

IVST12017SA1L – 1200V 17mΩ SiC Module

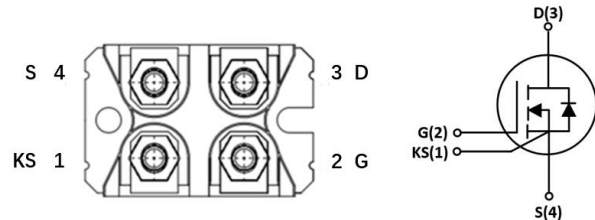
Features

- 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

- Introduction heating and welding
- Industrial motor drives
- Photo voltaic inverter
- Power supply and distribution

Package



Part Number	Package
IVST12017SA1L	SOT 227

Absolute Maximum Ratings ($T_c=25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Value	Unit	Test Conditions	Note
V_{DS}	Drain-Source voltage	1200	V	$V_{GS}=0V, I_D=100\mu A$	
$V_{GSmax}(DC)$	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)	121	A	$V_{GS}=20V, T_c=25^\circ\text{C}$	Fig. 23
		85	A	$V_{GS}=20V, T_c=100^\circ\text{C}$	
I_{DM}	Drain current (pulsed)	302	A	Pulse width limited by SOA	Fig. 26
P_{TOT}	Total power dissipation	464	W	$T_c=25^\circ\text{C}$	Fig. 24
T_{stg}	Storage temperature range	-55 to 175	$^\circ\text{C}$		
T_J	Operating junction temperature	-55 to 175	$^\circ\text{C}$		

Thermal Data

Symbol	Parameter	Value	Unit	Note
$R_{\theta(j-c)}$	Thermal Resistance from Junction to Case	0.323	$^\circ\text{C/W}$	Fig. 25

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 =18mA	Fig. 8, 9
			2.4			V _{GS} =V _{DS} , I _D =18mA @ T _c =175°C	
R _{ON}	Static drain-source on-resistance		17	21	mΩ	V _{GS} =20V, I _D =60A @T _J =25°C	Fig. 4, 5, 6, 7
			31.4		mΩ	V _{GS} =20V, I _D =60A @T _J =175°C	
C _{ISS}	Input capacitance		6180		pF	V _{DS} =800V, V _{GS} =0V, f=100kHz, V _{AC} =25mV	Fig. 16
C _{OSS}	Output capacitance		300		pF		
C _{RSS}	Reverse transfer capacitance		28.6		pF		
E _{OSS}	C _{OSS} stored energy		111		μJ		Fig. 17
Q _g	Total gate charge		280		nC	V _{DS} =800V, I _D =60A, V _{GS} =-5 to 20V	Fig. 18
Q _{gs}	Gate-source charge		96		nC		
Q _{gd}	Gate-drain charge		76		nC		
R _g	Gate input resistance		1.55		Ω	f=1MHz	
E _{ON}	Turn-on switching energy		1015		μJ	V _{DS} =800V, I _D =60A, V _{GS} =-3.5 to 20V, R _{G(ext)} =2.4Ω, L=200μH	Fig. 19, 20
E _{OFF}	Turn-off switching energy		744.7		μJ		
t _{d(on)}	Turn-on delay time		16.4		ns		
t _r	Rise time		39.6				
t _{d(off)}	Turn-off delay time		47.6				
t _f	Fall time		23.2				

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		3.5		V	$I_{SD}=30\text{A}, V_{GS}=0\text{V}$	Fig. 10, 11, 12
			3.2		V	$I_{SD}=30\text{A}, V_{GS}=0\text{V}, T_J=175^\circ\text{C}$	
t_{rr}	Reverse recovery time		22.8		ns	$V_{GS}=-3.5\text{V}/+20\text{V}, I_{SD}=60\text{A}, V_R=800\text{V}, R_{G(\text{ext})}=7.5\Omega,$	
Q_{rr}	Reverse recovery charge		418		nC	$dI/dt=3050\text{A}/\mu\text{s}, L=200\mu\text{H}$	
I_{RRM}	Peak reverse recovery current		31.6		A		

Module Characteristics

Symbol	Parameter	Conditions	Value			Unit
			Min.	Typ.	Max.	
V_{ISOL}	Isolation voltage	RMS, $f=50\text{Hz}, t=10\text{sec}, I_{ISOL} \leq 10\text{mA}^*$	3			kV
T_{STG}	Storage temperature		-40		150	$^\circ\text{C}$
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 distance	Terminal to heatsink		6.7		mm
		Terminal to terminal		4.05		mm

- *: 1. Isolation voltages are between terminals and baseplate.
2. All terminals are connected together during the test.

Typical Performance (curves)

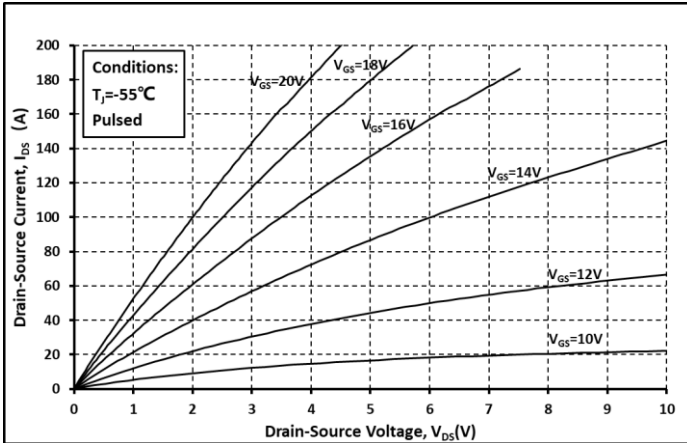


Fig. 1 Output Curve @ $T_j = -55^\circ\text{C}$

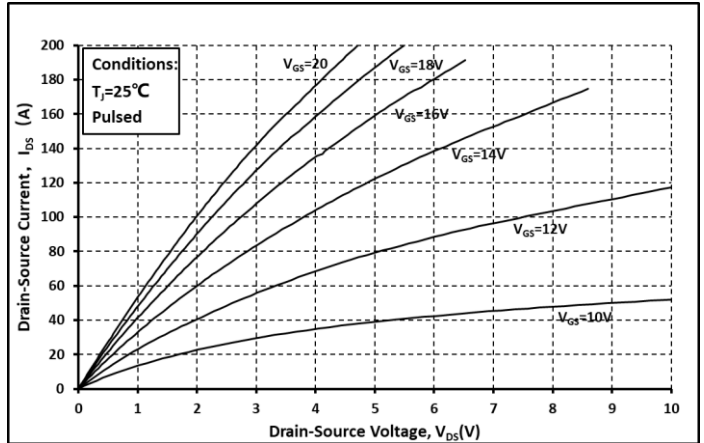


Fig. 2 Output Curve @ $T_j = 25^\circ\text{C}$

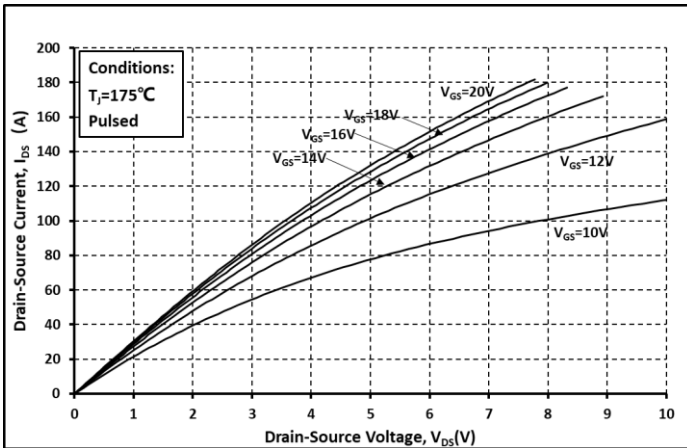


Fig. 3 Output Curve @ $T_j = 175^\circ\text{C}$

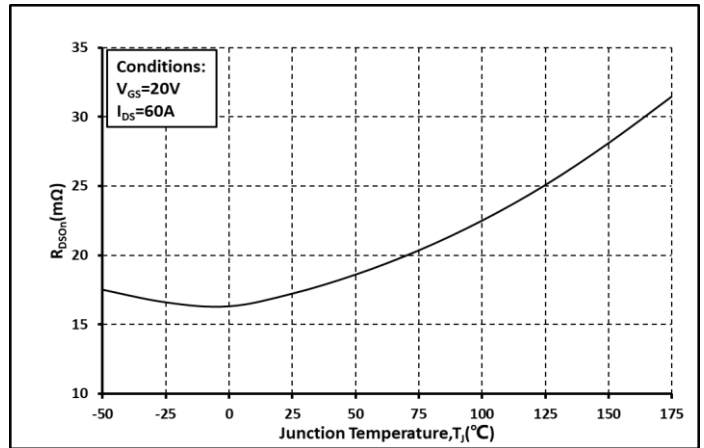


Fig. 4 R_{on} vs. Temperature

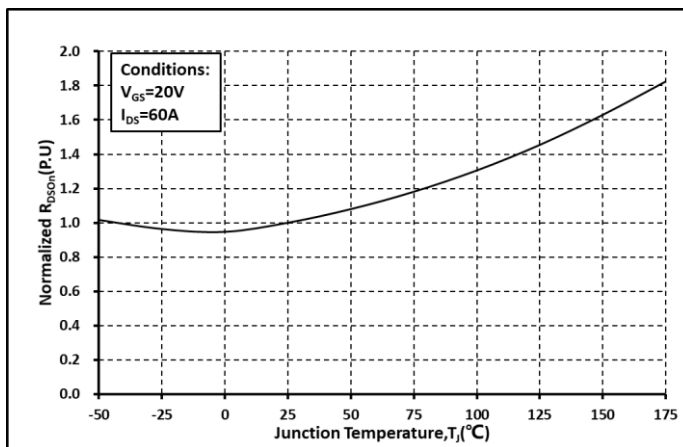


Fig. 5 Normalized R_{on} vs. Temperature

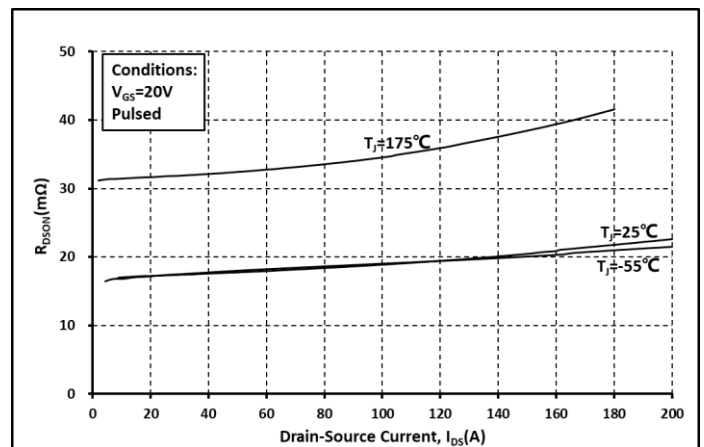


Fig. 6 R_{on} vs. I_{DS} @ Various Temperature

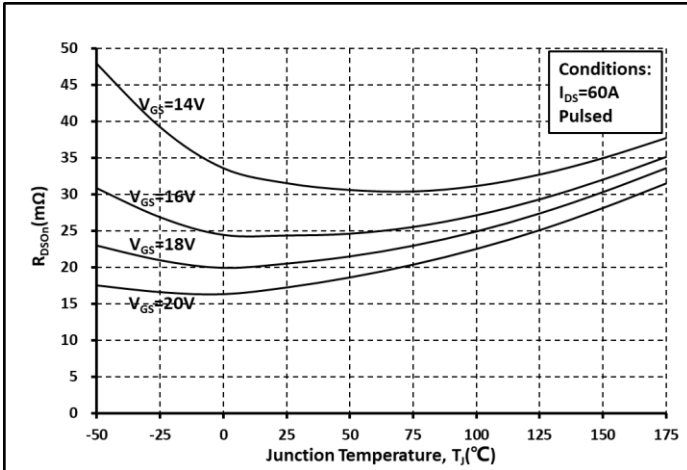


Fig. 7 Ron vs. Temperature @ Various V_{GS}

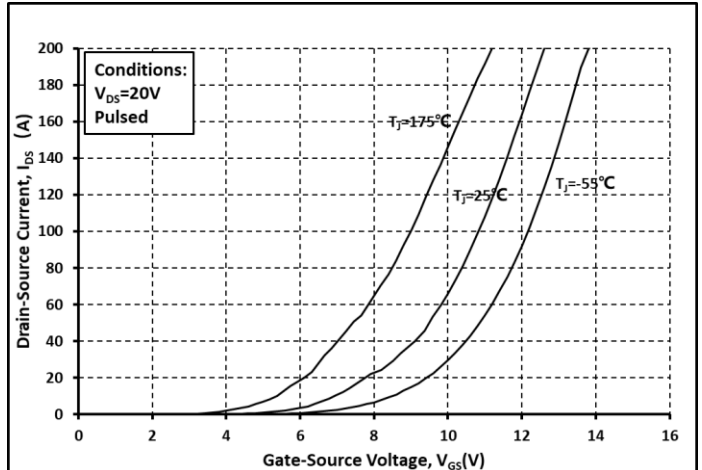


Fig. 8 Transfer Curves @ Various Temperature

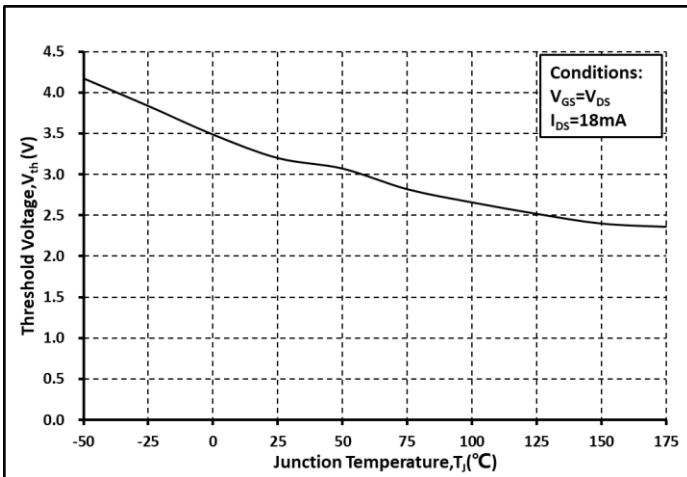


Fig. 9 Threshold Voltage vs. Temperature

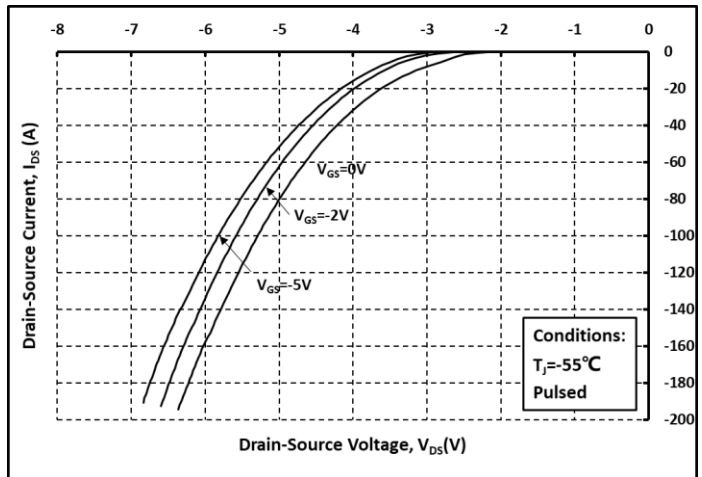


Fig. 10 Body Diode curves @ T_J = -55°C

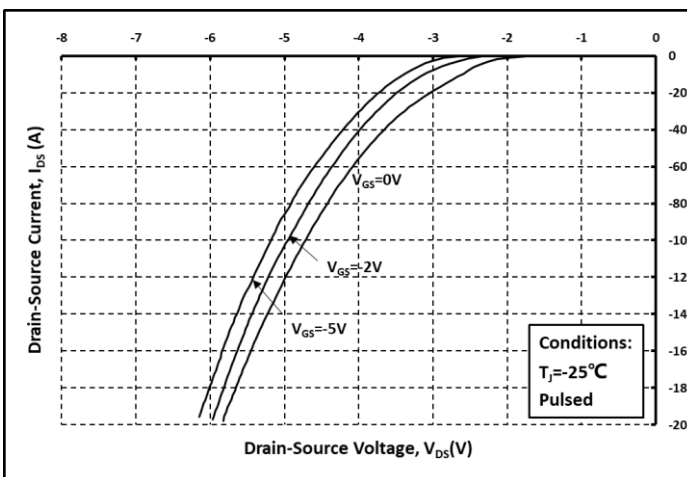


Fig. 11 Body Diode curves @ T_J = 25°C

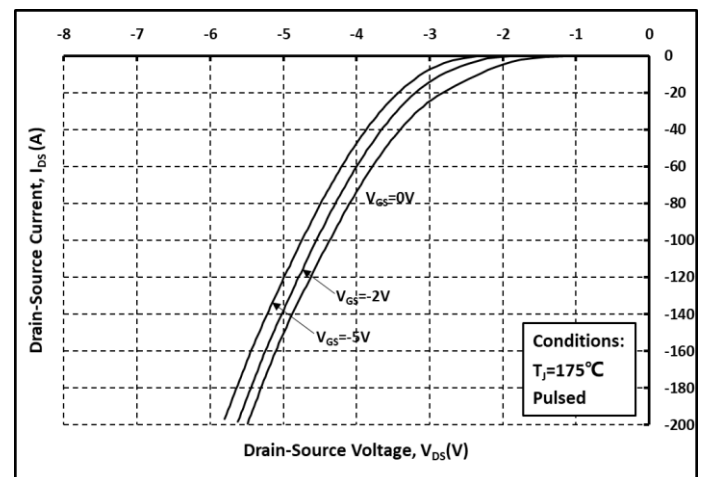


Fig. 12 Body Diode curves @ T_J = 175°C

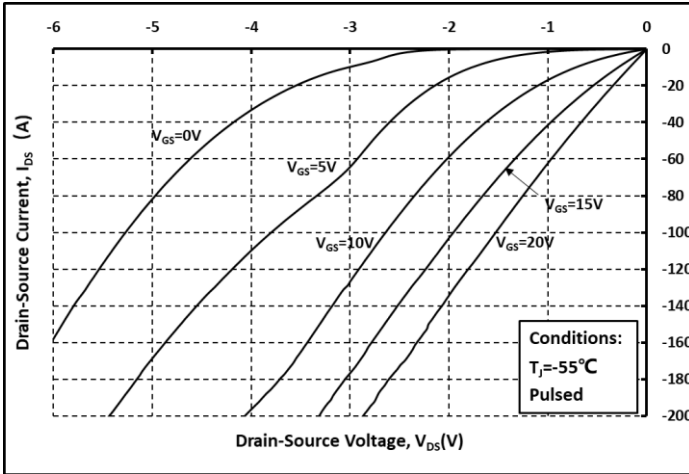


Fig. 13 3rd Quadrant curves @ $T_j = -55^\circ\text{C}$

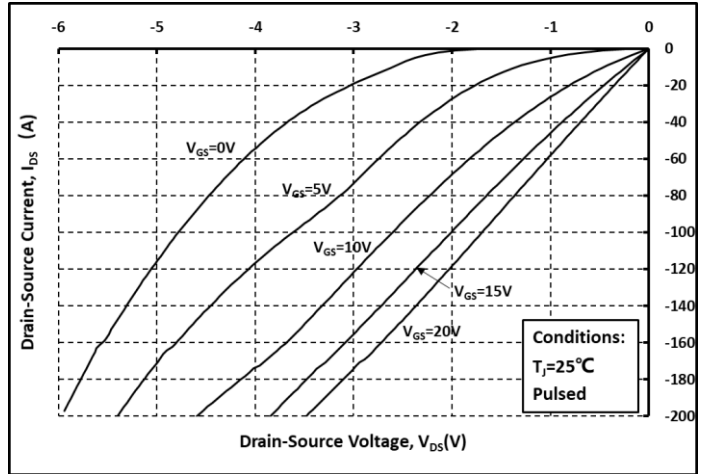


Fig. 14 3rd Quadrant curves @ $T_j = 25^\circ\text{C}$

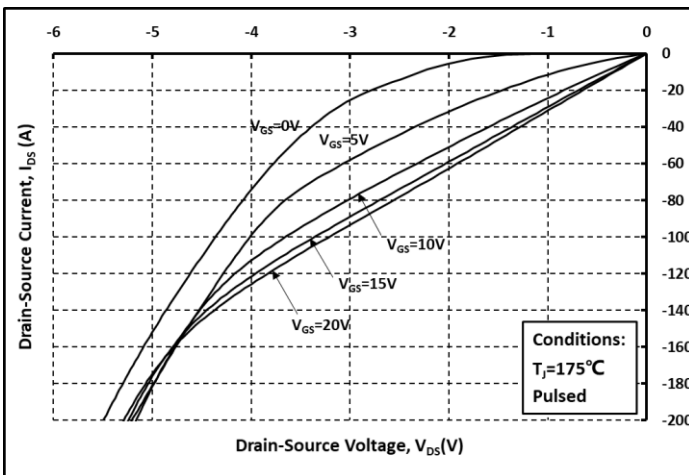


Fig. 15 3rd Quadrant curves @ $T_j = 175^\circ\text{C}$

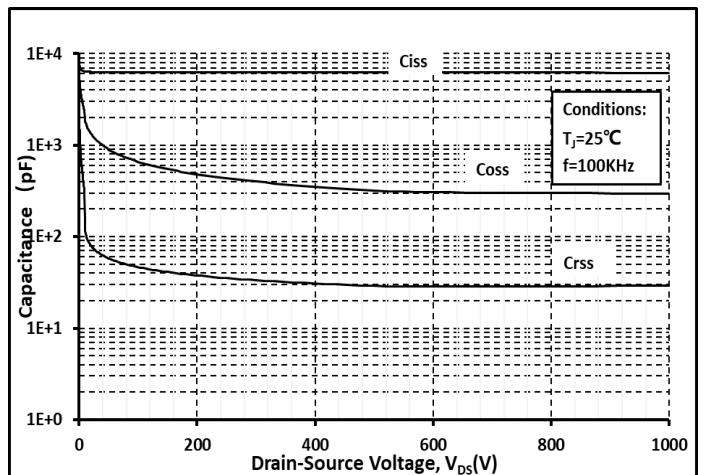


Fig. 16 Capacitance vs. V_{DS}

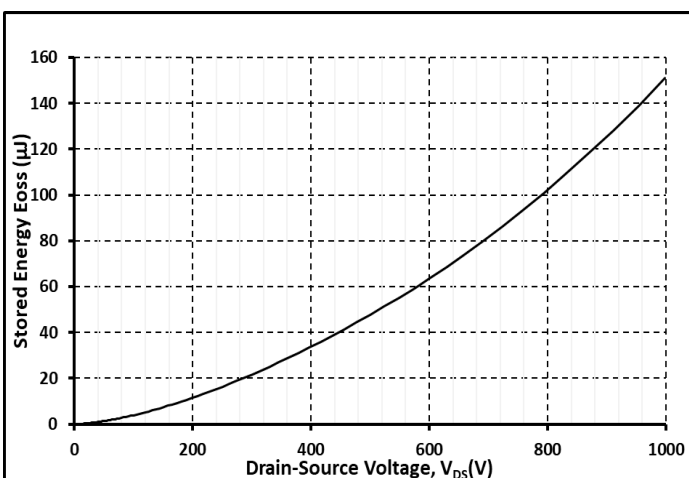


Fig. 17 Output Capacitor Stored Energy

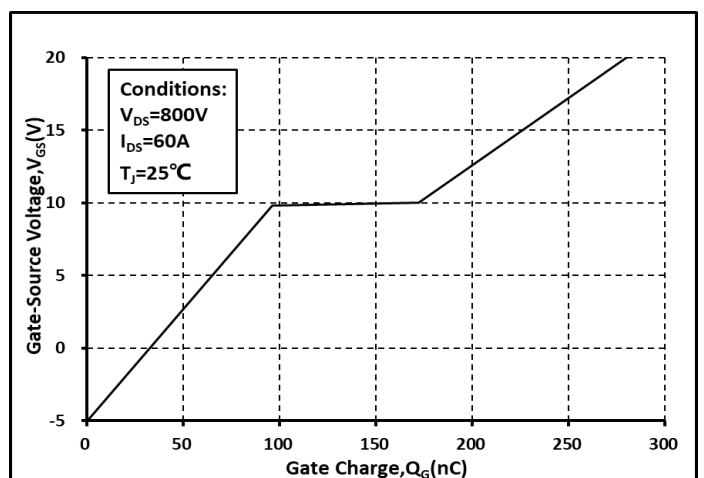


Fig. 18 Gate Charge Characteristics

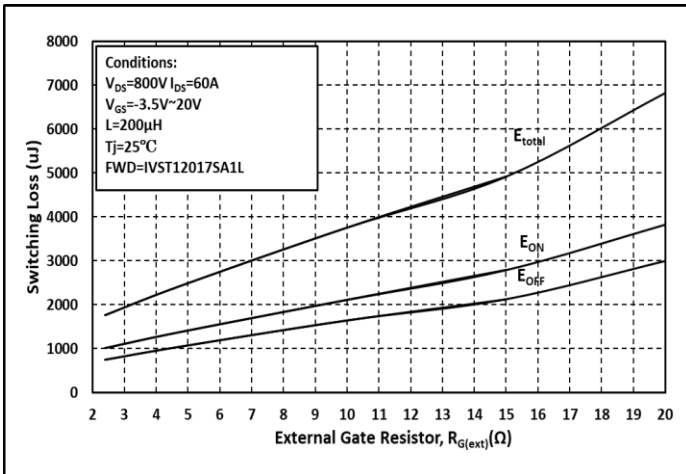


Fig. 19 Switching Energy vs. $R_{G(ext)}$

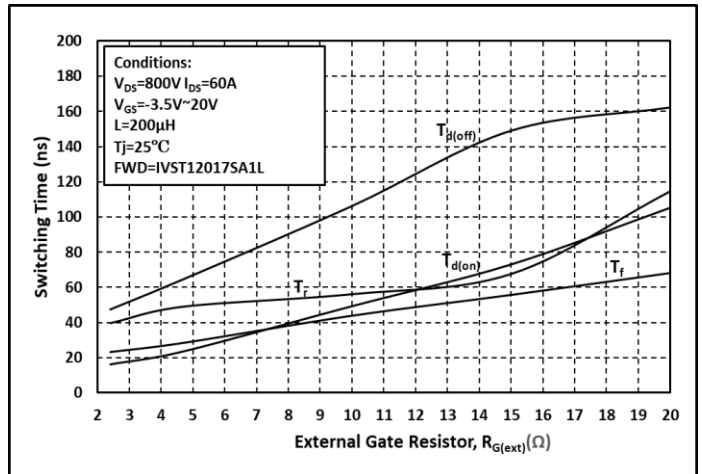


Fig. 20 Switching Times vs. $R_{G(ext)}$

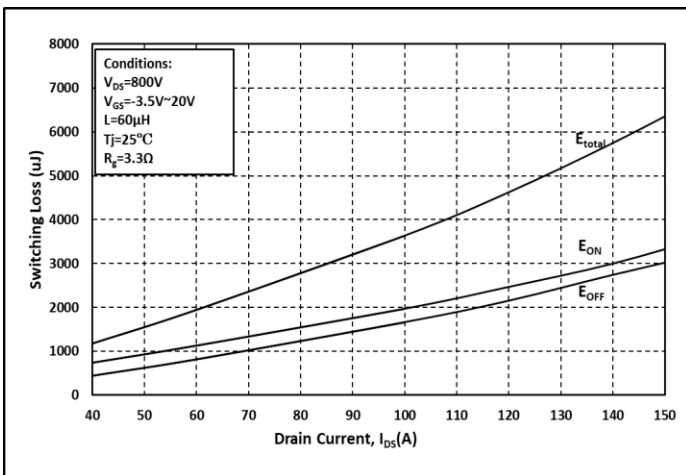


Fig. 21 Switching Energy vs. I_{DS}

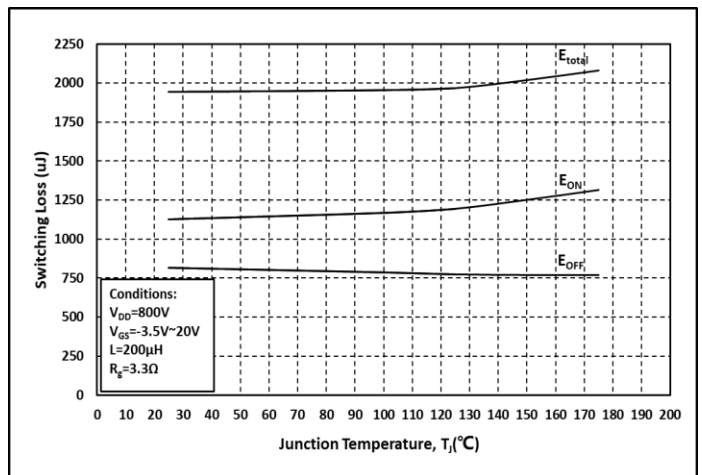


Fig. 22 Switching Energy vs. T_J

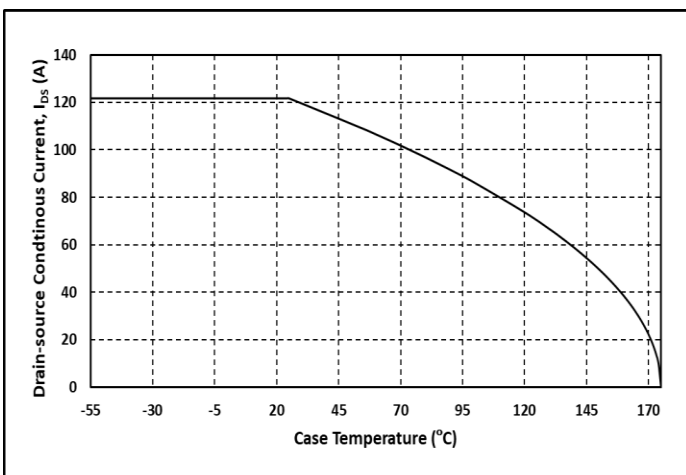


Fig. 23 Continuous Drain Current vs. Case Temperature

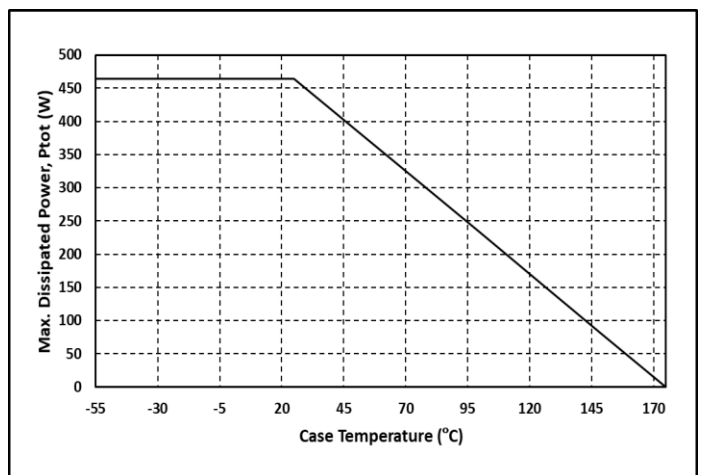


Fig. 24 Max. Power Dissipation Derating vs. Case Temperature

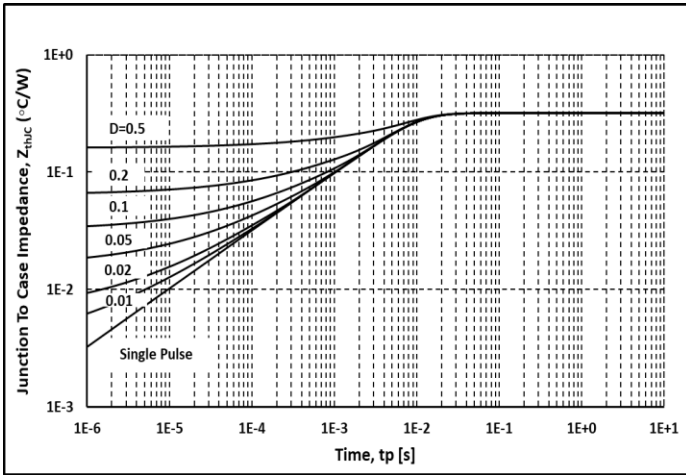


Fig. 25 Thermal impedance

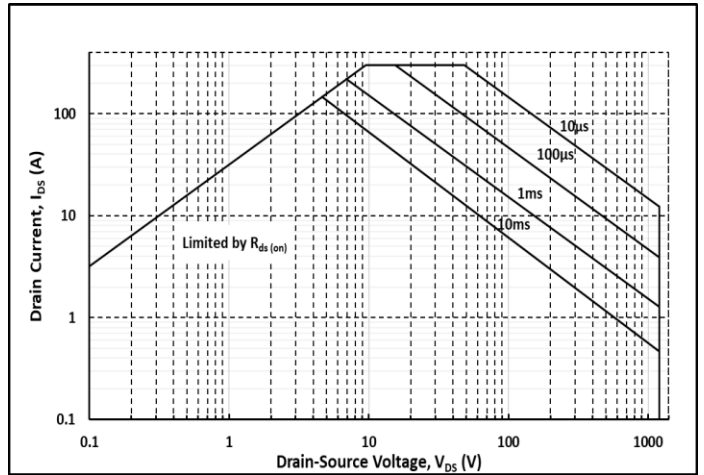
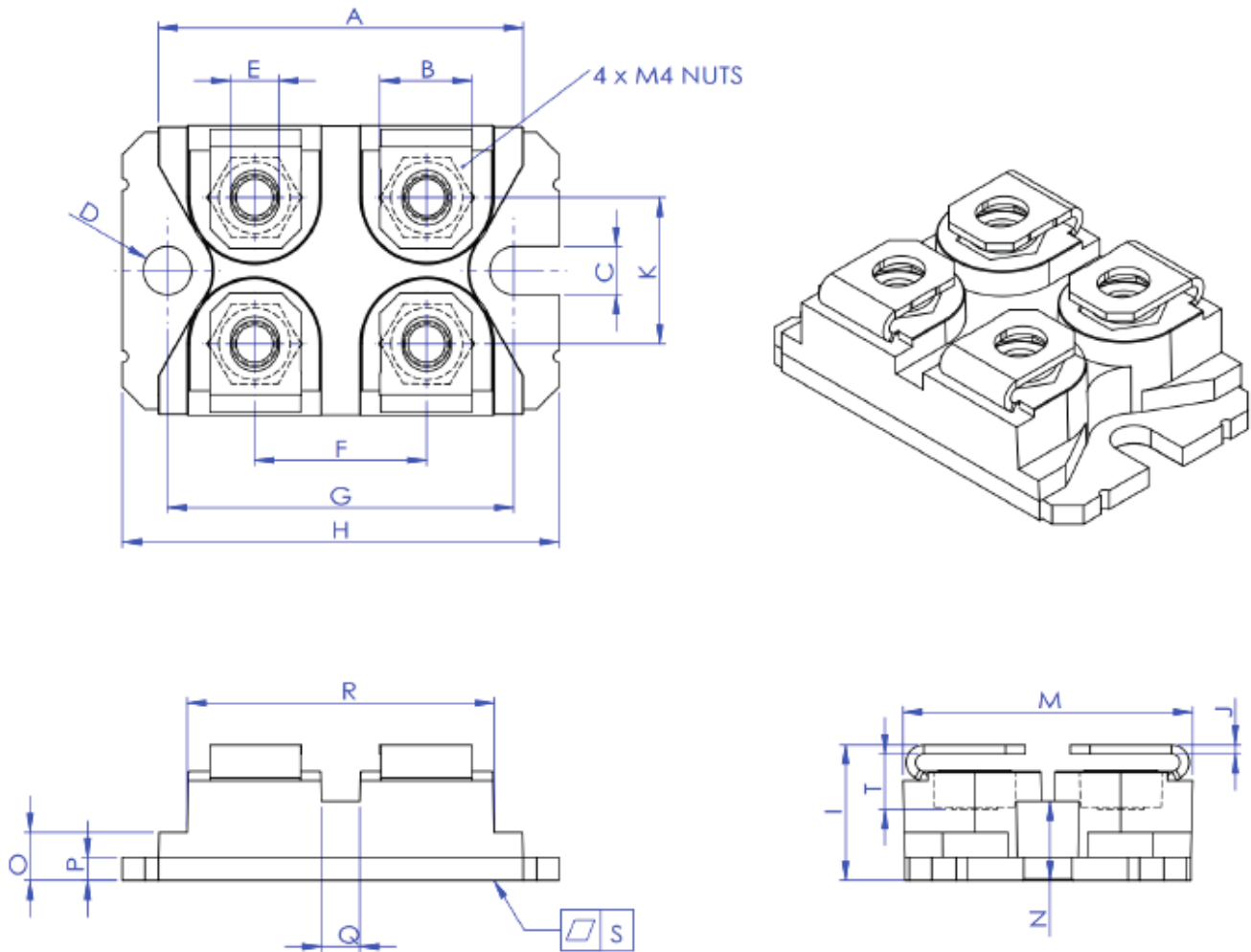


Fig. 26 Safe Operating Area

Package Dimensions



Dimension	Millimeter		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

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