IVST12050SA1L – 1200V 50mΩ SiC MODULE

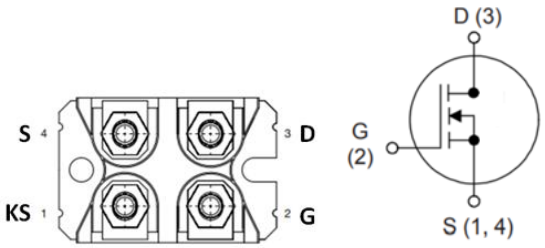
Features

- 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
- Kelvin gate input easing driver circuit design

Applications

- Solar inverters
- UPS application
- High voltage DC/DC converters
- Switch mode power supplies

Package



Part Number	Package
IVST12050SA1L	SOT 227

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

Symbol	Parameter	Value	Unit	Test Conditions	Note
V_{DS}	Drain-Source voltage	1200	V	V_{GS}=0V, I_D=100μA	
V_{GSmax} (DC)	Maximum DC voltage	-5 to 22	V	Static (DC)	
V_{GSmax} (Spike)	Maximum spike voltage	-10 to 25	V	<1% duty cycle, and pulse width<200ns	
V_{GSon}	Recommended turn-on voltage	20±0.5	V		
V_{GSoff}	Recommended turn-off voltage	-3.5 to -2	V		
I_D	Drain current (continuous)	64	A	V_{GS}=20V, T_C=25°C	Fig. 21
		45	A	V_{GS}=20V, T_C=100°C	
I_{DM}	Drain current (pulsed)	160	A	Pulse width limited by SOA	Fig. 24
P_{TOT}	Total power dissipation	413	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		

Thermal Data

Symbol	Parameter	Value	Unit	Note
$R_{\theta(J-C)}$	Thermal Resistance from Junction to Case	0.363	°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		5	100	μA	V_{DS}=1200V, V_{GS}=0V	
I_{GSS}	Gate leakage current			±100	nA	V_{DS}=0V, V_{GS}=-5~20V	
V_{TH}	Gate threshold voltage	1.8	3.2	5	V	V_{GS}=V_{DS}, I_D=6mA	Fig. 8, 9
			2.2			V_{GS}=V_{DS}, I_D=6mA @ T_C=175°C	
R_{ON}	Static drain-source on-resistance		50	65	mΩ	V_{GS}=20V, I_D=20A @T_J=25°C	Fig. 4, 5, 6, 7
			80		mΩ	V_{GS}=20V, I_D=20A @T_J=175°C	
C_{iss}	Input capacitance		2750		pF	V_{DS}=800V, V_{GS}=0V, f=1MHz, V_{AC}=25mV	Fig. 16
C_{oss}	Output capacitance		106		pF		
C_{rss}	Reverse transfer capacitance		5.2		pF		
E_{oss}	C_{oss} stored energy		43		μJ		Fig. 17
Q_g	Total gate charge		120		nC	V_{DS}=800V, I_D=20A, V_{GS}=-5 to 20V	Fig. 18
Q_{gs}	Gate-source charge		25		nC		
Q_{gd}	Gate-drain charge		48		nC		
R_g	Gate input resistance		2.8		Ω	f=1MHz	
E_{ON}	Turn-on switching energy		684.2		μJ	V_{DS}=800V I_{DS}=30A, V_{GS}=-3.5V~20V, $R_{G(ext)}$=3.3Ω, L=270μH	Fig. 19, 20
E_{OFF}	Turn-off switching energy		77.8		μJ		
$t_{d(on)}$	Turn-on delay time		14.7		ns		
t_r	Rise time		28.5				
$t_{d(off)}$	Turn-off delay time		23.1				
t_f	Fall time		12.4				

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		4.9		V	I_{SD}=20A, V_{GS}=0V	Fig. 10, 11, 12
			4.4		V	I_{SD}=20A, V_{GS}=0V, T_J=175°C	
t_{rr}	Reverse recovery time		54.6		ns	V_{GS}=-3.5V/+20V, I_{SD}=30A, V_R=800V, di/dt=2000A/us, $R_{G(ext)}$=16Ω, L=270μH	
Q_{rr}	Reverse recovery charge		233		nC		
I_{RRM}	Peak reverse recovery current		17.2		A		

Module Characteristics

Symbol	Parameter	Conditions	Value			Unit
			Min.	Typ.	Max.	
V_{ISOL}	Isolation test voltage	RMS, f=50Hz, t=1min			2.5	kV
Tstg	Storage temperature		-40		150	℃
M	Terminal connection torque	Screw M4	1.1		1.5	N·m
	Mounting torque	Screw M4	1.1		1.5	N·m
G	Weight of module			27		g
	Creepage distance	Terminal to heatsink		10.61		mm
		Terminal to terminal		10.37		mm
	Clearance	Terminal to heatsink		6.7		mm
		Terminal to terminal		4.05		mm

Typical Performance (curves)

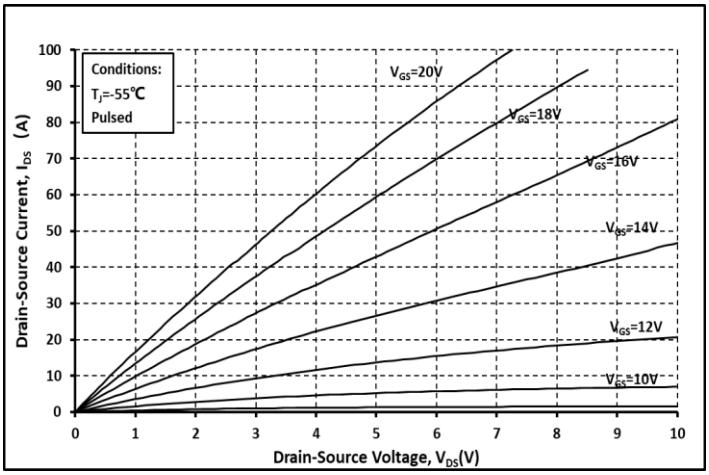


Fig. 1 Output Curve @ T_J=-55℃

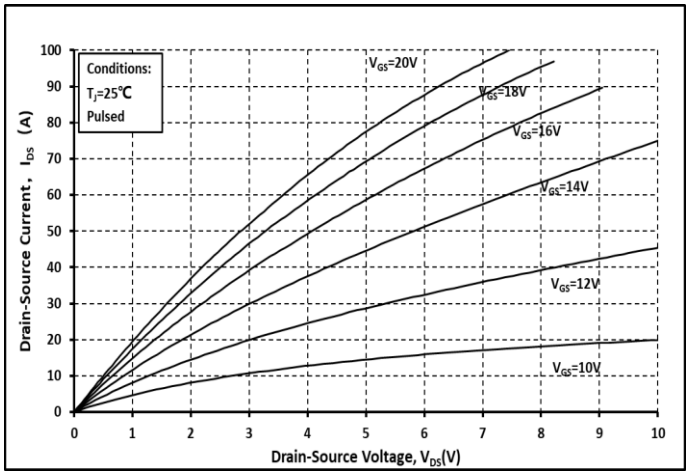


Fig. 2 Output Curve @ T_J=25℃

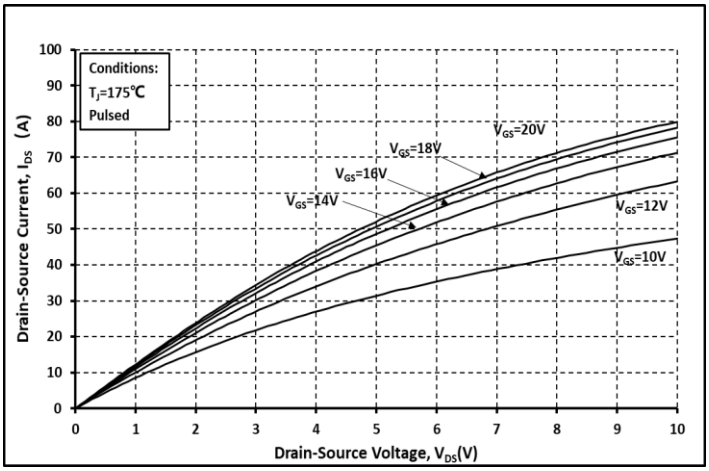


Fig. 3 Output Curve @ T_J=175℃

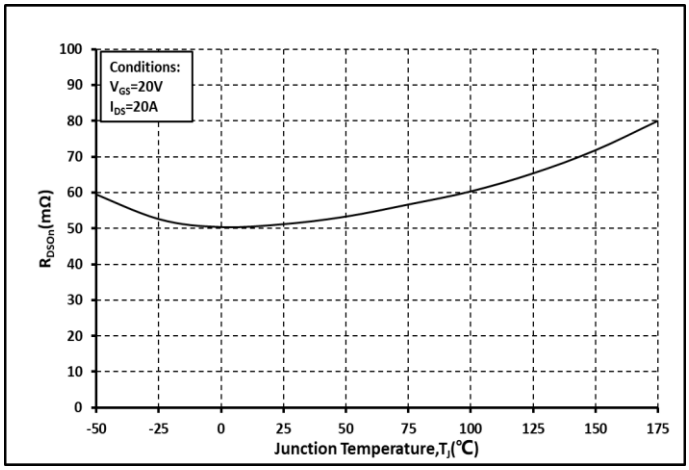


Fig. 4 Ron vs. Temperature

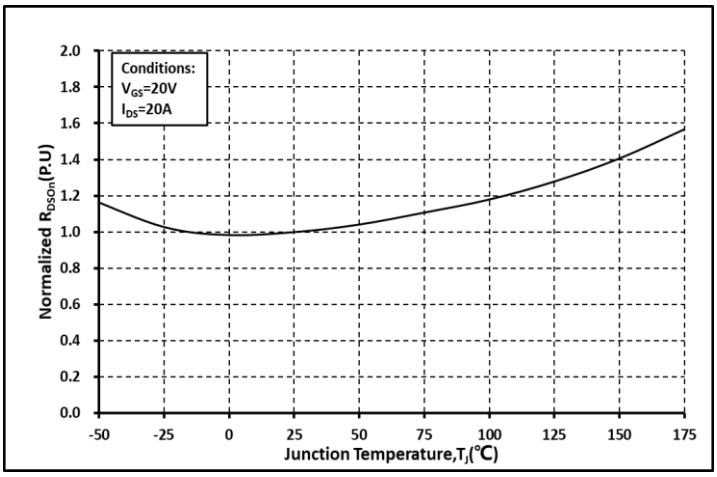


Fig. 5 Normalized Ron vs. Temperature

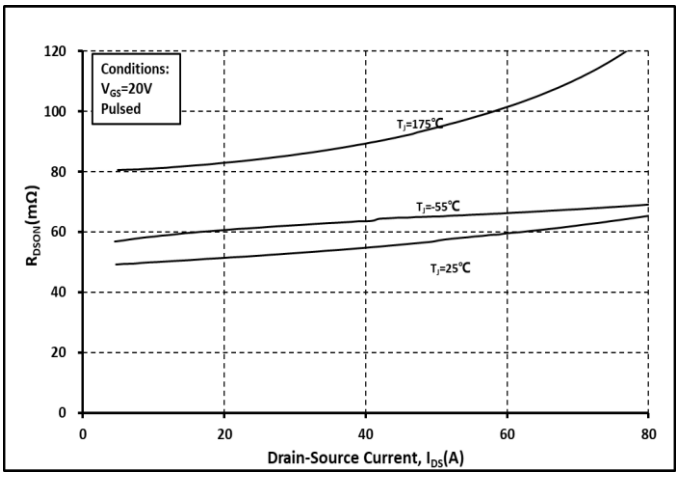


Fig. 6 Ron vs. I_{DS} @ Various Temperature

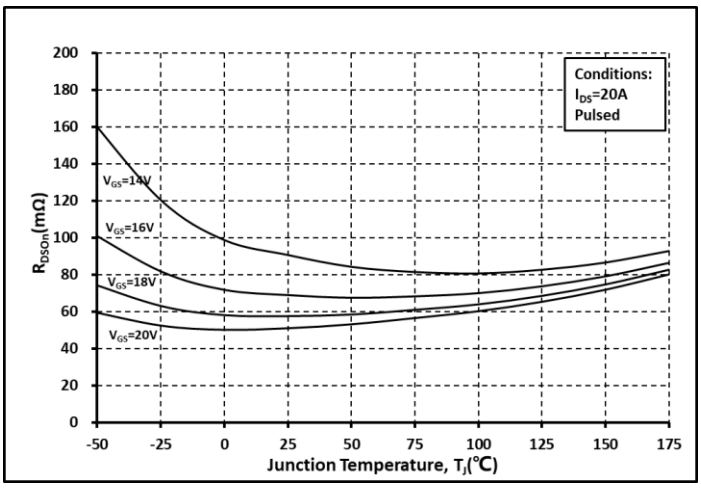


Fig. 7 Ron vs. Temperature @ Various V_{GS}

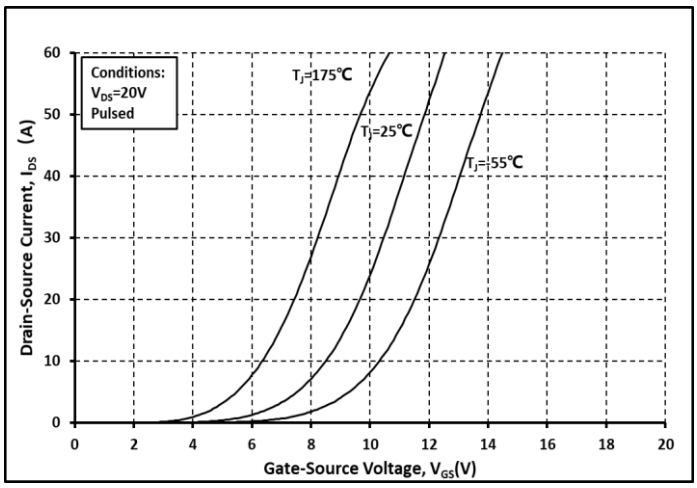


Fig. 8 Transfer Curves @ Various Temperature

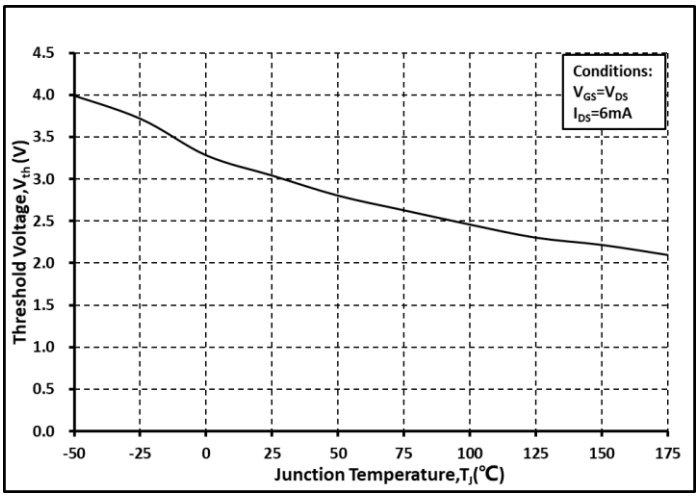


Fig. 9 Threshold Voltage vs. Temperature

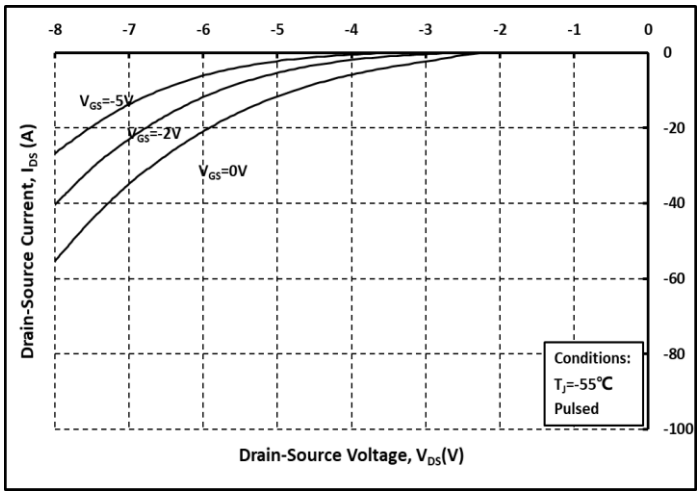


Fig. 10 Body Diode Curves @ T_J=-55°C

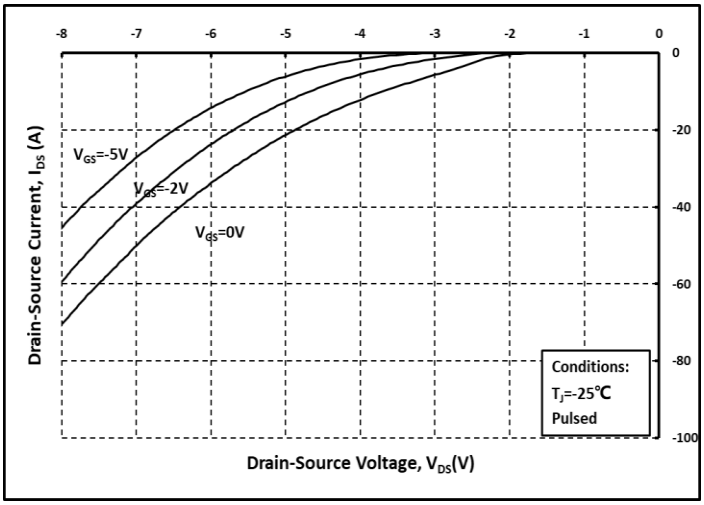


Fig. 11 Body Diode Curves @ T_J=25°C

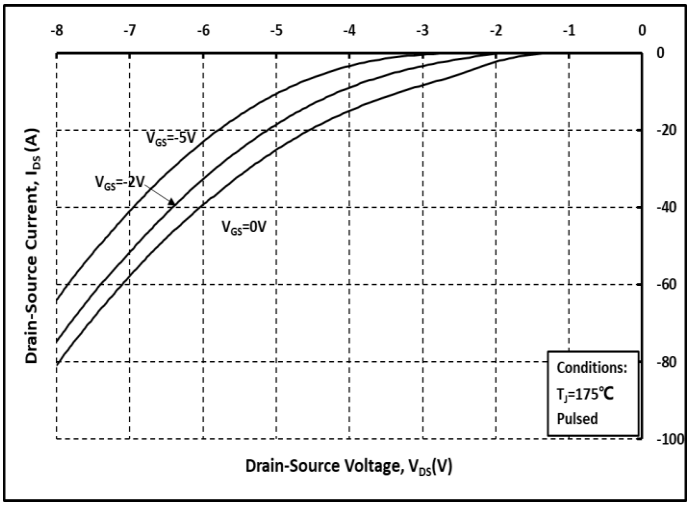


Fig. 12 Body Diode Curves @ T_J=175°C

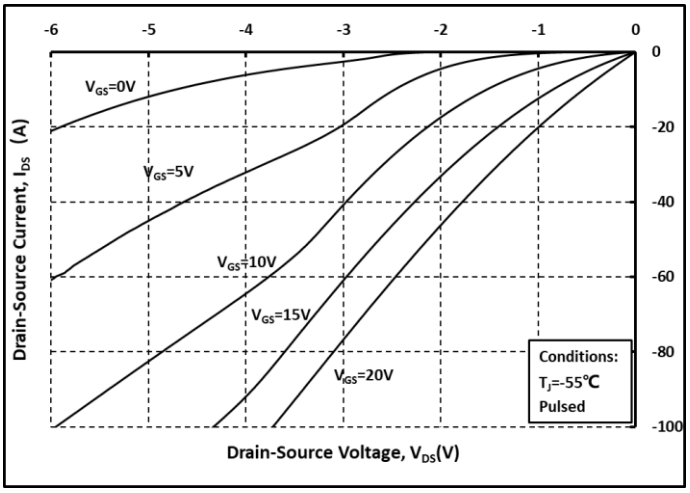


Fig. 13 3rd Quadrant Curves @ T_J=-55°C

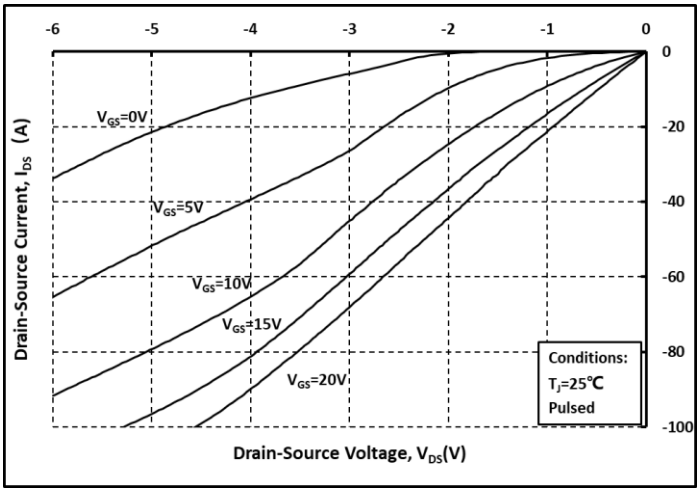


Fig. 14 3rd Quadrant Curves @ T_J=25°C

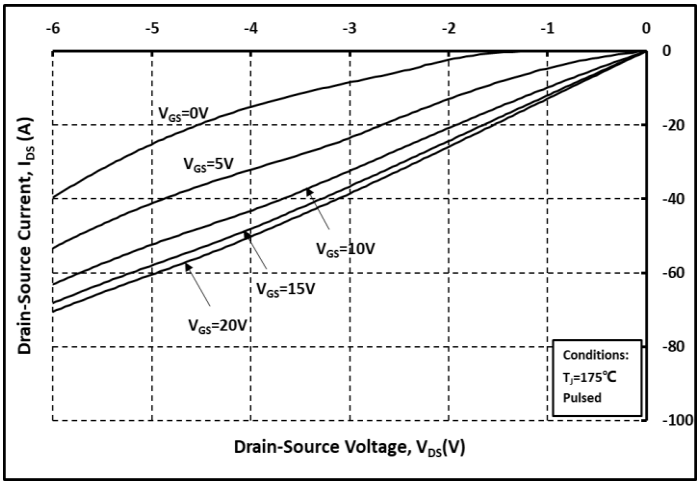


Fig. 15 3rd Quadrant Curves @ T_J=175°C

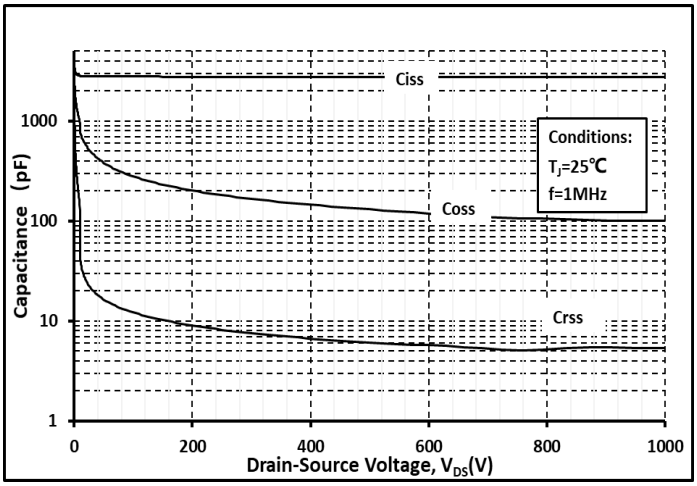


Fig. 16 Capacitance vs. V_{DS}

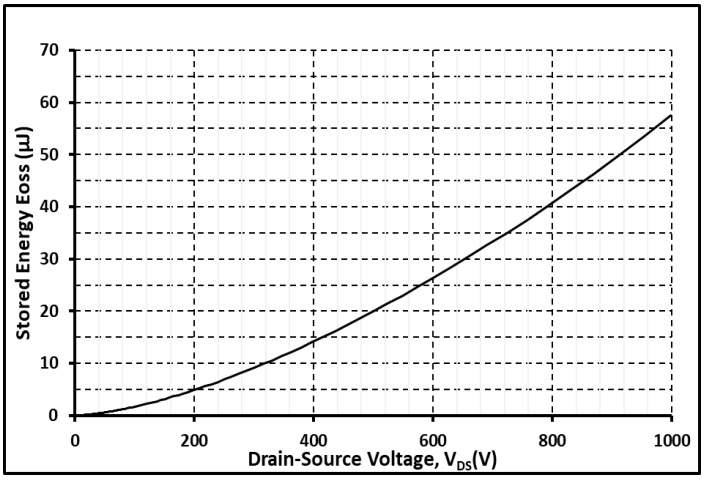


Fig. 17 Output Capacitor Stored Energy

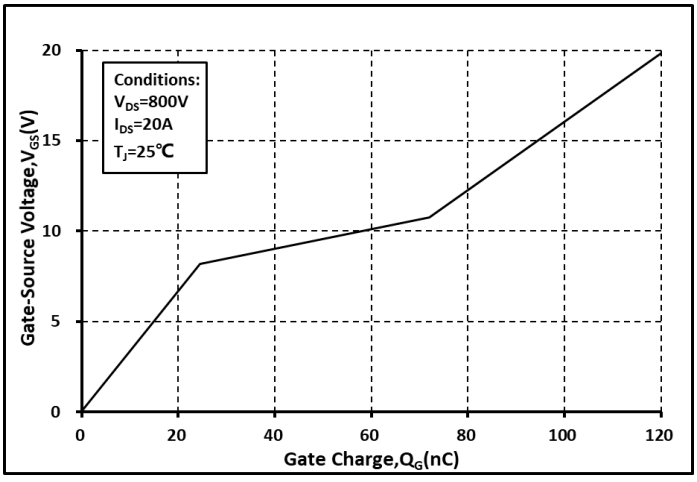


Fig. 18 Gate Charge Characteristics

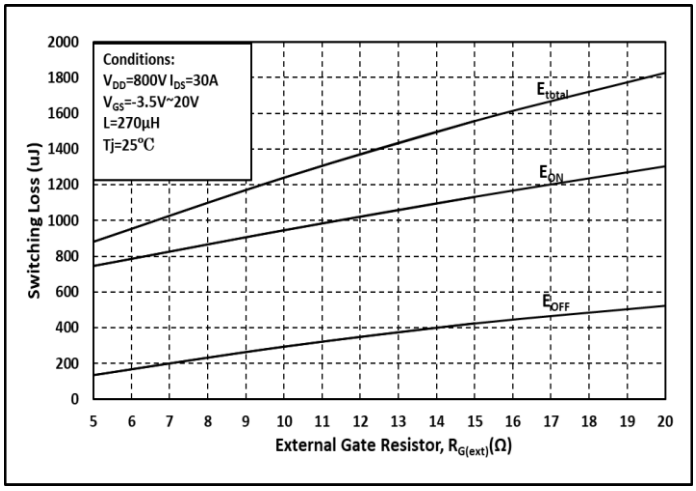


Fig. 19 Switching Energy vs. $R_{G(ext)}$

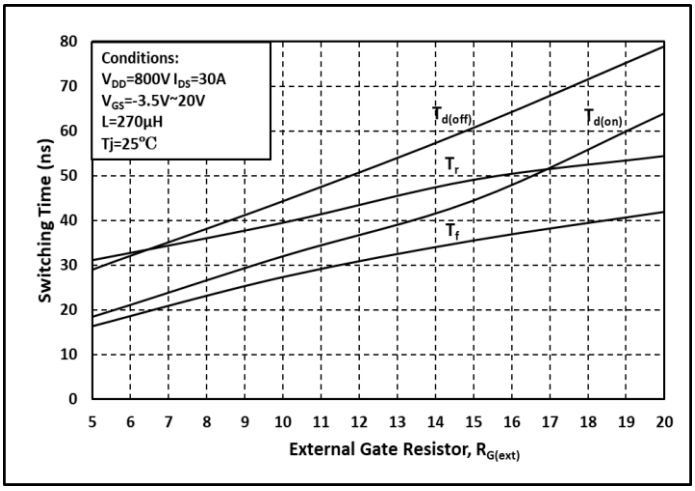


Fig. 20 Switching Times vs. $R_{G(ext)}$

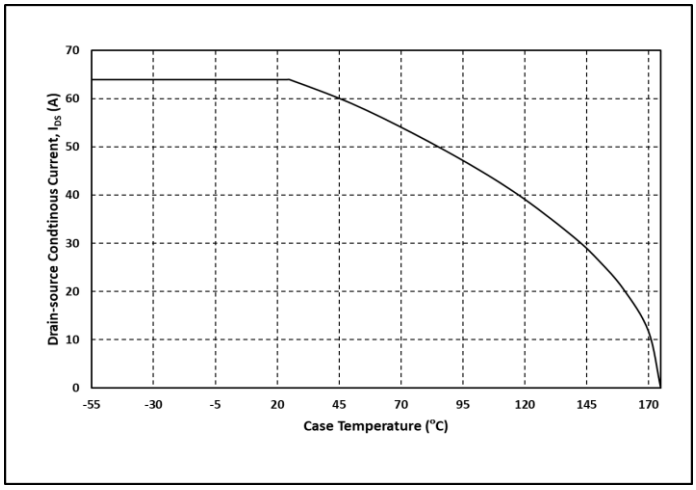


Fig. 21 Continuous Drain Current vs. Case Temperature

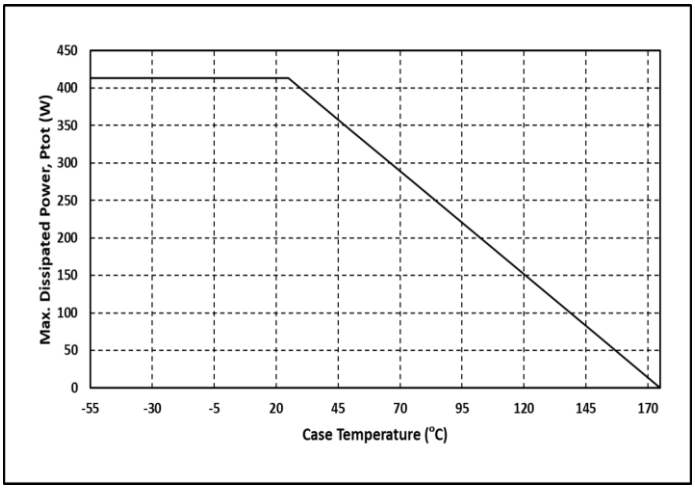


Fig. 22 Max. Power Dissipation Derating vs. Case Temperature

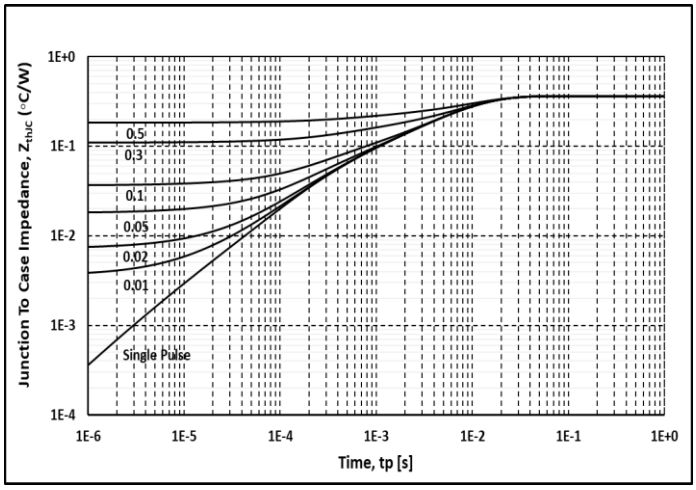


Fig. 23 Thermal Impedance

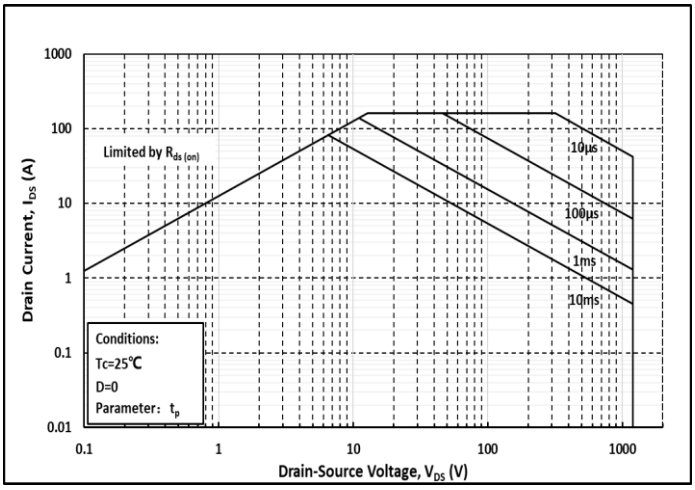
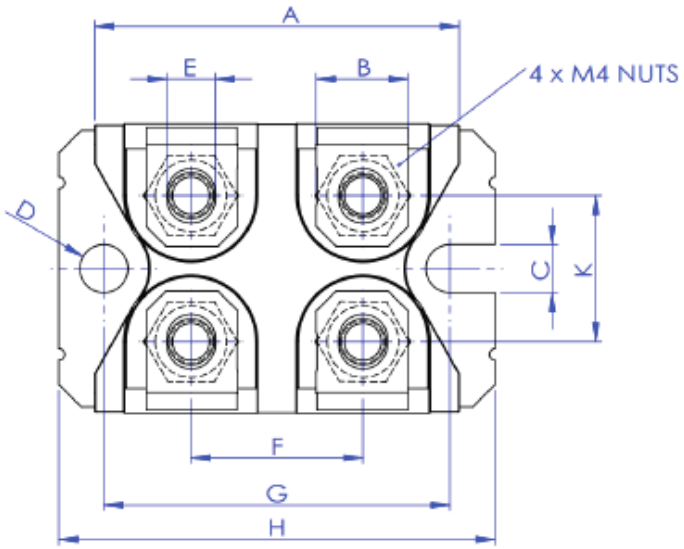
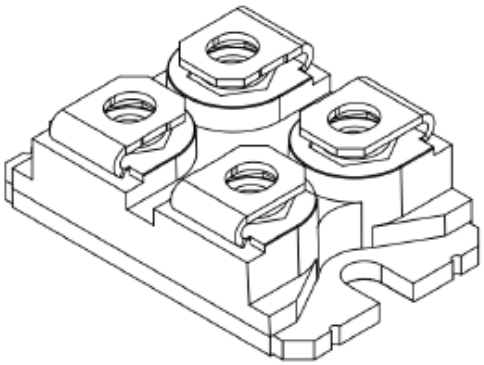
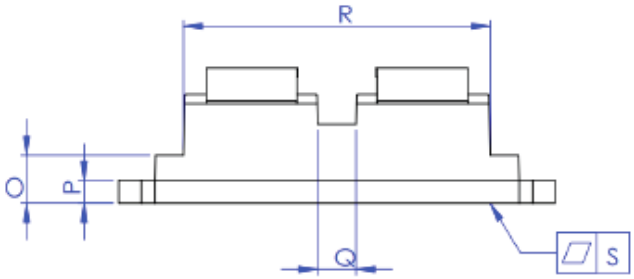


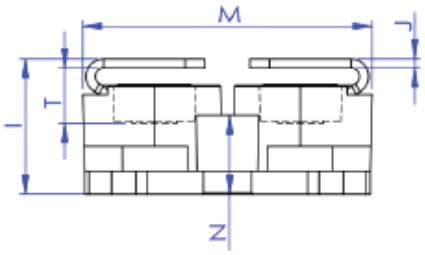
Fig. 24 Safe Operating Area

Package Dimensions









Dimension	Millmeter		Typical
	Min	Max	
A	31.50	32.00	31.70
B	7.70	8.30	8.00
C	4.10	4.30	4.20
D	4.10	4.30	4.20
E	4.10	4.30	4.20
F	14.90	15.15	15.0
G	29.80	30.40	30.10
H	37.80	38.30	38.05
I	11.80	12.30	12.05
J	0.75	0.85	0.80
K	12.50	13.00	12.75
M	25.00	25.50	25.30
N	6.75	7.10	6.90
O	4.00	4.40	4.20
P	1.90	2.10	2.00
Q	3.20	3.60	3.40
R	26.60	27.00	26.80
S	-0.03	0.10	0.01
T	4.85	5.25	5.05

Notes

For further information please contact IVCT's Office.

The Information in this document is subject to change without notice.

Related Links

http://www.inventchip.com.cn