

IV1Q171R0T3G – 1700V 1000mΩ SiC MOSFET

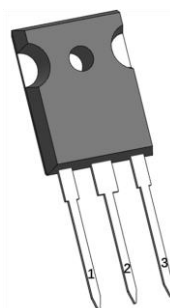
Features

- 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

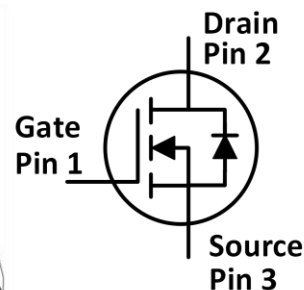
Applications

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

Outline:



TO247-3



Marking Diagram:

1Q171R0T3G
YYWWZ
XXXX

1Q171R0T3G= 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)	12	A	V _{GS} =18V, T _c =25°C	Fig. 21
		7.5	A	V _{GS} =18V, T _c =100°C	
I _{DM}	Drain current (pulsed)	30	A	Pulse width limited by SOA	Fig. 24
P _{TOT}	Total power dissipation	85	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	1.75	°C/W	Fig. 23

Electrical Characteristics (T_c=25°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} =1700V, V _{GS} =0V	
I _{GSS}	Gate leakage current			±100	nA	V _{DS} =0V, V _{GS} = -5~20V	
V _{TH}	Gate threshold voltage	1.8	2.9	5	V	V _{GS} =V _{DS} , I _D =380uA	Fig. 8, 9
			2.0		V	V _{GS} =V _{DS} , I _D =380uA @ T _J =175°C	
R _{ON}	Static drain-source on-resistance	520	650	800	mΩ	V _{GS} =18V, I _D =1A @T _J =25°C	Fig. 4, 5, 6, 7
		950	1180	1450		@T _J =175°C	
		700	850	1050	mΩ	V _{GS} =15V, I _D =1A @T _J =25°C @T _J =175°C	
C _{iss}	Input capacitance		285		pF	V _{DS} =1000V, V _{GS} =0V, f=1MHz, V _{AC} =25mV	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} =1000V, I _D =1A, V _{GS} = -5 to 18V	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=1MHz	
E _{ON}	Turn-on switching energy		65.3		μJ	V _{DS} =1000V, I _D =2A, V _{GS} = -2 to 18V, R _{G(ext)} =22Ω, L=300μH	
E _{OFF}	Turn-off switching energy		15.5		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°C unless otherwise specified)

Symbol	Parameter	Value			Unit	Test Conditions	Note
		Min.	Typ.	Max.			
V _{SD}	Diode forward voltage		3.5		V	I _{SD} =1A, V _{GS} =0V	Fig. 10, 11, 12
			3.2		V	I _{SD} =1A, V _{GS} =0V, T _J =175°C	

Typical Performance (curves)

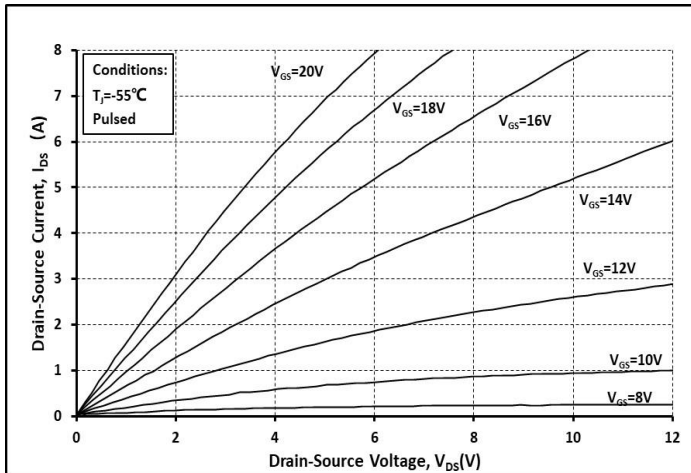


Fig. 1 Output Curve @ $T_j = -55^\circ\text{C}$

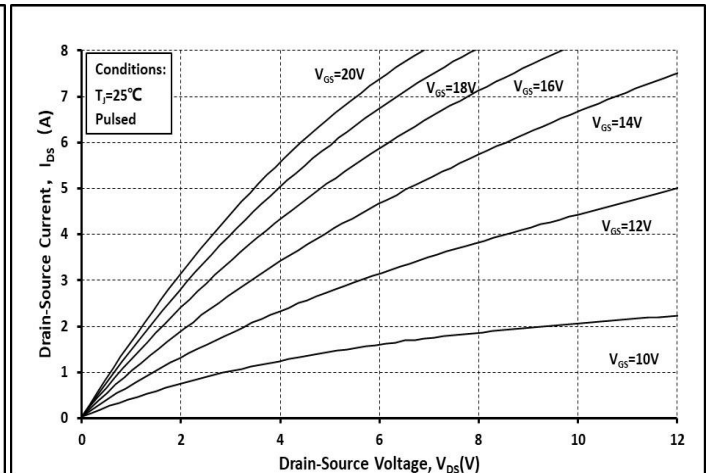


Fig. 2 Output Curve @ $T_j = 25^\circ\text{C}$

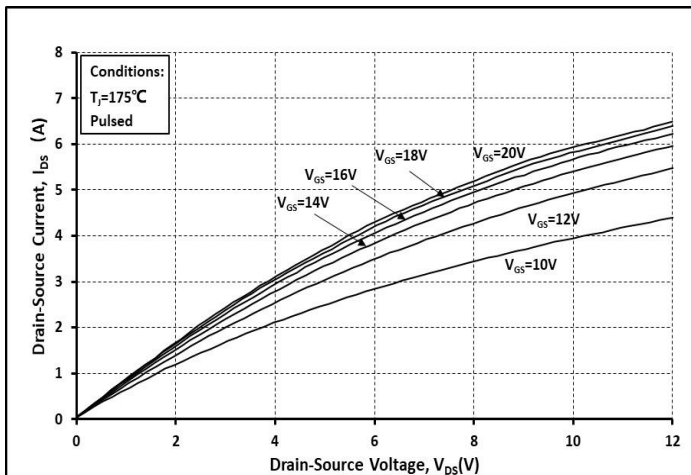


Fig. 3 Output Curve @ $T_j = 175^\circ\text{C}$

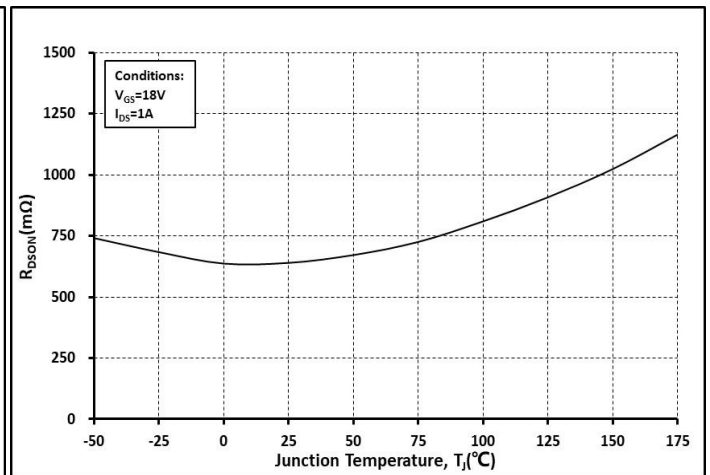


Fig. 4 R_{on} vs. Temperature

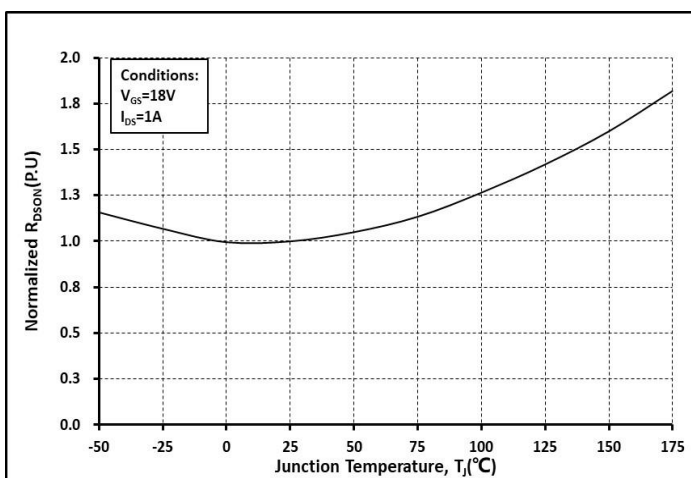


Fig. 5 Normalized R_{on} vs. Temperature

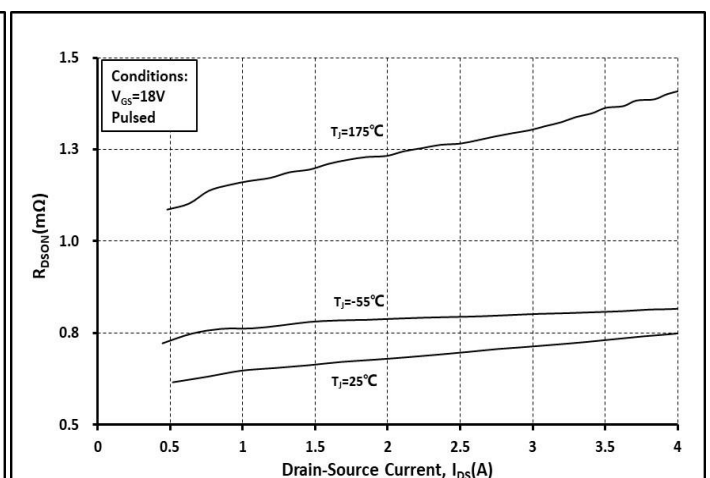


Fig. 6 R_{on} vs. I_{DS} @ Various Temperature

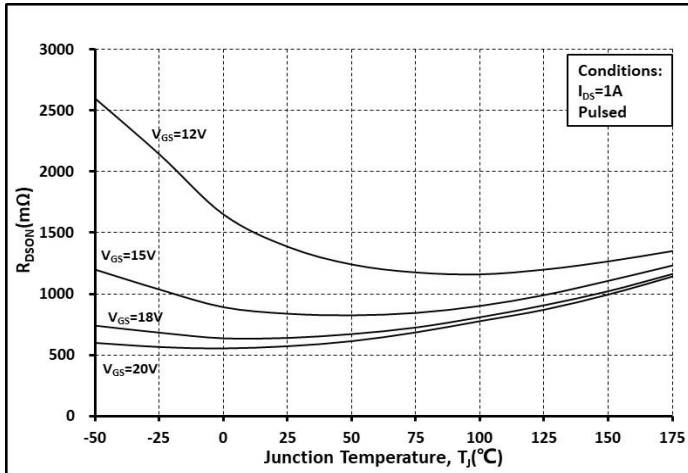


Fig. 7 Ron vs. Temperature @ Various V_{GS}

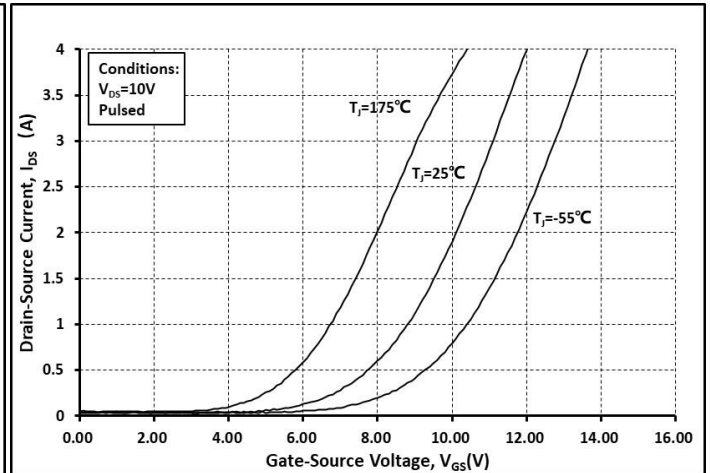


Fig. 8 Transfer Curves @ Various Temperature

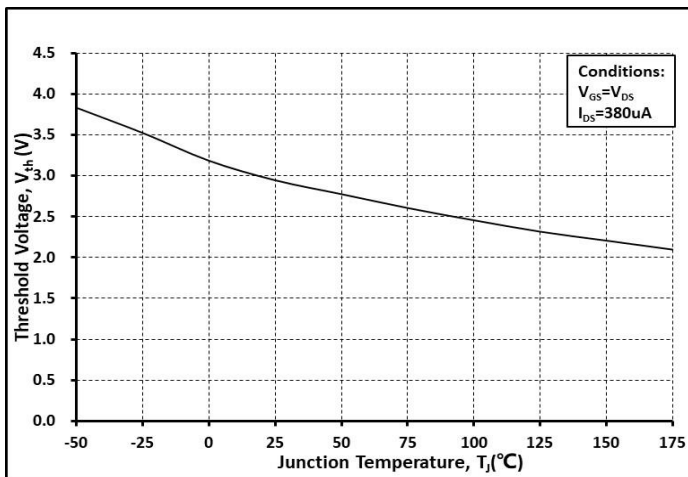


Fig. 9 Threshold Voltage vs. Temperature

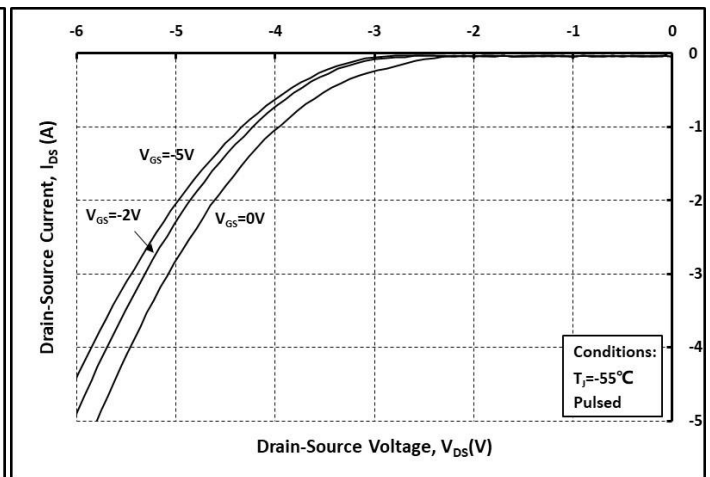


Fig. 10 Body Diode Curves @ $T_J = -55^{\circ}\text{C}$

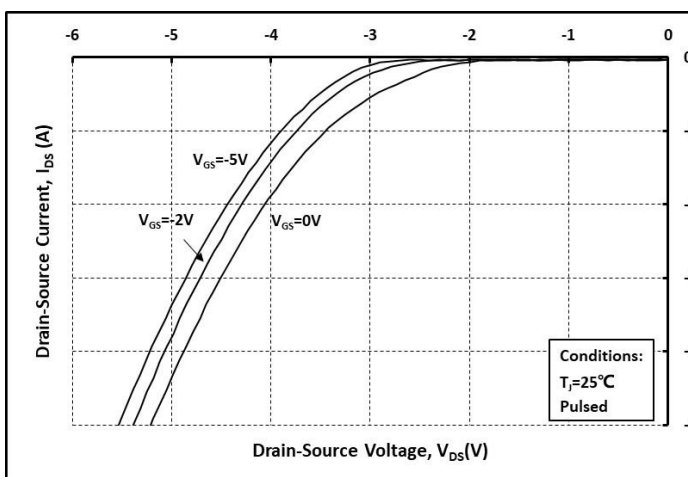


Fig. 11 Body Diode Curves @ $T_J = 25^{\circ}\text{C}$

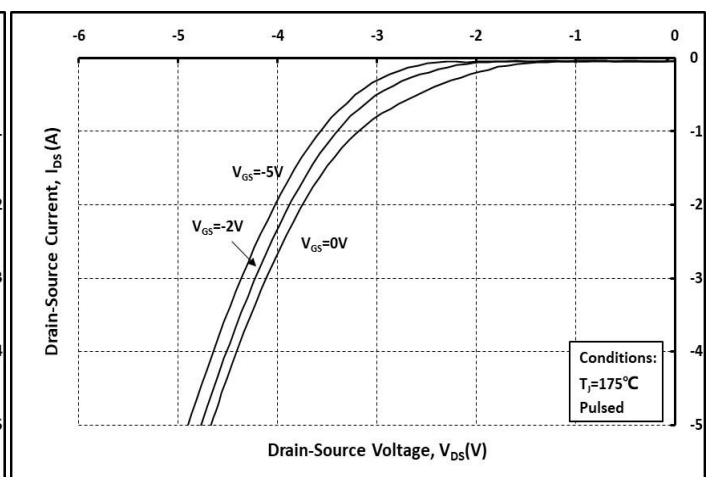


Fig. 12 Body Diode Curves @ $T_J = 175^{\circ}\text{C}$

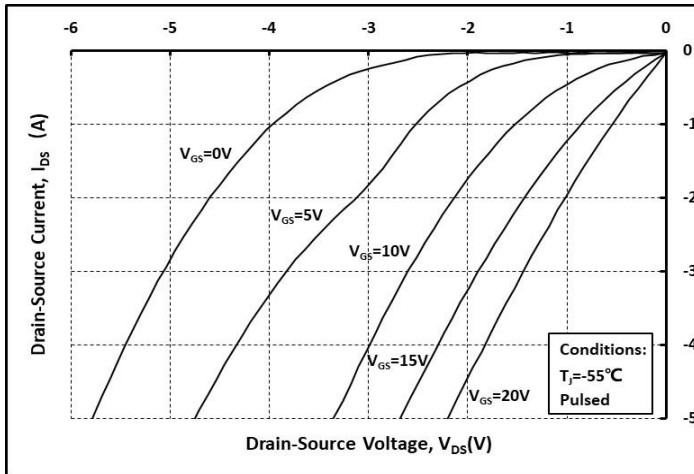


Fig. 13 3rd Quadrant Curves @ $T_j = -55^\circ\text{C}$

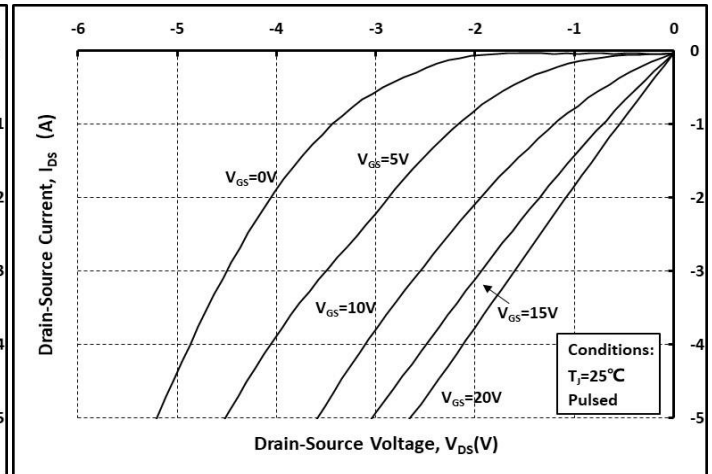


Fig. 14 3rd Quadrant Curves @ $T_j = 25^\circ\text{C}$

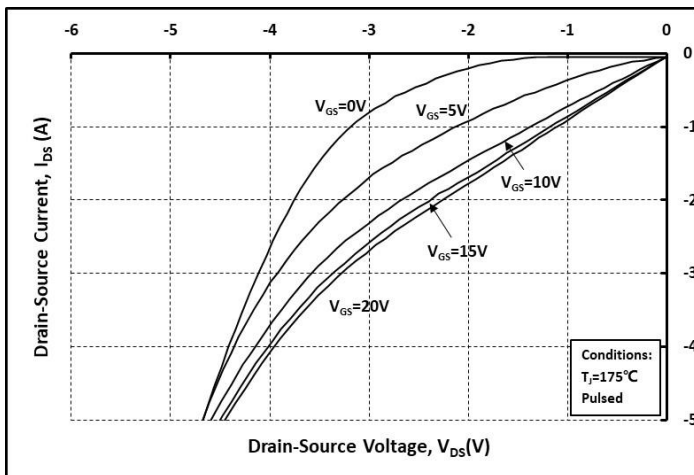


Fig. 15 3rd Quadrant Curves @ $T_j = 175^\circ\text{C}$

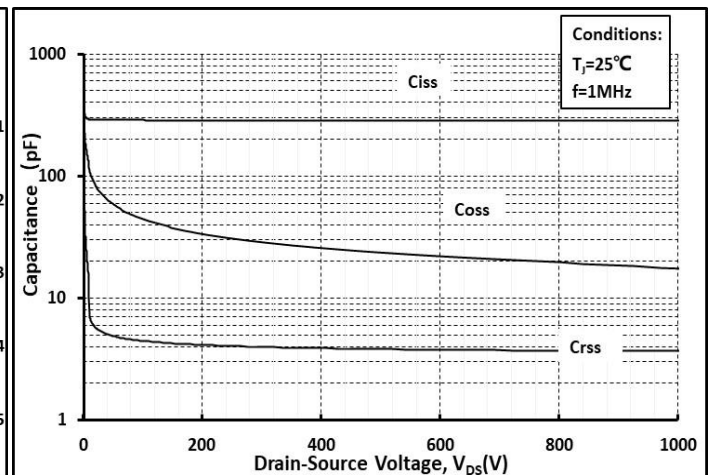


Fig. 16 Capacitance vs. V_{DS}

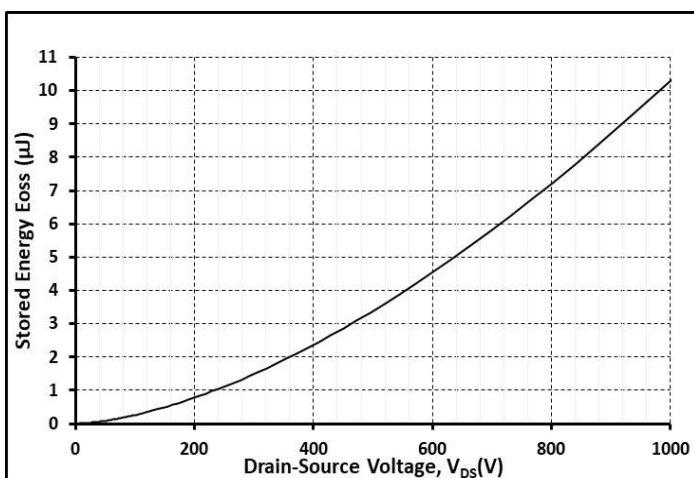


Fig. 17 Output Capacitor Stored Energy

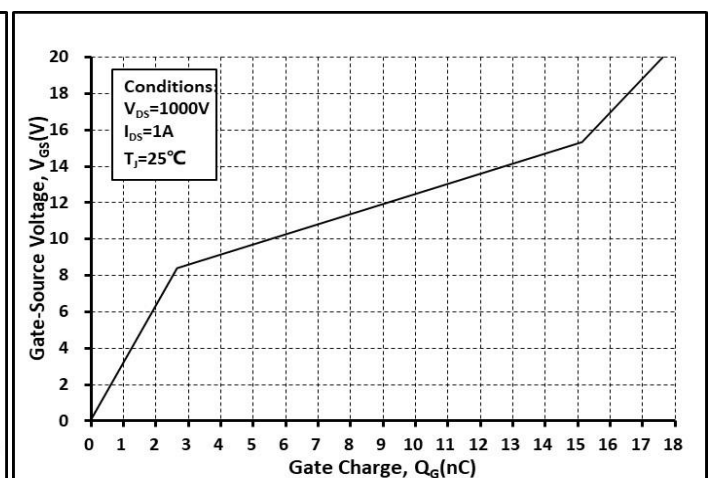
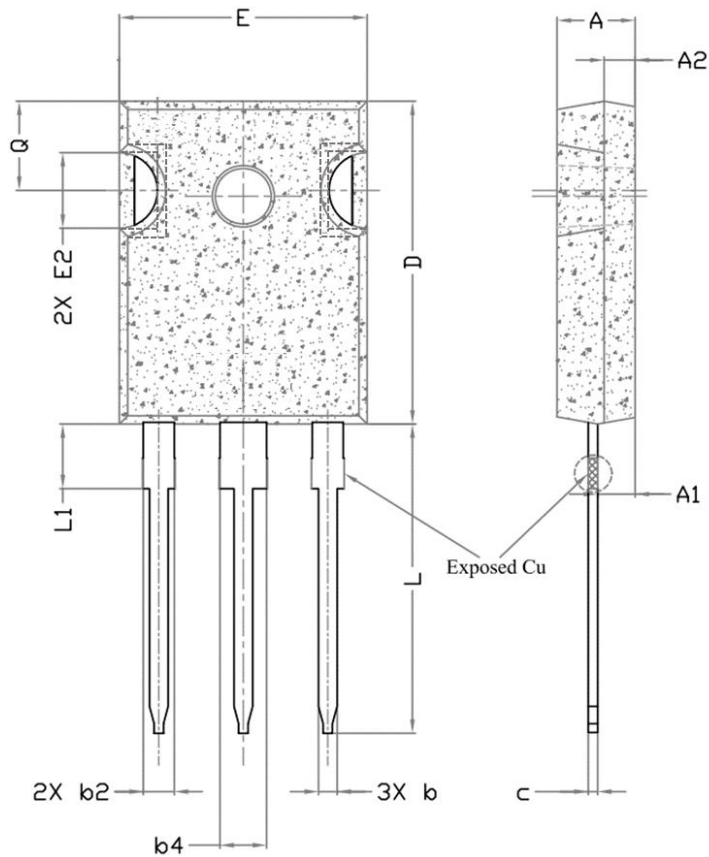
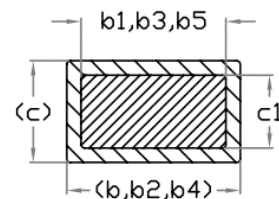
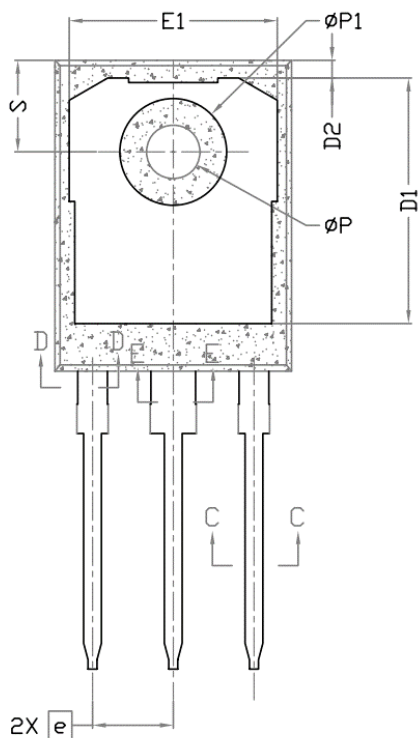


Fig. 18 Gate Charge Characteristics

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
φ P	3.50	3.70
φ 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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