

## IV1B12025HC1L – 1200V 25mohm SiC MODULE

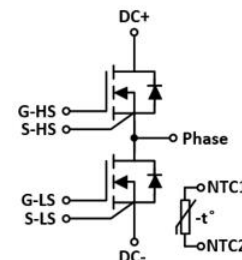
### Features

- 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

### Applications

- Solar applications
- UPS system
- Motor drivers
- High voltage DC/DC converters

### Package



IV1B12025HC1L	Specific Device Code	
YYWWZ-XXXXX	YY	Year
	WW	Work Week
	Z	Assembly Location
	XXXXX	Lot Traceability

### 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> =200μA	
V <sub>GSmax</sub> (DC)	Maximum DC voltage	-5 to 22	V	Static (DC)	
V <sub>GSmax</sub> (Spike)	Maximum spike voltage	-10 to 25	V	<1% duty cycle, and pulse width<200ns	
V <sub>GSon</sub>	Recommended turn-on voltage	20±0.5	V		
V <sub>GSoff</sub>	Recommended turn-off voltage	-3.5 to -2	V		
I <sub>D</sub>	Drain current (continuous)	74	A	V <sub>GS</sub> =20V, T <sub>C</sub> =25°C	
		50	A	V <sub>GS</sub> =20V, T <sub>C</sub> =94°C	
I <sub>DM</sub>	Drain current (pulsed)	185	A	Pulse width limited by SOA	Fig.26
P <sub>TOT</sub>	Total power dissipation	250	W	T <sub>C</sub> =25°C	Fig.24
T <sub>stg</sub>	Storage temperature range	-40 to 150	°C		
T <sub>J</sub>	Maximum virtual junction temperature under switching conditions	-40 to 150	°C	Operation	
		-55 to 175	°C	Intermittent with reduced life	

### Thermal Data

Symbol	Parameter	Value	Unit	Note
R <sub>θ(j-c)</sub>	Thermal Resistance from Junction to Case	0.5	°C/W	Fig.25

**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		10	200	$\mu\text{A}$	$V_{DS}=1200\text{V}, V_{GS}=0\text{V}$	
$I_{GSS}$	Gate leakage current		2	$\pm 200$	$\text{nA}$	$V_{DS}=0\text{V}, V_{GS}=-5\sim 20\text{V}$	
$V_{TH}$	Gate threshold voltage		3.2		$\text{V}$	$V_{GS}=V_{DS}, I_D=12\text{mA}$	Fig.9
			2.3			$V_{GS}=V_{DS}, I_D=12\text{mA}$ @ $T_c=150^{\circ}\text{C}$	
$R_{ON}$	Static drain-source on-resistance		25	33	$\text{m}\Omega$	$V_{GS}=20\text{V}, I_D=40\text{A}$ @ $T_j=25^{\circ}\text{C}$	Fig.4-7
			36		$\text{m}\Omega$	$V_{GS}=20\text{V}, I_D=40\text{A}$ @ $T_j=150^{\circ}\text{C}$	
$C_{iss}$	Input capacitance		5.5		$\text{nF}$	$V_{DS}=800\text{V}, V_{GS}=0\text{V},$ $f=100\text{kHz}, V_{AC}=25\text{mV}$	Fig.16
$C_{oss}$	Output capacitance		285		$\text{pF}$		
$C_{rss}$	Reverse transfer capacitance		20		$\text{pF}$		
$E_{oss}$	$C_{oss}$ stored energy		105		$\mu\text{J}$		Fig.17
$Q_g$	Total gate charge		240		$\text{nC}$	$V_{DS}=800\text{V}, I_D=40\text{A},$ $V_{GS}=-5\text{ to }20\text{V}$	Fig.18
$Q_{gs}$	Gate-source charge		50		$\text{nC}$		
$Q_{gd}$	Gate-drain charge		96		$\text{nC}$		
$R_g$	Gate input resistance		1.4		$\Omega$	$f=100\text{kHz}$	
$E_{ON}$	Turn-on switching energy		795		$\mu\text{J}$	$V_{DS}=600\text{V}, I_D=50\text{A},$ $V_{GS}=-5\text{ to }20\text{V},$ $R_{G(\text{ext})on} / R_{G(\text{ext})off}$ $=2.5\Omega/1.43\Omega,$ $L=120\mu\text{H}$	Fig.19-22
$E_{OFF}$	Turn-off switching energy		135		$\mu\text{J}$		
$t_{d(on)}$	Turn-on delay time		15		ns		
$t_r$	Rise time		4.1				
$t_{d(off)}$	Turn-off delay time		24				
$t_f$	Fall time		17				
$L_{sCE}$	Stray inductance		8.8		$\text{nH}$		

**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		4.9		V	$I_{SD}=40\text{A}, V_{GS}=0\text{V}$	Fig.10-12
			4.5		V	$I_{SD}=40\text{A}, V_{GS}=0\text{V}, T_J=150^\circ\text{C}$	
$t_{rr}$	Reverse recovery time		18		ns	$V_{GS}=-5\text{V}/+20\text{V},$	
$Q_{rr}$	Reverse recovery charge		1068		nC	$I_{SD}=50\text{A}, V_R=600\text{V},$ $di/dt=14.29\text{A/ns},$	
$I_{RRM}$	Peak reverse recovery current		96.3		A	$R_{G(\text{ext})}=2.5\Omega, L=120\mu\text{H}$	

**NTC Thermistor Characteristics**

Symbol	Parameter	Value			Unit	Test Conditions	Note
		Min.	Typ.	Max.			
$R_{NTC}$	Rated Resistance		5		k $\Omega$	$T_{NTC}=25^\circ\text{C}$	Fig.27
$\Delta R/R$	Resistance Tolerance at $25^\circ\text{C}$	-5		5	%		
$\beta_{25/50}$	Beta Value		3380		K	$\pm 1\%$	
$P_{max}$	Power Dissipation		5		mW		

## Typical Performance (curves)

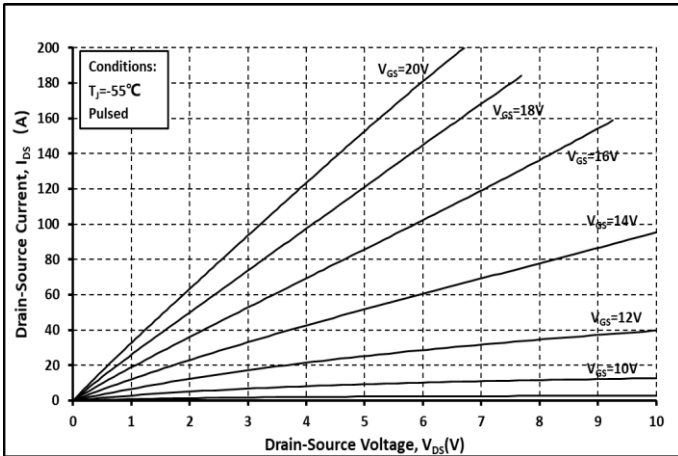


Fig. 1 Output Curve @  $T_j = -55^\circ\text{C}$

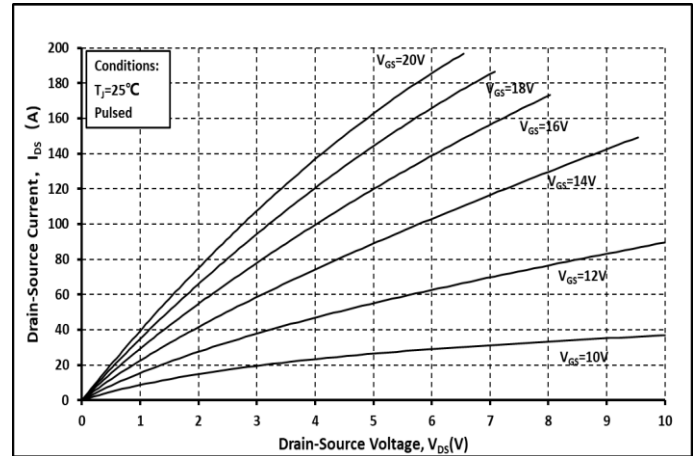


Fig. 2 Output Curve @  $T_j = 25^\circ\text{C}$

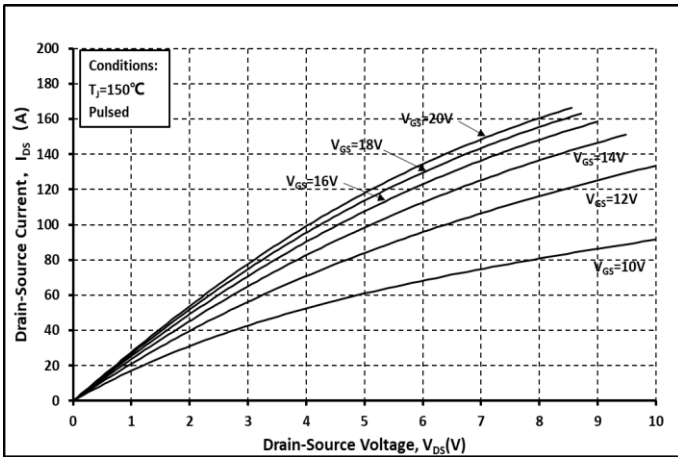


Fig. 3 Output Curve @  $T_j = 150^\circ\text{C}$

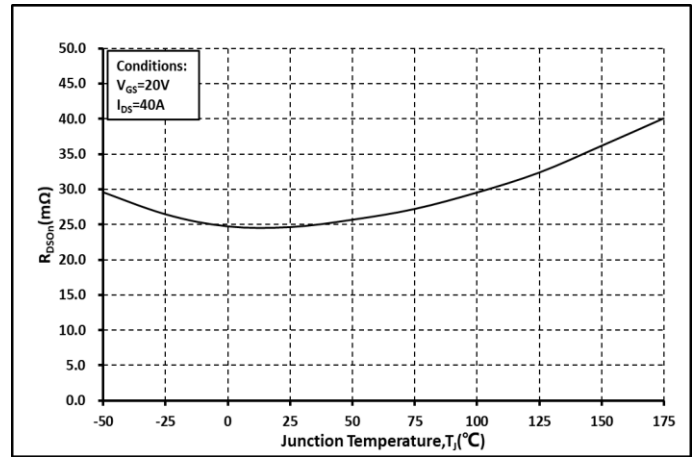


Fig. 4  $R_{on}$  vs. Temperature

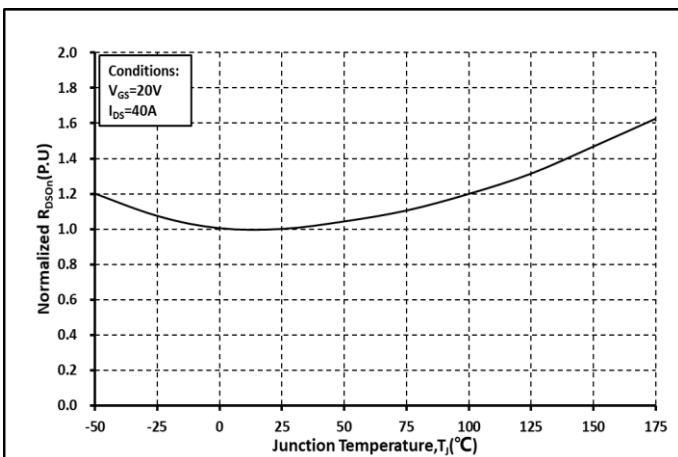


Fig. 5 Normalized  $R_{on}$  vs. Temperature

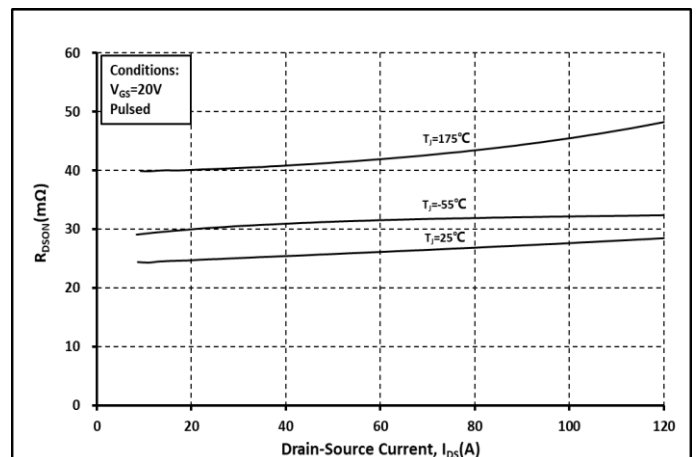


Fig. 6  $R_{on}$  vs.  $I_{DS}$  @ Various Temperature

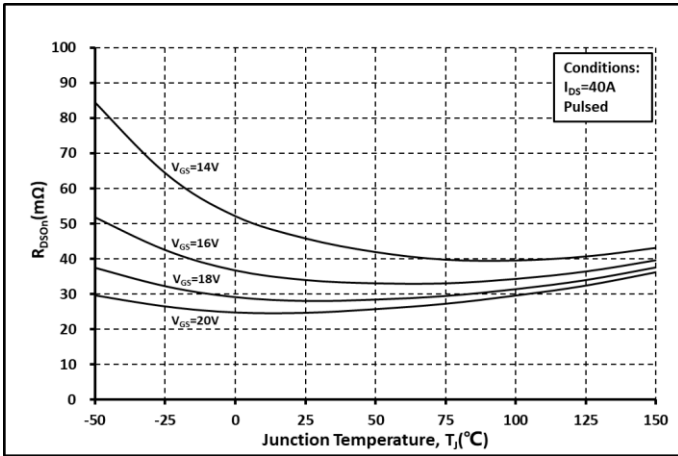


Fig. 7 Ron vs. Temperature @ Various  $V_{GS}$

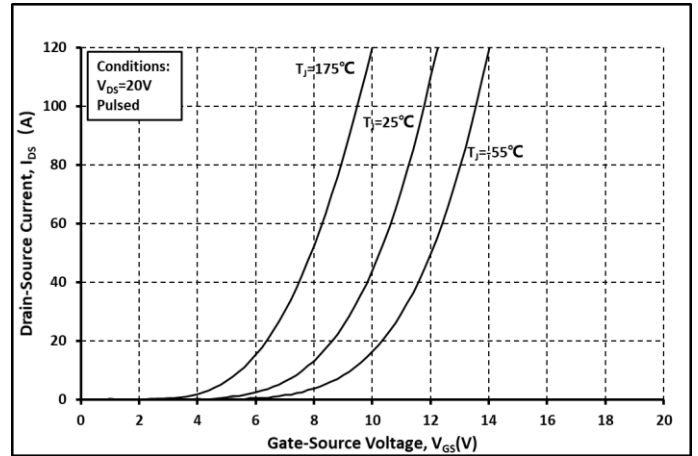


Fig. 8 Transfer Curves @ Various Temperature

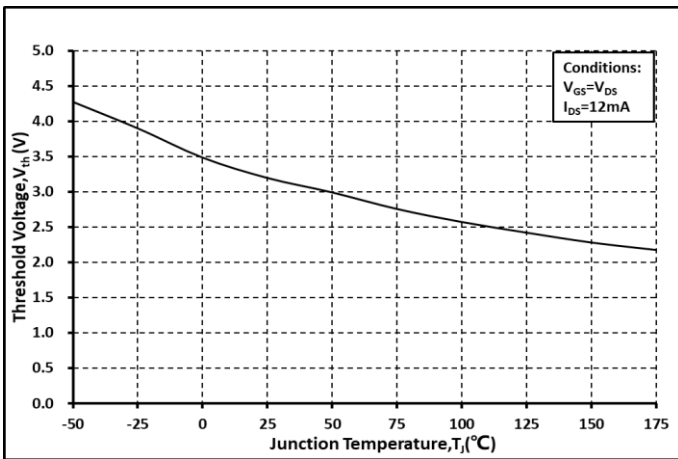


Fig. 9 Threshold Voltage vs. Temperature

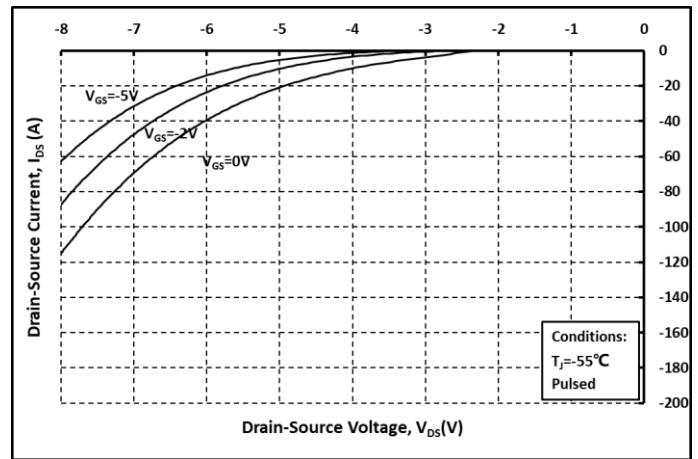


Fig. 10 Body Diode Curves @  $T_J = -55^\circ\text{C}$

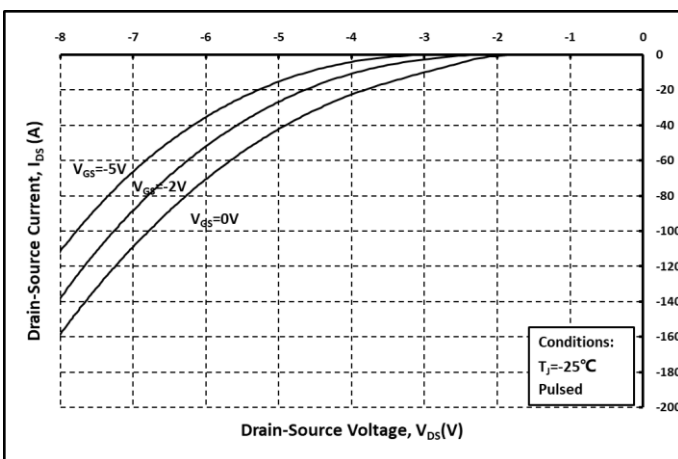


Fig. 11 Body Diode Curves @  $T_J = 25^\circ\text{C}$

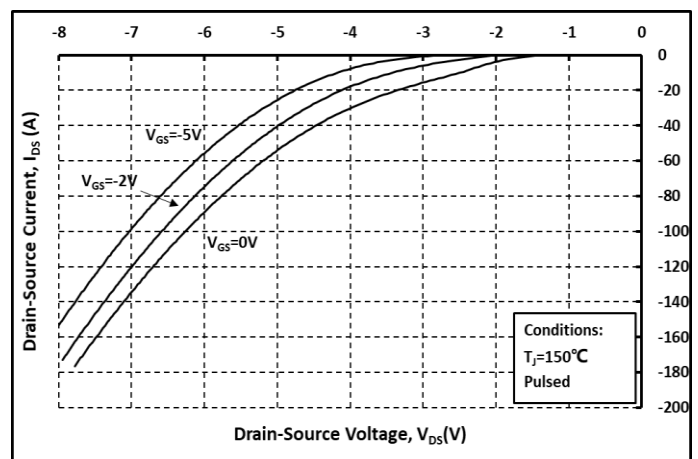


Fig. 12 Body Diode Curves @  $T_J = 150^\circ\text{C}$

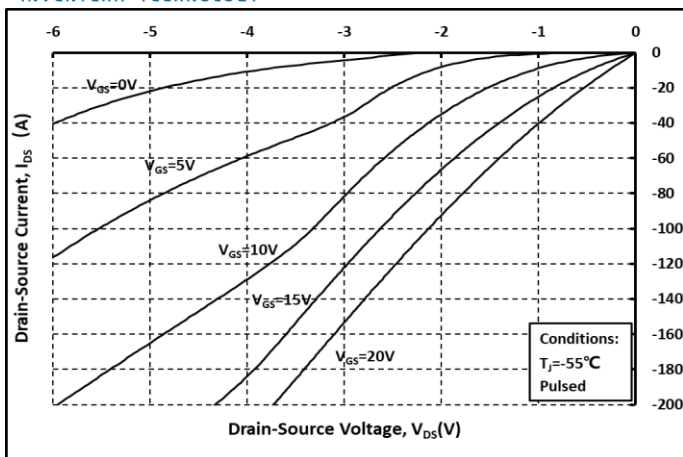


Fig. 13 3<sup>rd</sup> Quadrant Curves @  $T_j = -55^\circ\text{C}$

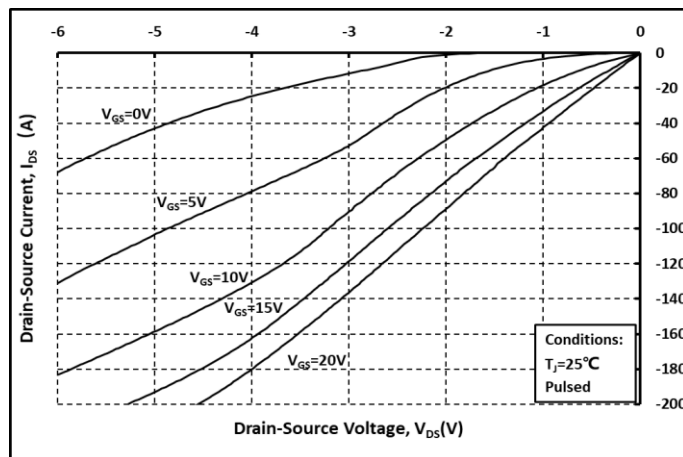


Fig. 14 3<sup>rd</sup> Quadrant Curves @  $T_j = 25^\circ\text{C}$

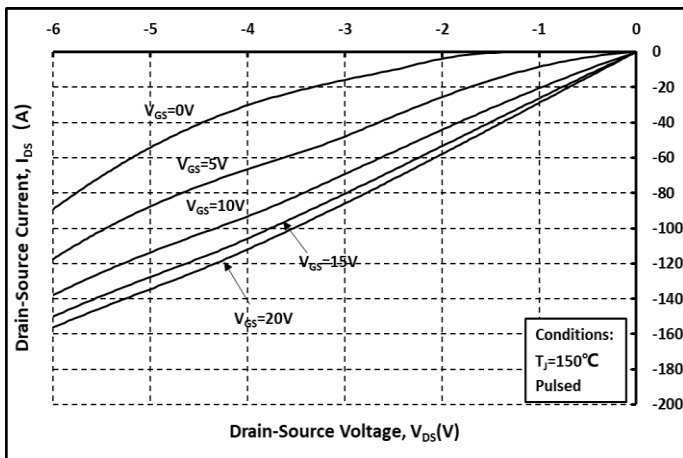


Fig. 15 3<sup>rd</sup> Quadrant Curves @  $T_j = 150^\circ\text{C}$

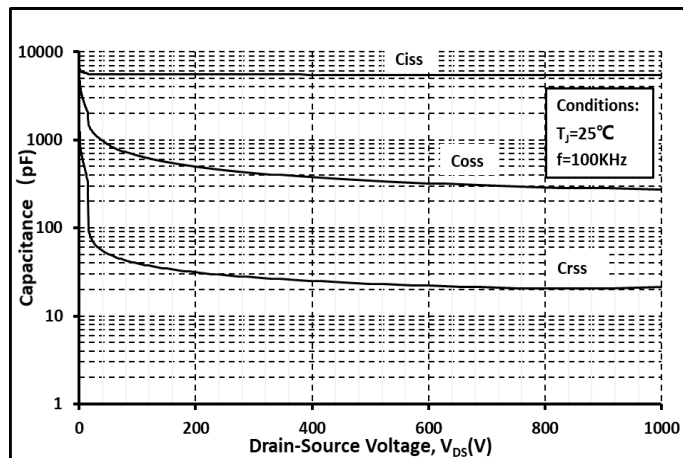


Fig. 16 Capacitance vs.  $V_{DS}$

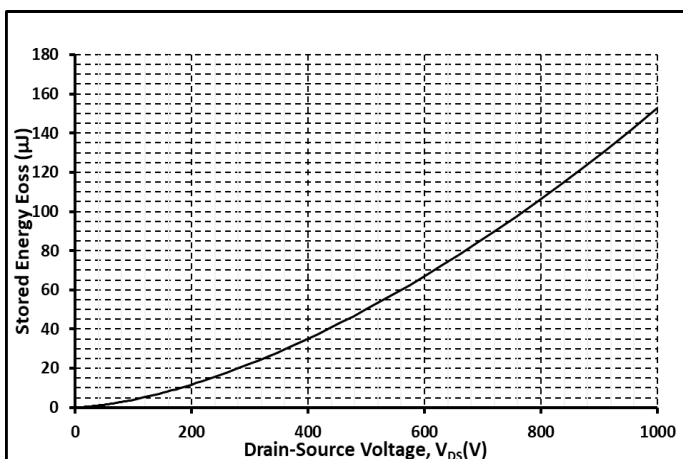


Fig. 17 Output Capacitor Stored Energy

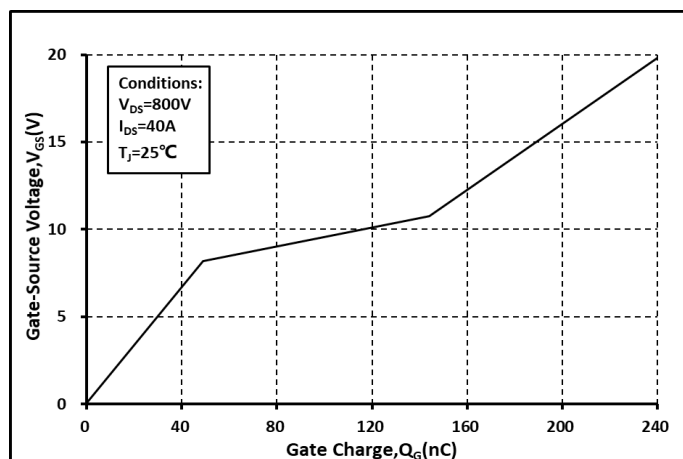


Fig. 18 Gate Charge Characteristics

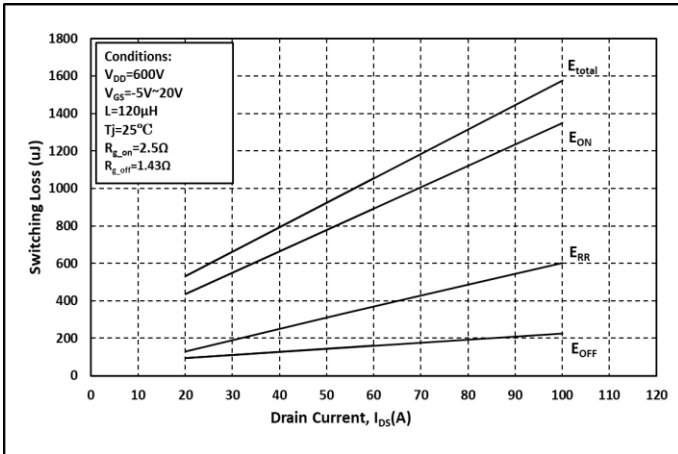


Fig. 19 Switching Energy vs. Drain Current

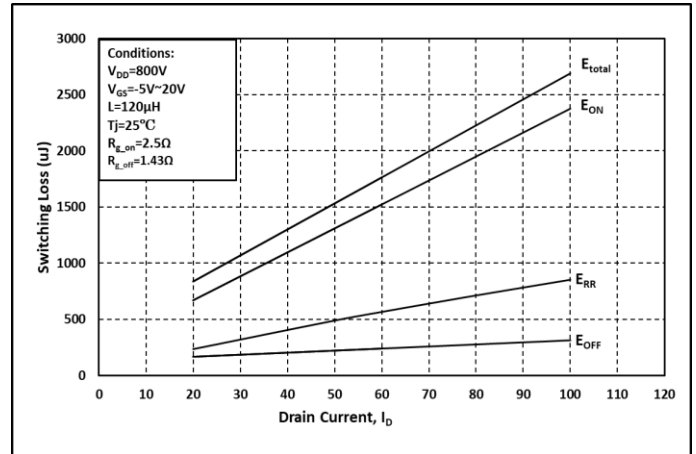


Fig. 20 Switching Energy vs. Drain Current

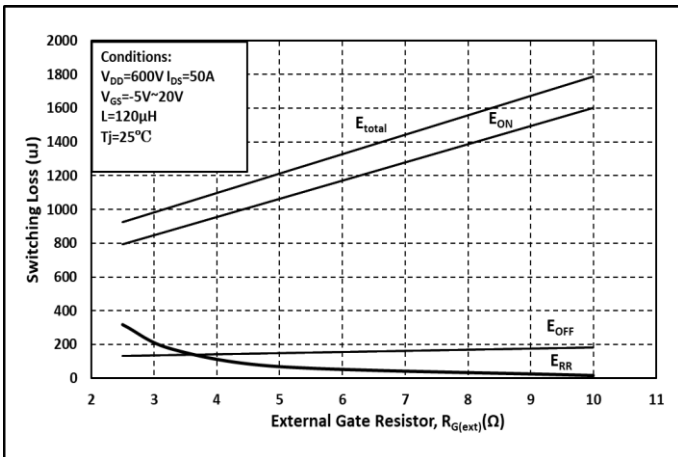


Fig. 21 Switching Energy vs.  $R_{G(ext)}$

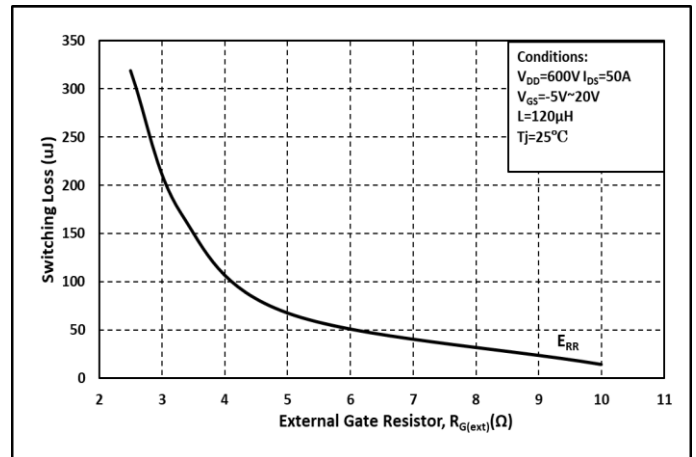


Fig. 22 Reverse Recovery Energy vs.  $R_{G(ext)}$

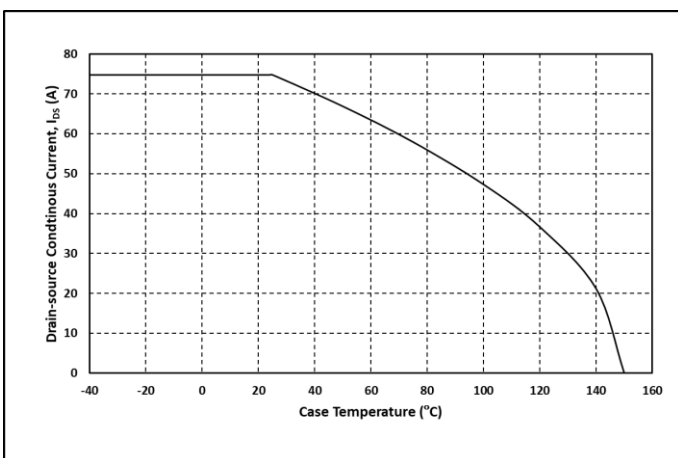


Fig. 23 Continuous Drain Current vs. Case Temperature

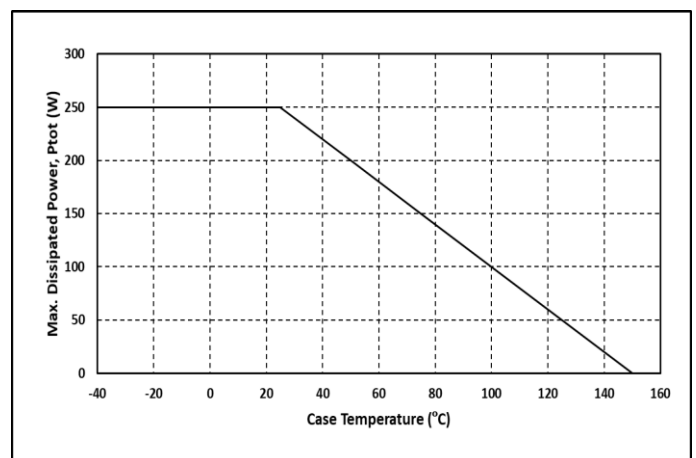


Fig. 24 Max. Power Dissipation Derating vs. Case Temperature

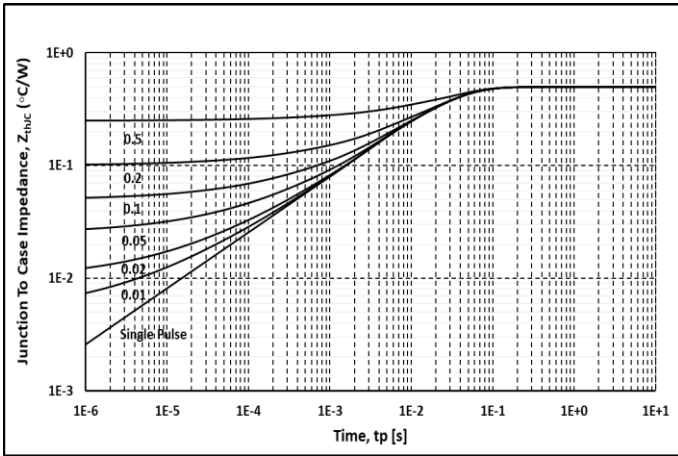


Fig. 25 Thermal Impedance

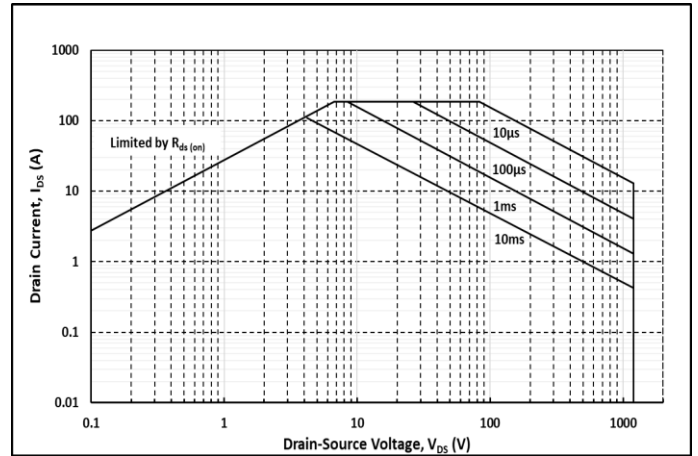


Fig. 26 Safe Operating Area

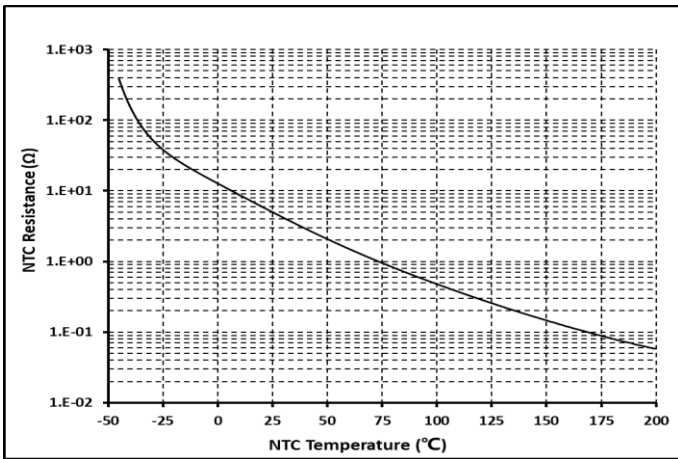
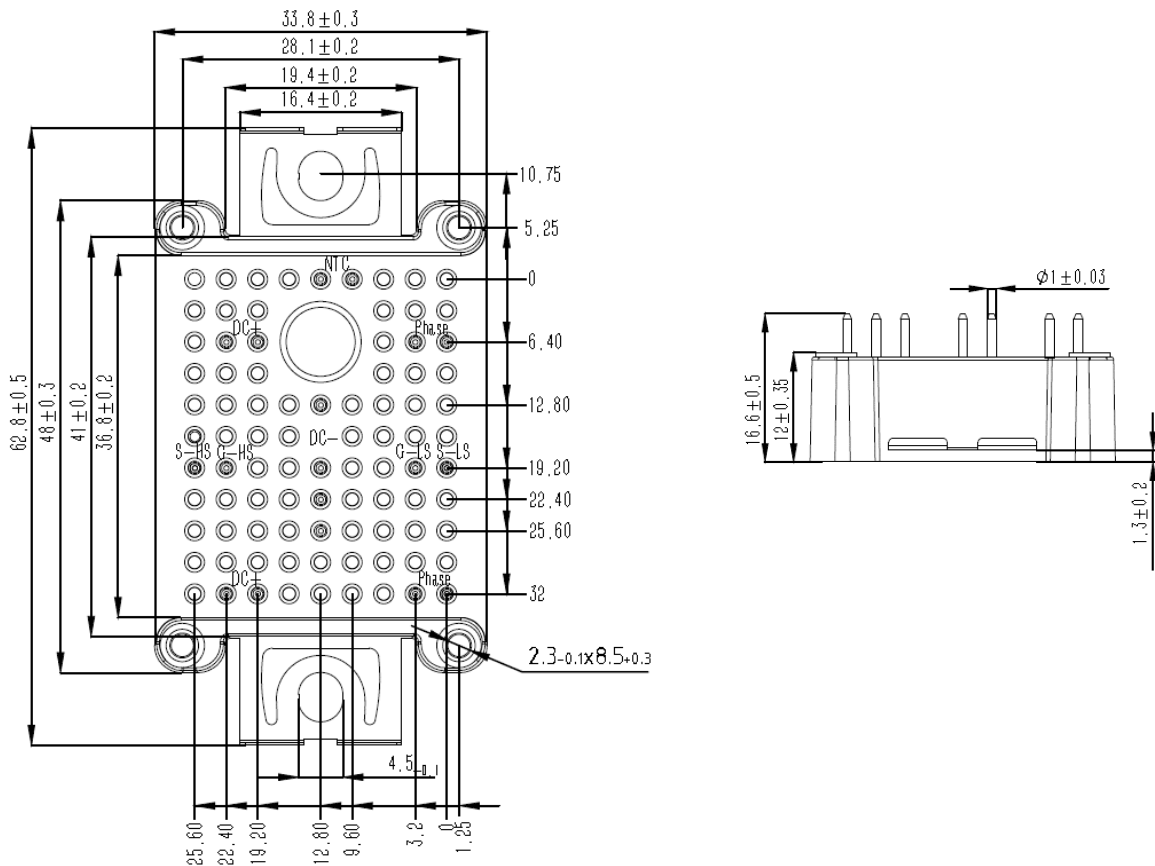


Fig. 27 NTC Resistance vs. Temperature



## Package Dimensions (mm)



## Notes

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