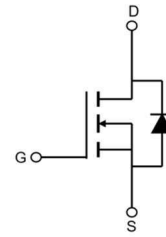


APG012N04T

N-Channel Shielding-Gate Mosfet

Feature

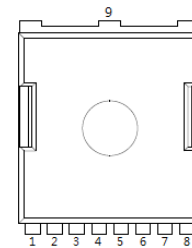
- 40V,160A
 $R_{DS(ON)} < 1.2m\Omega @ V_{GS}=10V$ TYP: 0.98 m Ω
- Split Gate Trench Technology
- Provide Excellent $R_{DS(ON)}$ And Low Gate Charge
- RoHS and Halogen-Free Compliant



Schematic Diagram

Application

- DC/DC Converter
- Load Switch for Portable Devices
- Battery Switch



TOLL-8L

1	Gate(G)
2,3,4,5,6,7,8	Source(S)
9	Drain(D)

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity(PCS)
G012N04T	APG012N04T	TOLL	13 inch	-	1200

ABSOLUTE MAXIMUM RATINGS ($T_J=25^{\circ}C$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	40	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current(Silicon limited) ⁽⁵⁾	I_D	380	A
Continuous Drain Current ($T_c = 25^{\circ}C$) ⁽⁶⁾	I_D	160	A
Continuous Drain Current ($T_c = 100^{\circ}C$)	I_D	160	A
Pulsed Drain Current ⁽¹⁾	I_{DM}	530	A
Single Pulsed Avalanche Energy ⁽²⁾	E_{AS}	840	mJ
Power Dissipation	P_D	278	W
Thermal Resistance from Junction to Case	$R_{\theta JC}$	0.45	$^{\circ}C/W$
Thermal Resistance from Junction to Ambient	$R_{\theta JA}$	35	$^{\circ}C/W$
Junction Temperature	T_J	150	$^{\circ}C$
Storage Temperature	T_{STG}	-55~ +150	$^{\circ}C$

MOSFET ELECTRICAL CHARACTERISTICS(T_J=25°C unless otherwise noted)

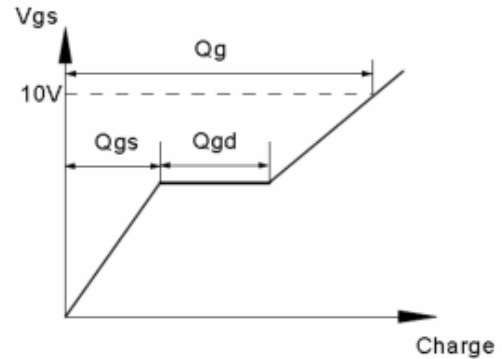
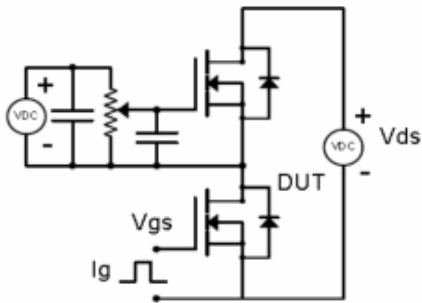
Parameter	Symbol	Test Condition	Min	Type	Max	Unit
Static Characteristics						
Drain-source breakdown voltage	V _{(BR)DSS}	V _{GS} = 0V, I _D =250μA	40	-	-	V
Zero gate voltage drain current	I _{DSS}	V _{DS} =40V, V _{GS} = 0V	-	-	1	μA
Gate-body leakage current	I _{GSS}	V _{GS} = ±20V, V _{DS} = 0V	-	-	±100	nA
Gate threshold voltage ⁽³⁾	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	2	3	4	V
Drain-source on-resistance ⁽³⁾	R _{DS(on)}	V _{GS} =10V, I _D =20A	-	0.98	1.2	mΩ
Gate Resistance	R _G	f =1MHz	-	6.5	-	Ω
Dynamic characteristics						
Input Capacitance	C _{iss}	V _{DS} =25V, V _{GS} =0V, f =300KHz	-	7000	-	pF
Output Capacitance	C _{oss}		-	2000	-	
Reverse Transfer Capacitance	C _{rss}		-	10	-	
Switching characteristics						
Turn-on delay time	t _{d(on)}	V _{DD} =20V, R _L =0.4Ω, V _{GS} =10V, R _G =4Ω	-	28	-	ns
Turn-on rise time	t _r		-	96	-	
Turn-off delay time	t _{d(off)}		-	73	-	
Turn-off fall time	t _f		-	116	-	
Total Gate Charge	Q _g	V _{DS} =20V, I _D =50A, V _{GS} =10V	-	80	-	nC
Gate-Source Charge	Q _{gs}		-	36	-	
Gate-Drain Charge	Q _{gd}		-	8	-	
Source-Drain Diode characteristics						
Diode Forward voltage ⁽³⁾	V _{DS}	V _{GS} =0V, I _S =40A	-	-	1.2	V
Diode Forward current ⁽⁴⁾	I _S		-	-	160	A
Reverse recovery time	T _{rr}	I _S =40A, V _{GS} =0V, dI _F /dt=100A/us		100		ns
Reverse recovery charge	Q _{rr}	I _S =40A, V _{GS} =0V, dI _F /dt=100A/us		230		nC

Notes:

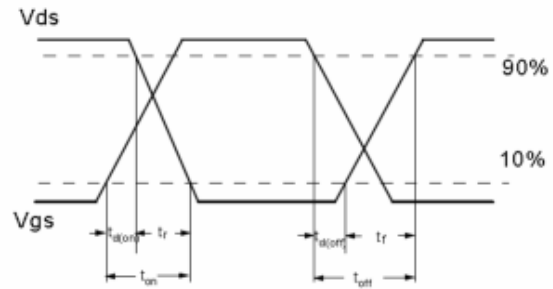
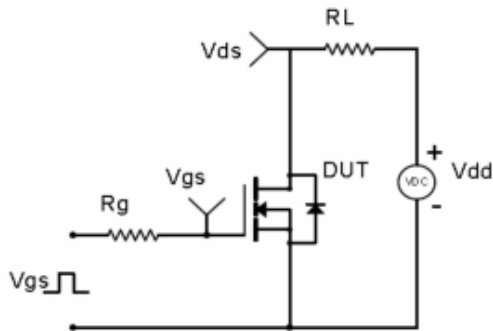
1. Repetitive Rating: pulse width limited by maximum junction temperature
2. EAS Condition:T_J=25°C, V_{DD}=32V, R_G=25 Ω ,L=0.5mH
3. Pulse Test: pulse width≤300μs, duty cycle≤2%
4. Surface Mounted on FR4 Board,t≤10 sec
5. The max drain current rating is silicon limited
6. The max drain current rating is package limited

Test Circuit & Waveform

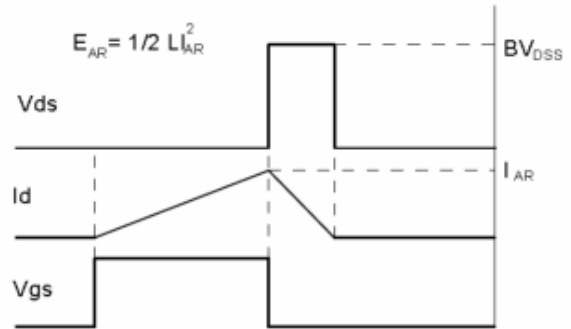
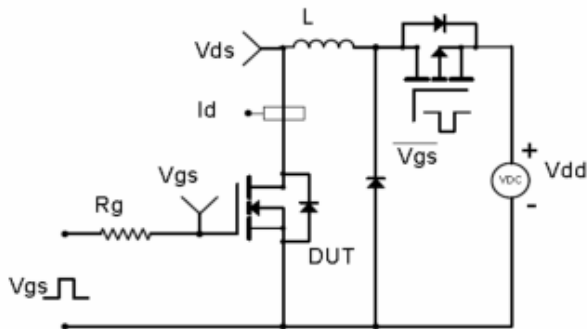
Gate Charge Test Circuit & Waveform



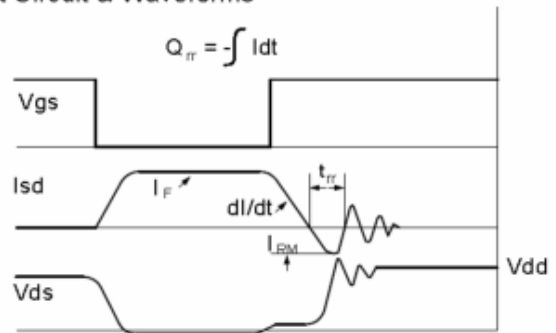
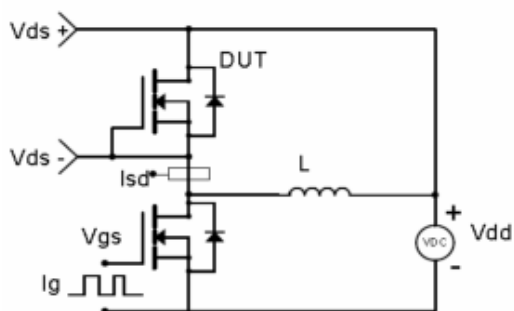
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



Typical Electronic and Thermal Characteristics

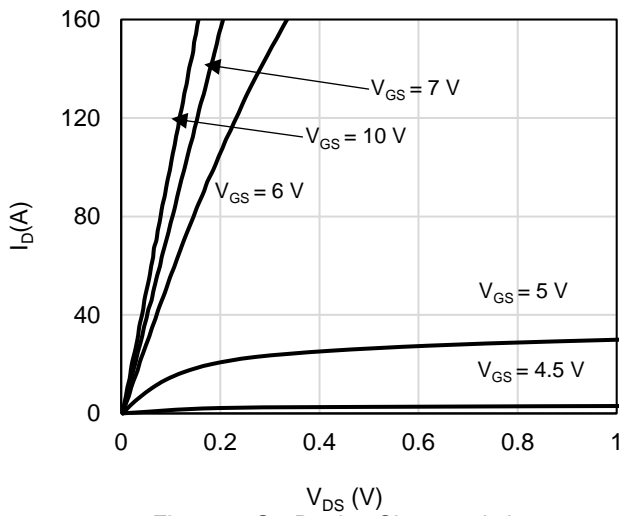


Figure 1: On-Region Characteristics

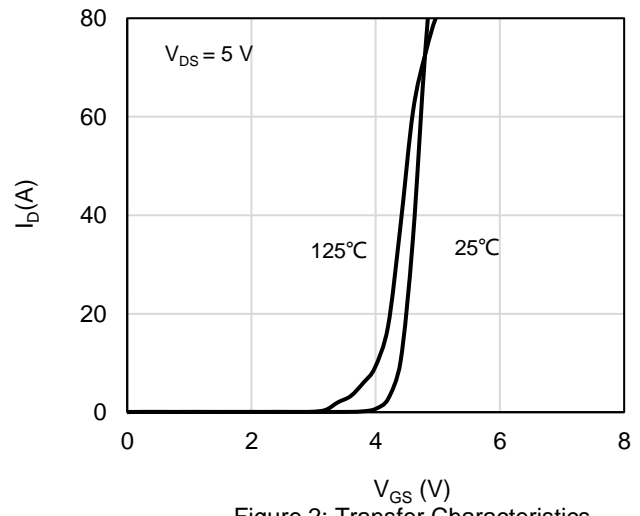


Figure 2: Transfer Characteristics

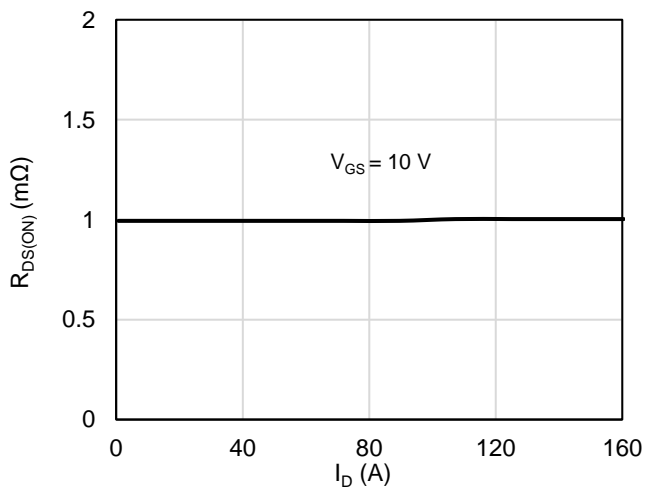


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

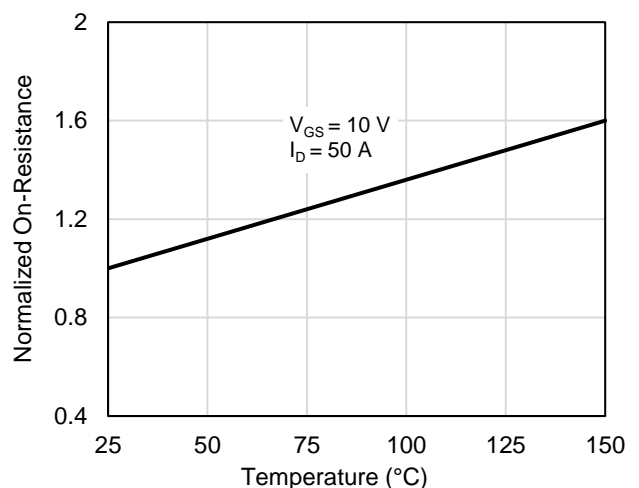


Figure 4: On-Resistance vs. Junction Temperature

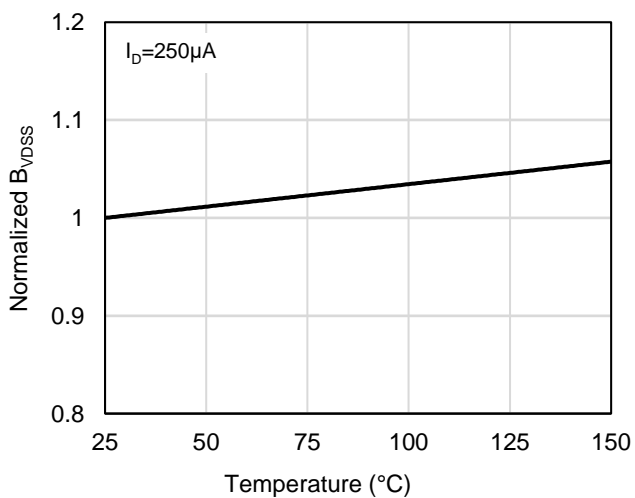


Figure 5: Breakdown Voltage vs. Junction Temperature

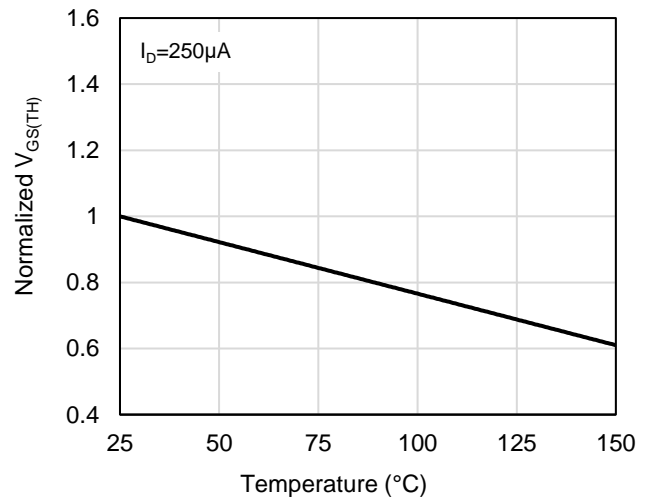


Figure 6: Threshold Voltage vs. Junction Temperature

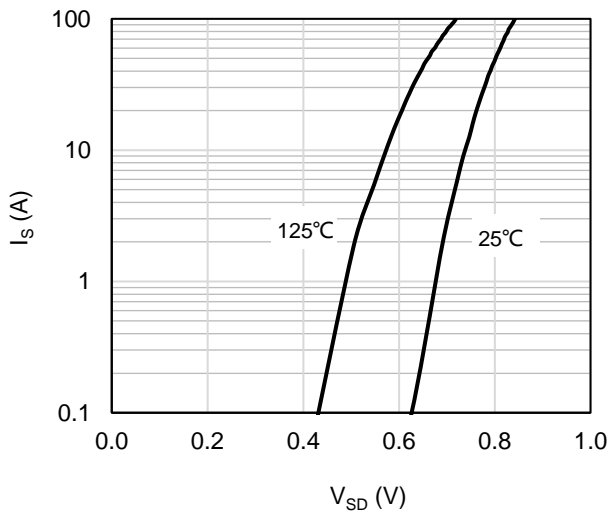


Figure 7: Body-Diode Characteristics

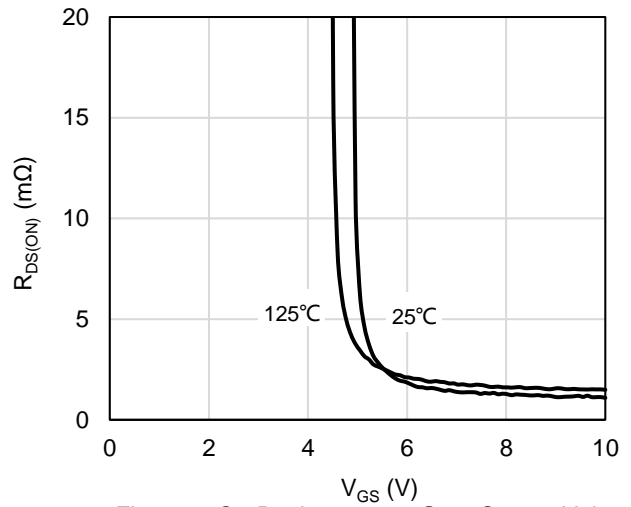


Figure 8: On-Resistance vs. Gate-Source Voltage

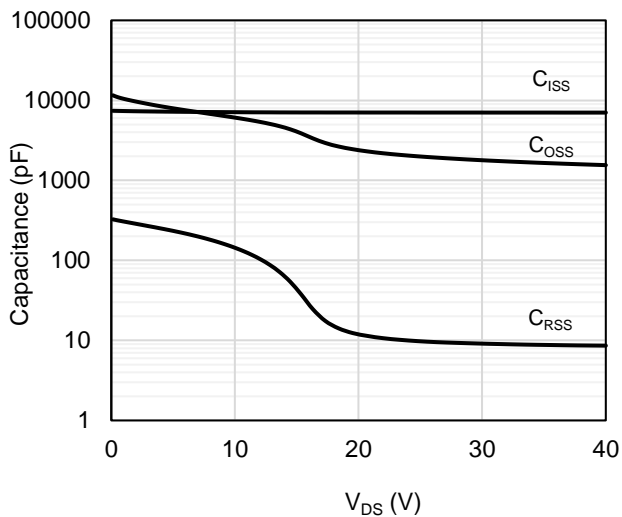


Figure 9: Capacitance Characteristics

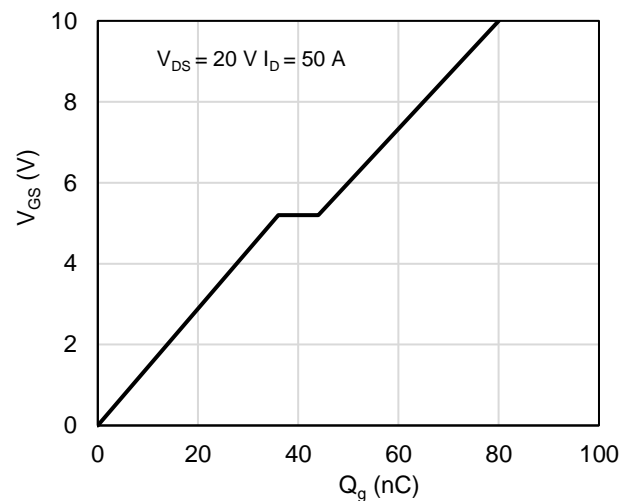


Figure 10: Gate-Charge Characteristics

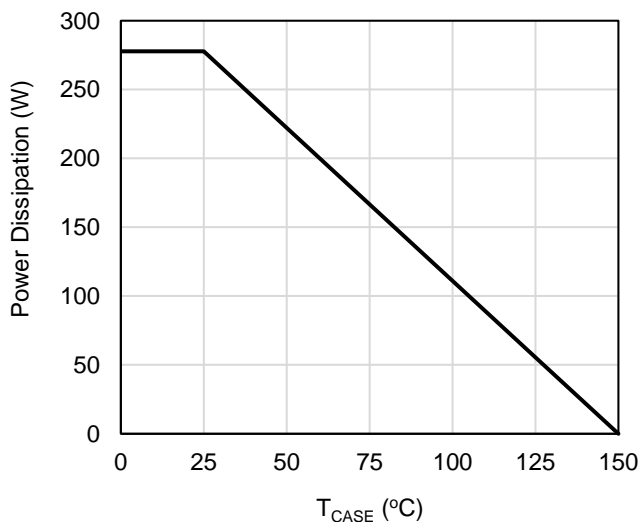


Figure 11: Power De-rating

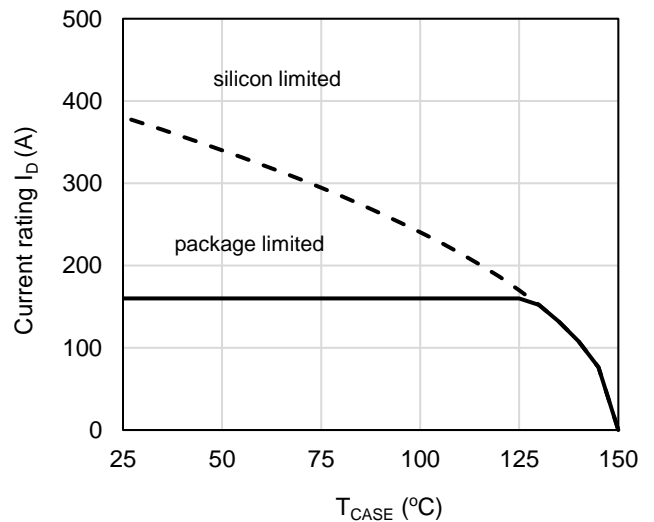


Figure 12: Current De-rating

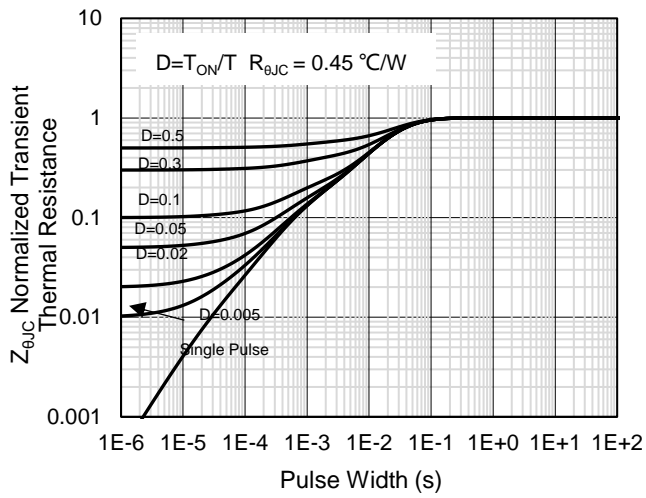


Figure 13: Normalized Maximum Transient Thermal Impedance

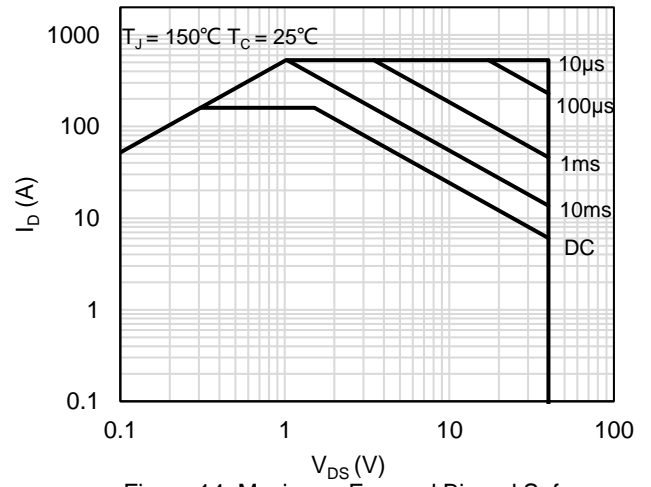
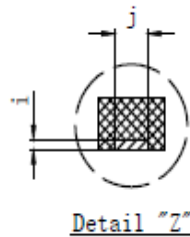
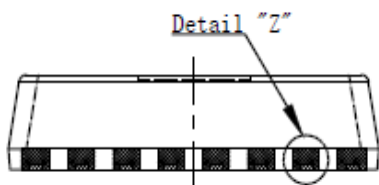
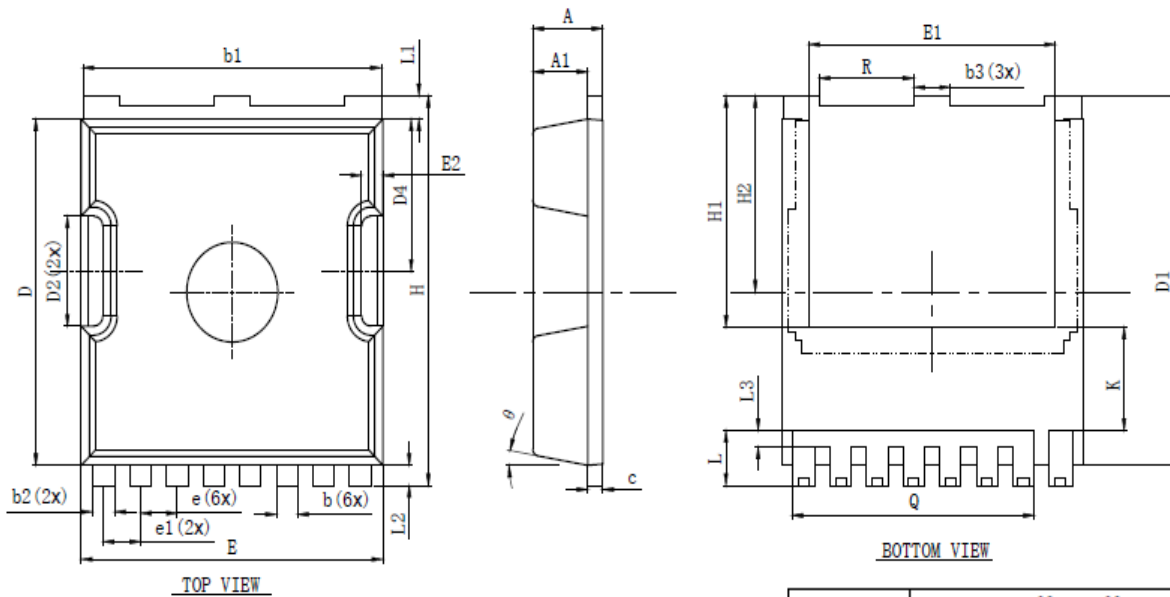


Figure 14: Maximum Forward Biased Safe Operating Area

Package Outlines



SYMBOL	MILLIMETER		
	MIN.	NOM.	MAX.
A	2.200	2.300	2.400
A1	1.700	1.800	1.900
b	0.600	0.700	0.800
b1	9.700	9.800	9.900
b2	0.650	0.750	0.850
b3	1.100	1.200	1.300
c	0.400	0.500	0.600
D	10.300	10.400	10.500
D1	11.000	11.100	11.200
D2	3.200	3.300	3.400
D4	4.470	4.570	4.670
E	9.800	9.900	10.000
E1	8.000	8.100	8.200
E2	0.500	0.600	0.700
e	1.200 BSC		
e1	1.225 BSC		
H	11.600	11.700	11.800
H1	6.950 BSC		
H2	5.900 BSC		
i	0.100 REF.		
j	0.350 REF.		
K	3.100 REF.		
L	1.550	1.650	1.750
L1	0.600	0.700	0.800
L2	0.500	0.600	0.700
L3	0.400	0.500	0.600
Q	7.950 REF.		
R	3.000	3.100	3.200
θ	10° REF.		