

IV1Q12750T3 – 1200V 750mΩ SiC MOSFET

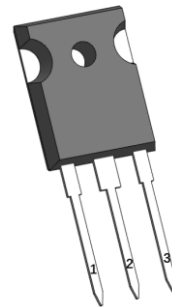
Features

- High blocking voltage with low on-resistance
- High speed switching with low capacitance
- High operating junction temperature capability
- Very fast and robust intrinsic body diode

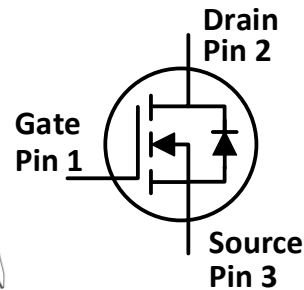
Applications

- Solar inverters
- UPS
- Motor drivers
- High voltage DC/DC converters
- Switch mode power supplies

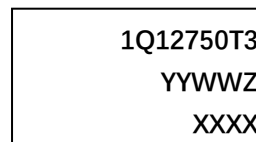
Outline:



TO247-3



Marking Diagram:



1Q12750T3 = Specific Device Code
 YY = Year
 WW = Work Week
 Z = Assembly Location
 XXXX = Lot Traceability

Absolute Maximum Ratings (T_c=25°C unless otherwise specified)

Symbol	Parameter	Value	Unit	Test Conditions	Note
V _{DS}	Drain-Source Voltage	1200	V	V _{GS} =0V, I _D =10μA	
V _{GSmax} (DC)	Maximum Gate-Source Voltage (DC)	-5 to 22	V	Static (DC)	
V _{GSmax} (Spike)	Maximum Gate-Source Voltage (Spike)	-10 to 25	V	Duty cycle<1% Pulse width<200ns	
V _{GS(on)}	Recommended Turn-on Voltage	20±0.5	V		
V _{GS(off)}	Recommended Turn-off Voltage	-3.5 to -2	V		
I _D	Drain Current (Continuous)	6.8	A	V _{GS} =20V, T _c =25°C	Fig. 21
		5.3	A	V _{GS} =20V, T _c =100°C	
I _{DM}	Drain Current (Pulsed)	13.6	A	Pulse width limited by SOA	Fig. 24
P _{TOT}	Total Power Dissipation	78.4	W	T _c =25°C	Fig. 22
T _{stg}	Storage Temperature Range	-55 to 175	°C		
T _J	Operating Junction Temperature	-55 to 175	°C		
T _L	Solder Temperature	260	°C	Wave soldering only allowed at leads, 1.6mm from case for 10 s	

Thermal Data

Symbol	Parameter	Value	Unit	Note
R _{θ(j-c)}	Thermal Resistance from Junction to Case	1.91	°C/W	Fig. 23

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

Symbol	Parameter	Value			Unit	Test Conditions	Note
		Min.	Typ.	Max.			
I_{DSS}	Drain Leakage Current (Zero Gate Voltage)		0.1	10	μA	$V_{DS}=1200\text{V}, V_{GS}=0\text{V}$	
I_{GSS}	Gate Leakage Current		1	± 100	nA	$V_{DS}=0\text{V}, V_{GS}=-5\sim 20\text{V}$	
V_{th}	Gate Threshold Voltage		4.3		V	$V_{GS}=V_{DS}, I_D=380\mu\text{A}$	Fig. 9
			3.3		V	$V_{GS}=V_{DS}, I_D=380\mu\text{A}$ @ $T_J=175^\circ\text{C}$	
R_{on}	Static Drain-Source On-resistance		750	900	$\text{m}\Omega$	$V_{GS}=20\text{V}, I_D=1.5\text{A}$ @ $T_J=25^\circ\text{C}$	Fig. 4, 5, 6, 7
			1070		$\text{m}\Omega$	$V_{GS}=20\text{V}, I_D=1.5\text{A}$ @ $T_J=175^\circ\text{C}$	
C_{iss}	Input Capacitance		260		pF	$V_{DS}=800\text{V}, V_{GS}=0\text{V},$ $f=1\text{MHz}, V_{AC}=25\text{mV}$	Fig. 16
C_{oss}	Output Capacitance		15		pF		
C_{riss}	Reverse Transfer Capacitance		2.6		pF		
E_{oss}	C_{oss} Stored Energy		5.8		μJ		Fig. 17
Q_G	Total Gate Charge		15.8		nC	$V_{DS}=800\text{V}, I_D=1.5\text{A},$ $V_{GS}=-5\text{ to }20\text{V}$	Fig. 18
Q_{GS}	Gate-Source Charge		3.3		nC		
Q_{GD}	Gate-Drain Charge		11.6		nC		
R_G	Gate Input Resistance		26.8		Ω	$f=1\text{MHz}$	
E_{on}	Turn-on Switching Energy		24		μJ	$V_{DS}=800\text{V}, I_D=1.5\text{A},$ $V_{GS}=-3.5\text{V to }20\text{V},$ $R_{G(ext)}=0\Omega,$ $L=1550\mu\text{H}$	Fig. 19, 20
E_{off}	Turn-off Switching Energy		4.1		μJ		
$t_{d(on)}$	Turn-on Delay Time		8.5		ns		
t_r	Rise Time		9.6				
$t_{d(off)}$	Turn-off Delay Time		12.4				
t_f	Fall Time		34.8				

Reverse Diode Characteristics ($T_c=25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Value			Unit	Test Conditions	Note
		Min.	Typ.	Max.			
V_{SD}	Diode Forward Voltage		4.1		V	$I_{SD}=1.5\text{A}, V_{GS}=0\text{V}$	Fig. 11, 12
			3.6		V	$I_{SD}=1.5\text{A}, V_{GS}=0\text{V},$ @ $T_J=175^\circ\text{C}$	
t_{rr}	Reverse Recovery Time		59		ns	$V_{GS}=-3.5\text{V}/+20\text{V},$	
Q_{rr}	Reverse Recovery Charge		26		nC	$I_{SD}=1.5\text{A}, V_R=800\text{V},$	
I_{RRM}	Peak Reverse Recovery Current		1.3		A	$di/dt=276\text{A}/\mu\text{s},$ $R_{G(ext)}=82\Omega$	

Typical Performance (curves)

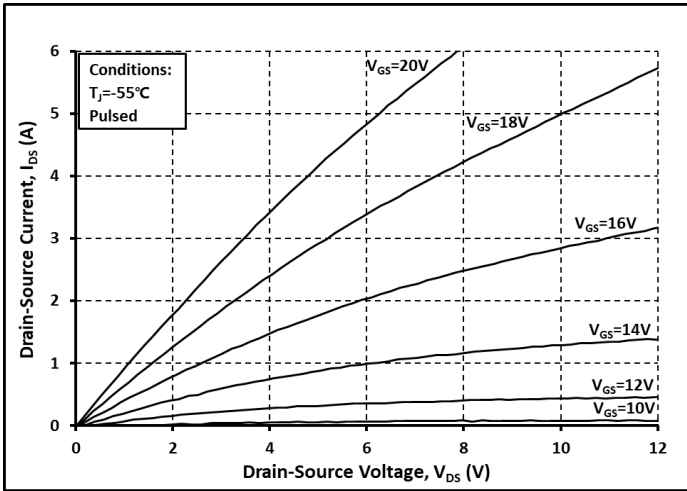


Fig. 1 Output Curve @ $T_j = -55^\circ\text{C}$

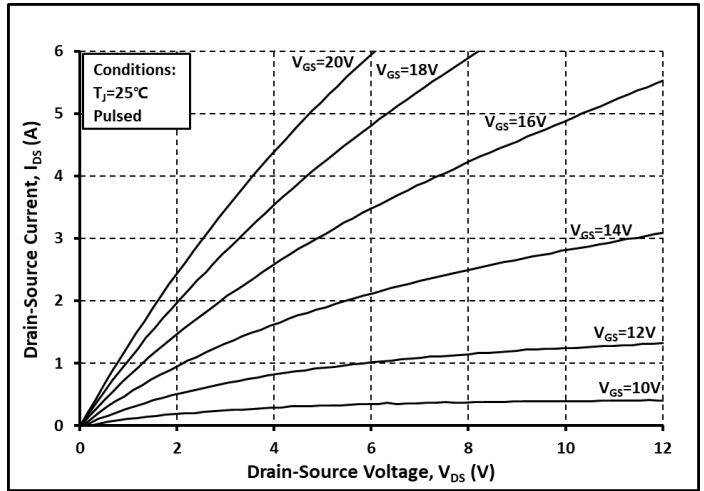


Fig. 2 Output Curve @ $T_j = 25^\circ\text{C}$

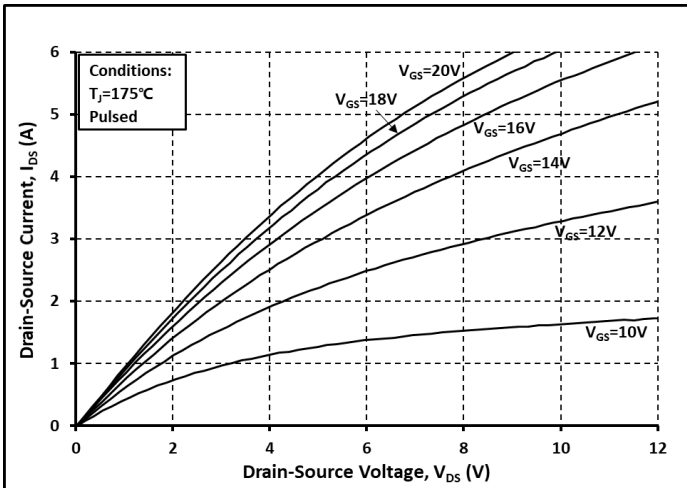


Fig. 3 Output Curve @ $T_j = 175^\circ\text{C}$

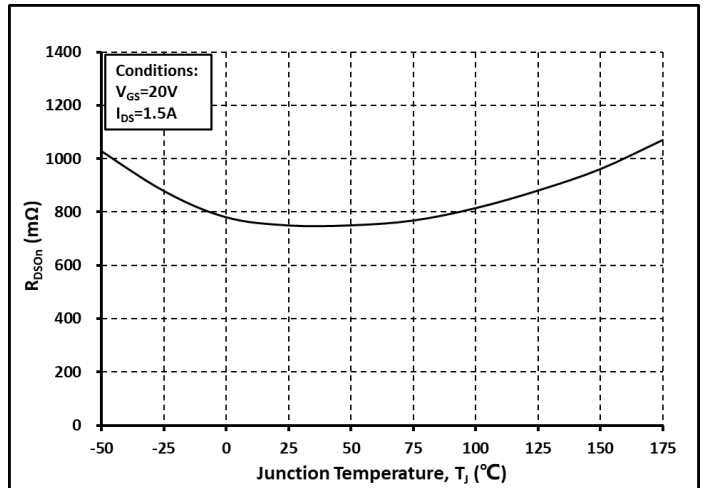


Fig. 4 R_{on} vs. Temperature

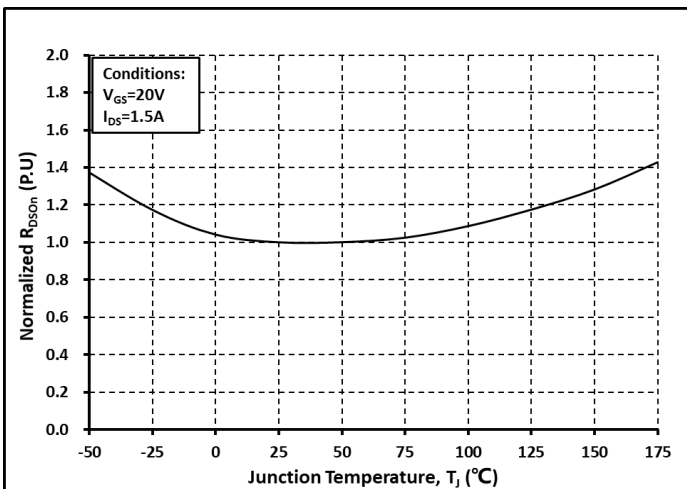


Fig. 5 Normalized R_{on} vs. Temperature

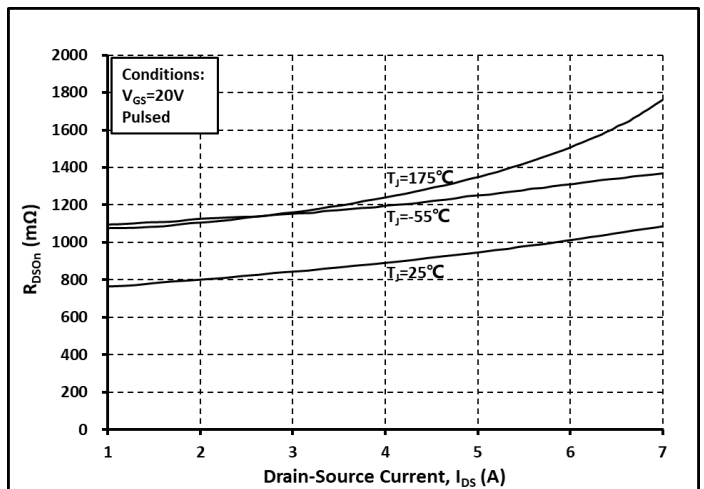


Fig. 6 R_{on} vs. I_{DS} @ Various Temperature

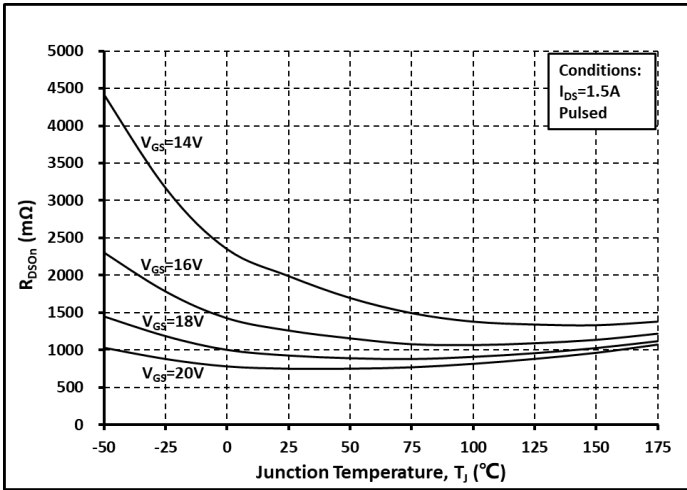


Fig. 7 Ron vs. Temperature @ Various V_{GS}

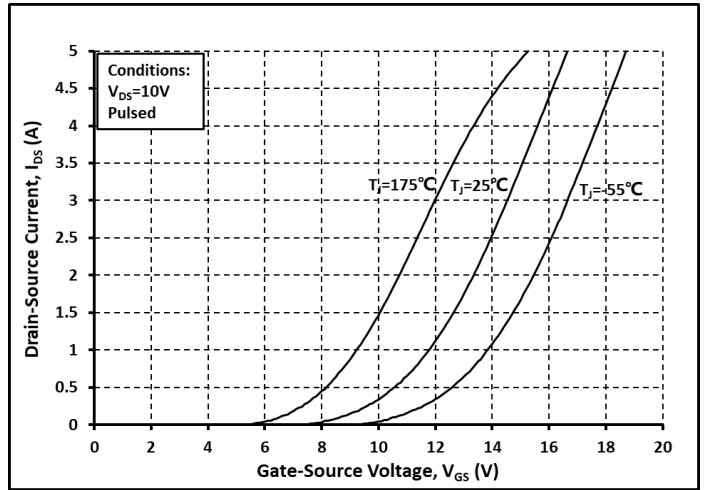


Fig. 8 Transfer Curves @ Various Temperature

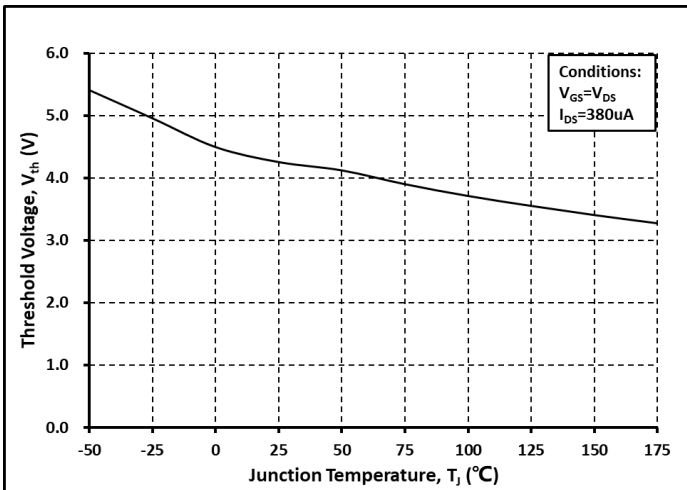


Fig. 9 Threshold Voltage vs. Temperature

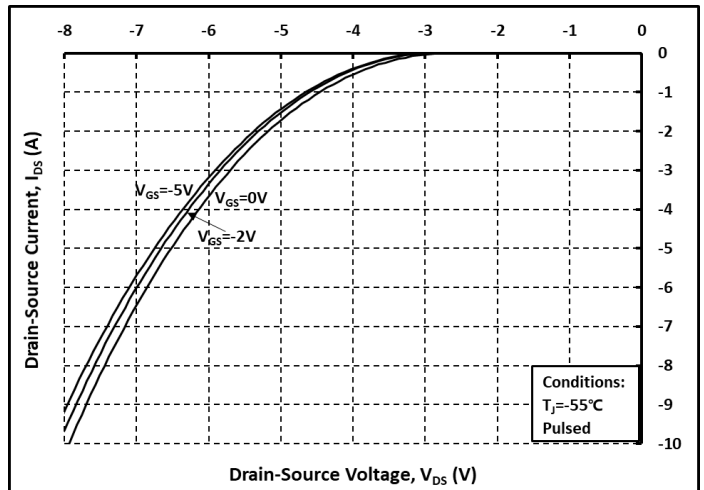


Fig. 10 Body Diode Curves @ $T_J = -55^\circ\text{C}$

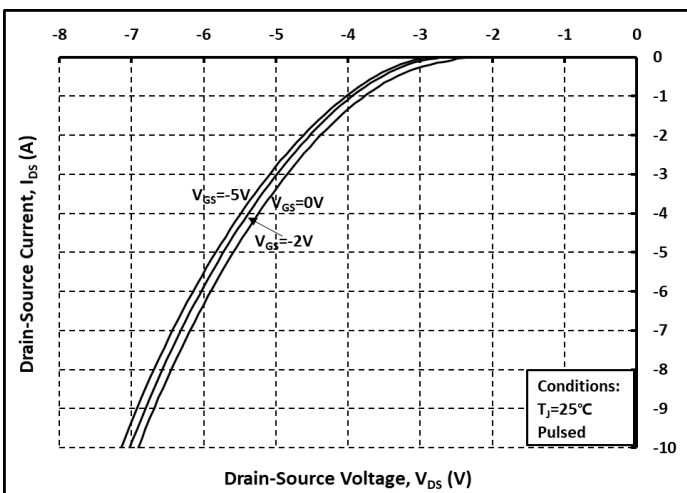


Fig. 11 Body Diode Curves @ $T_J = 25^\circ\text{C}$

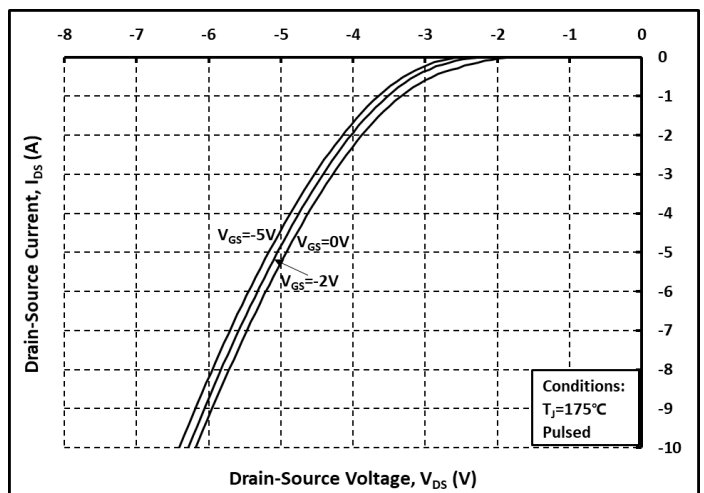


Fig. 12 Body Diode Curves @ $T_J = 175^\circ\text{C}$

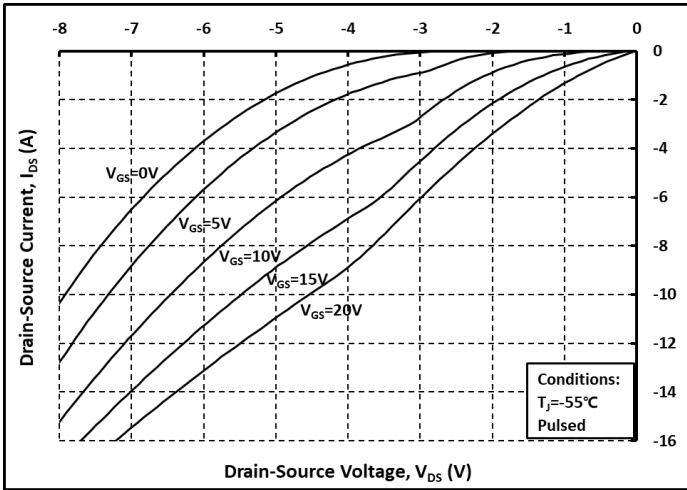


Fig. 13 3rd Quadrant Curves @ $T_j = -55^\circ\text{C}$

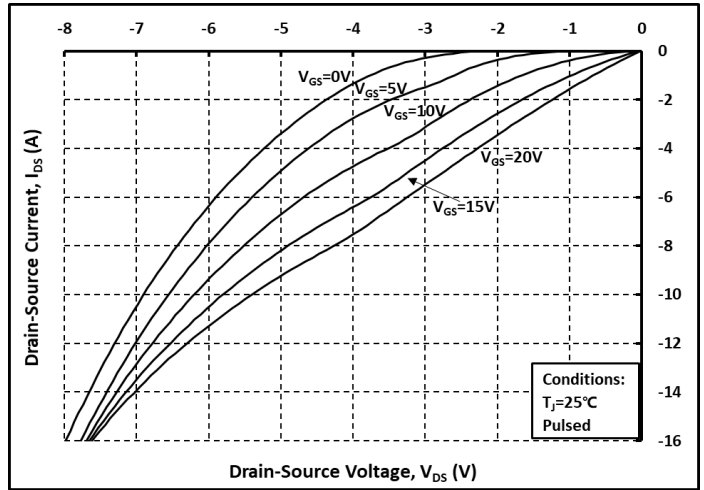


Fig. 14 3rd Quadrant Curves @ $T_j = 25^\circ\text{C}$

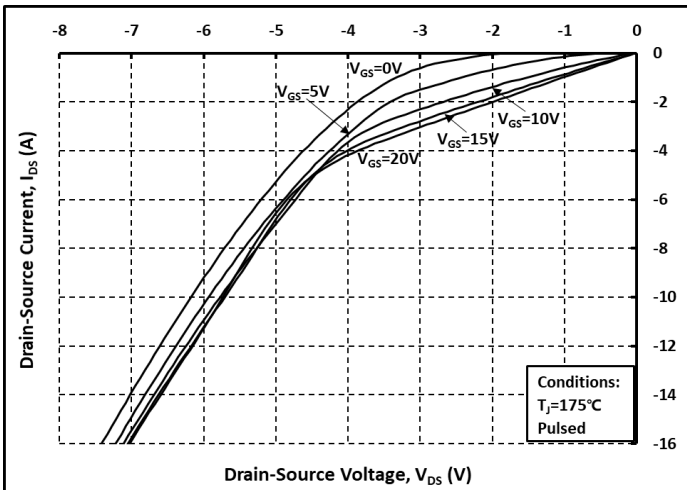


Fig. 15 3rd Quadrant Curves @ $T_j = 175^\circ\text{C}$

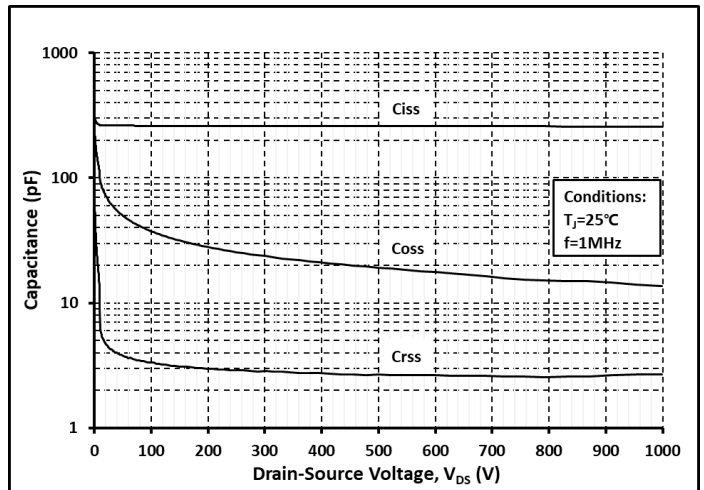


Fig. 16 Capacitance vs. V_{DS}

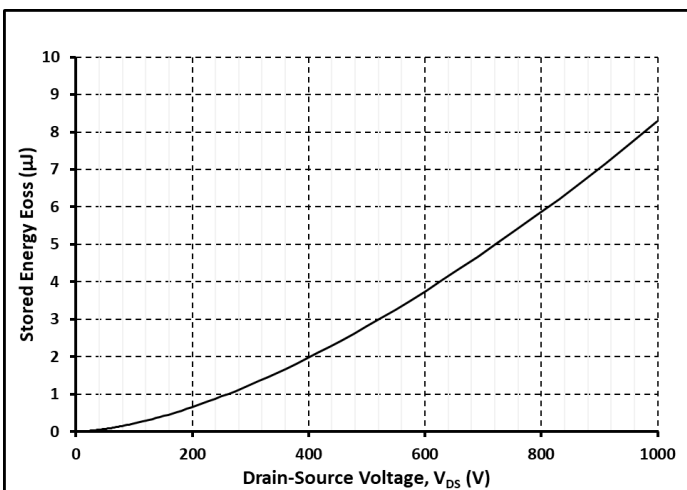


Fig. 17 Output Capacitor Stored Energy

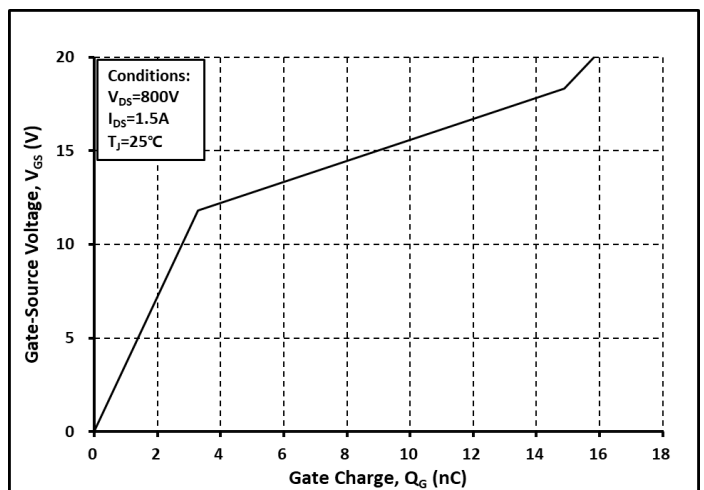


Fig. 18 Gate Charge Characteristics

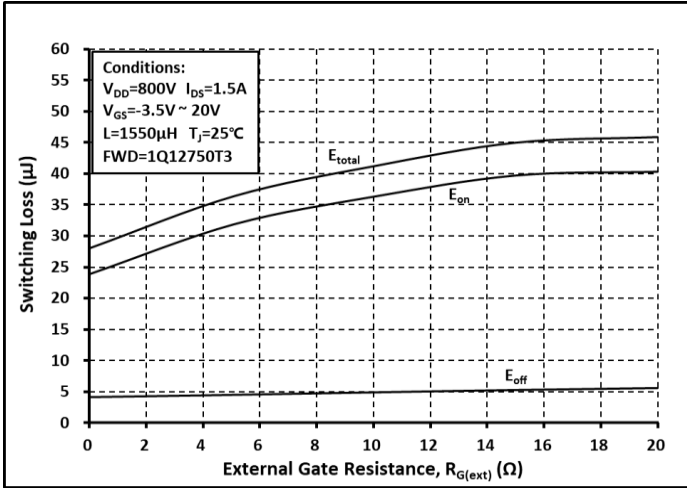


Fig. 19 Switching Energy vs. $R_{G(ext)}$

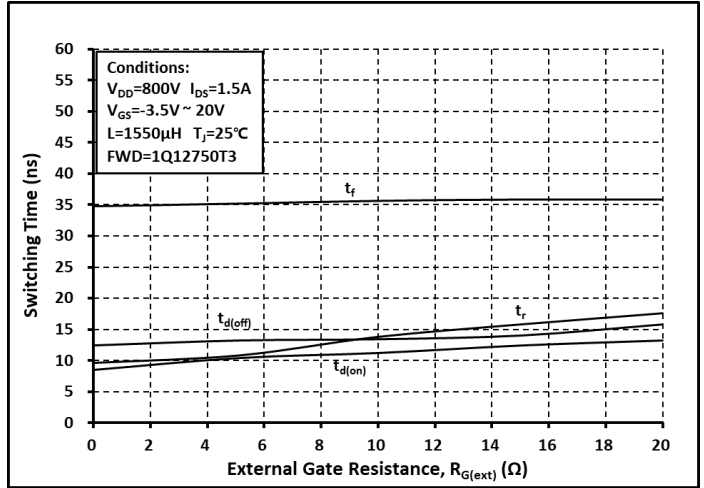


Fig. 20 Switching Time vs. $R_{G(ext)}$

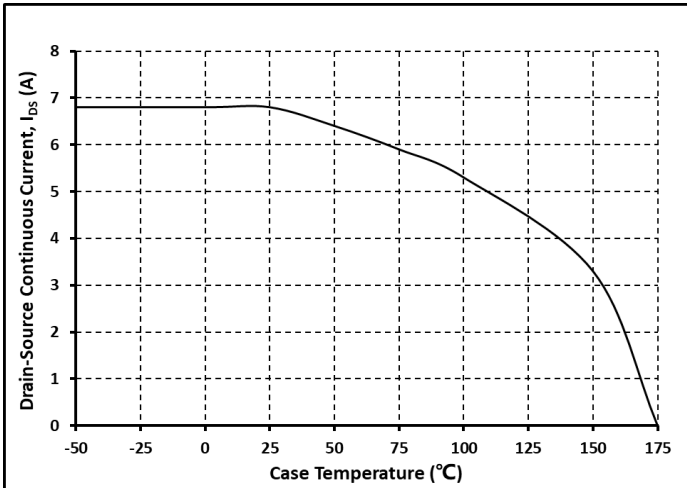


Fig. 21 Continuous I_{DS} vs. T_c

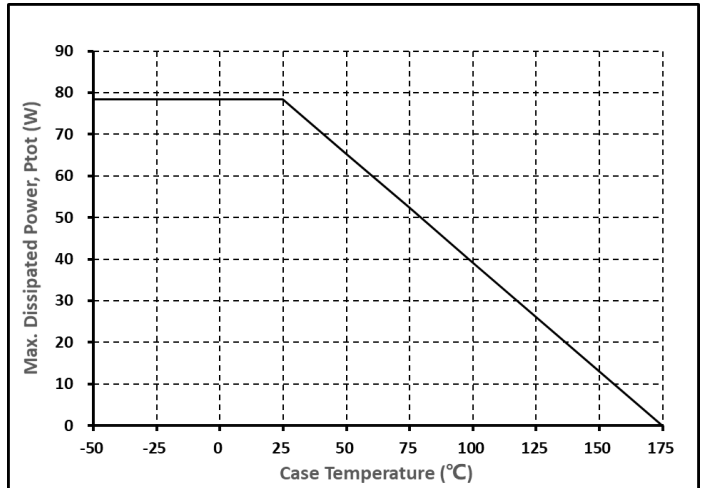


Fig. 22 Max. Power Dissipation Derating vs. T_c

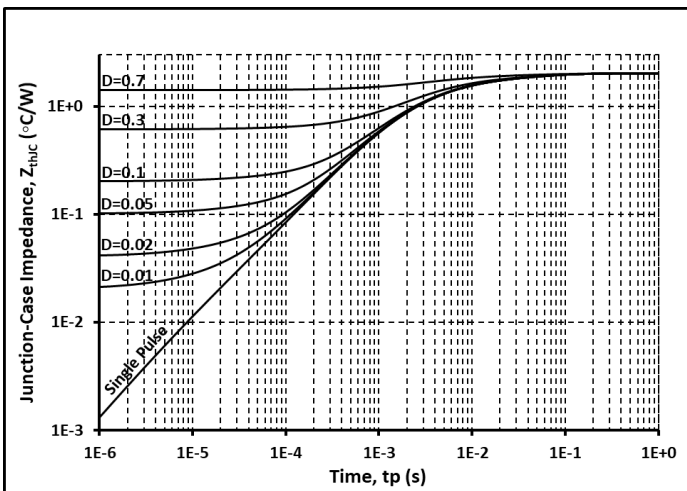


Fig. 23 Thermal Impedance

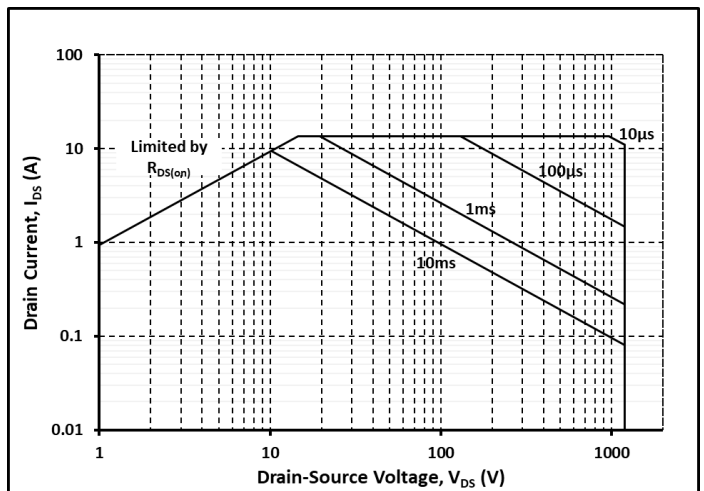
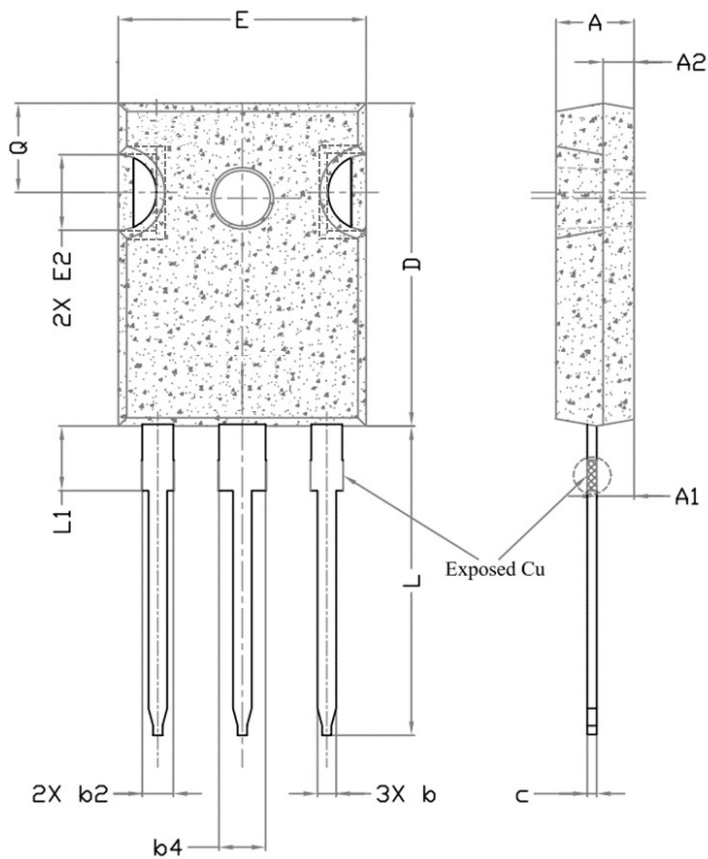
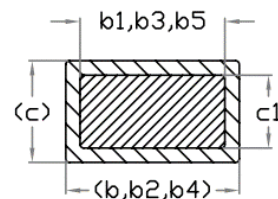
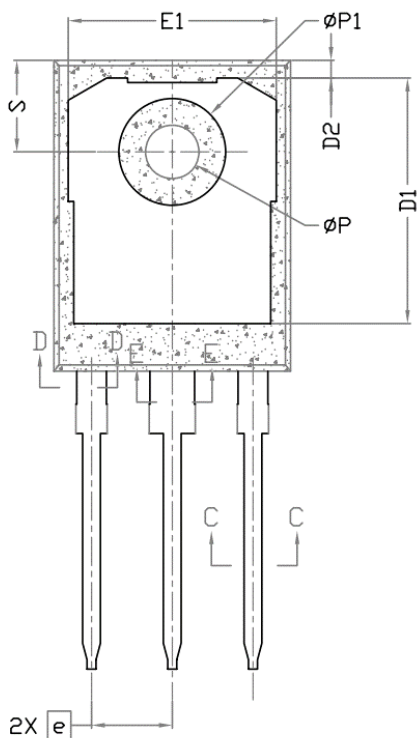


Fig. 24 Safe Operating Area

Package Dimensions



Dimensions In Millimeters		
SYMBOL	MIN.	MAX.
A	4.83	5.21
A1	2.29	2.55
A2	1.50	2.49
b	1.07	1.33
b1	1.07	1.28
b2	1.91	2.41
b3	1.91	2.34
b4	2.87	3.38
b5	2.87	3.18
c	0.55	0.69
c1	0.55	0.65
D	20.80	21.10
D1	16.25	17.65
D2	0.51	1.35
E	15.70	16.13
E1	13.10	14.16
E2	3.68	5.49
e	5.44 BSC	
L	19.80	20.32
L1	3.95	4.40
phi P	3.50	3.70
phi P1	7.00	7.40
Q	5.39	6.20
S	6.04	6.30



Section C--C, D--D, E--E

Note:

1. Package Reference: JEDEC TO247, Variation AD
2. All Dimensions are in mm
3. Slot Required, Notch May Be Rounded or Rectangular
4. Dimension D&E Do Not Include Mold Flash
5. Subject to Change Without Notice

Notes

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