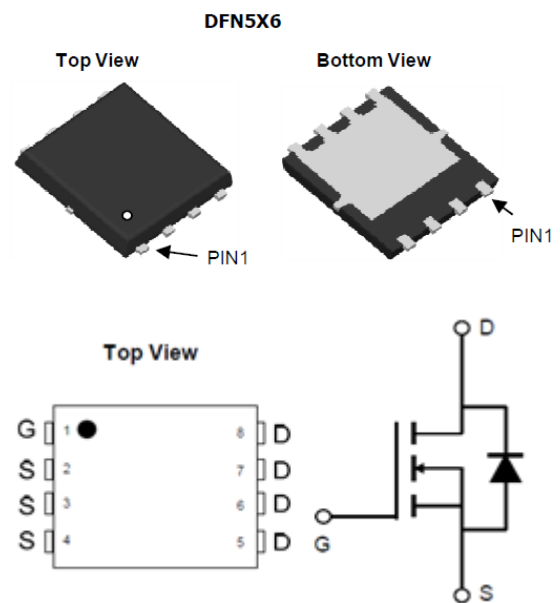
Silicon Carbide (SiC) MOSFET use a completely new technology that provide superior switching performance and higher reliability compared to Silicon. In addition, the low ON resistance and compact chip size ensure low capacitance and gate charge. Consequently, system benefits include highest efficiency, faster operating frequency, increased power density, reduced EMI, and reduced system size.

Features

- Extremely low switching loss
- High Blocking Voltage with Low RDS(on)
- Excellent stability and uniformity
- Easy to parallel and simple to drive
- ROHS Compliant, Halogen free

Application

- PC Power
- EV Charger
- LED Lighting
- Server Power/Telecom Power
- Solar PV inverters/UPS



Ordering Information

Part Number	Marking	Package	Packaging
ASR320N650MD56	ASR320N650MD56	DFN5*6	Reel

Absolute Maximum Ratings(Tc=25℃)

Symbol	Parameter	Value	Unit
V_{DS}	Drain-Source Voltage	650	V
I_D	Drain Current(continuous)at Tc=25℃	8	A
I_D	Drain Current(continuous)at Tc=100℃	6	A
I_{DM}	Drain Current (pulsed)	28	A
V_{GS}	Gate-Source Voltage	-5/+15	V
P_D	Power Dissipation T _C = 25℃	85	W
T _J , Tstg	Junction and Storage Temperature Range	-55 to +175	℃

Electrical Characteristics(T_J = 25℃ unless otherwise specified)

Typical Performance-Static

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
BV_{DS}	Drain-source Breakdown Voltage	$I_D=250\mu A, V_{GS}=0V$	650			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=650V, V_{GS}=0V, T_J=25^\circ C$			50	μA
I_{GSS}	Gate-body Leakage Current	$V_{DS}=0V; V_{GS}=-5 \text{ to } 15V$		10	100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=1mA$	1.5	1.9	2.5	V
$V_{GS(on)}$	Recommended turn-on Voltage	Static		12		V
$V_{GS(off)}$	Recommended turn-off Voltage			-3		V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS}=12V, I_D=2A$		320	380	mΩ
		$V_{GS}=12V, I_D=2A, T_J=175^\circ C$		400		mΩ

Typical Performance-Dynamic

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input Capacitance	$V_{DS}=600V, f=1MHz,$ $V_{AC}=25mV$		339		pF
C_{oss}	Output Capacitance			20		pF
C_{rss}	Reverse Transfer Capacitance			3.5		pF
g_{fs}	Transconductance	$V_{DS}=12V, I_D=2A$		2.8		S
E_{OSS}	C_{OSS} Stored Energy	$V_{DS}=600V, f=1MHz$		5		μJ
E_{ON}	Turn-On Energy (Body Diode)	$V_{DS}=400V, V_{GS}=-3V/12V,$ $I_D=2A, L=1.5mH$ $T_J=175^\circ C$		47		μJ
E_{OFF}	Turn-Off Energy (Body Diode)			8.5		μJ
Q_g	Total Gate Charge	$V_{DS}=400V, V_{GS}=-3V/12V,$ $I_D=2A$		9		nC
Q_{gs}	Gate-source Charge			2		nC
Q_{gd}	Gate-Drain Charge			3		nC
$R_{G(int)}$	Internal Gate Resistance	$f=1MHz, V_{AC}=25mV$		8		Ω
$t_{d(on)}$	Turn-on Delay Time	$V_{DS}=400V, V_{GS}=-3V/12V,$ $I_D=2A, L=1mH$ $R_{ext}=2.5\Omega$		5		ns
t_r	Rise Time			6		ns
$t_{d(off)}$	Turn-off Delay Time			7		ns
t_f	Fall Time			8.8		ns

Typical Performance-Reverse Diode($T_J = 25^\circ C$ unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{FSD}	Forward Voltage	$V_{GS}=0V, I_F=2A, T_J=25^\circ C$		3.5	6	V
		$V_{GS}=0V, I_F=2A, T_J=175^\circ C$		3	6	V
I_S	Continuous Diode Forward Current	$V_{GS}=0V, T_C=25^\circ C$		4		A

Thermal Characteristics

Symbol	Parameter	Value.	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	1.76	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62	$^\circ C/W$

The values are based on the junction-to case thermal impedance which is measured with the device mounted to a large heat sink assuming maximum junction temperature of $T_J(max)=175^\circ C$

Electrical Characteristics

Fig1. Output characteristics ($T_J = 25^\circ\text{C}$)

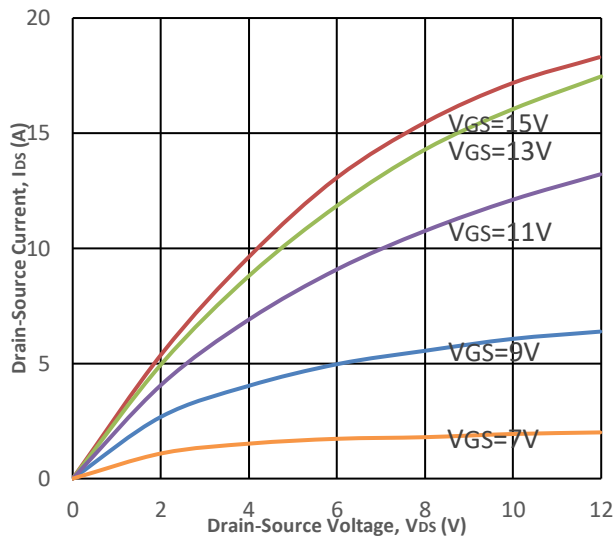


Fig2. Output characteristics ($T_J = 175^\circ\text{C}$)

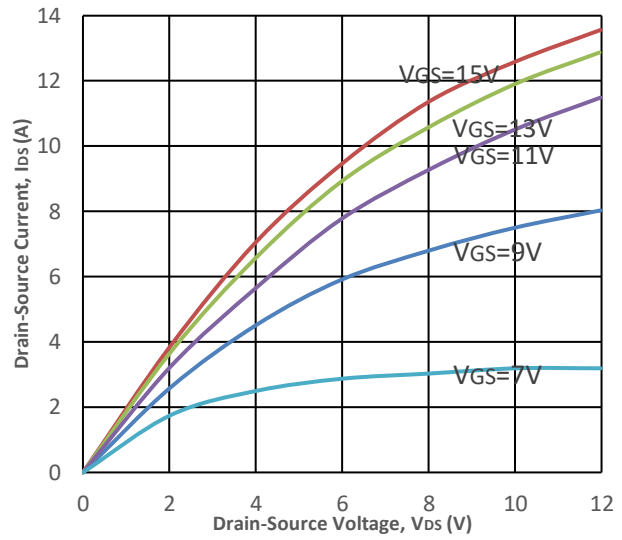


Fig3. Normalized On-Resistance vs. Temperature

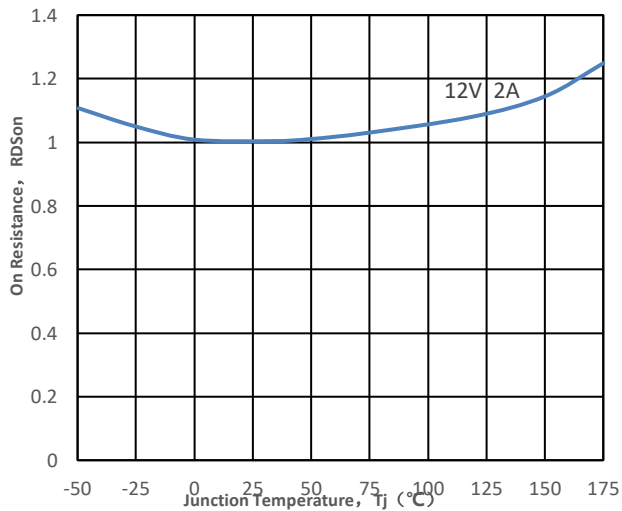


Fig4. On-Resistance vs. Temperature

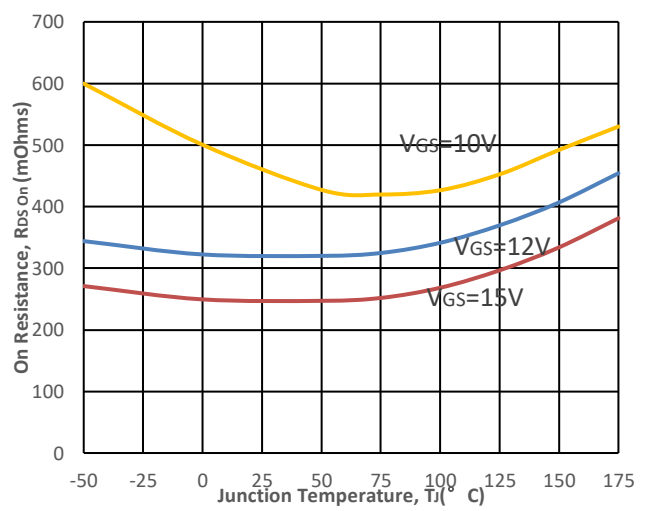


Fig5. Transfer Characteristic

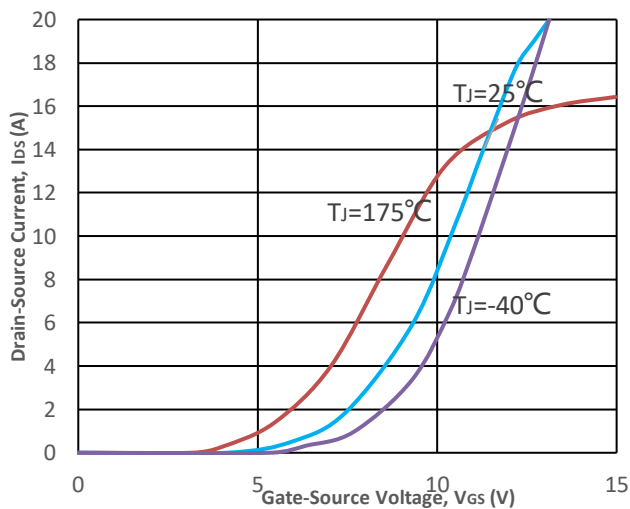


Fig6. Body Diode Characteristic at 25°C

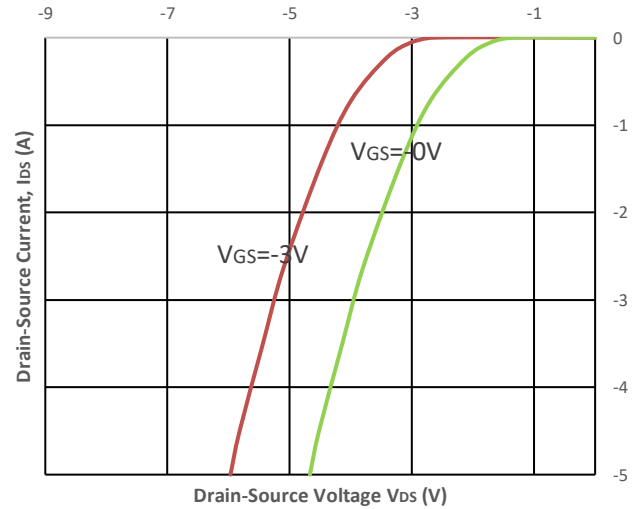


Fig7. Threshold Voltage vs. Temperature

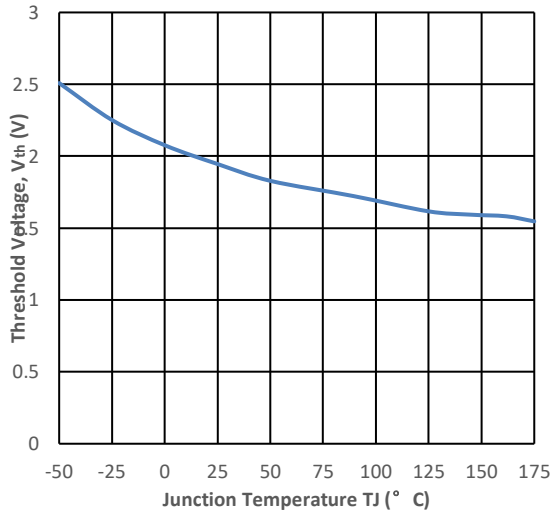


Fig8. Gate Charge Characteristics

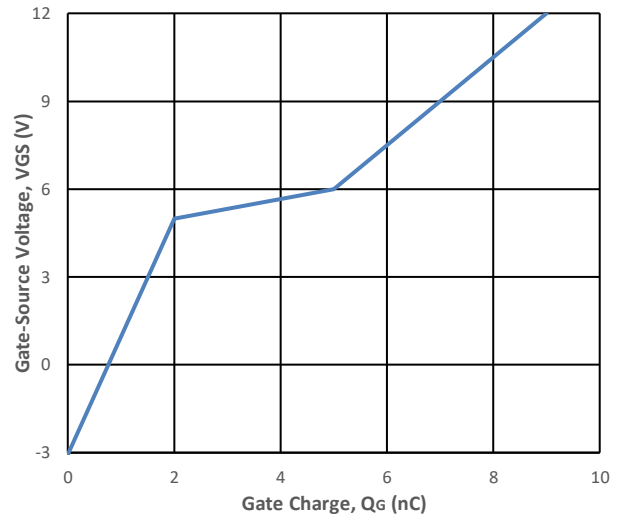


Fig9. 3rd Quadrant Characteristic at 25 $^{\circ}$ C

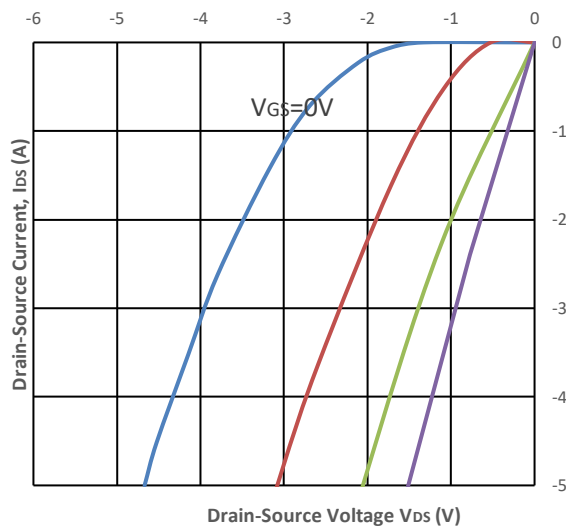


Fig10. Output Capacitor Stored Energy

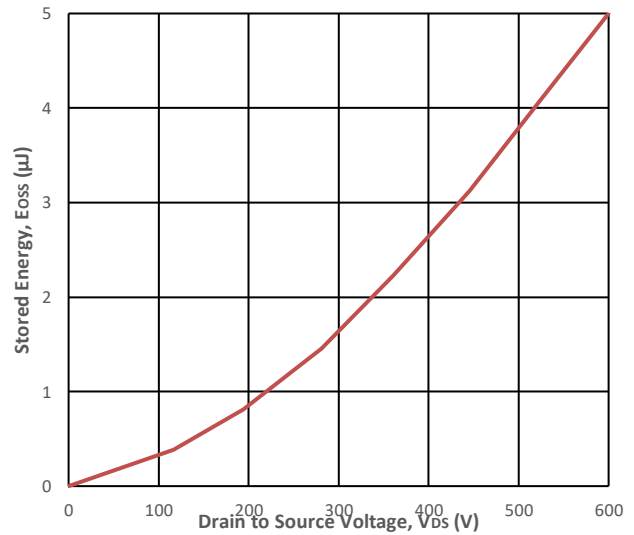


Fig11. Capacitances vs. Drain-Source

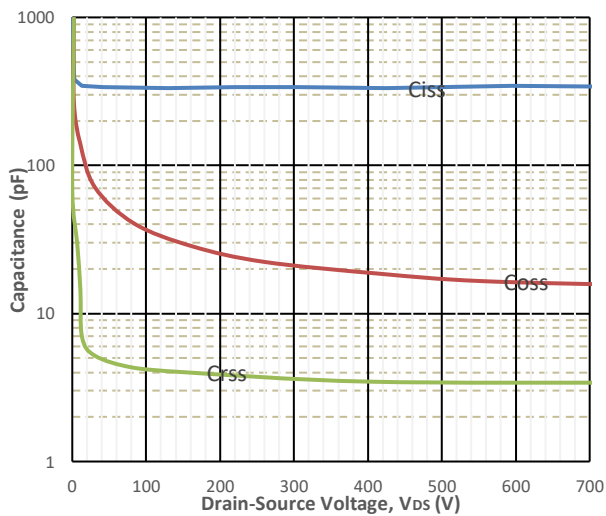


Fig12. Max Power Dissipation Derating Vs T_c

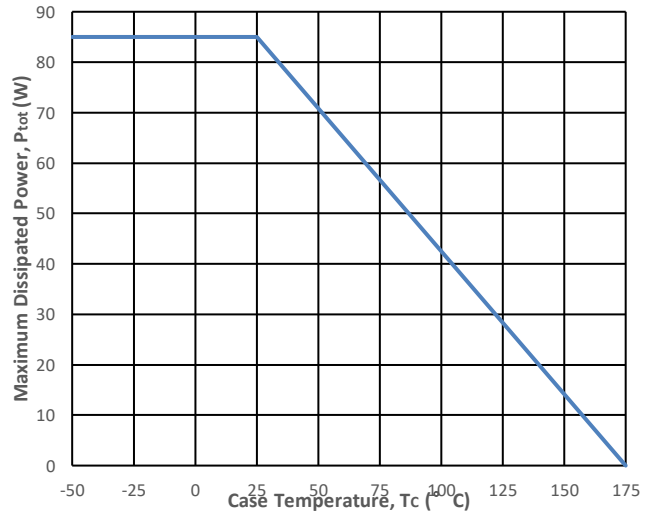


Fig13. Switching Energy vs. Drain Current

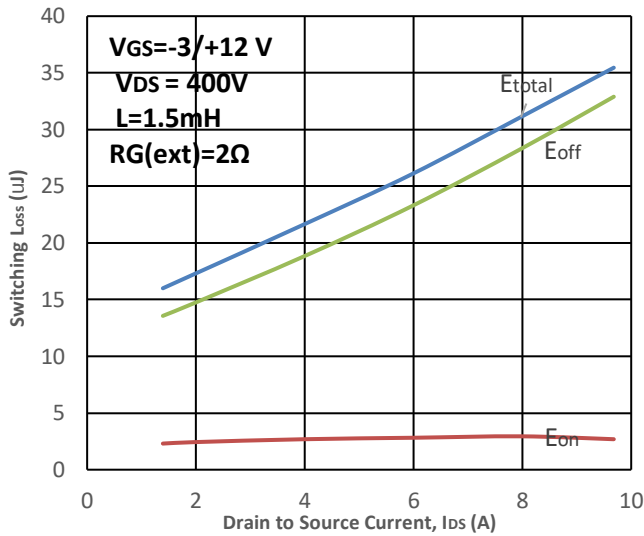


Fig14. Switching Energy vs. $R_{G(ext)}$

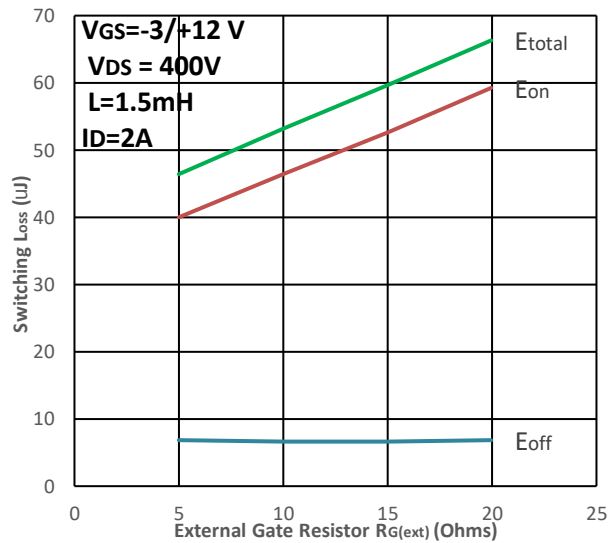


Fig15. Switching Energy vs. Temperature

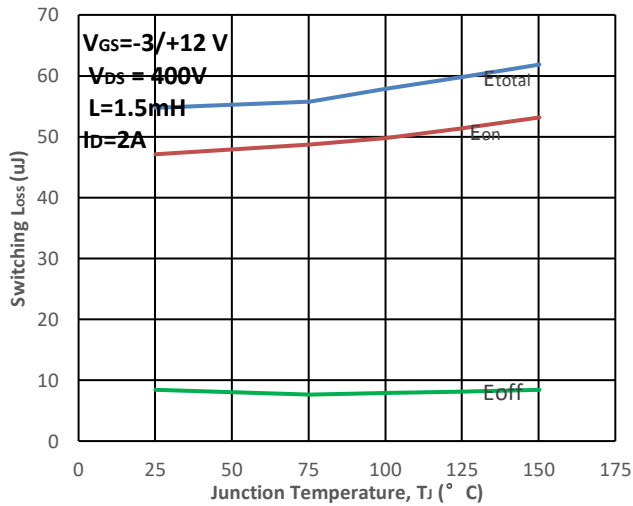


Fig16. Switching Times vs. $R_{G(ext)}$

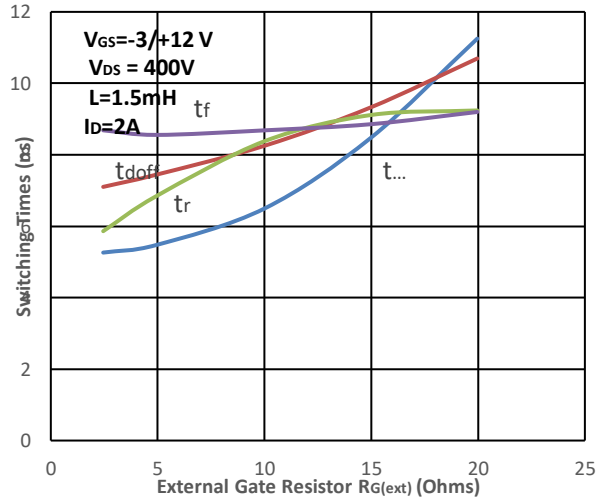


Fig17. Transient Thermal Impedance

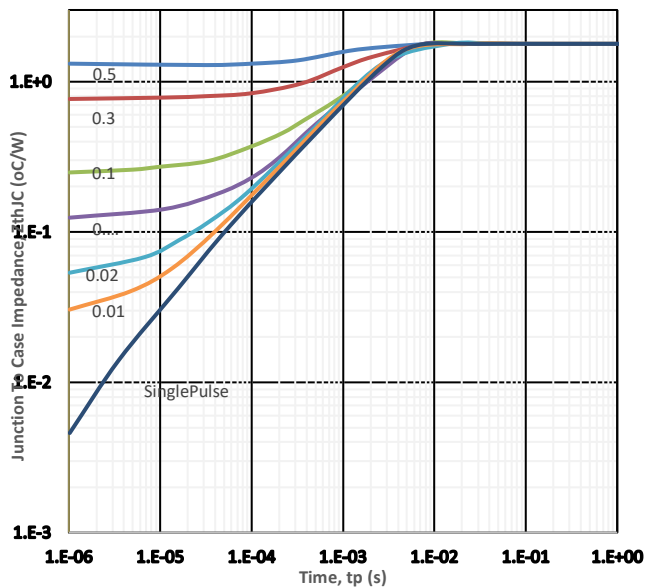
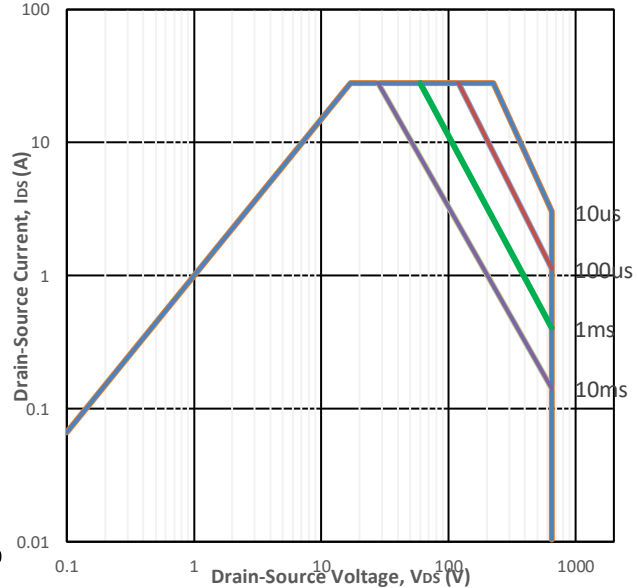
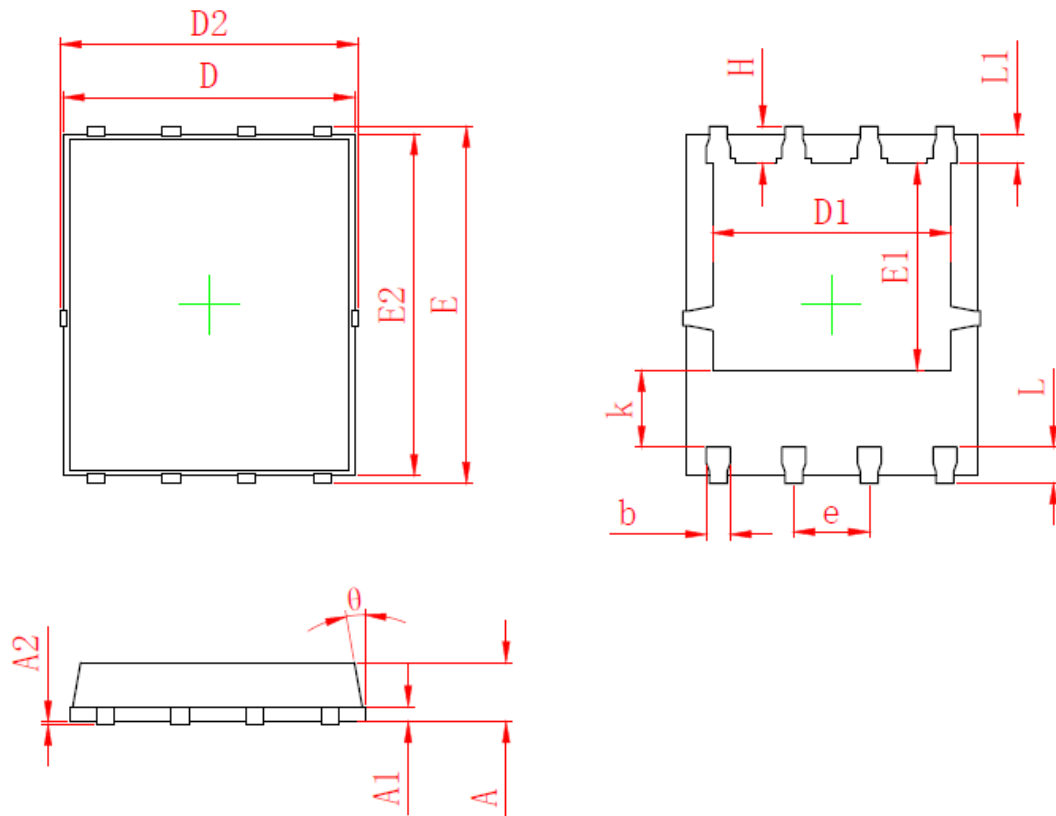


Fig18. Safe Operating Area



Package Drawing:



Dimensions (UNIT: mm)

SYMBDLS	DIMENSIONS IN MILLIMETERS		
	MIN	NOM	MAX
A	0.900	1.000	1.100
A1	0.254 REF.		
A2	0~0.5		
D	4.824	4.900	4.976
D1	3.910	4.010	4.110
D2	4.944	5.010	5.076
E	5.924	6.000	6.076
E1	3.375	3.475	3.575
E2	5.674	5.750	5.826
B	0.350	0.400	0.450
E	1.270 TYP.		
L	0.534	0.610	0.686
L1	0.424	0.500	0.576
K	1.190	1.290	1.390
H	0.549	0.625	0.701
θ	8°	10°	12°

Notes:

- The information in this document is subject to change without notice.
- For more product and company information, please contact us or visit the website.

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