

## 1200V N-Channel Silicon Carbide Power MOSFET

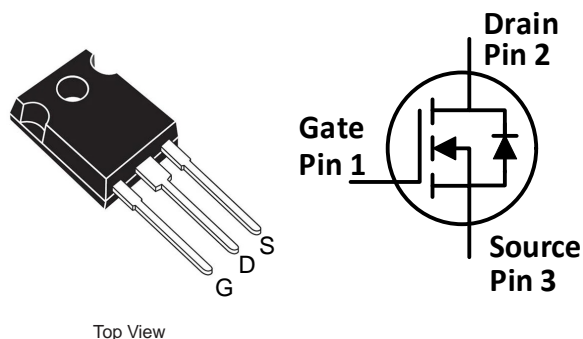
### Features:

- 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

### Package:



Part Number	Package
DTN19N120SC3	TO247-3

### Absolute Maximum Ratings (T<sub>c</sub>=25°C unless otherwise specified)

Symbol	Parameter	Value	Unit	Test Conditions	Note
V <sub>DS</sub>	Drain-Source voltage	1200	V	V <sub>GS</sub> =0V, I <sub>D</sub> =100μA	
V <sub>GS</sub>	Gate-Source voltage	-5 to 20	V	Recommended maximum	
I <sub>D</sub>	Drain current (continuous)	19	A	V <sub>GS</sub> =20V, T <sub>C</sub> =25°C	Fig. 21
		14	A	V <sub>GS</sub> =20V, T <sub>C</sub> =100°C	
I <sub>DM</sub>	Drain current (pulsed)	48	A	Pulse width limited by SOA	Fig. 24
P <sub>TOT</sub>	Total power dissipation	134	W	T <sub>C</sub> =25°C	Fig. 22
T <sub>stg</sub>	Storage temperature range	-55 to 175	°C		
T <sub>J</sub>	Operating junction temperature	-55 to 175	°C		
T <sub>L</sub>	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 <sub>θ(j-c)</sub>	Thermal Resistance from Junction to Case	1.122	°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		5	100	$\mu\text{A}$	$V_{DS}=1200\text{V}, V_{GS}=0\text{V}$	
$I_{GSS}$	Gate leakage current		1	$\pm 100$	nA	$V_{DS}=0\text{V}, V_{GS}=-5\sim 20\text{V}$	
$V_{TH}$	Gate threshold voltage		2.9		V	$V_{GS}=V_{DS}, I_D=1.9\text{mA}$	Fig. 8, 9
			1.9			$V_{GS}=V_{DS}, I_D=1.9\text{mA}$ @ $T_c=175^\circ\text{C}$	
$R_{ON}$	Static drain-source on-resistance		160	195	$\text{m}\Omega$	$V_{GS}=20\text{V}, I_D=10\text{A}$ @ $T_j=25^\circ\text{C}$	Fig. 4, 5, 6, 7
			285		$\text{m}\Omega$	$V_{GS}=20\text{V}, I_D=10\text{A}$ @ $T_j=175^\circ\text{C}$	
$C_{iss}$	Input capacitance		895		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		43		pF		
$C_{riss}$	Reverse transfer capacitance		2		pF		
$E_{oss}$	$C_{oss}$ stored energy		4.2		$\mu\text{J}$		Fig. 17
$Q_g$	Total gate charge		43		nC	$V_{DS}=800\text{V}, I_D=10\text{A},$ $V_{GS}=-5\text{ to }20\text{V}$	Fig. 18
$Q_{gs}$	Gate-source charge		9		nC		
$Q_{gd}$	Gate-drain charge		19		nC		
$R_g$	Gate input resistance		8.5		$\Omega$	$f=1\text{MHz}$	
$E_{ON}$	Turn-on switching energy		204		$\mu\text{J}$	$V_{DS}=800\text{V}, I_D=10\text{A},$ $V_{GS}=-2\text{ to }20\text{V},$ $R_{G(ext)}=3.3\Omega,$ $L=450\mu\text{H}$	Fig. 19, 20
$E_{OFF}$	Turn-off switching energy		34.4		$\mu\text{J}$		
$t_{d(on)}$	Turn-on delay time		15.2		ns		
$t_r$	Rise time		14.4				
$t_{d(off)}$	Turn-off delay time		11.3				
$t_f$	Fall time		13.1				

**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	$I_{SD}=5\text{A}, V_{GS}=0\text{V}$	Fig. 10, 11, 12
			3.7		V	$I_{SD}=5\text{A}, V_{GS}=0\text{V},$ $T_J=175^\circ\text{C}$	
$t_{rr}$	Reverse recovery time		33.2		ns	$V_{GS}=-2\text{V}/+20\text{V},$ $I_{SD}=10\text{A}, V_R=800\text{V},$ $di/dt=1000\text{A}/\mu\text{s},$	
$Q_{rr}$	Reverse recovery charge		101.5		nC		
$I_{RRM}$	Peak reverse recovery current		5.6		A	$R_{G(\text{ext})}=13\Omega$	

Typical Performance (curves)

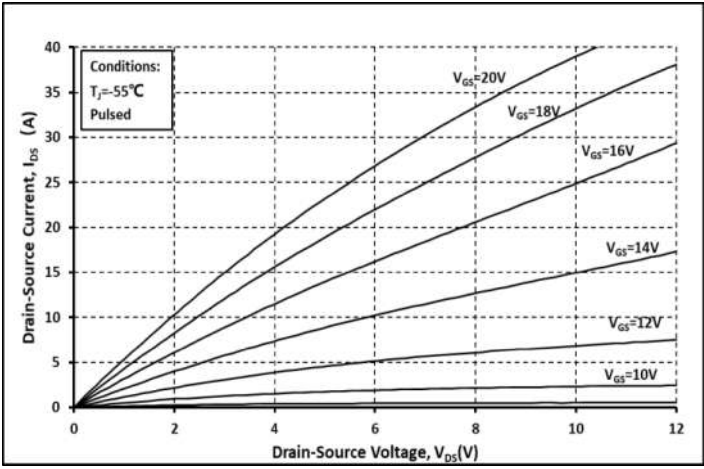


Fig. 1 Output Curve @  $T_j = -55^\circ\text{C}$

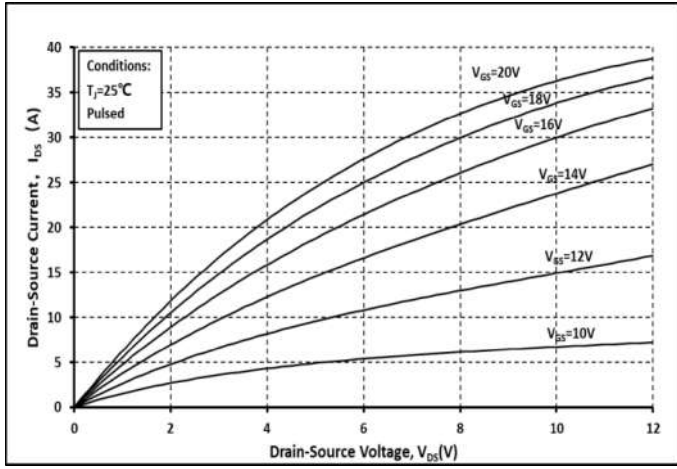


Fig. 2 Output Curve @  $T_j = 25^\circ\text{C}$

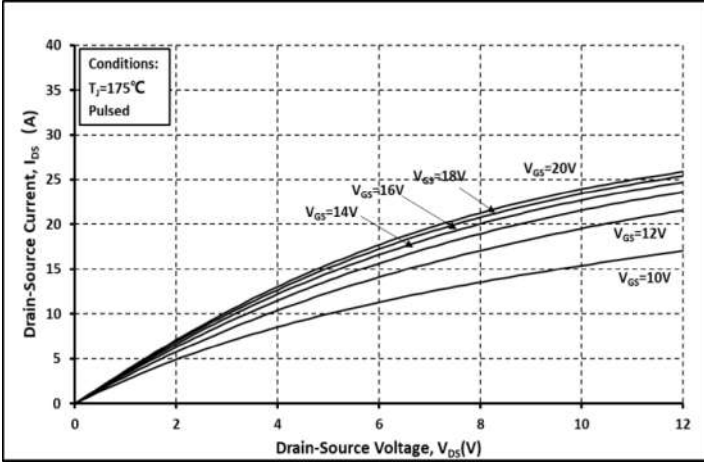


Fig. 3 Output Curve @  $T_j = 175^\circ\text{C}$

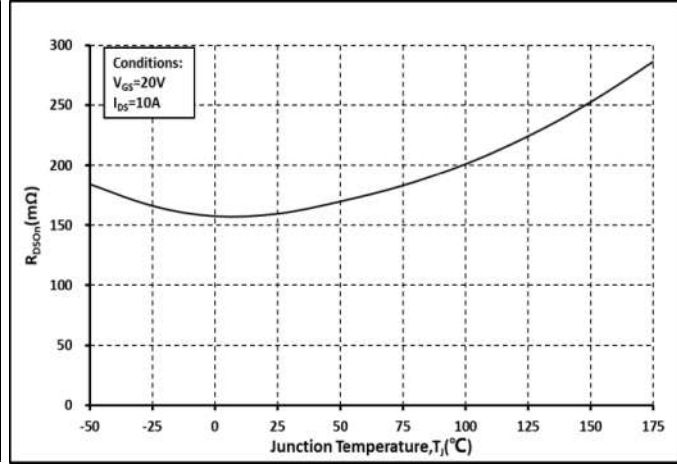


Fig. 4  $R_{on}$  vs. Temperature

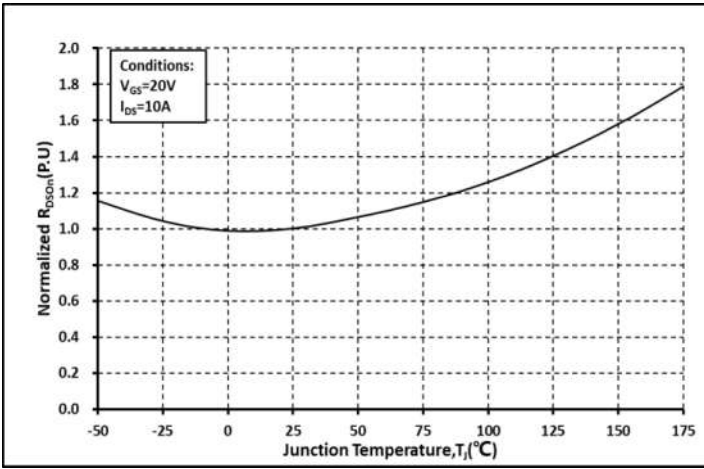


Fig. 5 Normalized  $R_{on}$  vs. Temperature

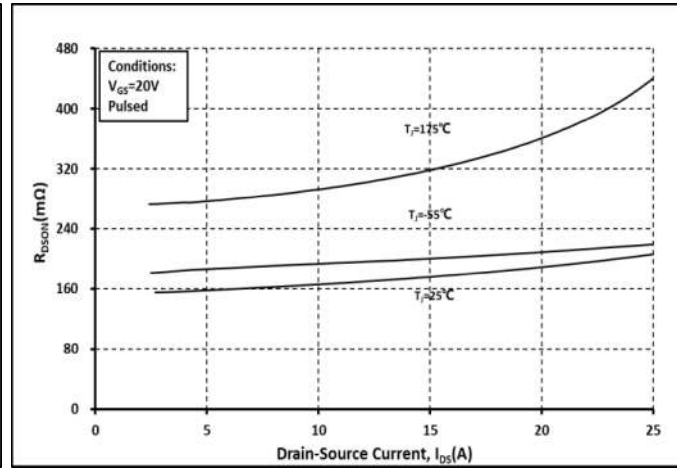


Fig. 6  $R_{on}$  vs.  $I_{DS}$  @ Various Temperature

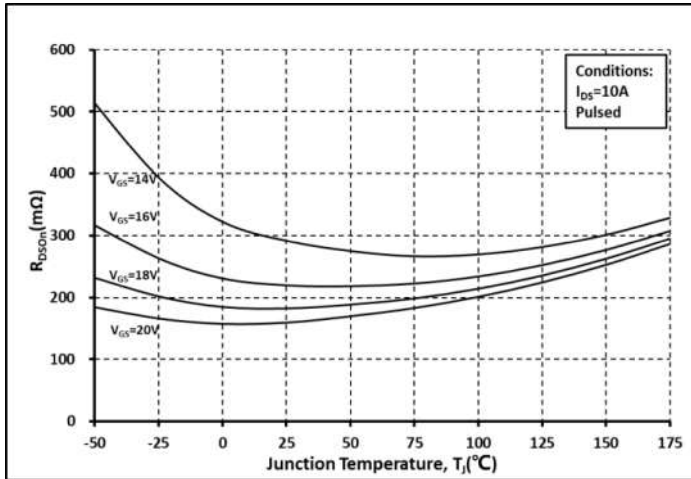


Fig. 7 Ron vs. Temperature @ Various  $V_{GS}$

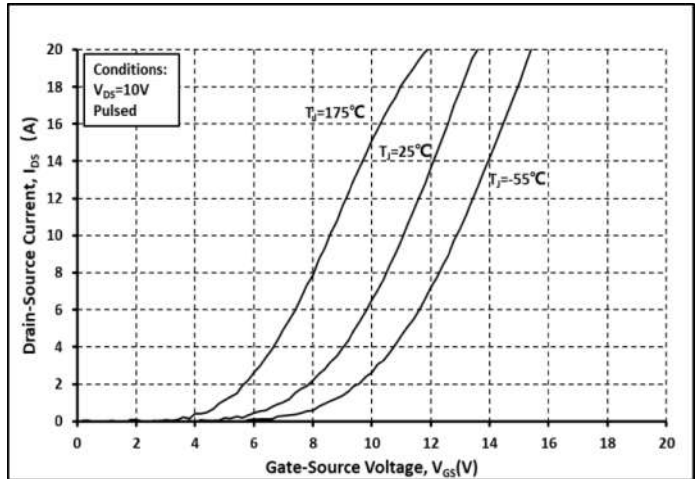


Fig. 8 Transfer Curves @ Various Temperature

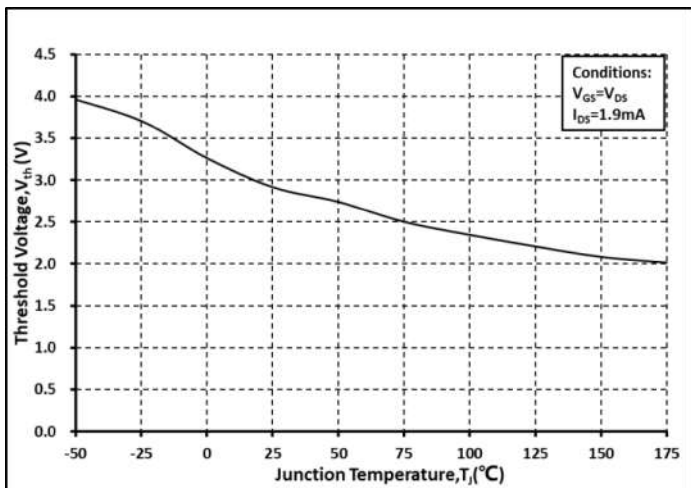


Fig. 9 Threshold Voltage vs. Temperature

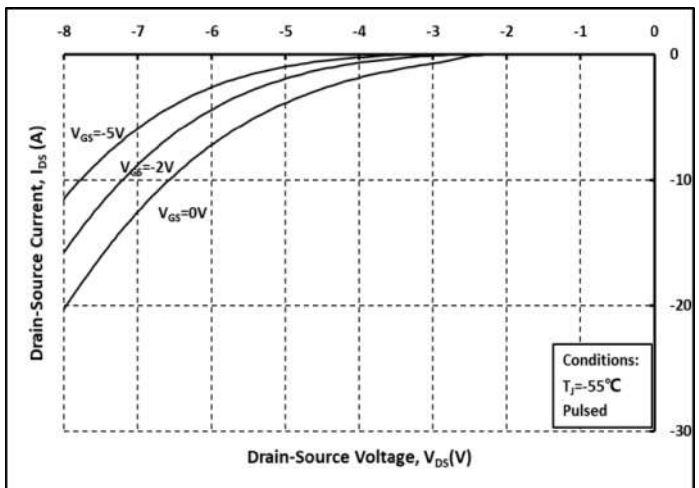


Fig. 10 Body Diode Curves @  $T_j = -55^\circ\text{C}$

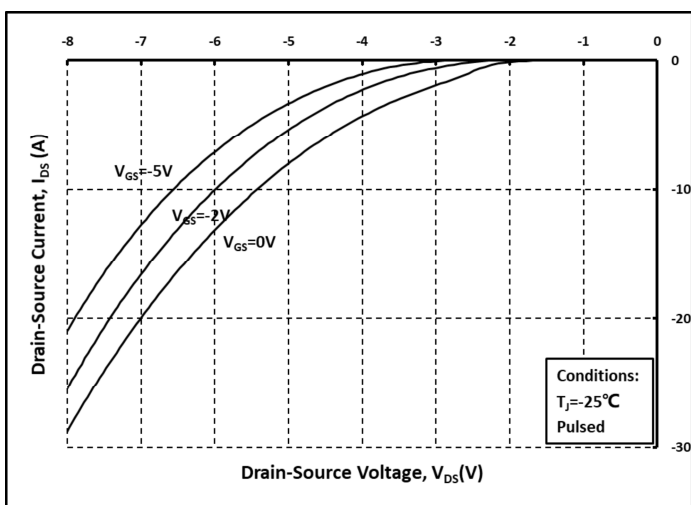


Fig. 11 Body Diode Curves @  $T_j = 25^\circ\text{C}$

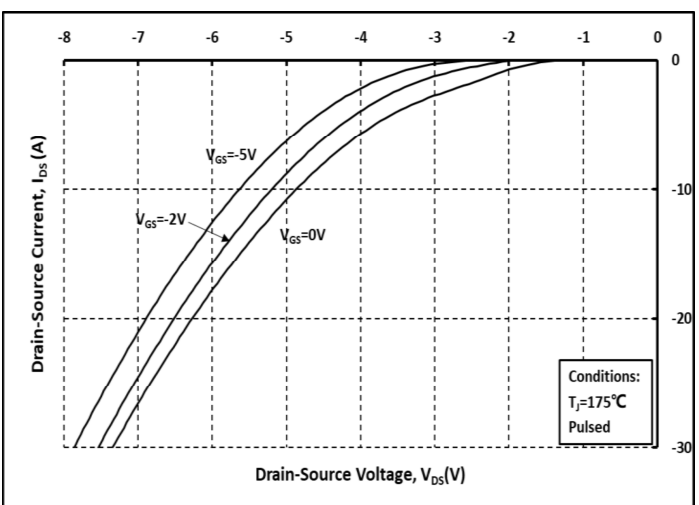


Fig. 12 Body Diode Curves @  $T_j = 175^\circ\text{C}$

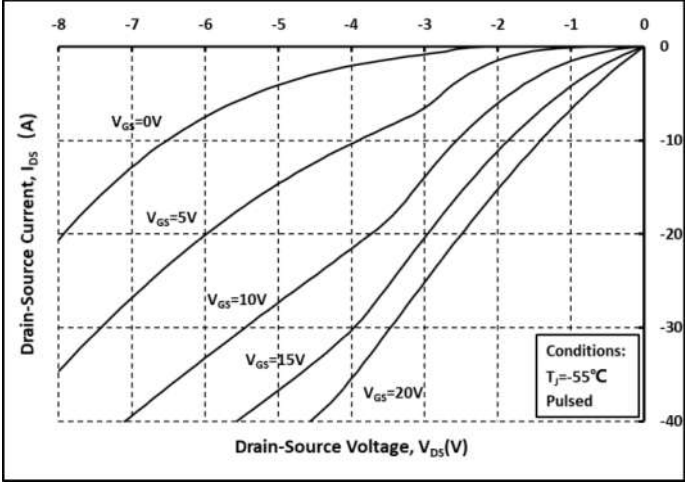


Fig. 13 3<sup>rd</sup> Quadrant Curves @  $T_j = -55^\circ\text{C}$

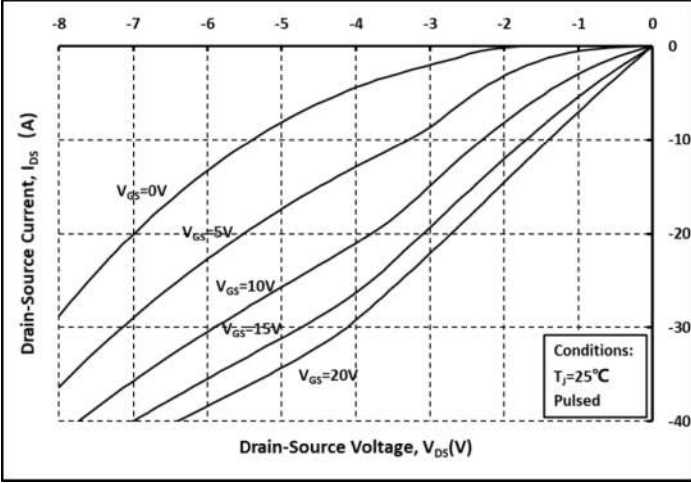


Fig. 14 3<sup>rd</sup> Quadrant Curves @  $T_j = 25^\circ\text{C}$

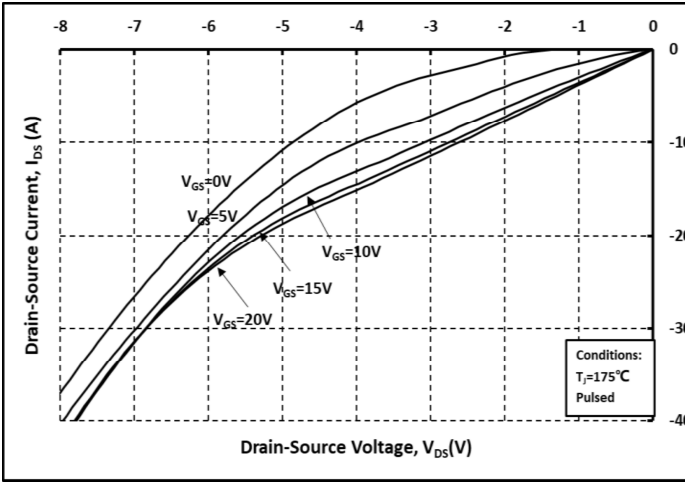


Fig. 15 3<sup>rd</sup> Quadrant Curves @  $T_j = 175^\circ\text{C}$

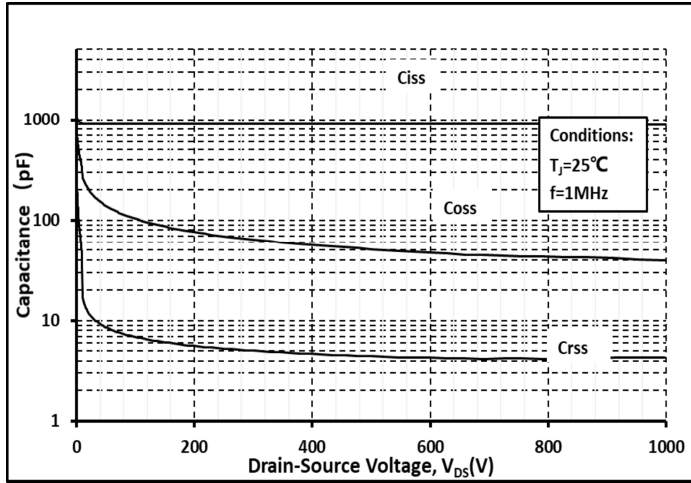


Fig. 16 Capacitance vs.  $V_{DS}$

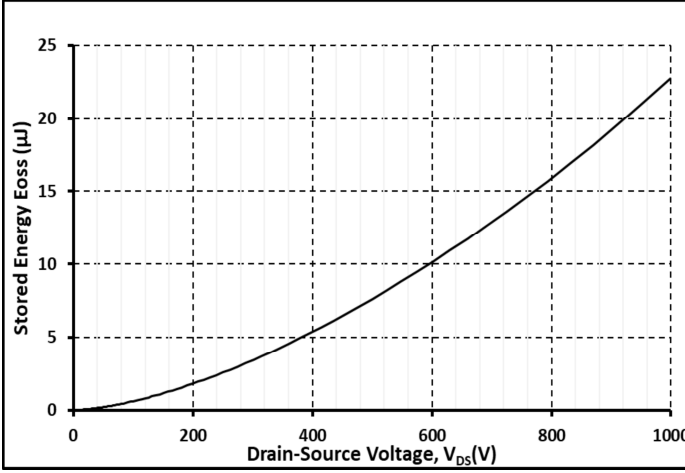


Fig. 17 Output Capacitor Stored Energy

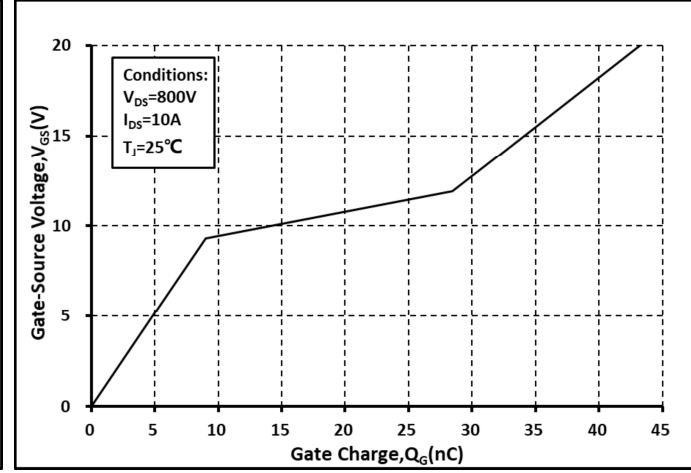


Fig. 18 Gate Charge Characteristics

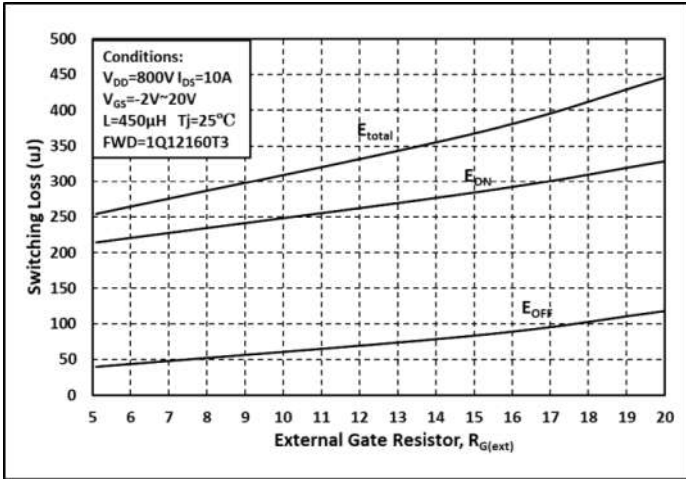


Fig. 19 Switching Energy vs.  $R_{G(ext)}$

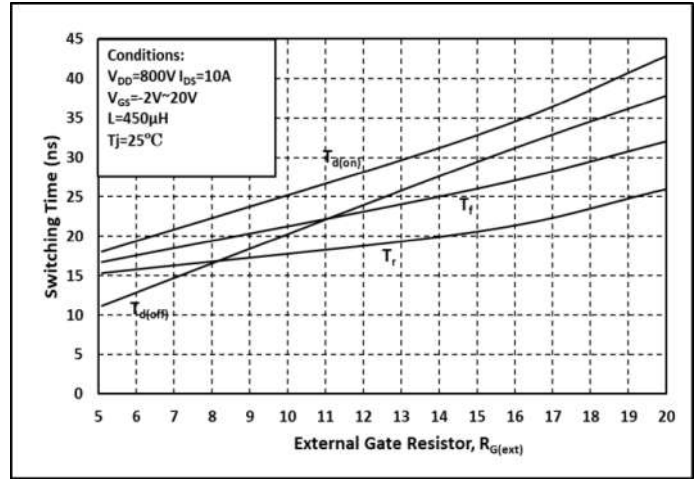


Fig. 20 Switching Times vs.  $R_{G(ext)}$

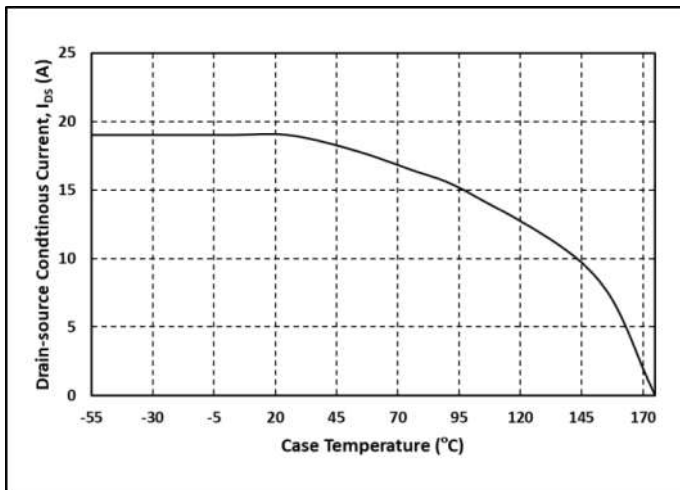


Fig. 21 Continuous Drain Current vs. Case Temperature

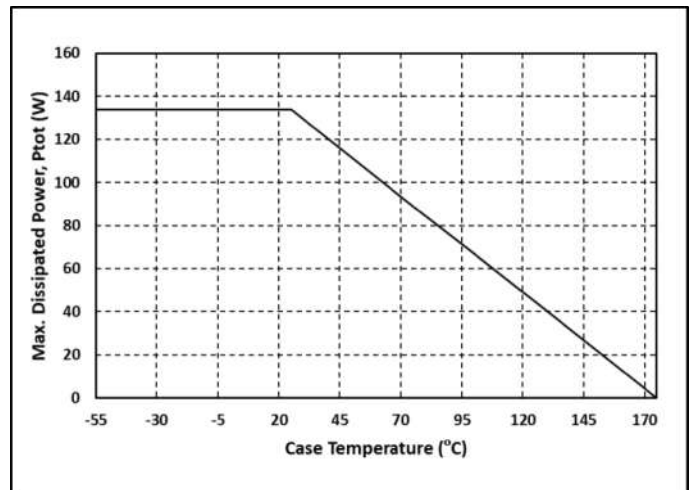


Fig. 22 Max. Power Dissipation Derating vs. Case Temperature

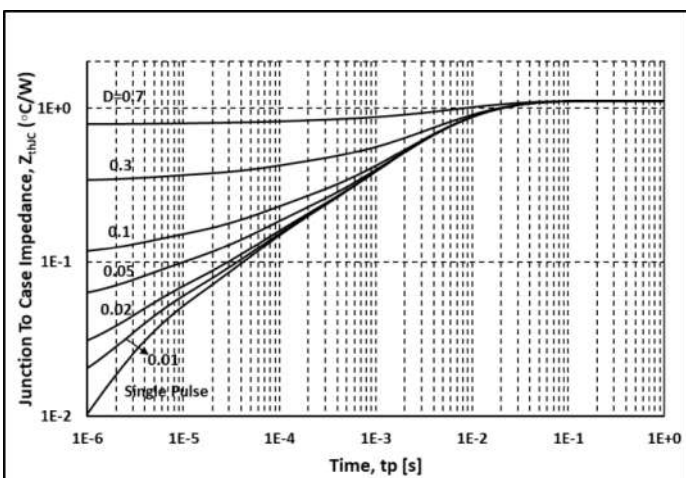


Fig. 23 Thermal Impedance

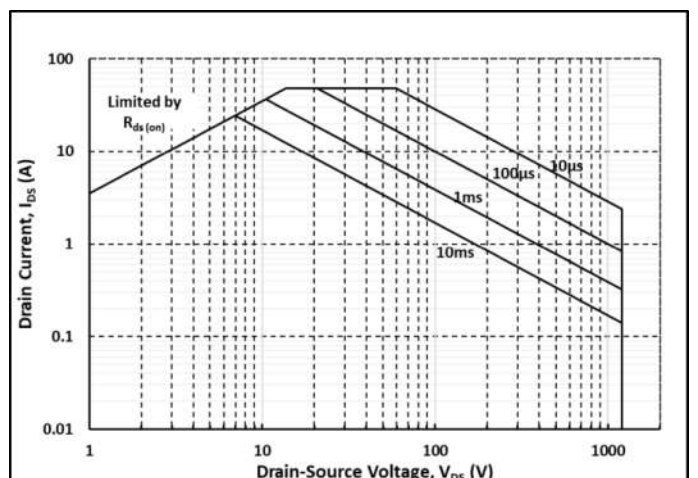
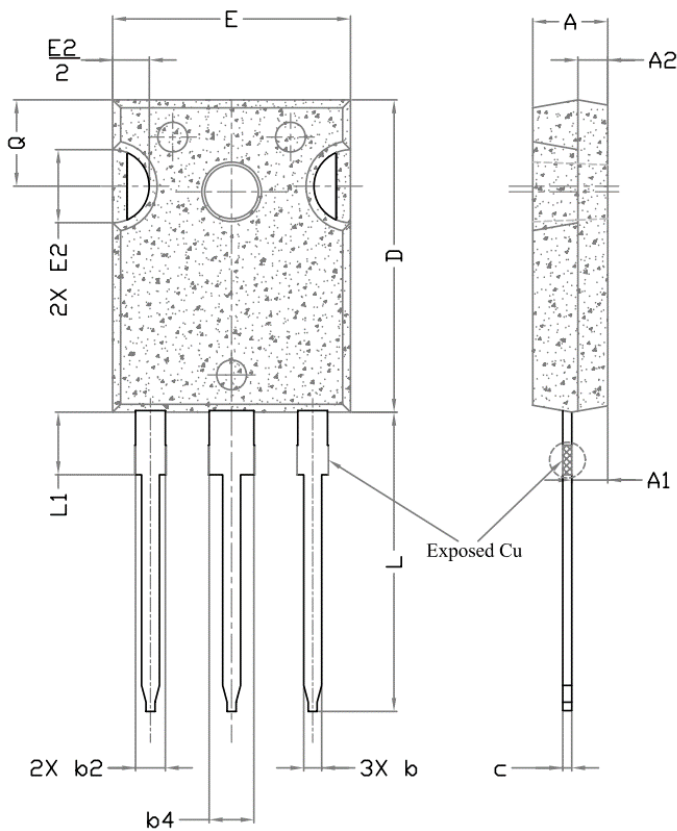
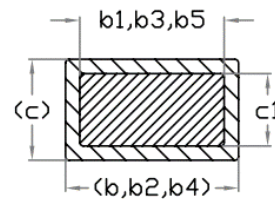
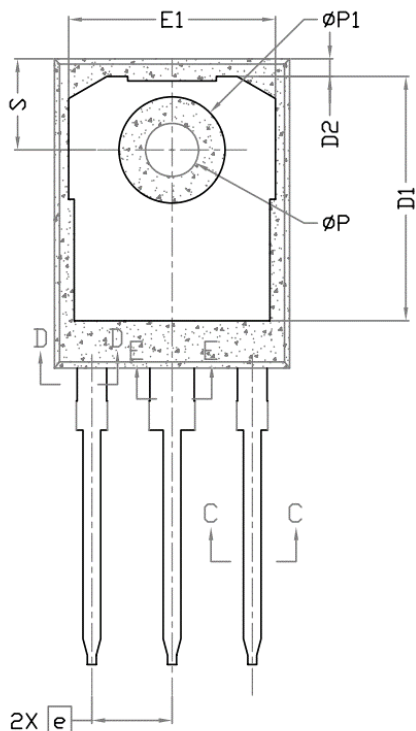


Fig. 24 Safe Operating Area

**Package Dimensions**



SYMBOL	DIMENSIONS			NOTES
	MIN.	NOM.	MAX.	
A	4.83	5.02	5.21	
A1	2.29	2.41	2.55	
A2	1.50	2.00	2.49	
b	1.12	1.20	1.33	
b1	1.12	1.20	1.28	
b2	1.91	2.00	2.39	6
b3	1.91	2.00	2.34	
b4	2.87	3.00	3.22	6, 8
b5	2.87	3.00	3.18	
c	0.55	0.60	0.69	6
c1	0.55	0.60	0.65	
D	20.80	20.95	21.10	4
D1	16.25	16.55	17.65	5
D2	0.51	1.19	1.35	
E	15.75	15.94	16.13	4
E1	13.46	14.02	14.16	5
E2	4.32	4.91	5.49	3
e	5.44BSC			
L	19.81	20.07	20.32	
L1	4.10	4.19	4.40	6
∅P	3.56	3.61	3.65	7
∅P1	7.19REF.			
Q	5.39	5.79	6.20	
S	6.04	6.17	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
4. Dimension D&E Do Not Include Mold Flash



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