

IV2Q171R0T3 – 1700V 1000mΩ SiC MOSFET

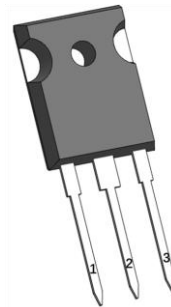
Features

- 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

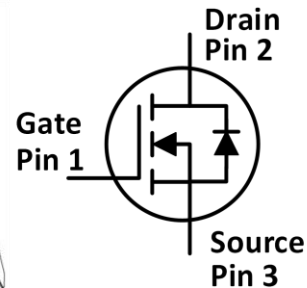
Applications

- Auxiliary power supplies
- Solar inverters
- Switch mode power supplies
- Smart meters

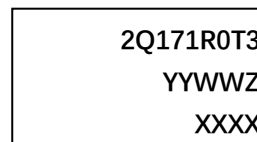
Outline:



TO247-3



Marking Diagram:



2Q171R0T3 = 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	1700	V	V _{GS} =0V, I _D =10μA	
V _{GSmax} (DC)	Maximum DC voltage	-5 to 20	V	Static (DC)	
V _{GSmax} (Spike)	Maximum spike voltage	-8 to 22	V	<1% duty cycle, and pulse width<200ns	
V _{GSon}	Recommended turn-on voltage	15 to 18	V		
V _{GSoff}	Recommended turn-off voltage	-3.5 to -2	V		
I _D	Drain current (continuous)	5.8	A	V _{GS} =18V, T _c =25°C	Fig. 21
		4.4	A	V _{GS} =18V, T _c =100°C	
I _{DM}	Drain current (pulsed)	14	A	Pulse width limited by SOA	Fig. 24
P _{TOT}	Total power dissipation	58	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	2.6	°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}	Zero gate voltage drain current		1	10	μA	$V_{DS}=1700\text{V}, V_{GS}=0\text{V}$	
I_{GSS}	Gate leakage current			± 100	nA	$V_{DS}=0\text{V}, V_{GS}=-5\sim 20\text{V}$	
V_{TH}	Gate threshold voltage	1.8	3.0	5.0	V	$V_{GS}=V_{DS}, I_D=380\mu\text{A}$	Fig. 8, 9
			2.0		V	$V_{GS}=V_{DS}, I_D=380\mu\text{A}$ @ $T_J=175^\circ\text{C}$	
R_{ON}	Static drain-source on-resistance	520	700	850	m Ω	$V_{GS}=18\text{V}, I_D=1\text{A}$ @ $T_J=25^\circ\text{C}$	Fig. 4, 5, 6, 7
		950	1280	1540	m Ω	@ $T_J=175^\circ\text{C}$	
		700	900	1100	m Ω	$V_{GS}=15\text{V}, I_D=1\text{A}$ @ $T_J=25^\circ\text{C}$	
		1050	1320	1600	m Ω	@ $T_J=175^\circ\text{C}$	
C_{ISS}	Input capacitance		285		pF	$V_{DS}=1000\text{V}, V_{GS}=0\text{V},$ $f=1\text{MHz}, V_{AC}=25\text{mV}$	Fig. 16
C_{OSS}	Output capacitance		15.3		pF		
C_{RSS}	Reverse transfer capacitance		2.2		pF		
E_{OSS}	C_{OSS} stored energy		11		μJ		Fig. 17
Q_g	Total gate charge		16.5		nC	$V_{DS}=1000\text{V}, I_D=1\text{A},$ $V_{GS}=-5\text{ to }18\text{V}$	Fig. 18
Q_{GS}	Gate-source charge		2.7		nC		
Q_{GD}	Gate-drain charge		12.5		nC		
R_g	Gate input resistance		18		Ω	$f=1\text{MHz}$	
E_{ON}	Turn-on switching energy		63.3		μJ	$V_{DS}=1000\text{V}, I_D=2\text{A},$ $V_{GS}=-3.5\text{V to }18\text{V},$ $R_{G(ext)}=22\Omega,$ $L=300\mu\text{H}$	
E_{OFF}	Turn-off switching energy		16.8		μJ		
$t_{d(on)}$	Turn-on delay time		10.5		ns		
t_r	Rise time		16.7				
$t_{d(off)}$	Turn-off delay time		17.2				
t_f	Fall time		46				

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		3.7		V	$I_{SD}=1\text{A}, V_{GS}=0\text{V}$	Fig. 10, 11, 12
			3.5		V	$I_{SD}=1\text{A}, V_{GS}=0\text{V},$ $T_J=175^\circ\text{C}$	

Typical Performance (curves)

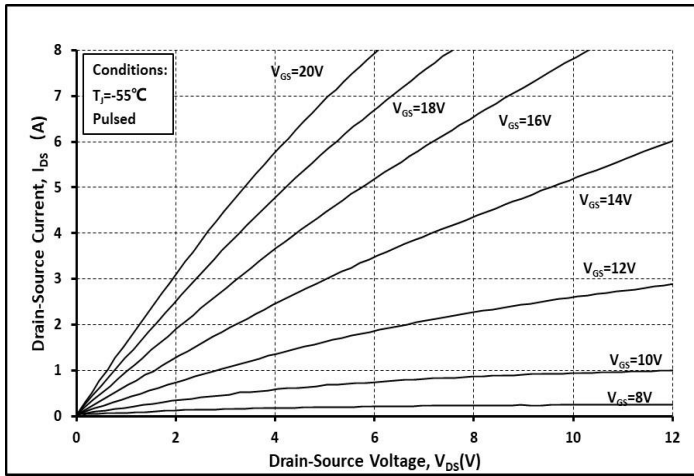


Fig. 1 Output Curve @ $T_j = -55^\circ\text{C}$

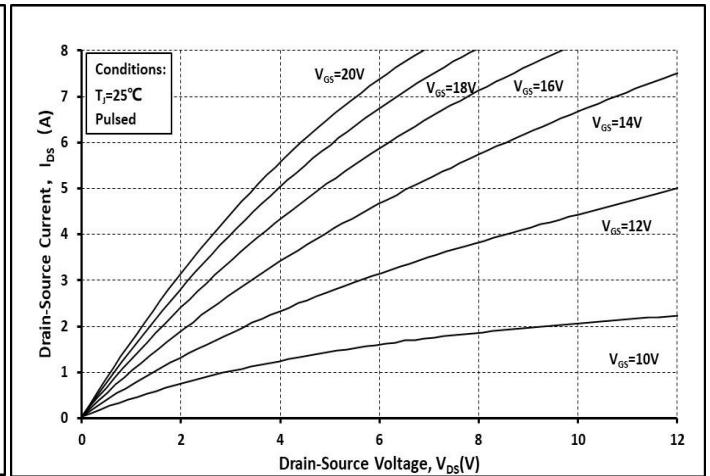


Fig. 2 Output Curve @ $T_j = 25^\circ\text{C}$

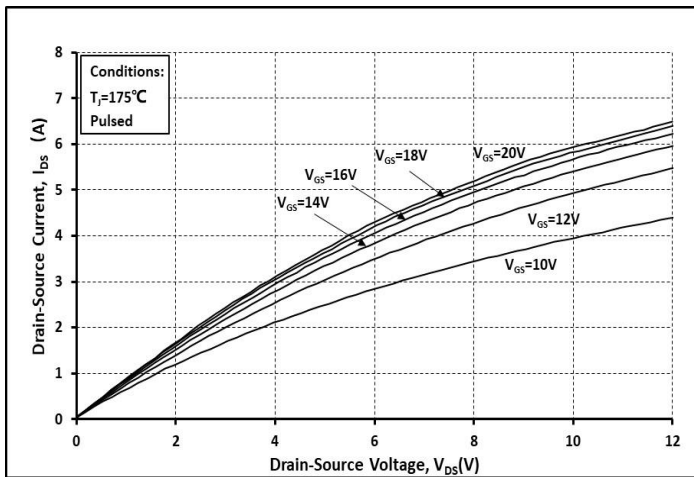


Fig. 3 Output Curve @ $T_j = 175^\circ\text{C}$

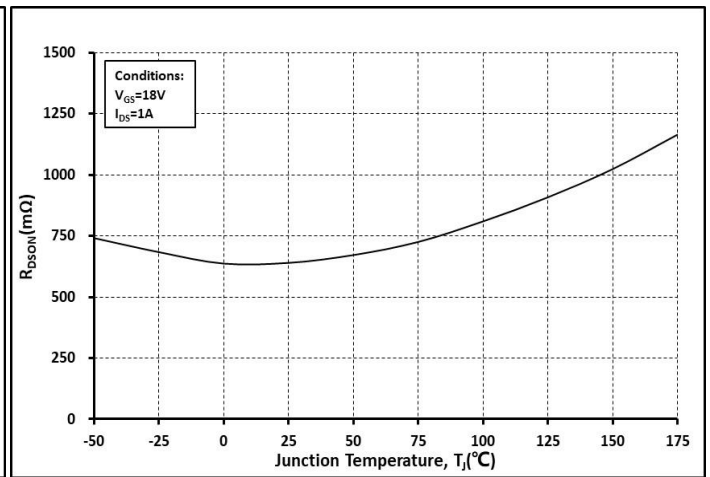


Fig. 4 $R_{DS(on)}$ vs. Temperature

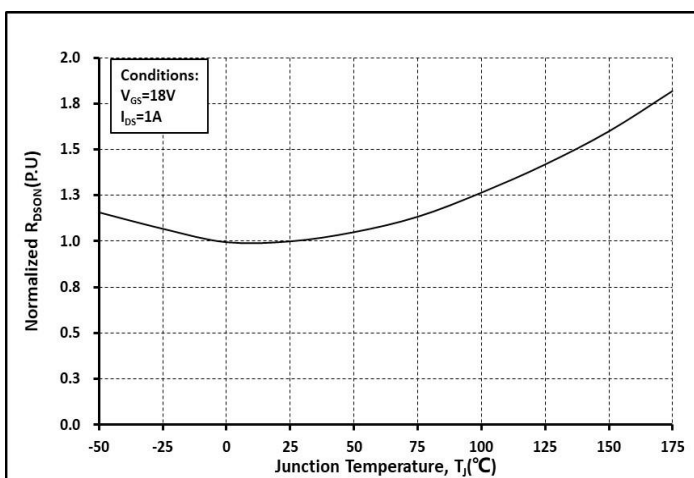


Fig. 5 Normalized $R_{DS(on)}$ vs. Temperature

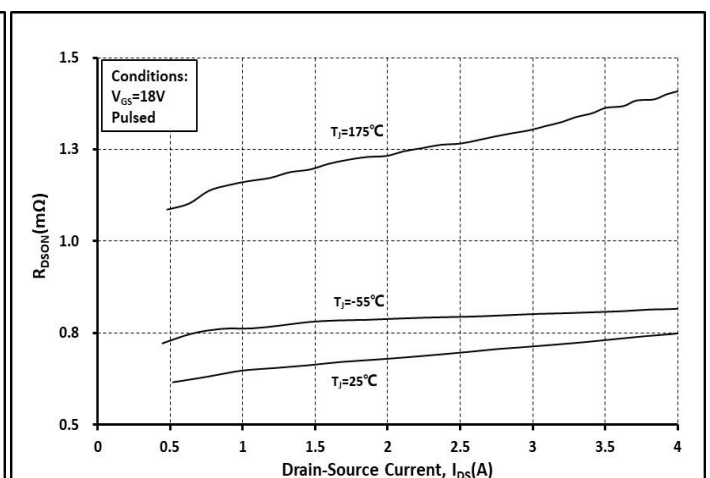


Fig. 6 $R_{DS(on)}$ vs. I_{DS} @ Various Temperature

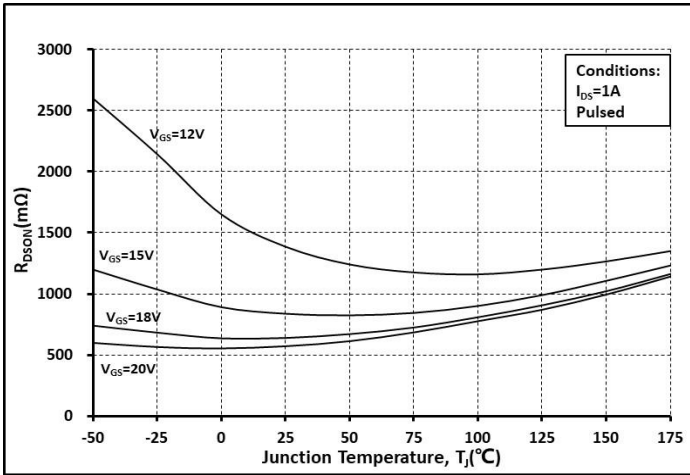


Fig. 7 Ron vs. Temperature @ Various V_{GS}

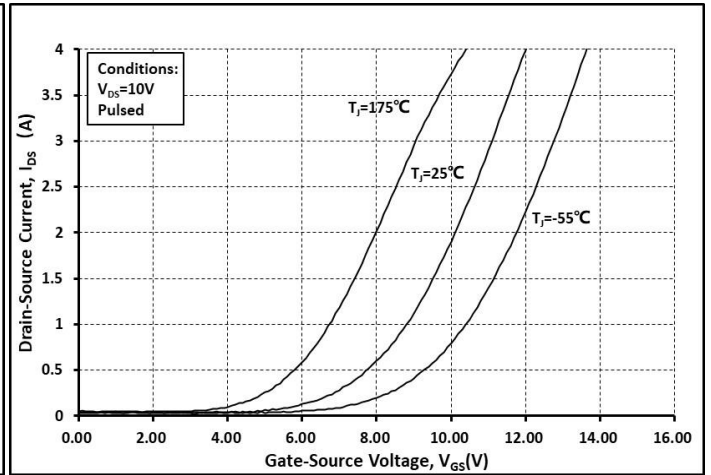


Fig. 8 Transfer Curves @ Various Temperature

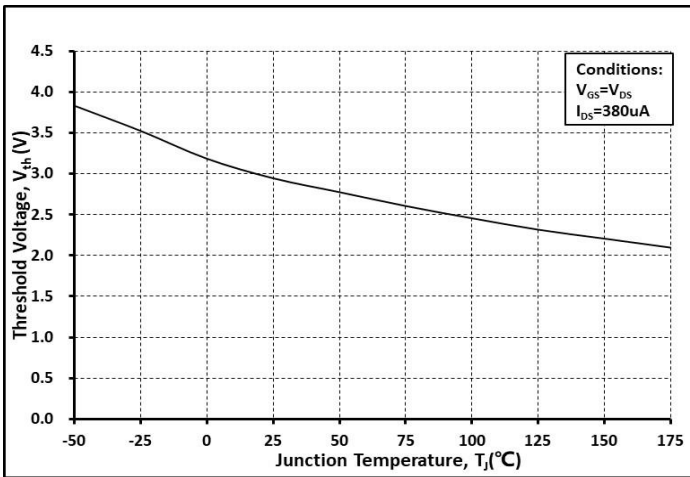


Fig. 9 Threshold Voltage vs. Temperature

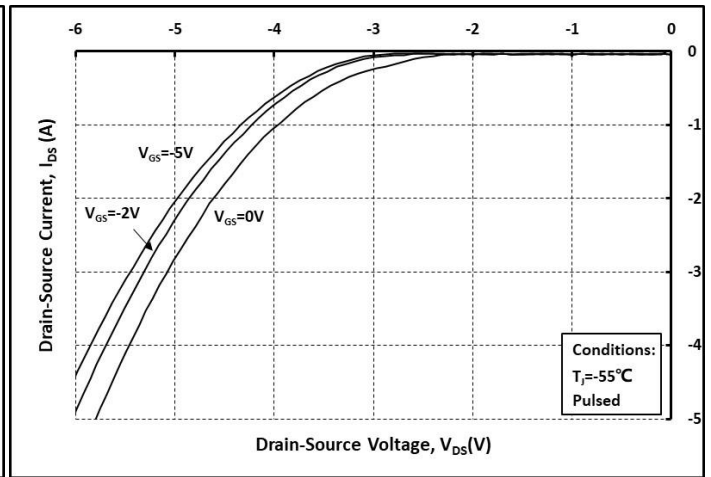


Fig. 10 Body Diode Curves @ $T_j=-55^{\circ}\text{C}$

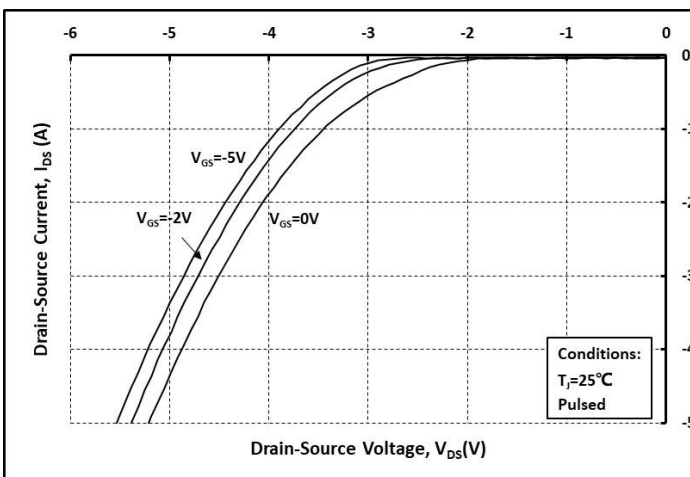


Fig. 11 Body Diode Curves @ $T_j=25^{\circ}\text{C}$

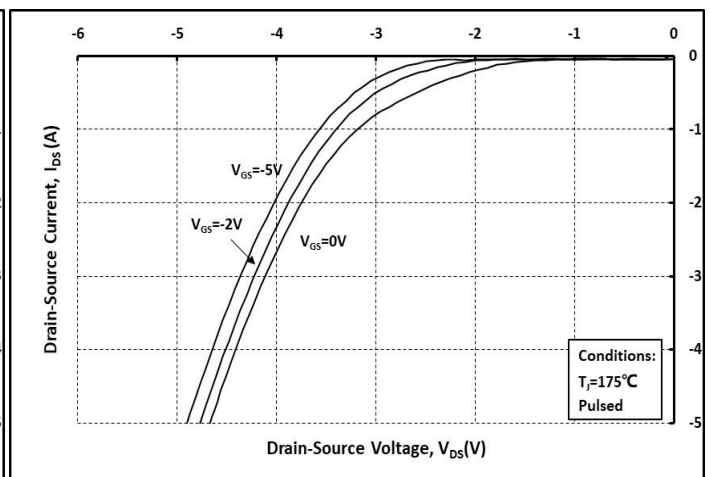


Fig. 12 Body Diode Curves @ $T_j=175^{\circ}\text{C}$

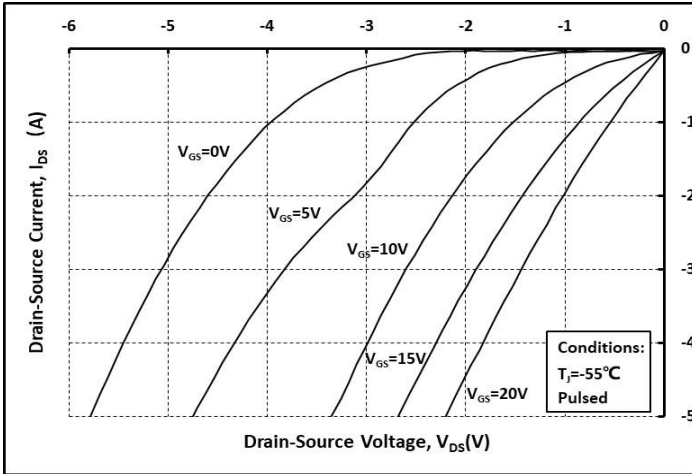


Fig. 13 3rd Quadrant Curves @ $T_j = -55^\circ\text{C}$

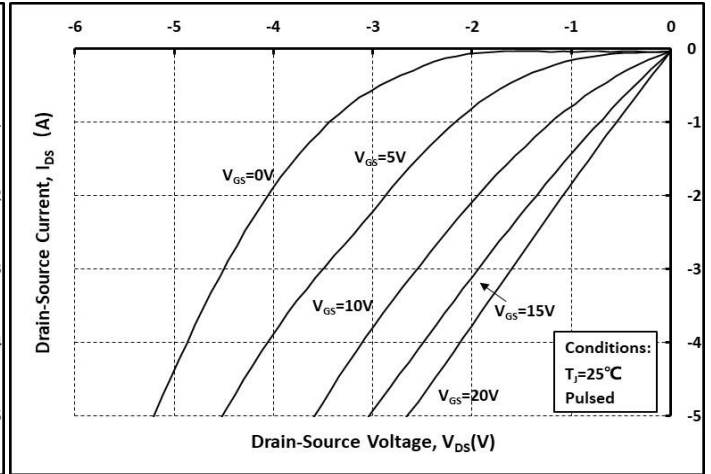


Fig. 14 3rd Quadrant Curves @ $T_j = 25^\circ\text{C}$

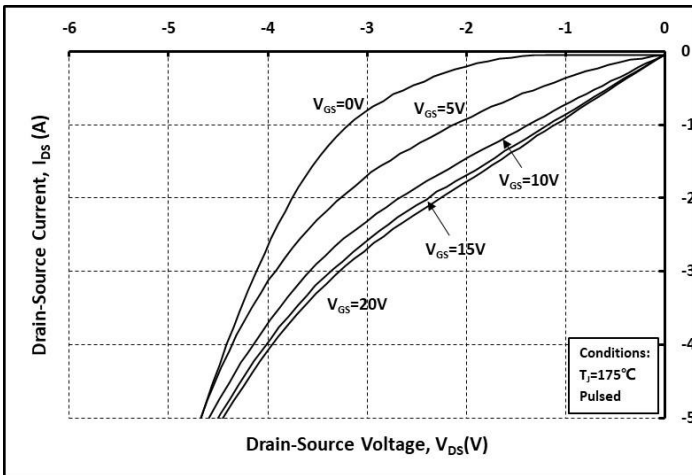


Fig. 15 3rd Quadrant Curves @ $T_j = 175^\circ\text{C}$

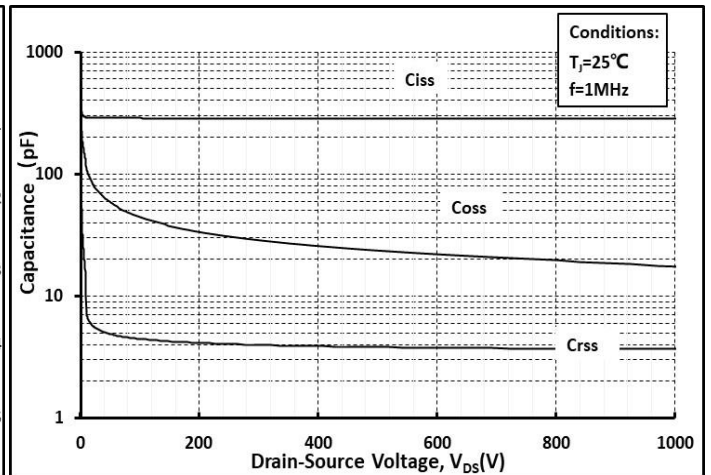


Fig. 16 Capacitance vs. V_{DS}

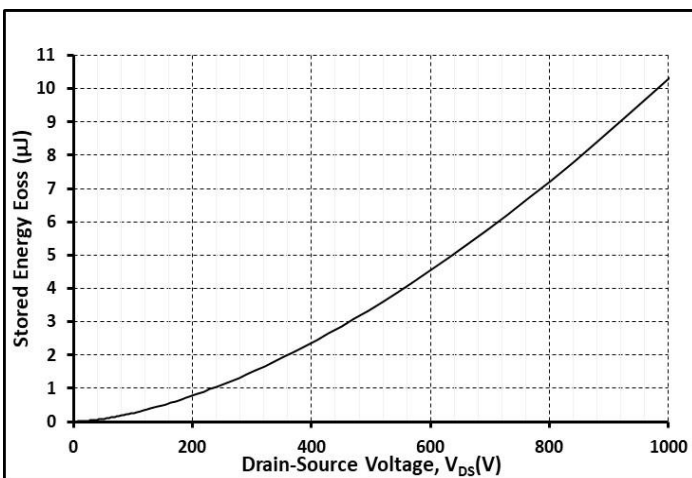


Fig. 17 Output Capacitor Stored Energy

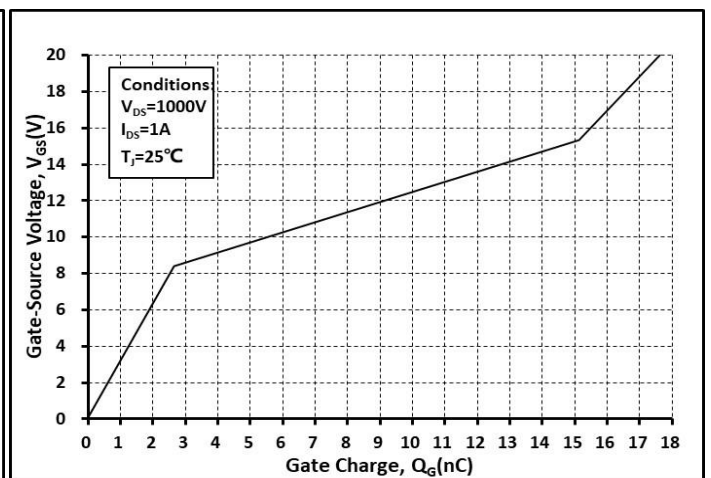


Fig. 18 Gate Charge Characteristics

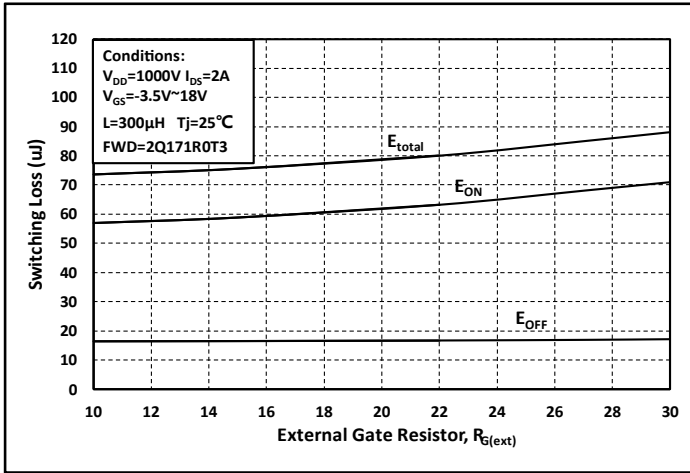


Fig. 19 Switching Energy vs. $R_{G(ext)}$

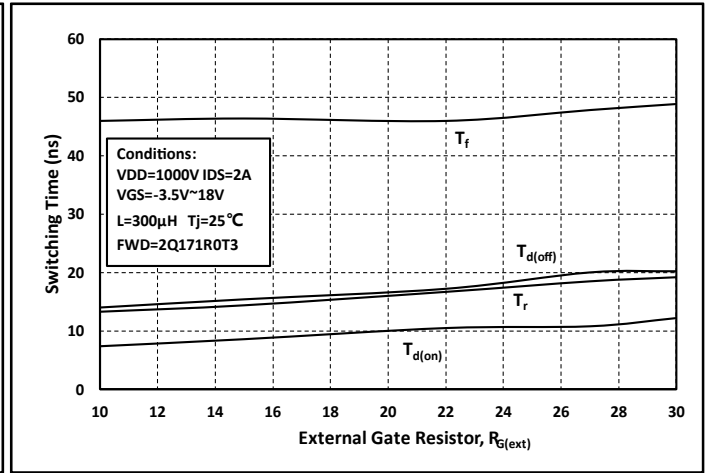


Fig. 20 Switching Times vs. $R_{G(ext)}$

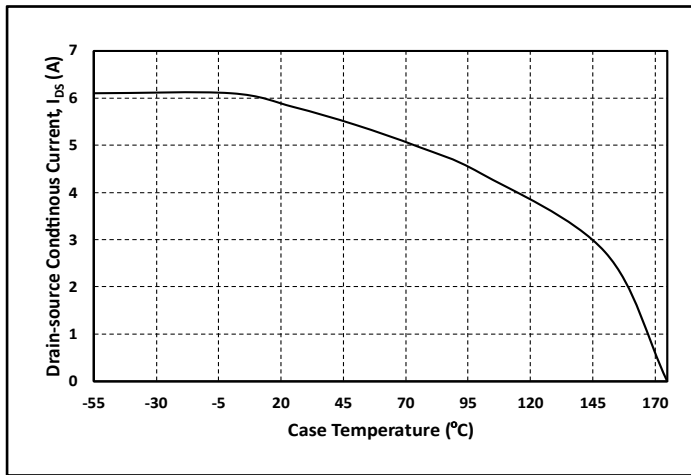


Fig. 21 Continuous Drain Current vs. Case Temperature

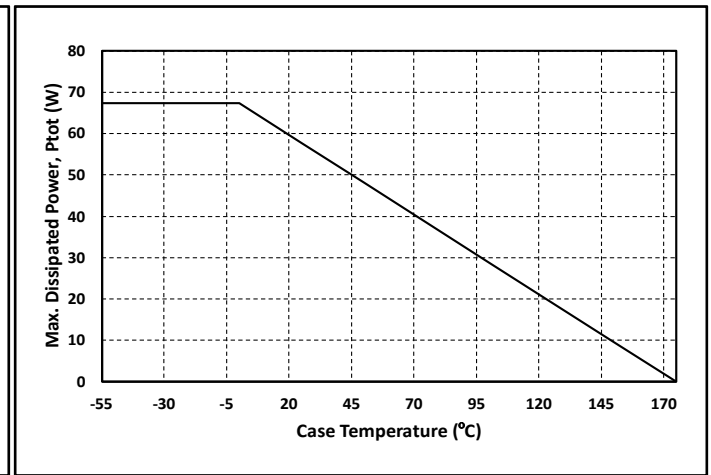


Fig. 22 Max. Power Dissipation Derating vs. Case Temperature

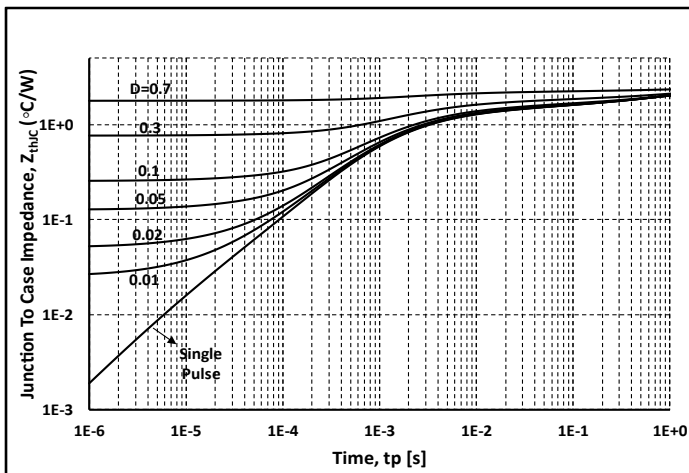


Fig. 23 Thermal Impedance

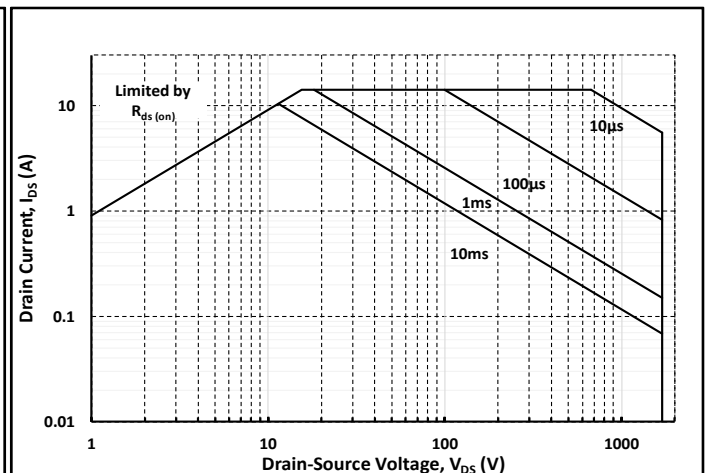
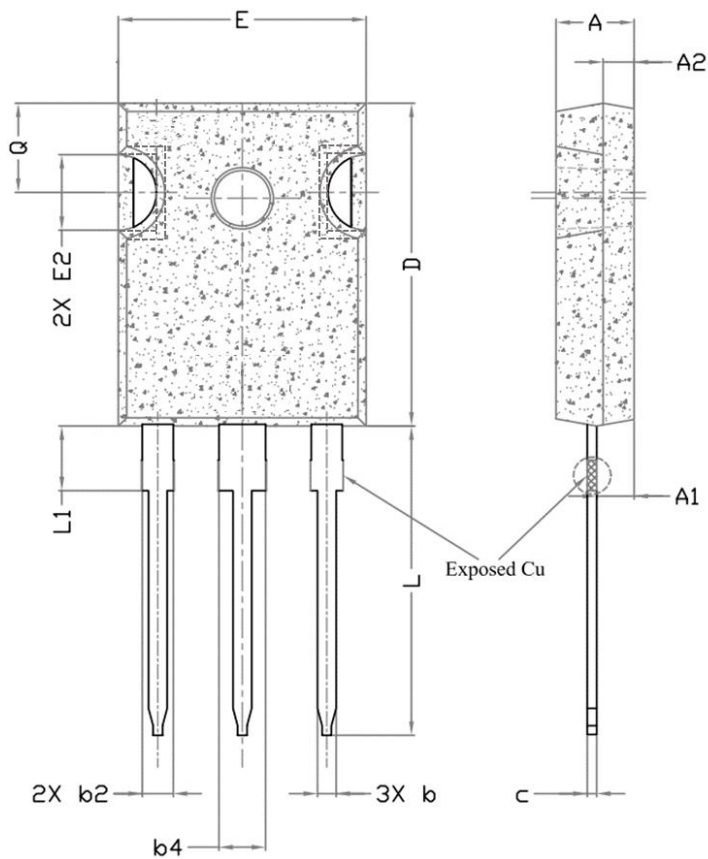
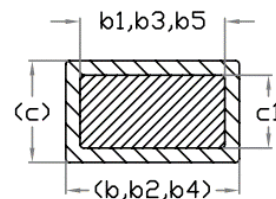
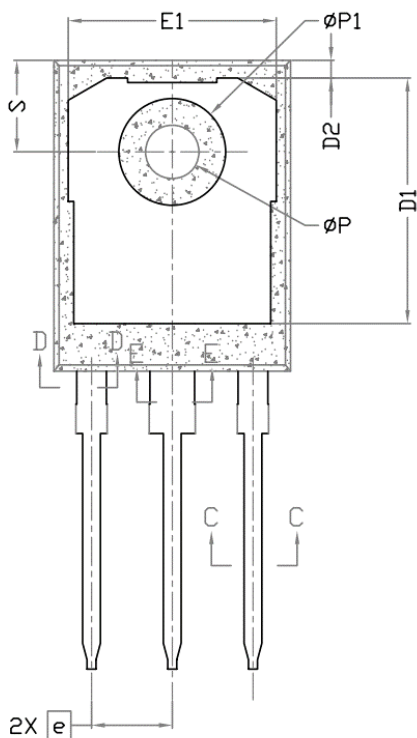


Fig. 24 Safe Operating Area

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
ϕP	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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