General Description

The SYSD080N120T44 1200V, 80mΩ SiC power MOSFET is an N-channel enhancement mode device. This device shows high current density and great switching behavior. Due to excellent thermal conductivity, this device significantly improved in thermal capability and temperature independent switching behavior.

Features

- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitances
- Easy to Parallel and Simple to Drive
- Avalanche Ruggedness
- Halogen Free, RoHS Compliant

Applications

- Solar Inverters
- Switch Mode Power Supplies
- High Voltage DC/DC Converters
- Battery Chargers
- Motor Drives
- Pulsed Power applications

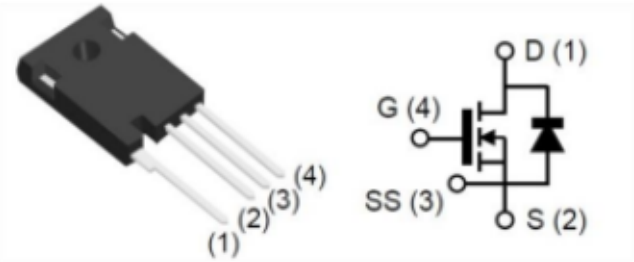
Pros

- Higher System Efficiency
- Reduced Cooling Requirements
- Increased Power Density
- Increased System Switching Frequency

Product Summary

V_{DS}	1200V
$I_{D(@25^oC)}$	36A
$R_{DS(on)}$	80mΩ

Ordering Information



Part Number	Package
SYSD080N120T44	TO-247-4L

Electrical Characteristics (Tc = 25 °C unless otherwise specified)

Parameters	Symbol	Condition	Min	Typ	Max	Units
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS}=0V, I_D=100μA	1200			V
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=5mA	2.0	2.9	4	V
		V_{DS}=V_{GS}, I_D=5mA, T_J=150°C		2.4		
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=1200V, V_{GS}=0V		1	100	μA
Gate-Source Leakage Current	I_{GSS}	V_{GS}=20V, V_{DS}=0V			250	nA
Drain-Source On-State Resistance	$R_{DS(on)}$	V_{GS}=20V, I_D=20A		80	98	mΩ
		V_{GS}=20 V, I_D=20A, T_J=150°C		144		
Transconductance	g_{fs}	V_{DS}=20V, I_{DS}=20A		10		S
		V_{DS}=20V, I_{DS}=20A, T_J=150°C		9		
Input Capacitance	C_{iss}	V_{GS}=0V V_{DS}=1000V f=1MHz V_{AC}=25mV		1130		pF
Output Capacitance	C_{oss}			92		
Reverse Transfer Capacitance	C_{rss}			7.5		
C_{oss} Stored Energy	E_{oss}			50		μJ
Turn-On Switching Energy	E_{ON}	V_{DS}=800V,V_{GS}=-5/20V, I_D=20A,$R_{G(ext)}$=2.5Ω, L=156μH		523		μJ
Turn Off Switching Energy	E_{OFF}			72		
Turn-On Delay Time	$t_{d(on)}$	V_{DD}=800V, V_{GS}=-5/20V I_D=20A, $R_{G(ext)}$=2.5Ω, R_L=40Ω,		15		ns
Rise Time	t_r			22		
Turn-Off Delay Time	$t_{d(off)}$			24		
Fall Time	t_f			14		
Internal Gate Resistance	$R_{G(int)}$	f=1MHz, V_{AC}=25mV		3.9		Ω
Gate to Source Charge	Q_{gs}	V_{DS}=800V, V_{GS}=-5/20V I_D=20A		17		nC
Gate to Drain Charge	Q_{gd}			29		
Total Gate Charge	Q_g			71		

*Based on the results of calculation, note that the energy loss caused by the reverse recovery of free-wheeling diode is not included in Eon

Built-in SiC Diode Characteristics (Tc = 25 °C unless otherwise specified)

Parameter	Symbol	Test Conditions	Typ.	Max.	Unit
Inverse Diode Forward Voltage	V_{SD}	V_{GS}=-5V, I_{SD}=10A	4.3		V
		V_{GS}=-5V, I_{SD}=10A, T_J=150°C	3.8		
Continuous Diode Forward Current	I_s	T_C=25°C		36	A
Reverse Recovery Time	t_{rr}	V_{GS}=-5V, I_{SD}=20A, V_R=800V dif/dt=1950A/μs	24		ns
Reverse Recovery Charge	Q_{rr}		152		nC
Peak Reverse Recovery Current	I_{rrm}		10		A

Absolute Maximum Ratings (Tc = 25 °C unless otherwise specified)

Parameter	Symbol	Test Conditions	Value	Unit
Drain - Source Voltage	V_{DSmax}	V_{GS} =0V, I_D=100μA	1200	V
Gate - Source Voltage	V_{GSmax}	Absolute maximum values	- 10/+25	V
Gate - Source Voltage	V_{GSop}	Recommended operational values	-5/+20	V
Continuous Drain Current	I_D	V_{GS}=20V, T_C=25˚C	36	A
		V_{GS}=20V, T_C=100˚C	24	
Pulsed Drain Current	$I_{D(pulse)}$	Pulse width t_P limited by T_{jmax}	80	A
Power Dissipation	P_D	T_C=25˚C, T_J=150˚C	192	W
Operating Junction and Storage Temperature	T_J, T_{stg}		-55 to +150	°C
Solder Temperature	T_L	1.6mm (0.063”) from case for 10s	260	°C
Mounting Torque	M_d	M3 or 6-32 screw	1	Nm

Thermal Resistance

Parameter	Symbol	Min.	Typ.	Max	Unit
Thermal Resistance, Junction to Case	$R_{θ,JC}$		0.60	0.65	°C/W
Thermal Resistance, Junction to Ambient	$R_{θ,JA}$			40	°C/W

Typical Device Performance

Fig.1 Output Characteristics T_J = -55 ºC

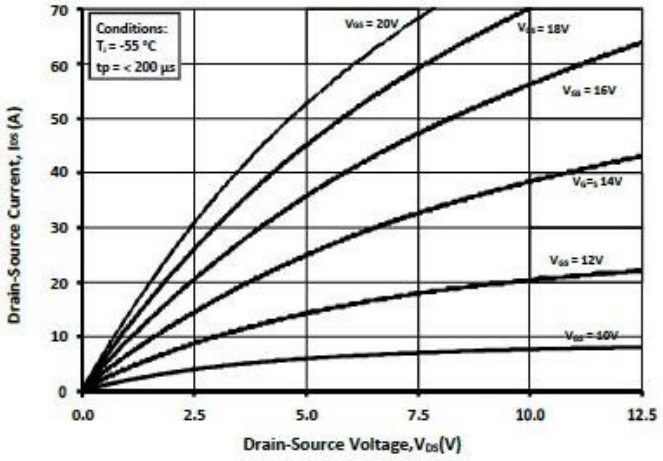


Fig.2 Output Characteristics T_J = 25 ºC

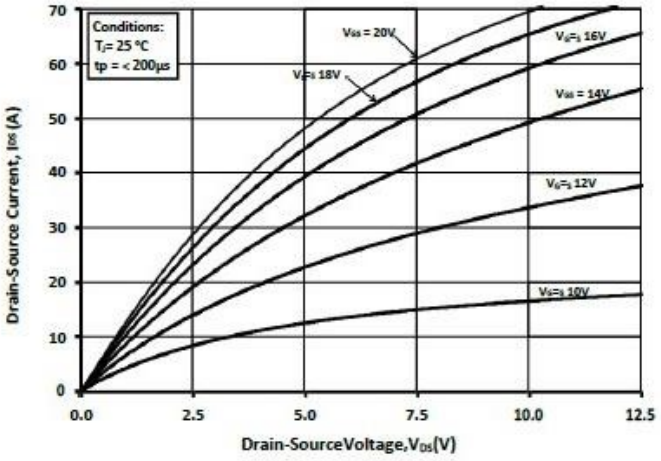


Fig.3 Output Characteristics T_J = 150 ºC

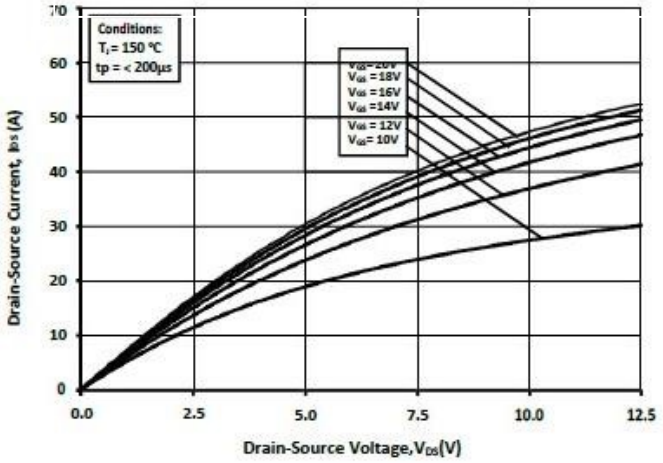


Fig.4 Normalized On-Resistance vs. Temperature

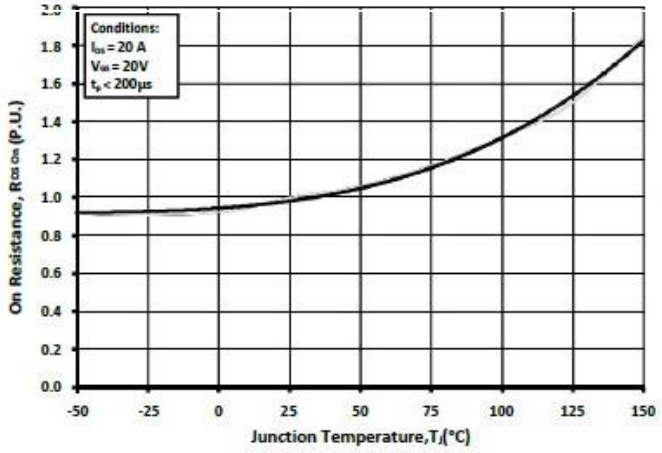


Fig. 5 On-Resistance vs. Drain Current For Various Temperatures

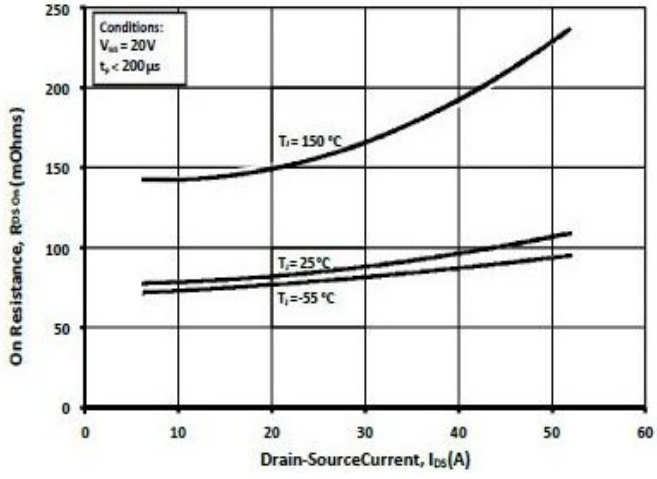


Fig. 6 On-Resistance vs. Temperature For Various Gate Voltage

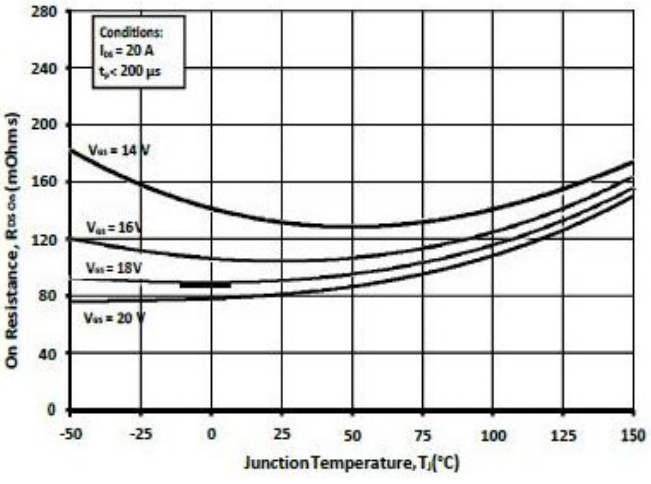


Fig.7 Normalized On-Resistance vs. Temperature

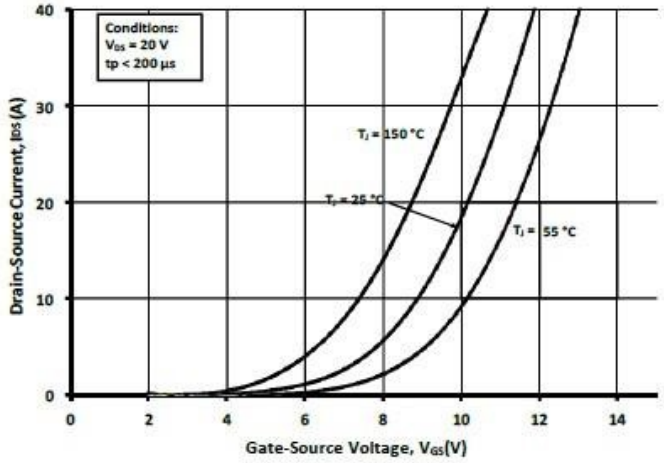


Fig.8 Body Diode Characteristic at -55 ºC

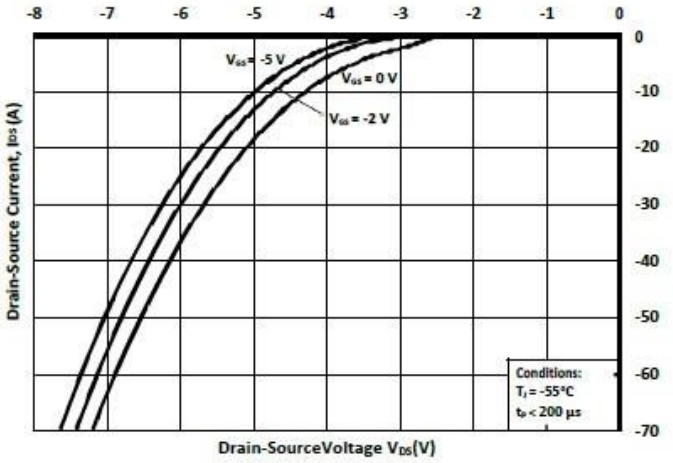


Fig.9 Body Diode Characteristic at 25 ºC

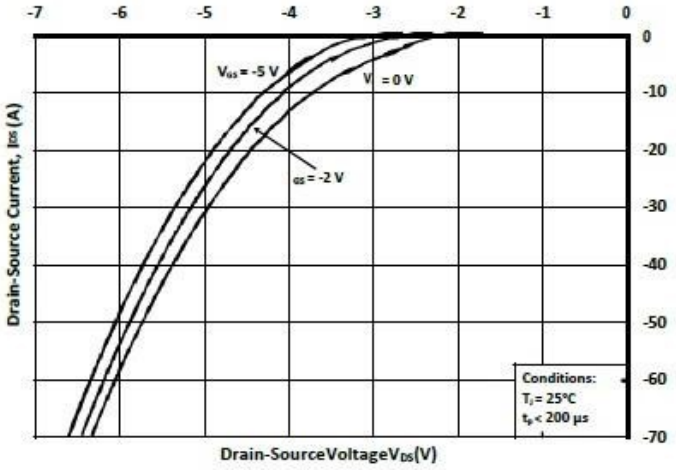


Fig.10 Body Diode Characteristic at 150 ºC

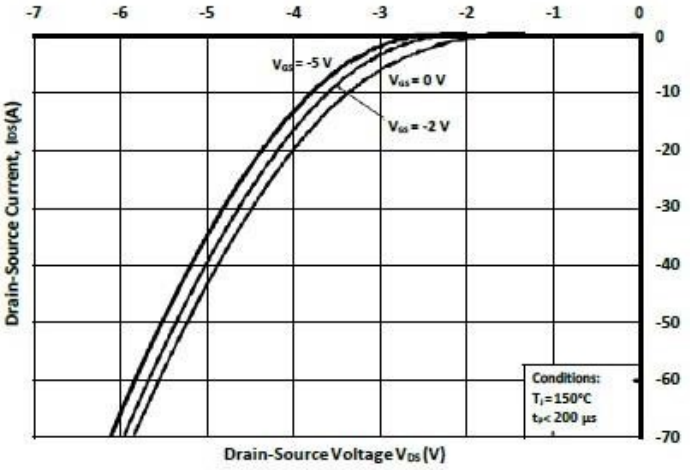


Fig.11 Threshold Voltage vs. Temperature

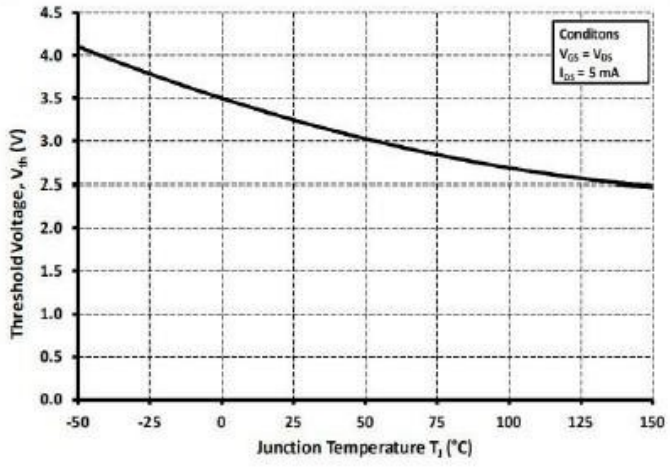


Fig.12 Gate Charge Characteristics

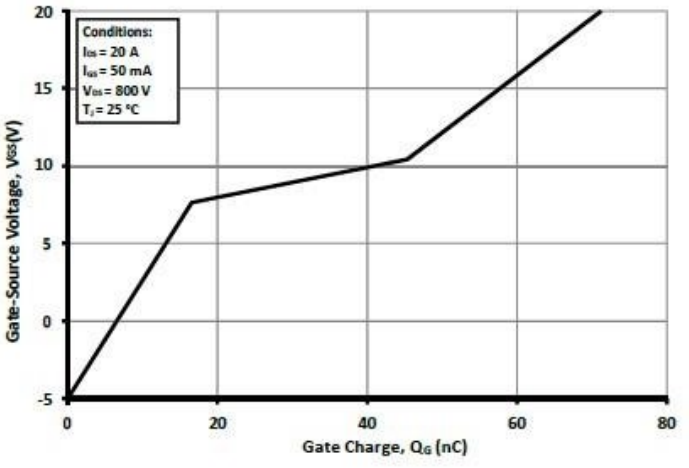


Fig.13 3rd Quadrant Characteristic at -55 °C

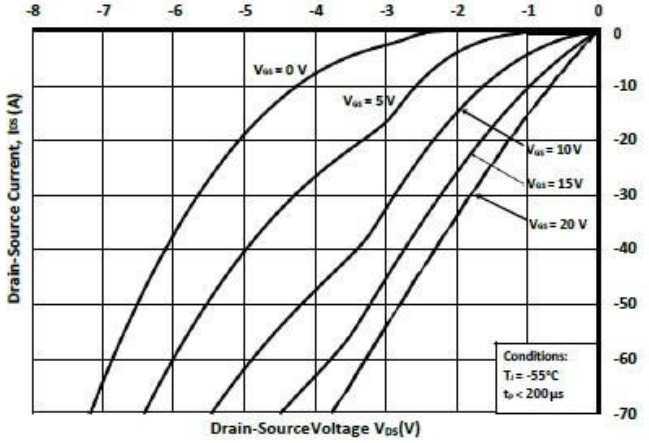


Fig.14 3rd Quadrant Characteristic at 25 °C

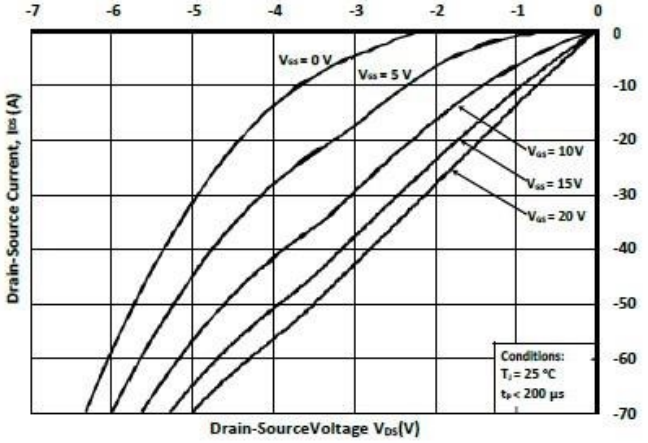


Fig.15 3rd Quadrant Characteristic at 150 °C

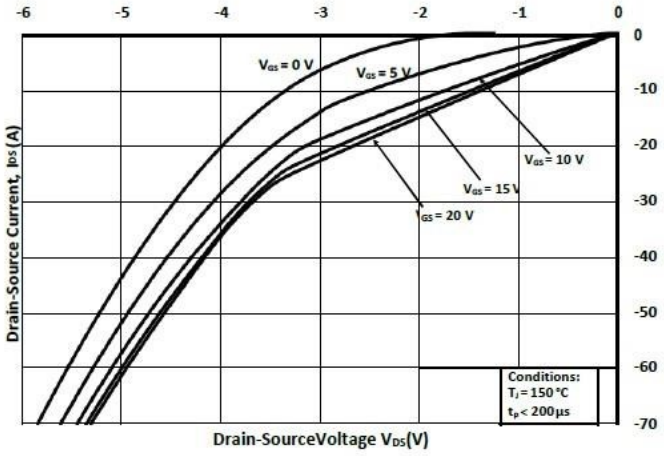


Fig.16 Output Capacitor Stored Energy

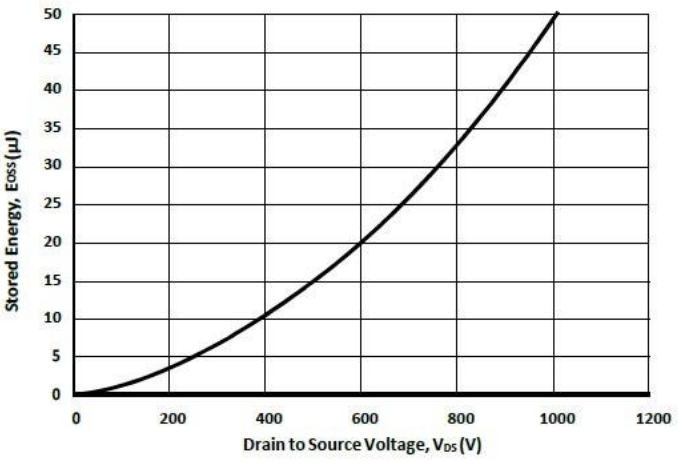


Fig.17 Capacitances vs. Drain-Source Voltage (0 - 200V)

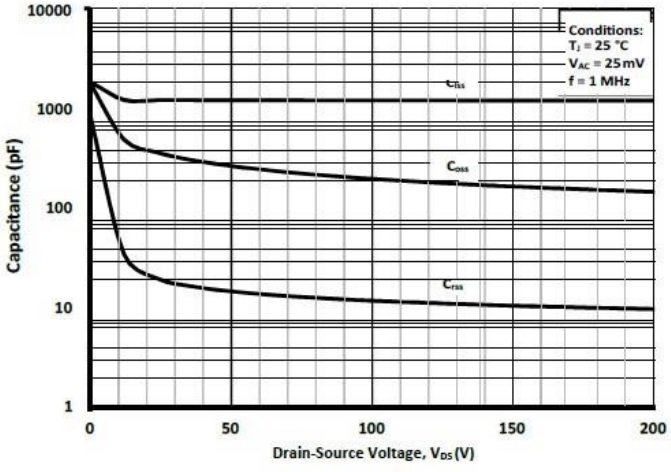


Fig.18 Capacitances vs. Drain-Source Voltage (0 - 1000V)

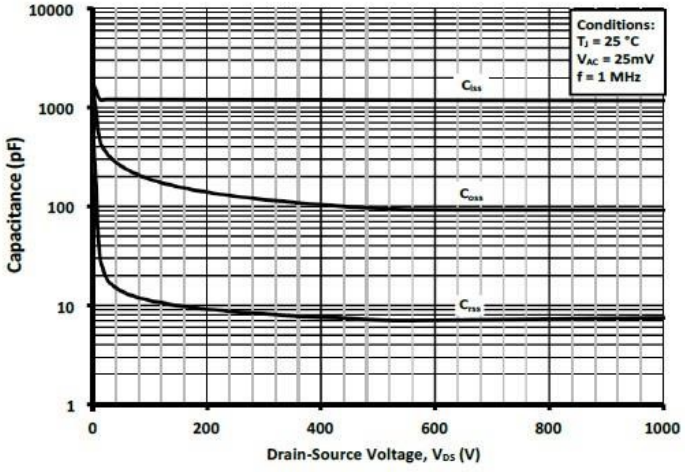


Fig.19 Continuous Drain Current Derating vs. Case Temperature

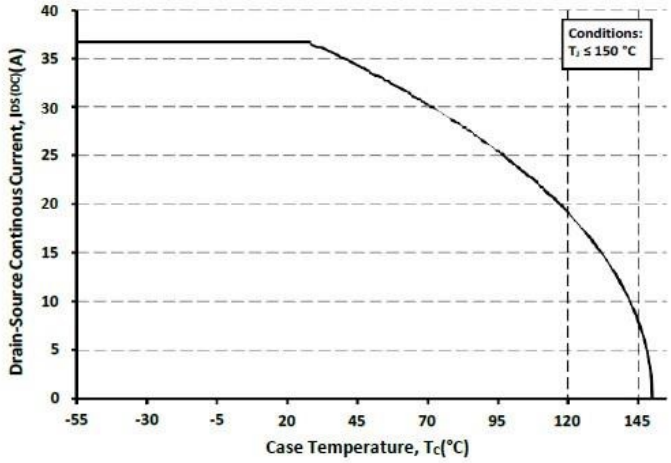


Fig.20 Maximum Power Dissipation Derating vs. Case Temperature

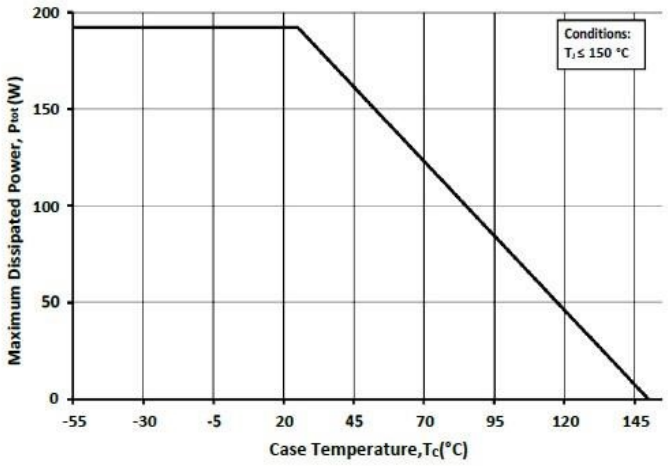


Fig.21 Transient Thermal Impedance (Junction - Case)

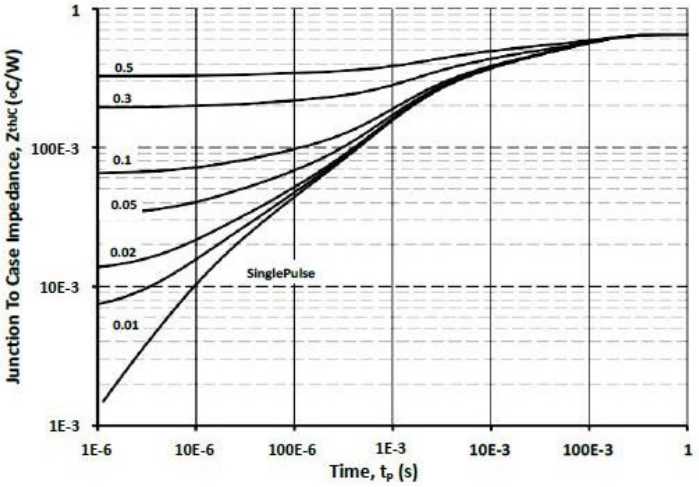


Fig.22 Safe Operating Area

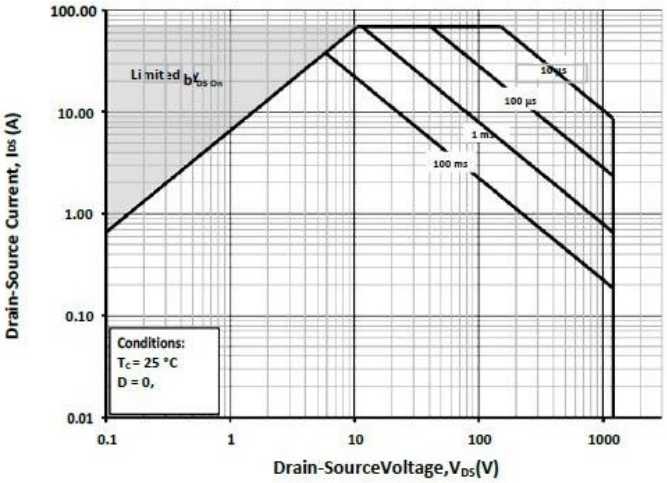


Fig.23 Clamped Inductive Switching Energy vs. Drain Current (V_{DD} = 800V)

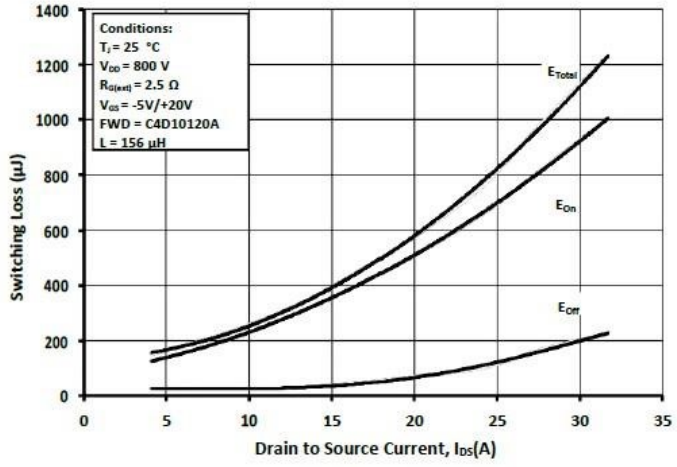


Fig.24 Clamped Inductive Switching Energy vs. Drain Current (V_{DD} = 600V)

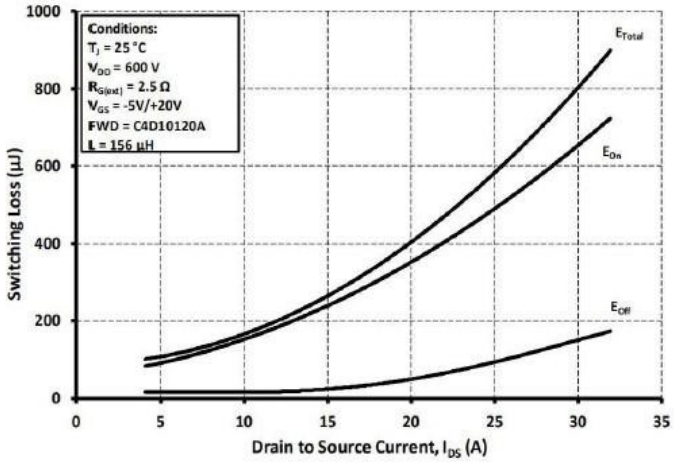


Fig. 25 Clamped Inductive Switching Energy vs. $R_{G(ext)}$

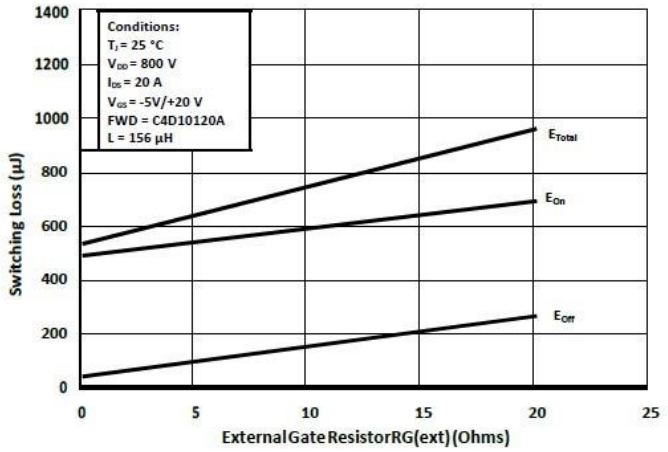


Fig. 26 Clamped Inductive Switching Energy vs. Temperature

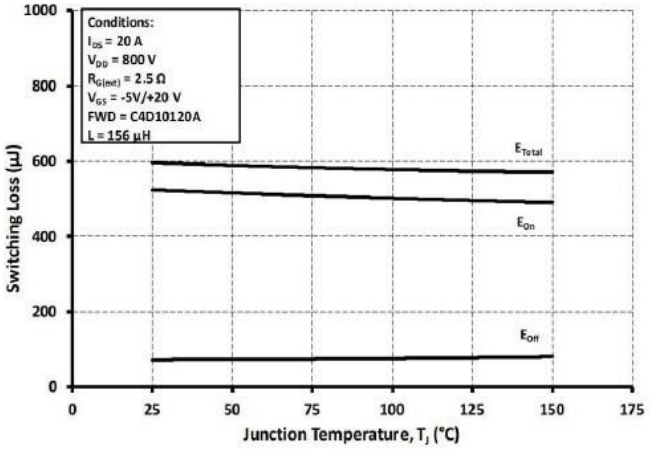


Fig.27 Switching Times vs. $R_{G(ext)}$

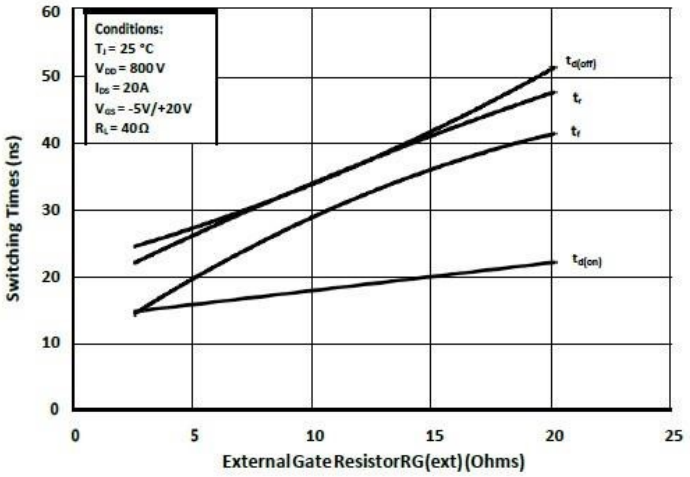


Fig.28 Switching Times Definition

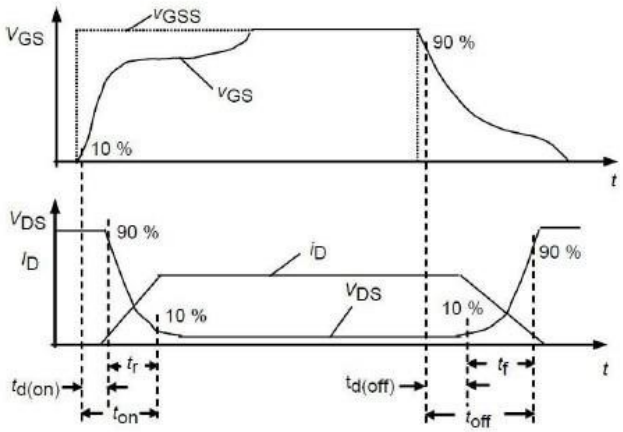
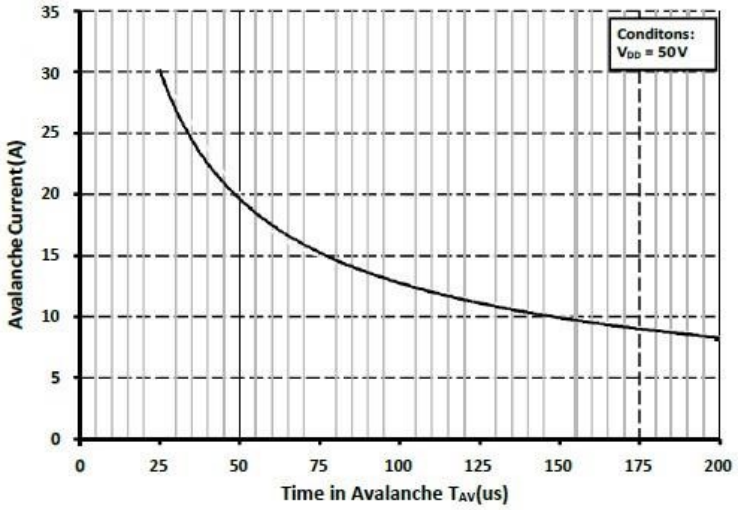
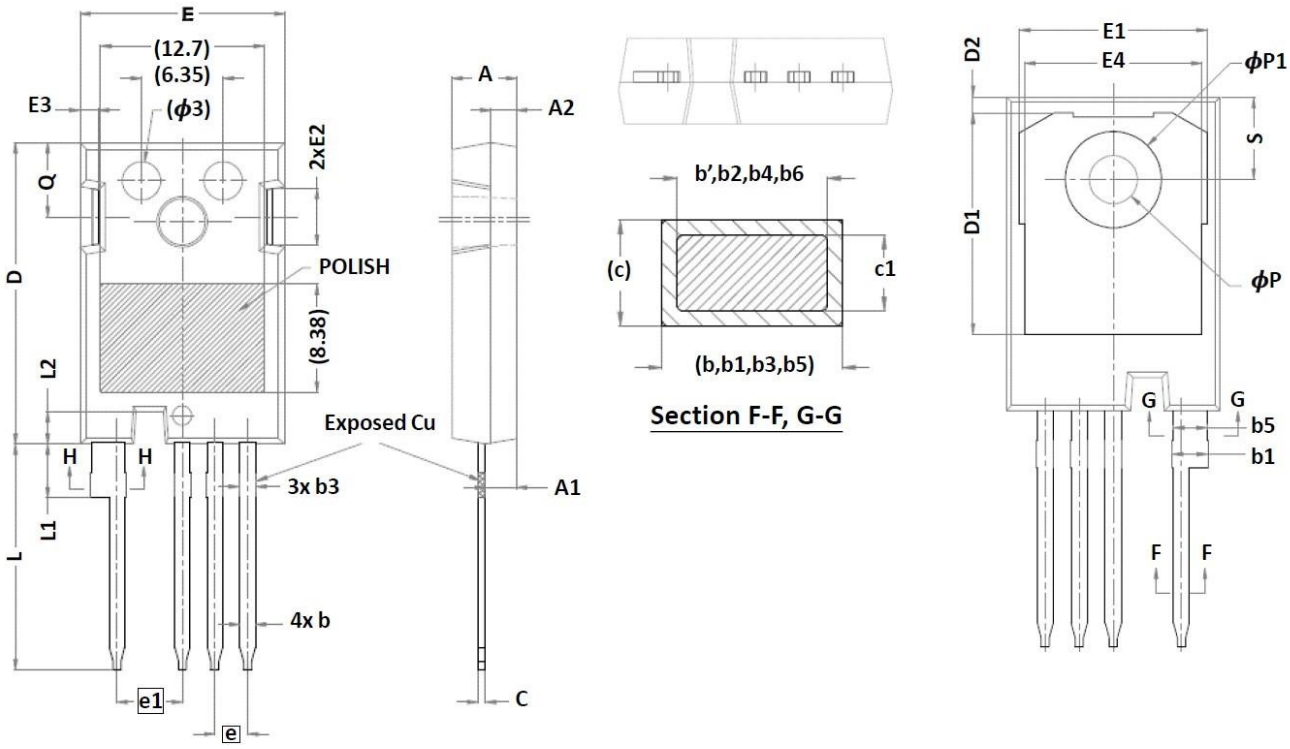


Fig. 29 Single Avalanche SOA curve



Package Dimensions



Symbol	Dimensions In Millimeters		
	Min.	Avg.	Max.
A	4.83	5.02	5.21
A1	2.29	2.41	2.54
A2	1.91	2.00	2.16
b'	1.07	1.20	1.28
b	1.07	1.20	1.33
b1	2.39	2.67	2.94
b2	2.39	2.67	2.84
b3	1.07	1.30	1.60
b4	1.07	1.30	1.50
b5	2.39	2.53	2.69
b6	2.39	2.53	2.64
c	0.55	0.60	0.68
c1	0.55	0.60	0.65
D	23.30	23.45	23.60
D1	16.25	16.55	17.65

Symbol	Dimensions In Millimeters		
	Min.	Avg.	Max.
D2	0.95	1.19	1.25
E	15.75	15.94	16.13
E1	13.10	14.02	14.15
E2	3.68	4.40	5.10
E3	1.00	1.45	1.90
E4	12.38	13.26	13.43
e	2.54 BSC		
e1	5.08 BSC		
L	17.31	17.57	17.82
L1	3.97	4.19	4.37
L2	2.35	2.50	2.65
ϕP	3.51	3.61	3.65
ϕP1	7.19 REF.		
Q	5.49	5.79	6.00
S	6.04	6.17	6.30