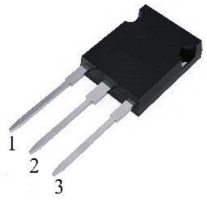
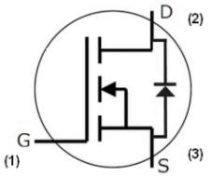
1200V N-Channel Silicon Carbide Power MOSFET

Features

- High blocking voltage with low on-resistance
- High-speed switching with low capacitances
- Fast intrinsic diode with low reverse recovery (Qrr)
- Easy to parallel
- RoHS compliant

Pin Description

TO-247-3	Symbol
	

Applications

- Switch Mode Power Supplies
- DC/DC converters
- Solar Inverters
- Battery Chargers
- Motor Drives

V_{DS}	1200	V
$R_{DS(ON)-Typ}$	80	mΩ
I_D	42	A

Absolute Maximum Ratings (T_C=25℃, Unless Otherwise Noted)

Symbol	Parameter	Value	Unit
V_{DS}	Drain-Source Voltage	1200	V
I_D	Continuous Drain Current	42	A
$I_{D,\ pulse}$	Pulse Drain Current Tested	80	A
V_{GSmax}	Maximum Gate Source Voltage	-10/+25	V
$V_{GS,op}$	Recommend Gate Source Voltage	-5/+20	V
P_D	Maximum Power Dissipation	208	W
T_J	Maximum Junction Temperature	-55 to 175	℃
T_{STG}	Storage Temperature Range	-55 to 175	℃

Thermal Characteristics

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance-Junction to Case	0.68	℃/W

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Electrical Characteristics (T_J=25℃, Unless Otherwise Noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
Static Electrical Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V, I_D=100uA	1200	---	---	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=1200V, V_{GS}=0V	---	10	100	uA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} , I_D=5mA	2	3	4	V
I_{GSS}	Gate Leakage Current	V_{GS}=20V, V_{DS}=0V	---	---	250	uA
$R_{DS(ON)}$	Drain-Source On-state Resistance	V_{GS}=20V, I_D=20A	---	80	100	mΩ
Dynamic Characteristics						
$R_{G(int)}$	Internal Gate Resistance	f=1MHz, V_{AC}=25 mV	---	4	---	Ω
C_{iss}	Input Capacitance	V_{DS}=1000V, V_{GS}=0V, f=1MHz	---	1128	---	pF
C_{oss}	Output Capacitance		---	86	---	
C_{rss}	Reverse Transfer Capacitance		---	5	---	
E_{OSS}	C_{OSS} Stored Energy		---	44	---	μJ
$T_{d(on)}$	Turn-on Delay Time	V_{DS}=800V,V_{GS}=-5/+20V, I_D=20A,$R_{G(ext)}$ =2.5Ω	---	18	---	nS
T_r	Turn-on Rise Time		---	65	---	
$T_{d(off)}$	Turn-off Delay Time		---	36	---	
T_f	Turn-off Fall Time		---	15	---	
Q_g	Total Gate Charge	V_{DS}=800V,V_{GS}=-5/+20V, I_D=20A	---	52	---	nC
Q_{gs}	Gate-Source Charge		---	17	---	
Q_{gd}	Gate-Drain Charge		---	15	---	
Source-Drain Characteristics						
I_S	Continuous Diode Froward Current	V_{GS} = 0V	---	42	---	A
V_{SD}	Diode Forward Voltage	I_S=10A, V_{GS}=0V	---	4	---	V
t_{rr}	Reverse Recovery Time	V_{DS}=800V,I_S=20A, V_{GS} = -5V dif/dt = 2100 A/μs	---	26	---	nS
Q_{rr}	Reverse Recovery Charge		---	163	---	nC
I_{rrm}	Peak reverse recovery current		---	12	---	A

Typical Performance Characteristics

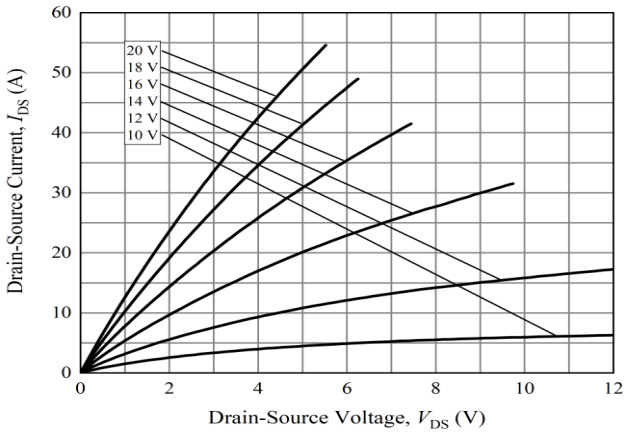


Figure 1: Typical Output Characteristics at T_J=-55 °C

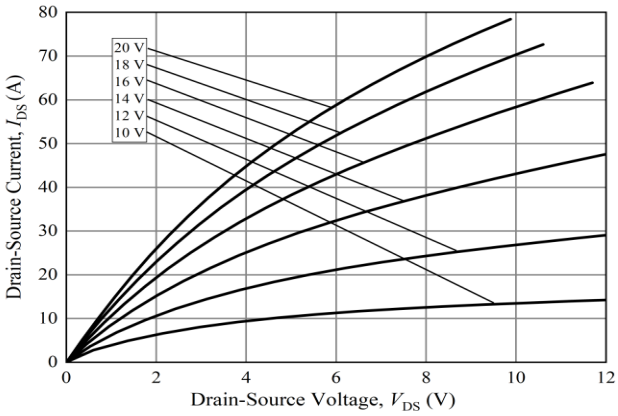


Figure 2: Typical Output Characteristics at T_J=25 °C

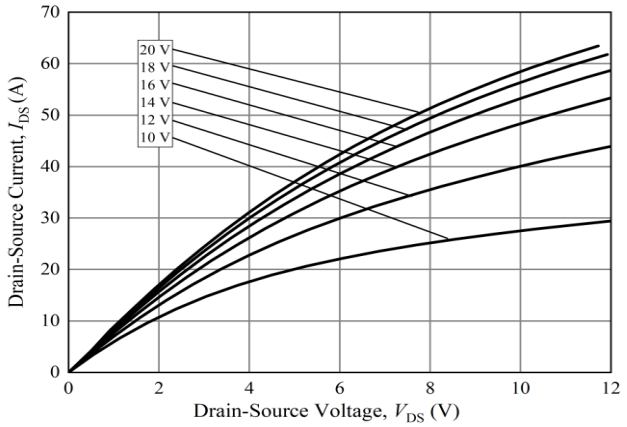


Figure 3: Typical Output Characteristics at T_J=175 °C

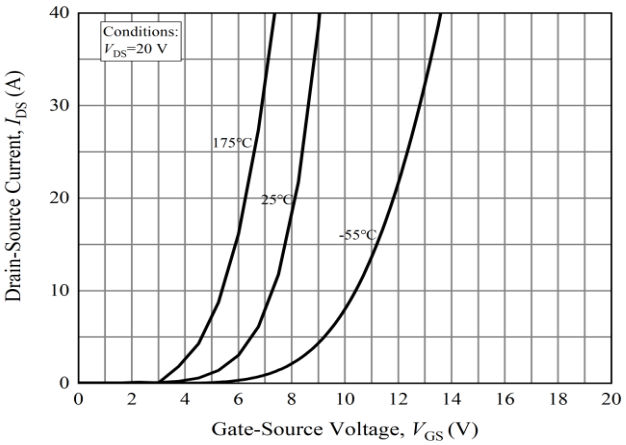


Figure 4: Typical Transfer Characteristics for Various Temperature

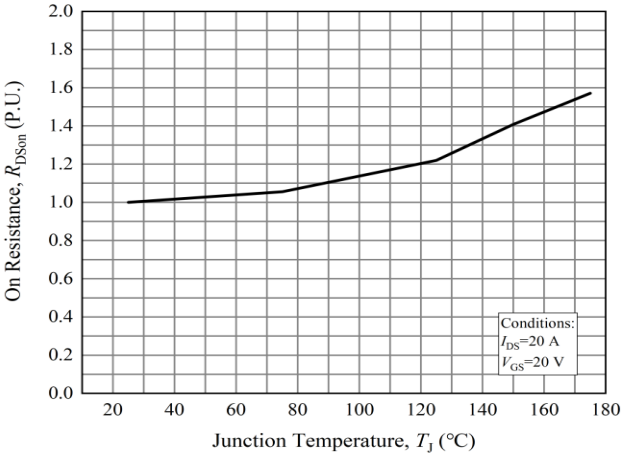


Figure 5: Normalized On-Resistance vs. Temperature

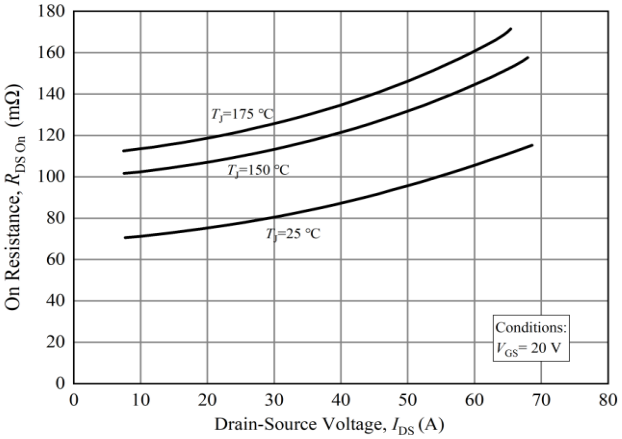


Figure 6: On-Resistance vs. Drain Current for Gate Various Temperatures

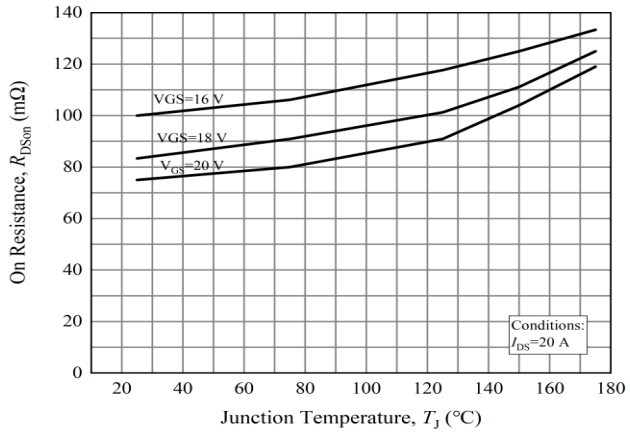


Figure 7: On-Resistance vs. Temperature for Various Voltage

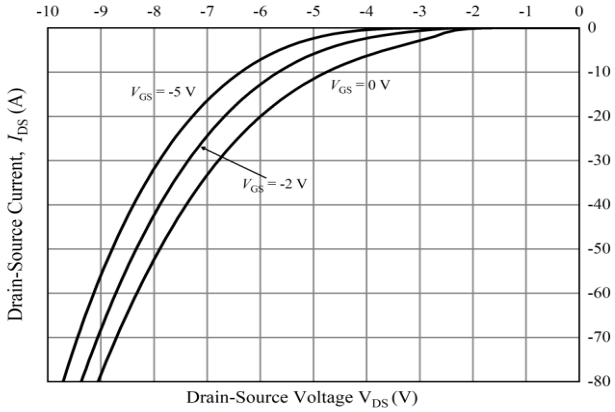


Figure 8: Typical Body Diode Characteristics at T_J=-55 ℃

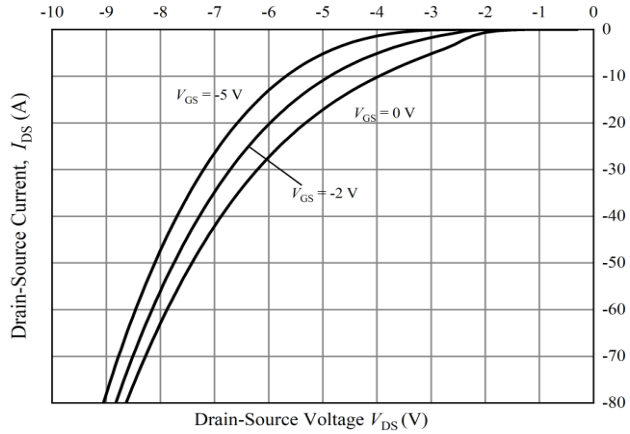


Figure 9: Typical Body Diode Characteristics at T_J=25 ℃

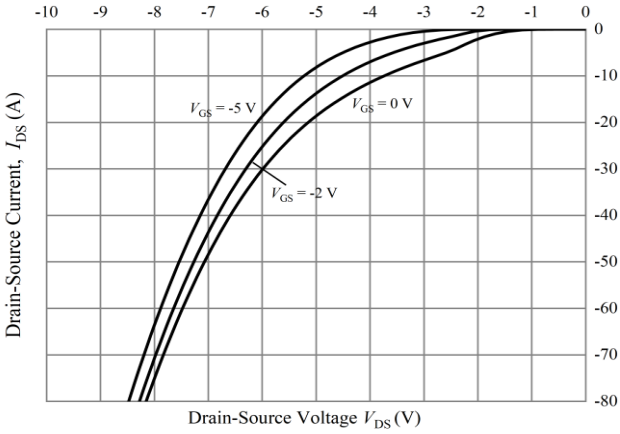


Figure 10: Typical Body Diode Characteristics at T_J=175 ℃

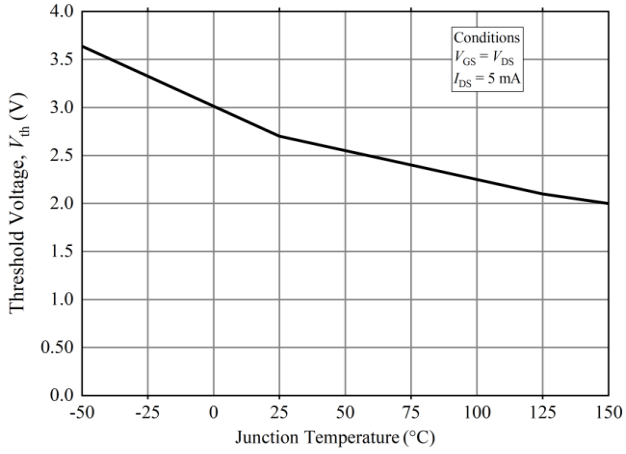


Figure 11: Typical Threshold Voltage vs. Temperature

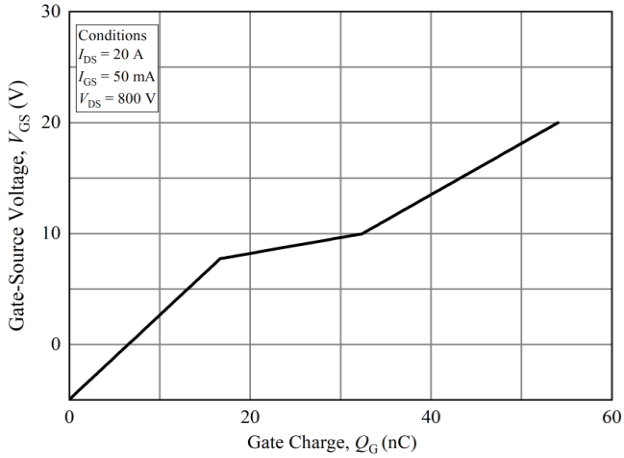


Figure 12: Typical Gate Charge Characteristics at T_J=25 ℃

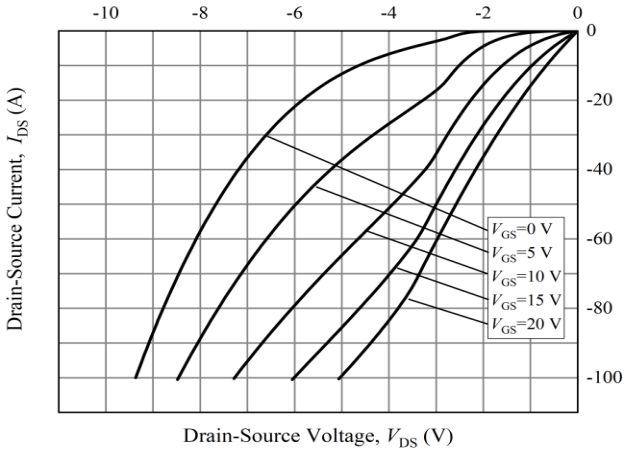


Figure 13: Typical 3rd Quadrant Characteristics T_J=-55 °C

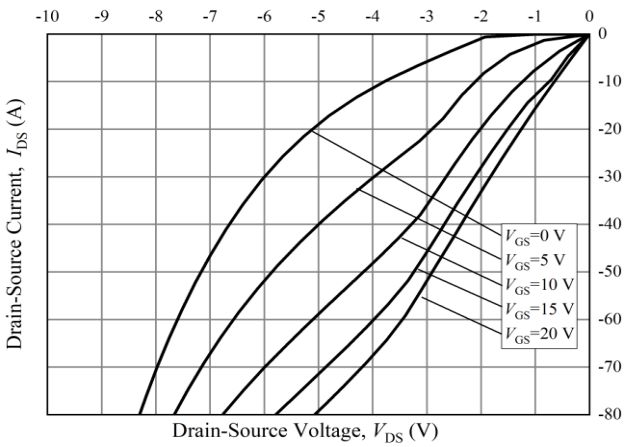


Figure 14: Typical 3rd Quadrant Characteristics at T_J=25 °C

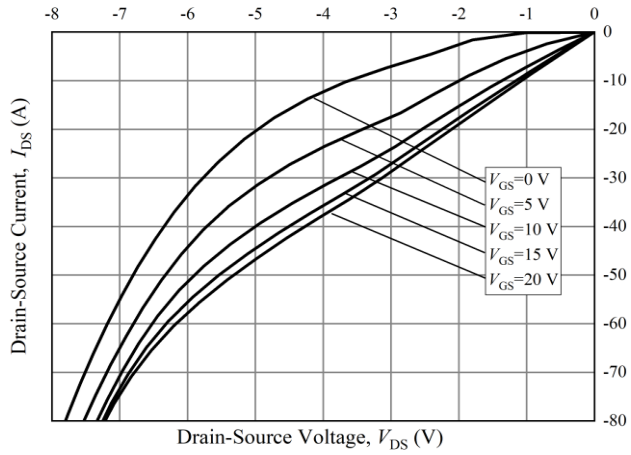


Figure 15: Typical 3rd Quadrant Characteristics at T_J=175 °C

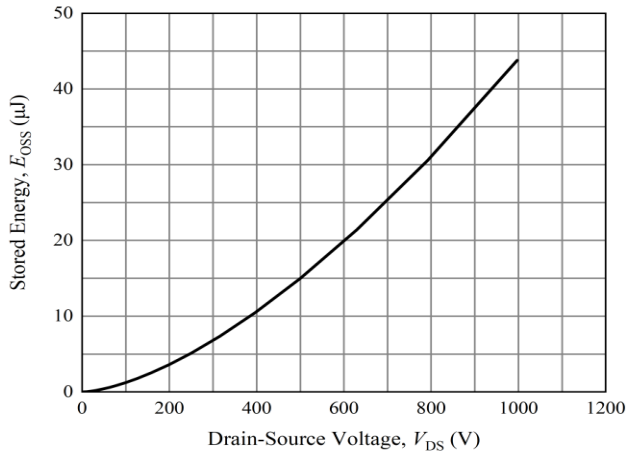


Figure 16: Typical Output Capacitor Stored Energy

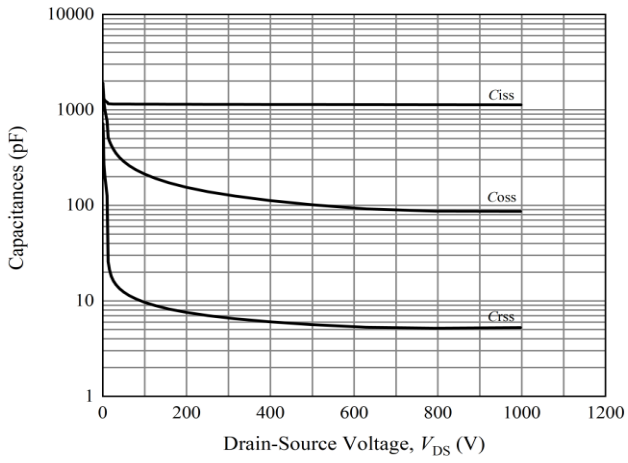


Figure 17: Typical Capacitances vs. Drain-Source Voltage

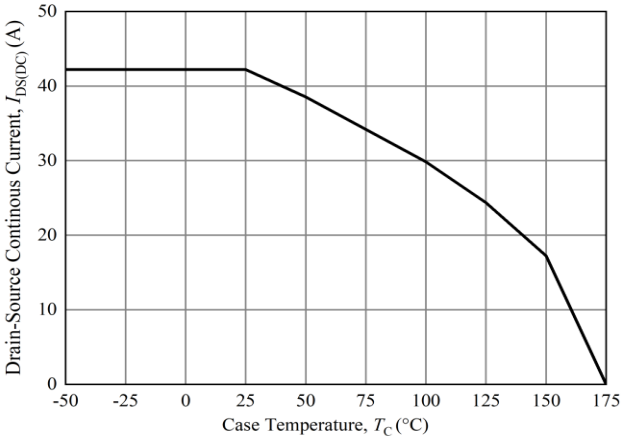


Figure 18: Continuous I_{DS} Current Derating Curve

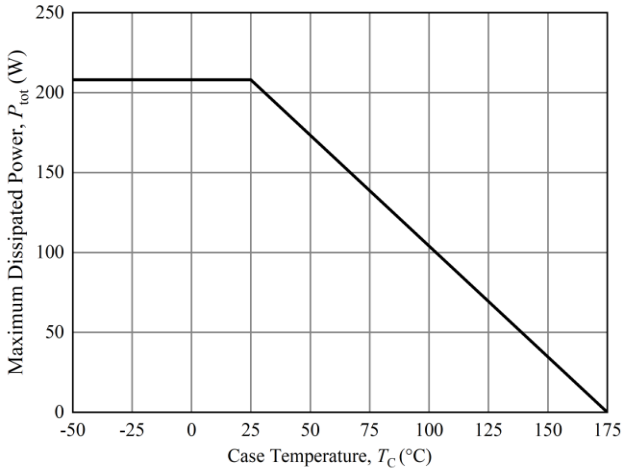


Figure 19: Power Dissipation Derating Curve

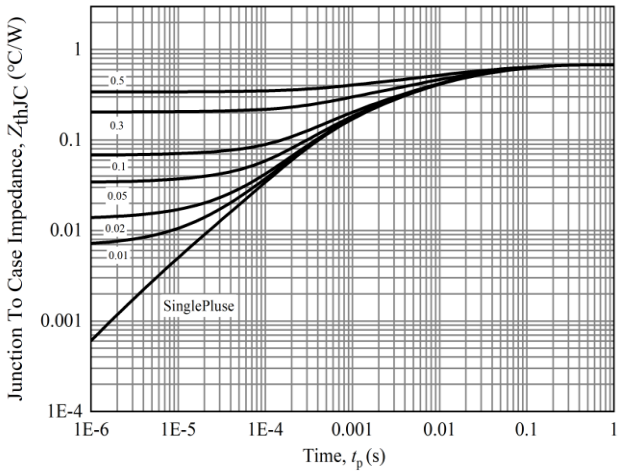


Figure 20: Typical Transient Thermal Impedance (Junction – Case) with Duty Cycle

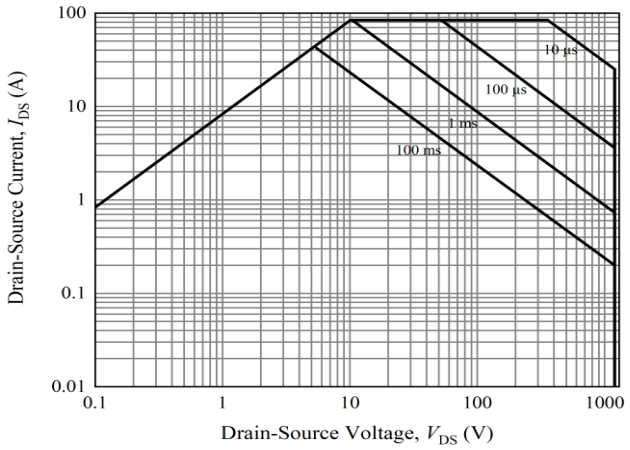


Figure 21: Safe Operate Area

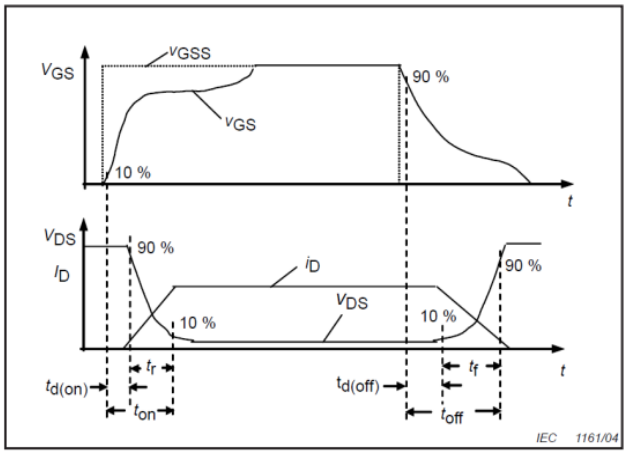
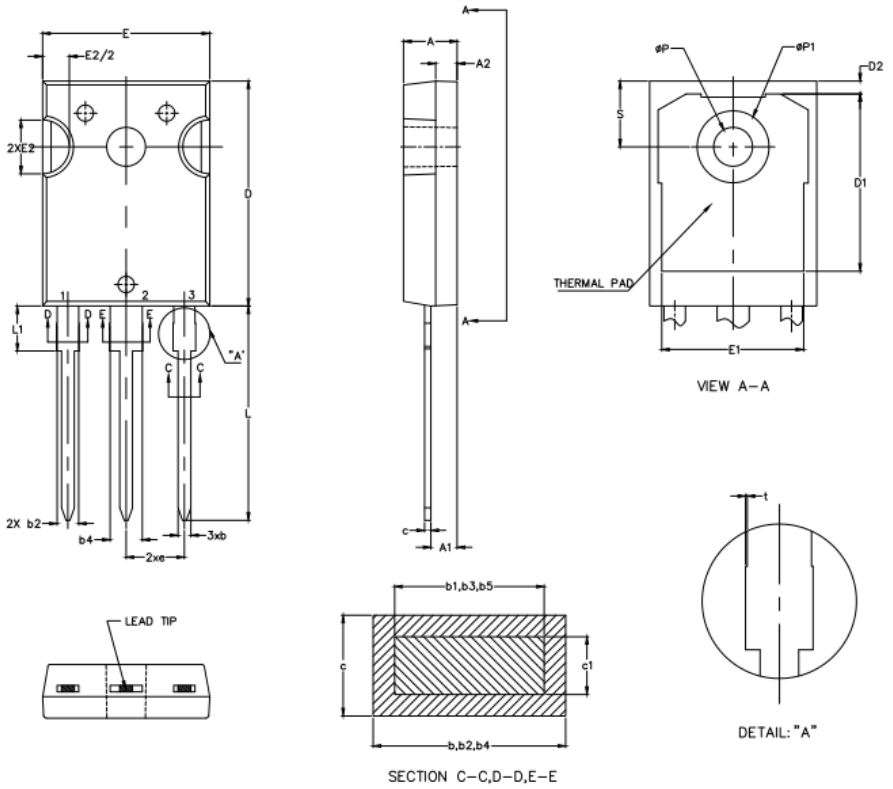


Figure 22: Resistive Switching Time Description

1200V N-Channel Silicon Carbide Power MOSFET

Package：TO-247-3



SYMBOLS	DIMENSIONS			
	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A	4.90	5.10	0.193	0.201
A1	2.31	2.51	0.091	0.099
A2	1.90	2.10	0.075	0.083
b	1.16	1.26	0.046	0.050
b1	1.15	1.22	0.045	0.048
b2	1.96	2.06	0.077	0.081
b3	1.95	2.02	0.077	0.080
b4	2.96	3.06	0.117	0.120
b5	2.95	3.02	0.116	0.119
c	0.59	0.66	0.023	0.026
c1	0.58	0.62	0.023	0.024
D	20.90	21.10	0.823	0.831
D1	16.25	16.85	0.640	0.663
D2	1.05	1.35	0.041	0.053
E	15.75	15.90	0.620	0.626
E1	13.26	—	0.552	—
E2	4.90	5.10	0.193	0.201
e	5.44BSC		0.214BSC	
L	19.80	20.10	0.780	0.791
L1	—	4.30	—	0.169
øP	3.50	3.70	0.138	0.146
øP1	—	7.40	—	0.291
S	6.05	6.25	0.238	0.246
t	0.00	0.15	0.000	0.006