

IV1Q12750O3 – 1200V 750mΩ SiC MOSFET

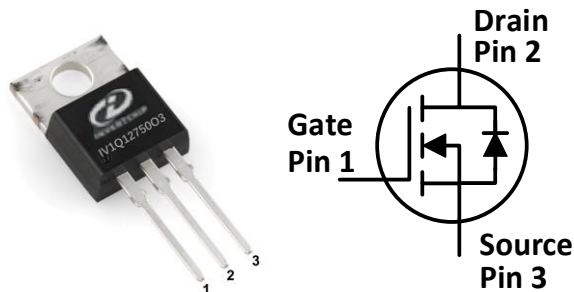
Features

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

Applications

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

Package



Part Number	Package
IV1Q12750O3	TO220-3

Absolute Maximum Ratings ($T_c=25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Value	Unit	Test Conditions	Note
V_{DS}	Drain-Source Voltage	1200	V	$V_{GS}=0V$, $I_D=10\mu A$	
$V_{GSmax}(DC)$	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)	6.4	A	$V_{GS}=20V$, $T_c=25^\circ\text{C}$	Fig. 21
		4.9	A	$V_{GS}=20V$, $T_c=100^\circ\text{C}$	
I_{DM}	Drain Current (Pulsed)	12.8	A	Pulse width limited by SOA	Fig. 24
P_{TOT}	Total Power Dissipation	66.9	W	$T_c=25^\circ\text{C}$	Fig. 22
T_{stg}	Storage Temperature Range	-55 to 175	$^\circ\text{C}$		
T_J	Operating Junction Temperature	-55 to 175	$^\circ\text{C}$		
T_L	Solder Temperature	260	$^\circ\text{C}$	Wave soldering only allowed at leads, 1.6mm from case for 10 s	

Thermal Data

Symbol	Parameter	Value	Unit	Note
$R_{\theta(J-C)}$	Thermal Resistance from Junction to Case	2.24	$^\circ\text{C/W}$	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} =1200V, V _{GS} =0V	
I _{GSS}	Gate Leakage Current		1	±100	nA	V _{DS} =0V, V _{GS} = -5~20V	
V _{th}	Gate Threshold Voltage		4.3		V	V _{GS} =V _{DS} , I _D =380μA	Fig. 9
			3.3		V	V _{GS} =V _{DS} , I _D =380μA @ T _C =175°C	
R _{on}	Static Drain-Source On-resistance		750	900	mΩ	V _{GS} =20V, I _D =1.5A @T _J =25°C	Fig. 4, 5, 6, 7
			1070		mΩ	V _{GS} =20V, I _D =1.5A @T _J =175°C	
C _{iss}	Input Capacitance		260		pF	V _{DS} =800V, V _{GS} =0V, f=1MHz, V _{AC} =25mV	Fig. 16
C _{OSS}	Output Capacitance		15		pF		
C _{rss}	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} =800V, I _D =1.5A, V _{GS} = -5 to 20V	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=1MHz	
E _{on}	Turn-on Switching Energy		24		μJ	V _{DS} =800V, I _D =1.5A, V _{GS} = -3.5V to 20V, R _{G(ext)} =0Ω, L=1550μH	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	$V_{GS}=-3.5\text{V}/+20\text{V}$, $I_{SD}=1.5\text{A}$, $V_R=800\text{V}$,	
Q_{rr}	Reverse Recovery Charge		26		nC	$di/dt=276\text{A}/\mu\text{s}$,	
I_{RRM}	Peak Reverse Recovery Current		1.3		A	$R_{G(ext)}=82\Omega$	

Typical Performance (curves)

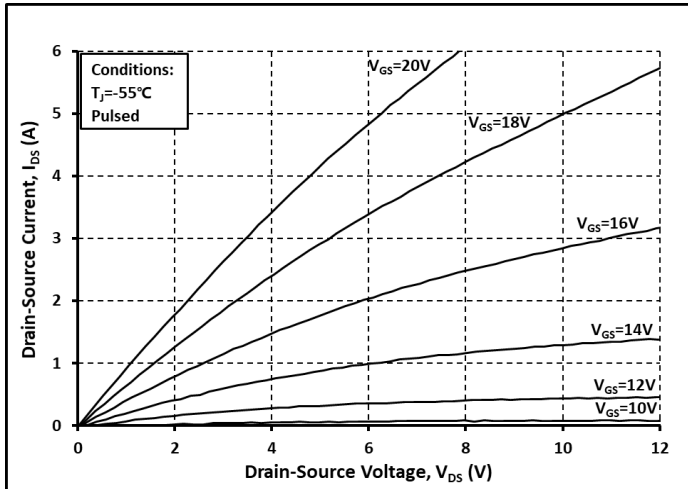


Fig. 1 Output Curve @ $T_j = -55^\circ\text{C}$

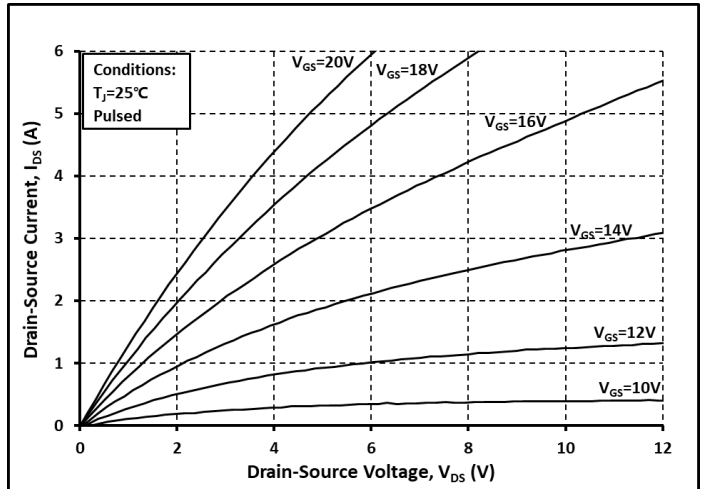


Fig. 2 Output Curve @ $T_j = 25^\circ\text{C}$

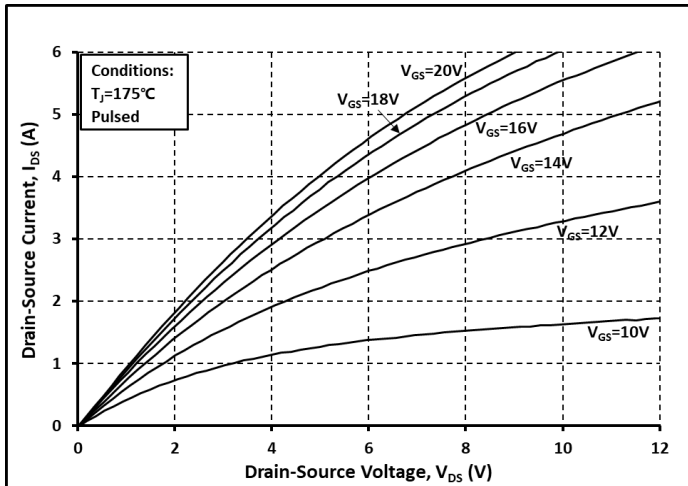


Fig. 3 Output Curve @ $T_j = 175^\circ\text{C}$

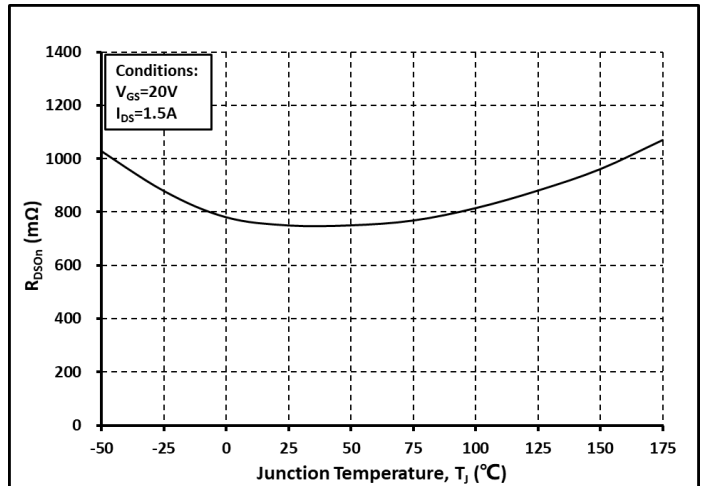


Fig. 4 R_{on} vs. Temperature

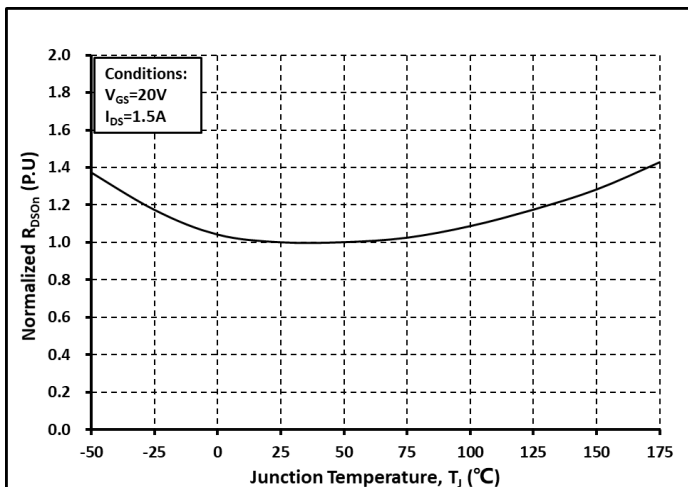


Fig. 5 Normalized R_{on} vs. Temperature

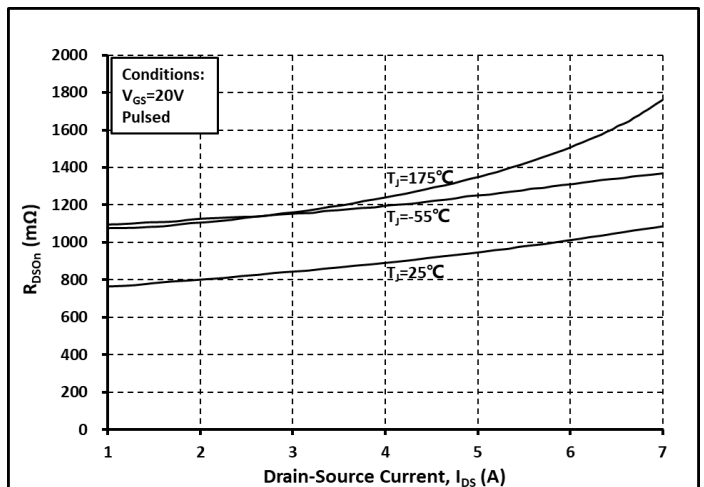


Fig. 6 R_{on} vs. I_{DS} @ Various Temperature

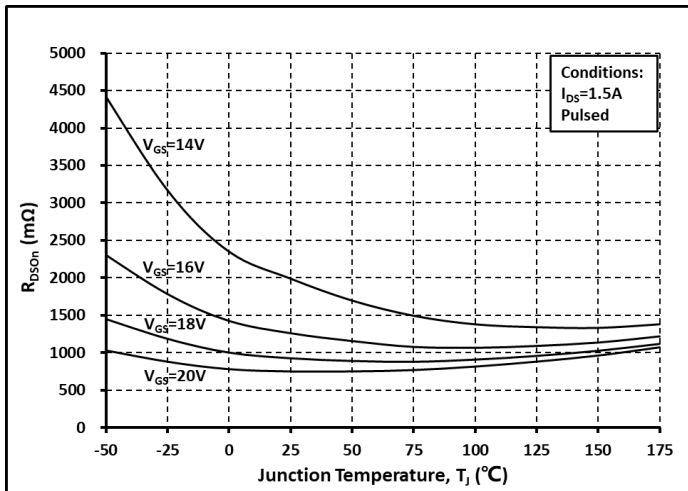


Fig. 7 Ron vs. Temperature @ Various V_{GS}

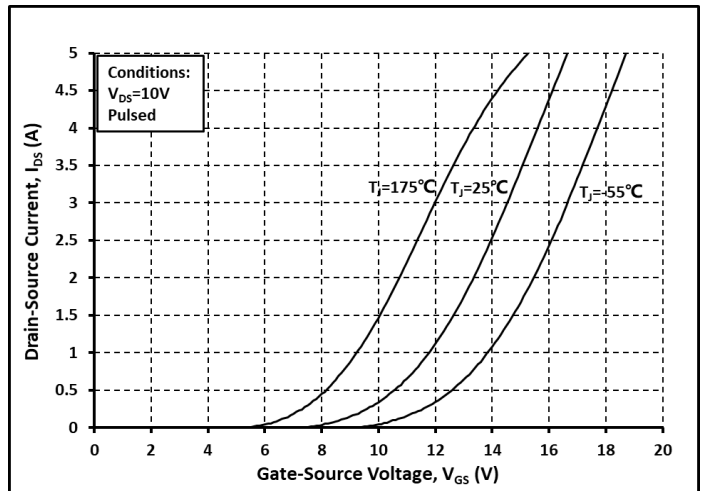


Fig. 8 Transfer Curves @ Various Temperature

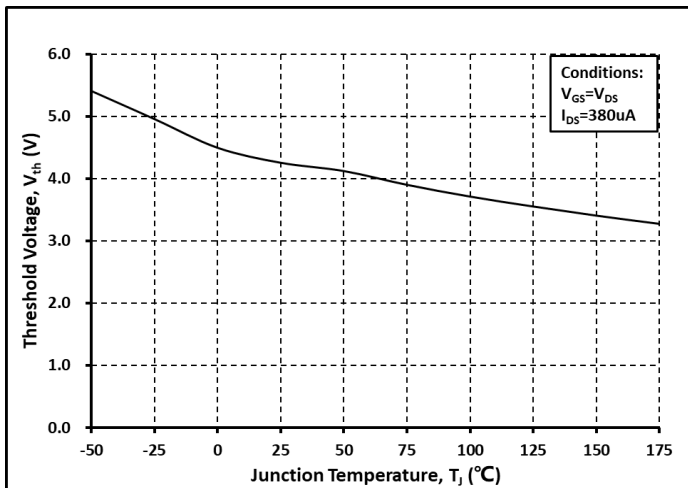


Fig. 9 Threshold Voltage vs. Temperature

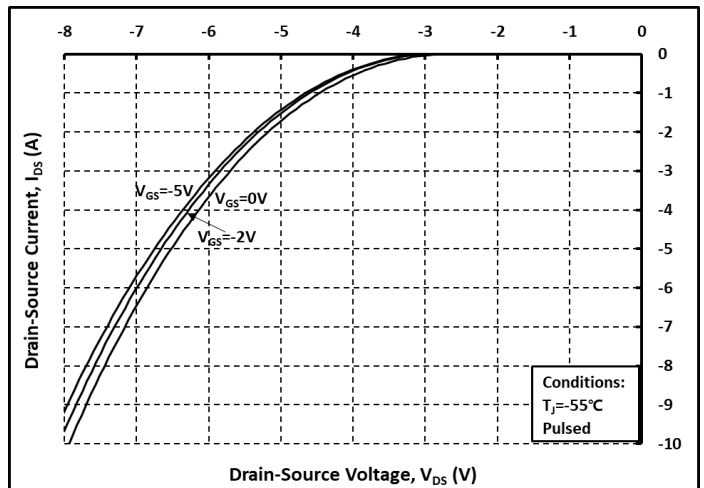


Fig. 10 Body Diode Curves @ $T_J = -55^\circ\text{C}$

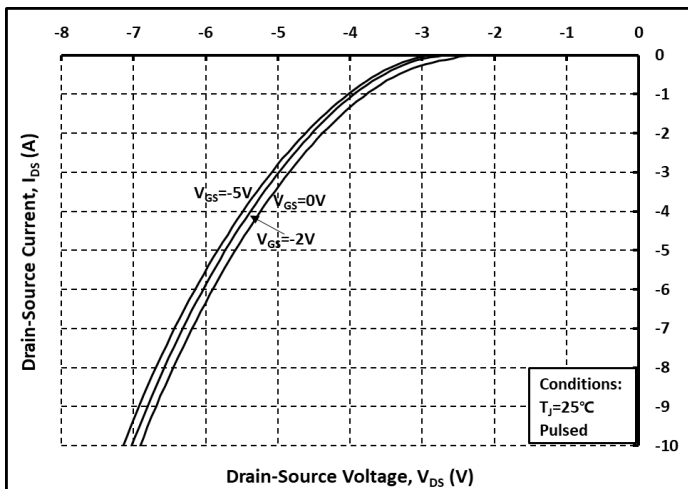


Fig. 11 Body Diode Curves @ $T_J = 25^\circ\text{C}$

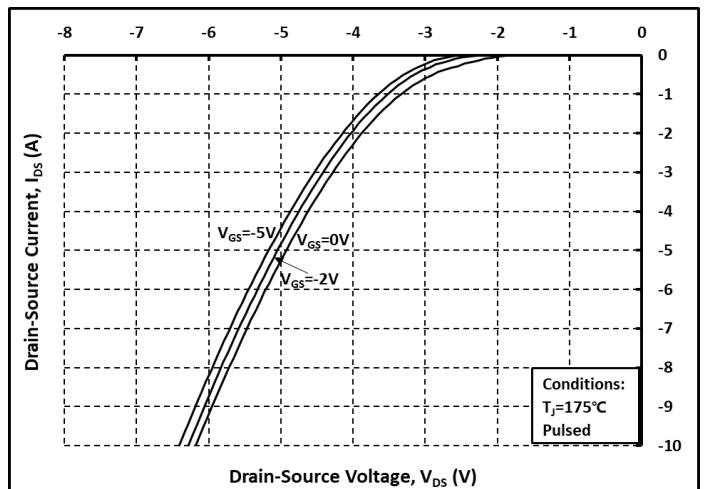


Fig. 12 Body Diode Curves @ $T_J = 175^\circ\text{C}$

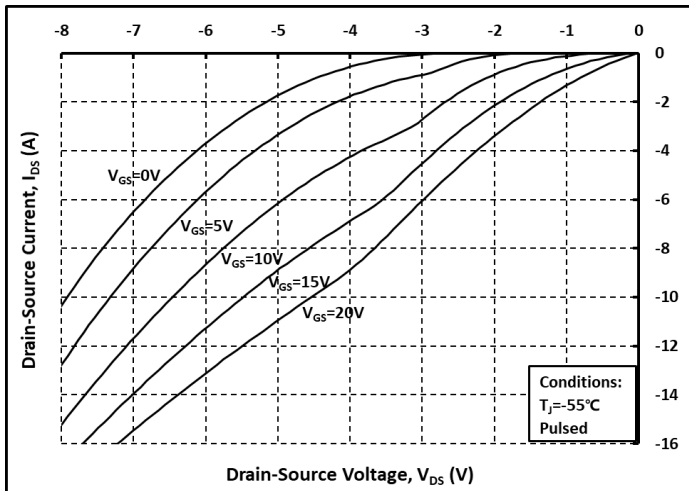


Fig. 13 3rd Quadrant Curves @ $T_j = -55^\circ\text{C}$

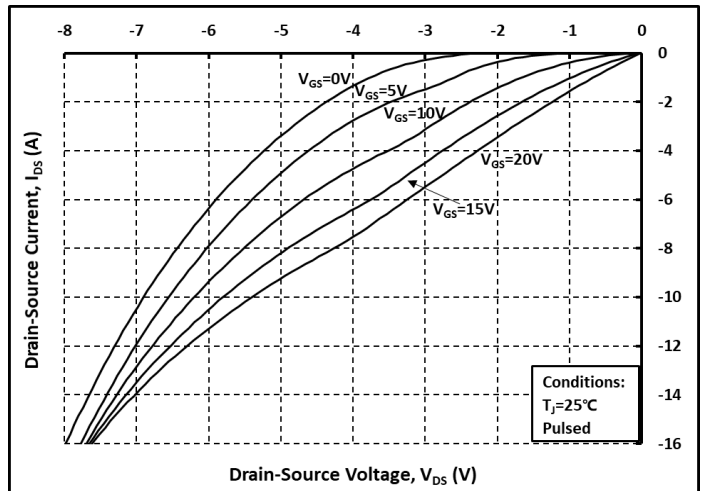


Fig. 14 3rd Quadrant Curves @ $T_j = 25^\circ\text{C}$

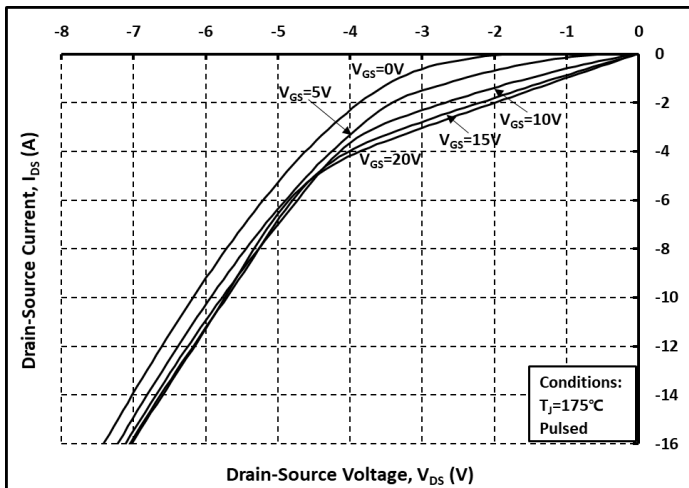


Fig. 15 3rd Quadrant Curves @ $T_j = 175^\circ\text{C}$

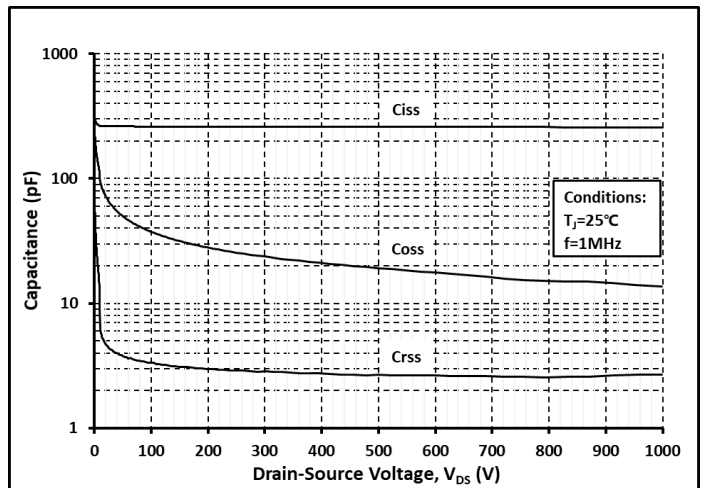


Fig. 16 Capacitance vs. V_{DS}

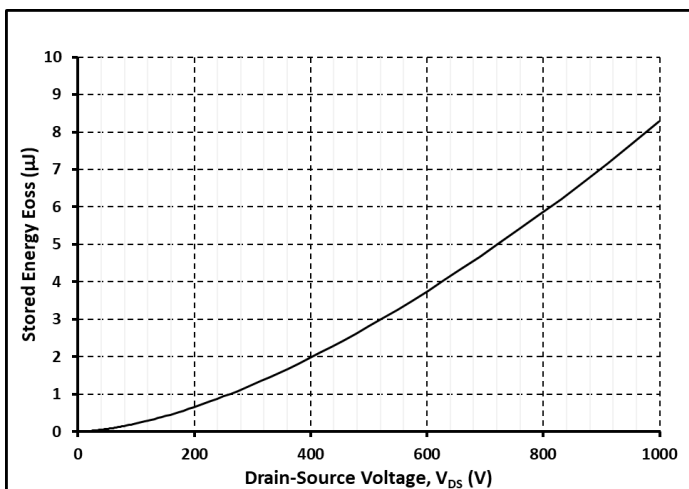


Fig. 17 Output Capacitor Stored Energy

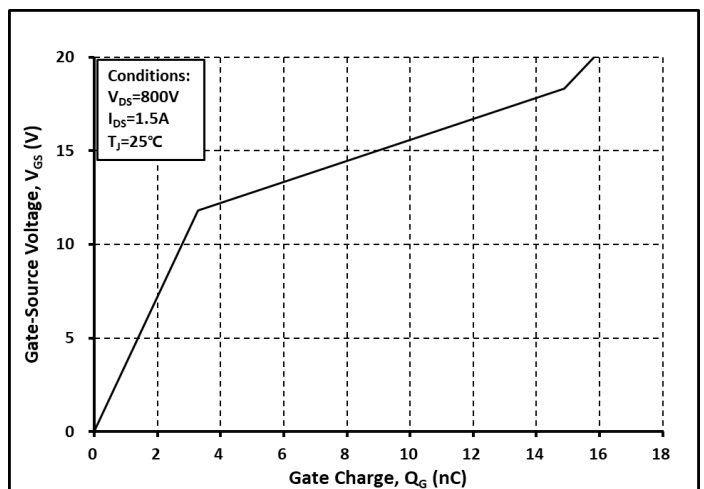


Fig. 18 Gate Charge Characteristics

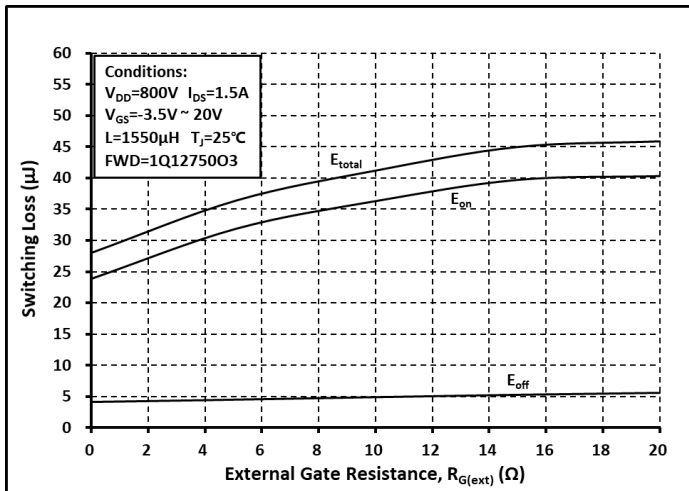


Fig. 19 Switching Energy vs. $R_{G(ext)}$

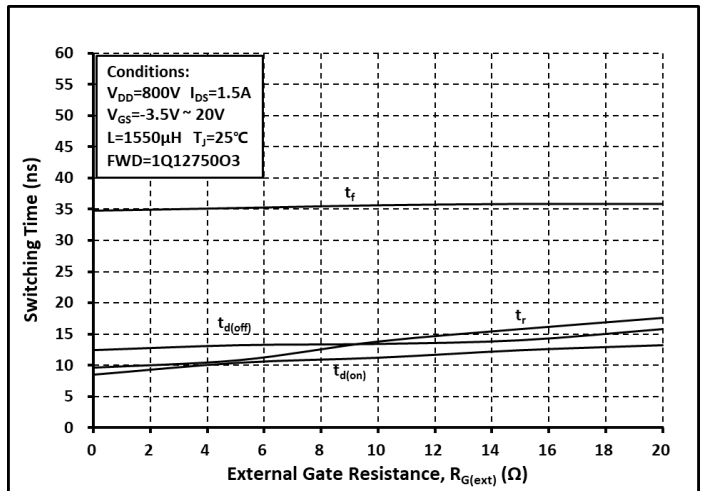


Fig. 20 Switching Time vs. $R_{G(ext)}$

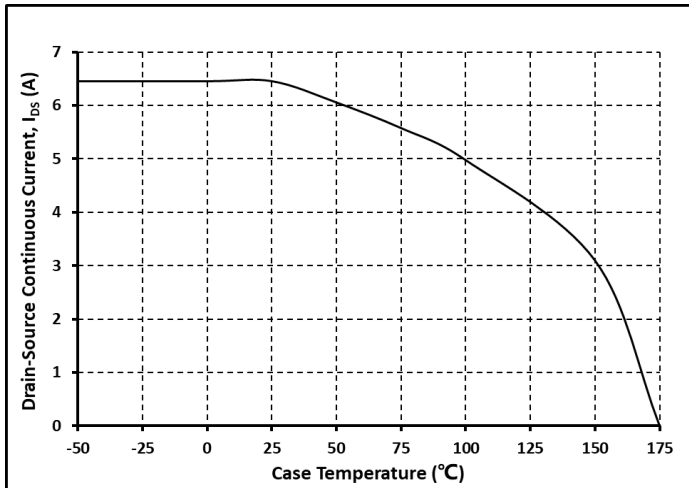


Fig. 21 Continuous I_{DS} vs. T_c

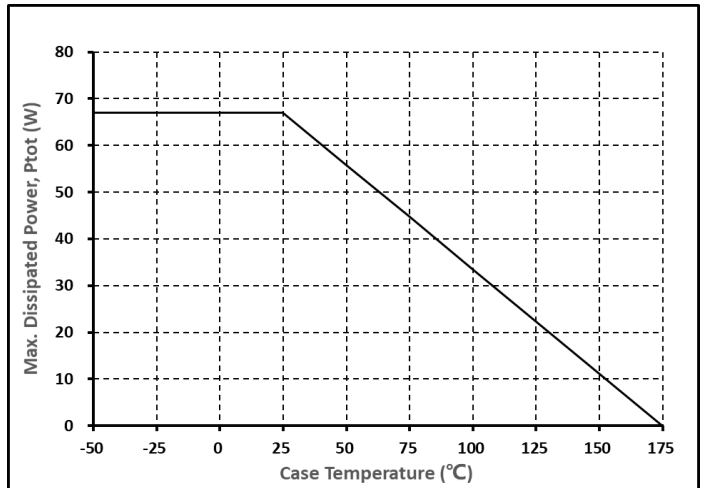


Fig. 22 Max. Power Dissipation Derating vs. T_c

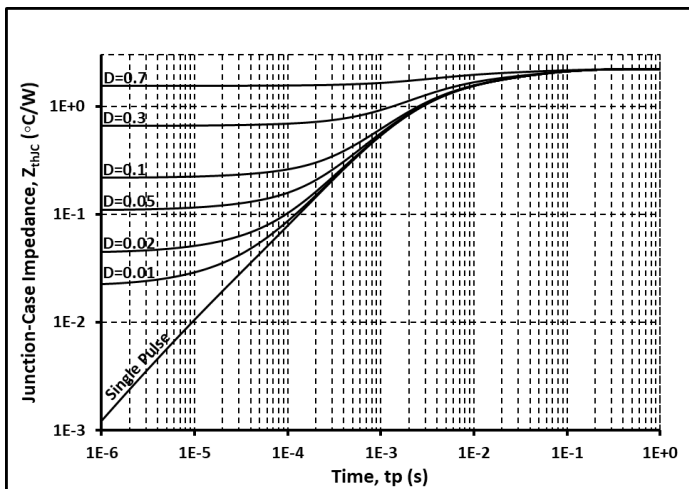


Fig. 23 Thermal Impedance

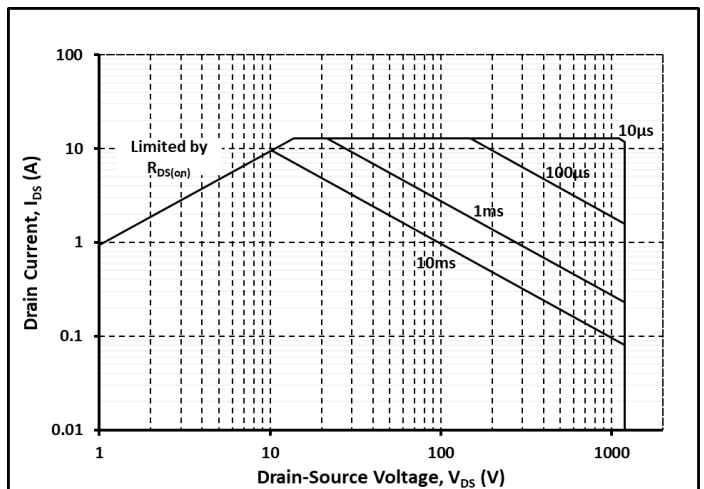
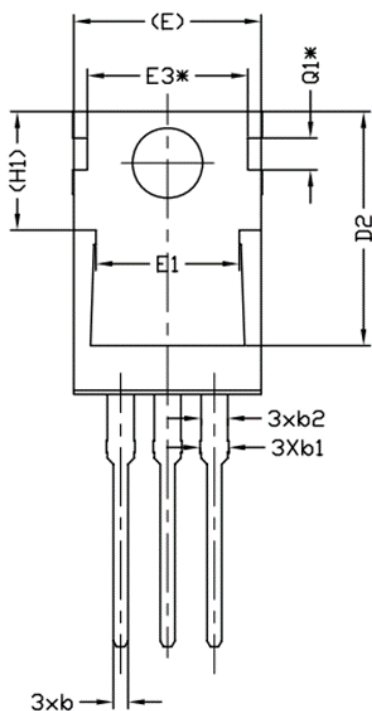
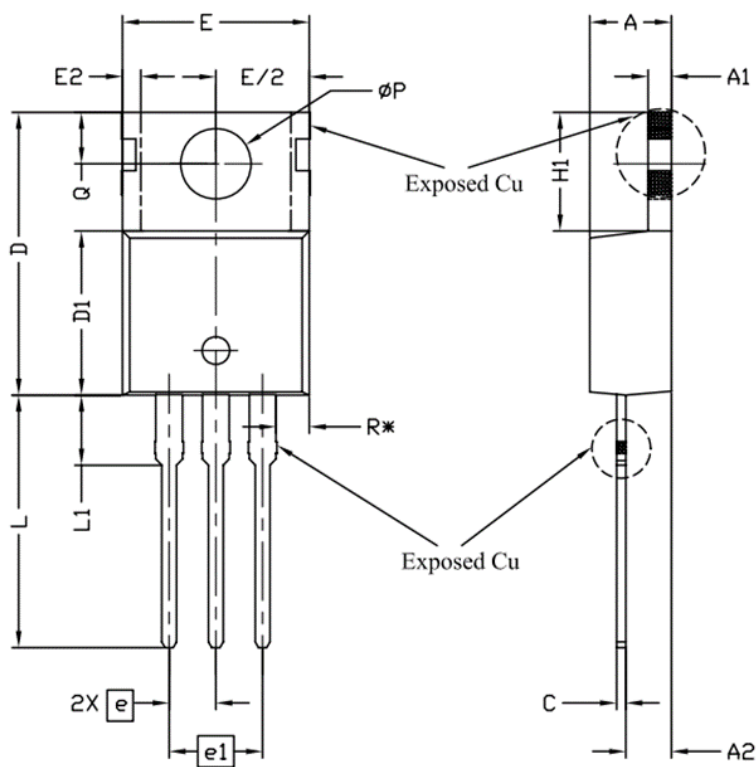


Fig. 24 Safe Operating Area

Package Dimensions



SYMBOL	DIMENSIONS			NOTES
	MIN.	NOM.	MAX.	
A	4.24	4.44	4.64	
A1	1.15	1.27	1.40	
A2	2.30	2.48	2.70	
b	0.70	0.80	0.90	
b1	1.20	1.55	1.75	
b2	1.20	1.45	1.70	
c	0.40	0.50	0.60	
D	14.70	15.37	16.00	4
D1	8.82	8.92	9.02	
D2	12.43	12.73	12.83	5
E	9.96	10.16	10.36	4,5
E1	6.86	7.77	8.89	5
E2	-	-	0.76	6
E3*	8.70REF.			
e	2.54BSC			
e1	5.08BSC			
H1	6.30	6.45	6.60	5,6
L	13.47	13.72	13.97	
L1	3.60	3.80	4.00	
ØP	3.75	3.84	3.93	
Q	2.60	2.80	3.00	
Q1*	1.73REF.			
R*	1.82REF.			

Note:

1. Package Reference: JEDEC TO220, Variation AB.
2. All Dimensions are in mm.
3. Slot Required, Notch may be Rounded.
4. Dimension D & E do not Include Mold Flash. Mold Flash shall not Exceed 0.127mm per Side. These Dimensions are Measured at the Outermost Extreme of the Plastic Body.
5. Thermal Pad Contour Optional within Dimensions E, H1, D2 & E1.
6. Dimension E2 & H1 Define a Zone where Stamping and Singulation Irregularities are Allowed.
7. "*" is Reference.

Notes

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