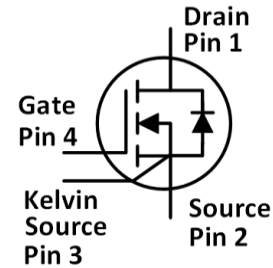
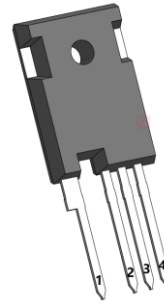


IV1Q12050T4 – 1200V 50mΩ SiC MOSFET

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

Outline:

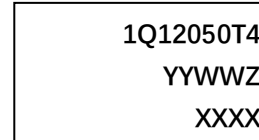


TO247-4

Applications

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

Marking Diagram:



1Q12050T4 = Specific Device Code
YY = Year
WW = Work Week
Z = Assembly Location
XXXX = Lot Traceability

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)	58	A	$V_{GS}=20V, T_c=25^\circ\text{C}$	Fig. 21
		43	A	$V_{GS}=20V, T_c=100^\circ\text{C}$	
I_{DM}	Drain current (pulsed)	145	A	Pulse width limited by SOA	Fig. 24
P_{TOT}	Total power dissipation	344	W	$T_c=25^\circ\text{C}$	Fig. 22
T_{stg}	Storage temperature range	-55 to 175	$^\circ\text{C}$		
T_J	Operating junction temperature	-55 to 175	$^\circ\text{C}$		
T_L	Solder Temperature	260	$^\circ\text{C}$	wave soldering only allowed at leads, 1.6mm from case for 10 s	

Thermal Data

Symbol	Parameter	Value	Unit	Note
$R_{\theta(J-C)}$	Thermal Resistance from Junction to Case	0.436	$^\circ\text{C/W}$	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 _b =6mA @ T _J =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		455.4		μJ	V _{DS} =800V, I _D =30A, V _{GS} = -2 to 20V, R _{G(ext)} =3.3Ω, L=450μH	Fig. 19, 20
E _{OFF}	Turn-off switching energy		213.6		μJ		
t _{d(on)}	Turn-on delay time		8.9		ns		
t _r	Rise time		28.9				
t _{d(off)}	Turn-off delay time		25.6				
t _f	Fall time		17.2				

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		20		ns	V _{GS} =-2V/+20V, I _{SD} =30A, V _R =800V, di/dt=1200A/us, R _{G(ext)} =20Ω L=450μH	
Q _{rr}	Reverse recovery charge		143.9		nC		
I _{RRM}	Peak reverse recovery current		13		A		

Typical Performance (curves)

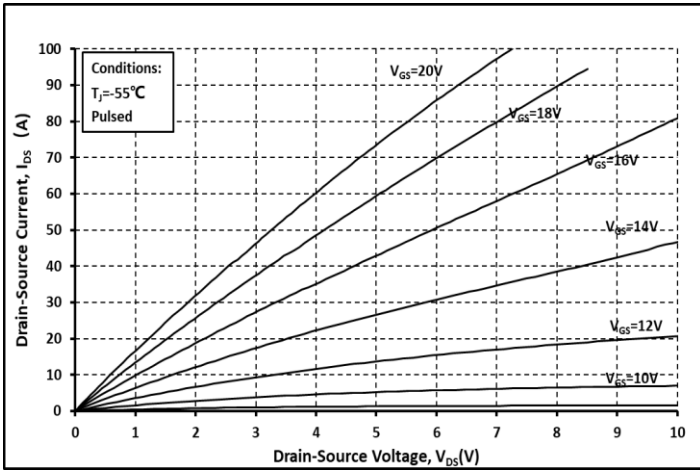


Fig. 1 Output Curve @ $T_j = -55^\circ\text{C}$

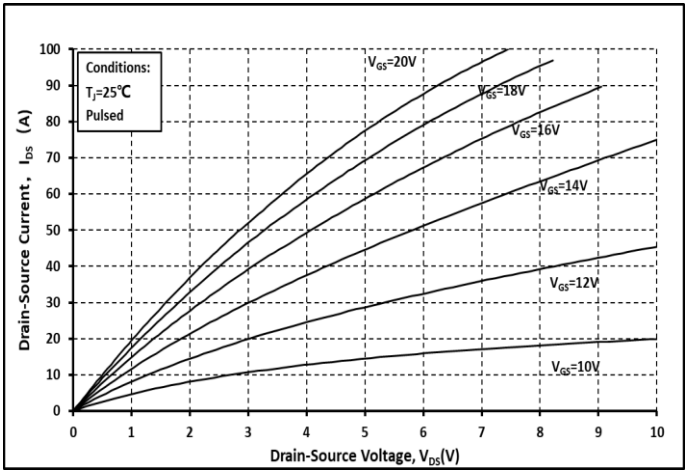


Fig. 2 Output Curve @ $T_j = 25^\circ\text{C}$

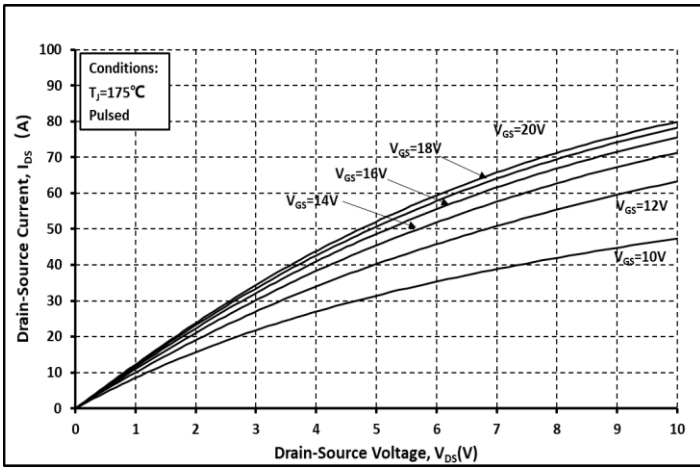


Fig. 3 Output Curve @ $T_j = 175^\circ\text{C}$

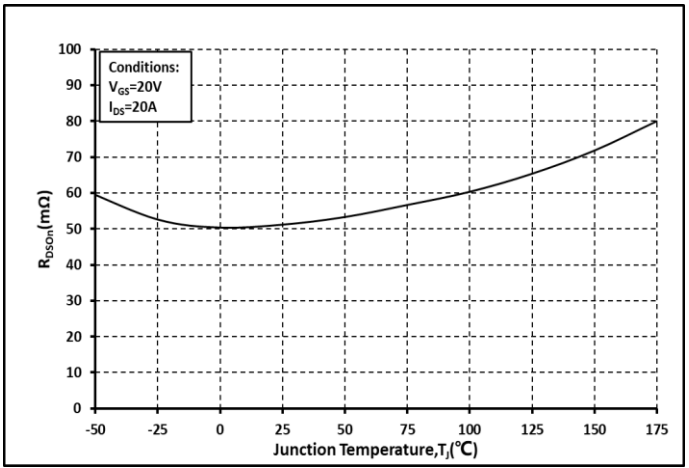


Fig. 4 R_{on} vs. Temperature

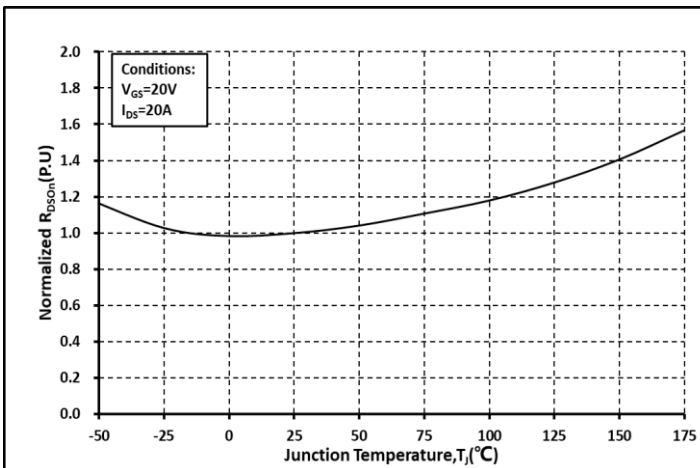


Fig. 5 Normalized R_{on} vs. Temperature

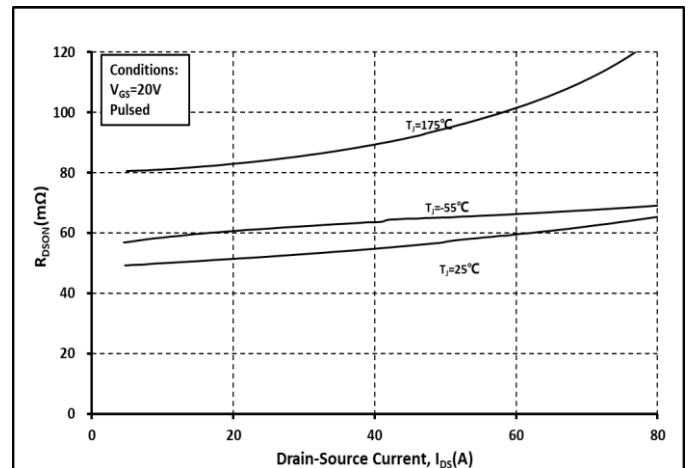


Fig. 6 R_{on} vs. I_{DS} @ Various Temperature

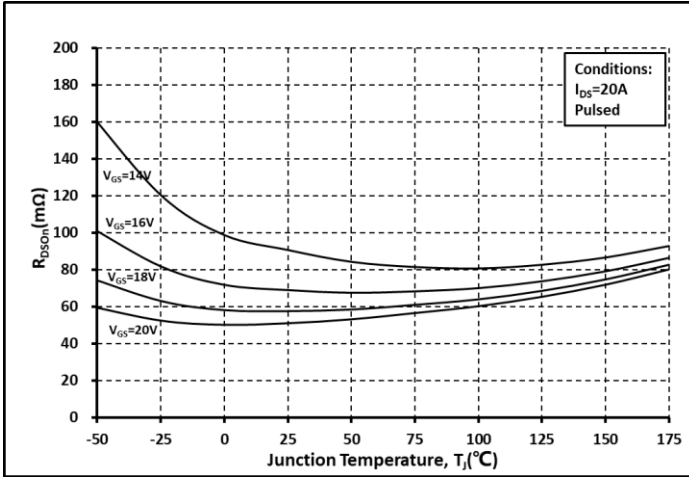


Fig. 7 Ron vs. Temperature @ Various V_{GS}

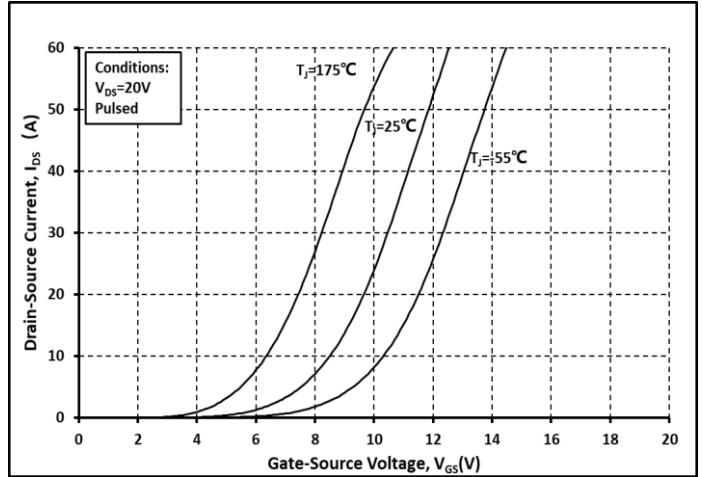


Fig. 8 Transfer Curves @ Various Temperature

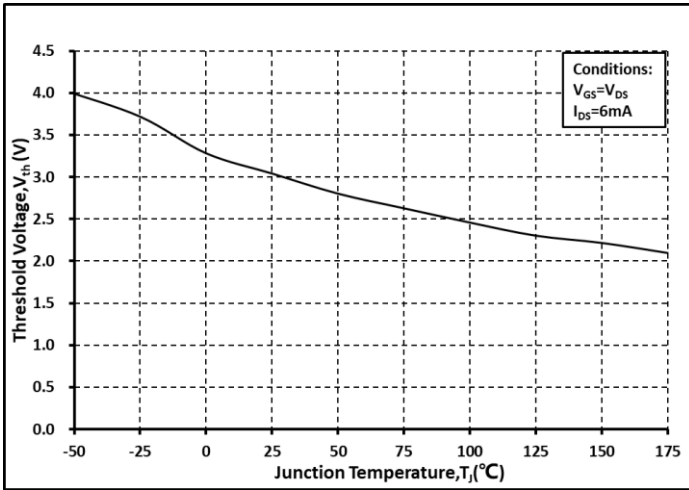


Fig. 9 Threshold Voltage vs. Temperature

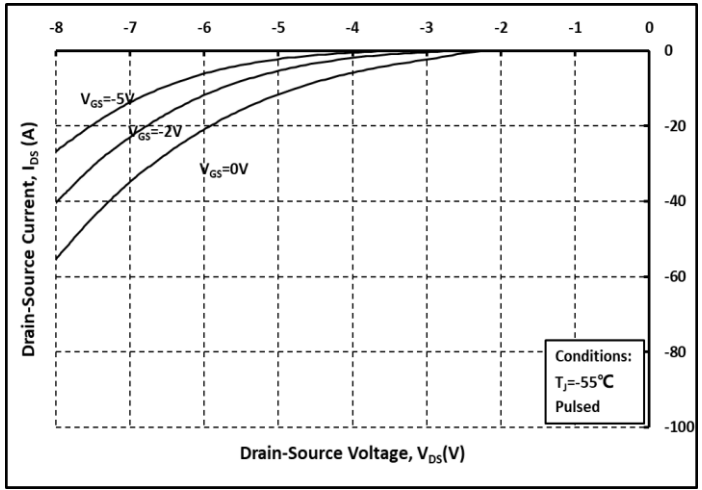


Fig. 10 Body Diode Curves @ $T_J = -55^{\circ}\text{C}$

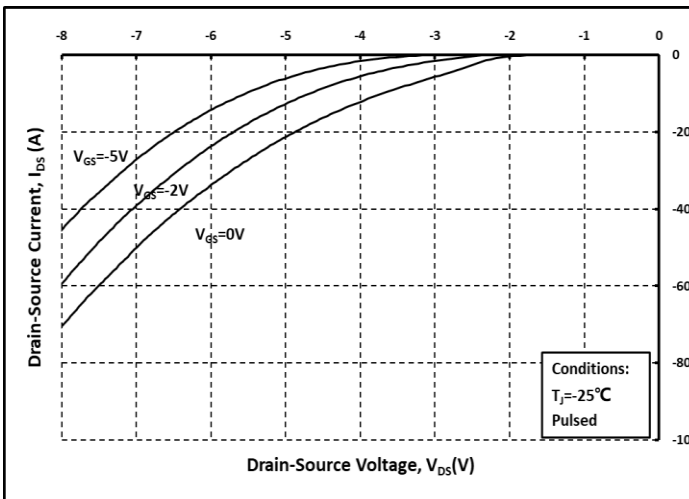


Fig. 11 Body Diode Curves @ $T_J = 25^{\circ}\text{C}$

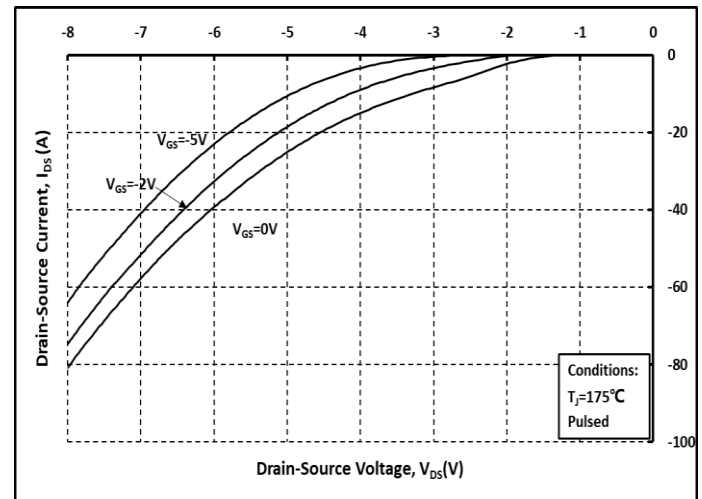


Fig. 12 Body Diode Curves @ $T_J = 175^{\circ}\text{C}$

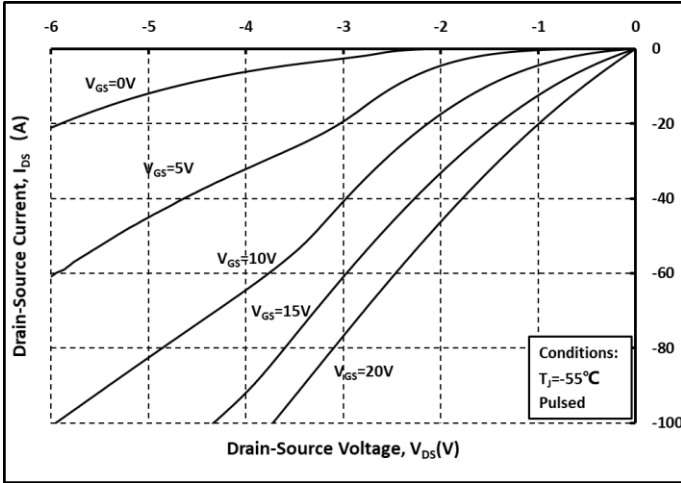


Fig. 13 3rd Quadrant Curves @ $T_j = -55^\circ\text{C}$

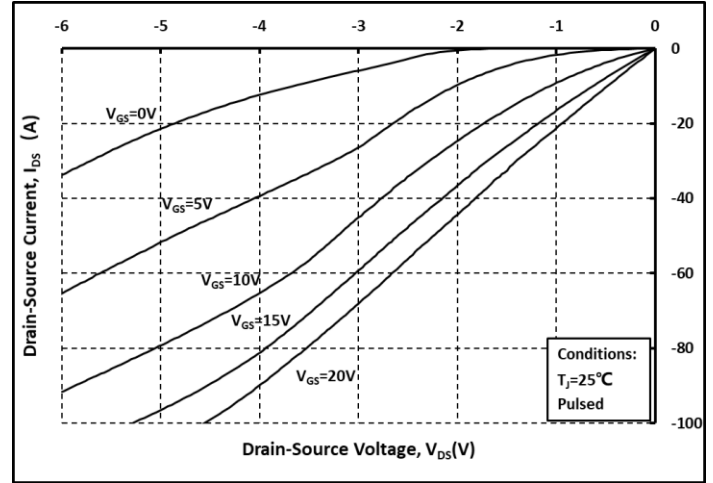


Fig. 14 3rd Quadrant Curves @ $T_j = 25^\circ\text{C}$

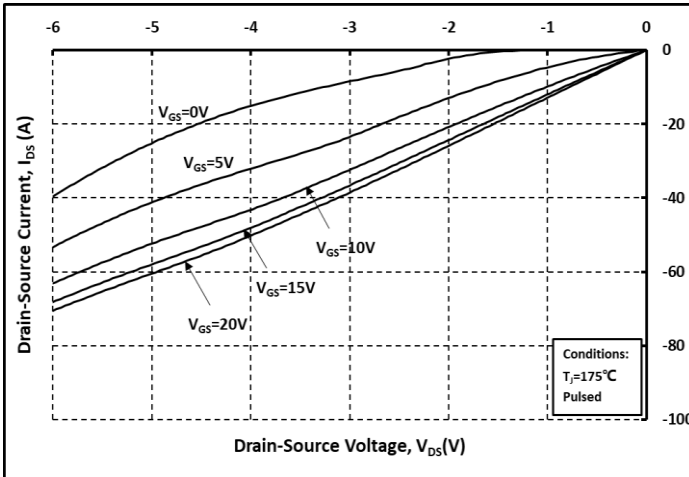


Fig. 15 3rd Quadrant Curves @ $T_j = 175^\circ\text{C}$

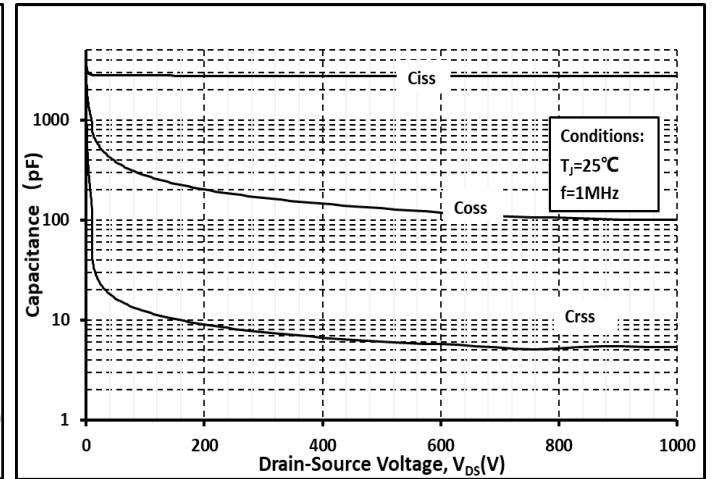


Fig. 16 Capacitance vs. V_{ds}

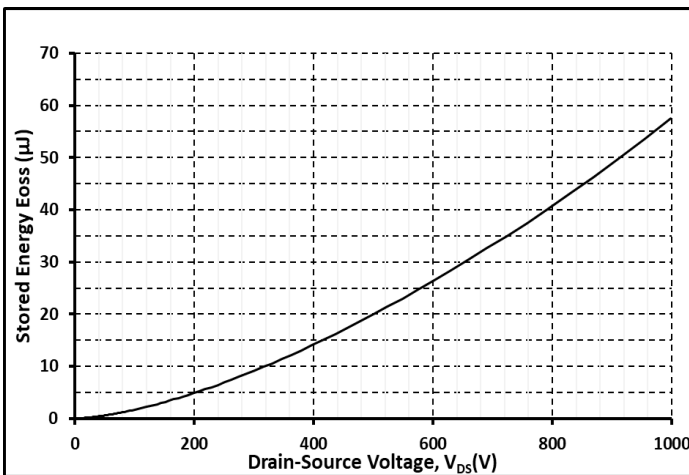


Fig. 17 Output Capacitor Stored Energy

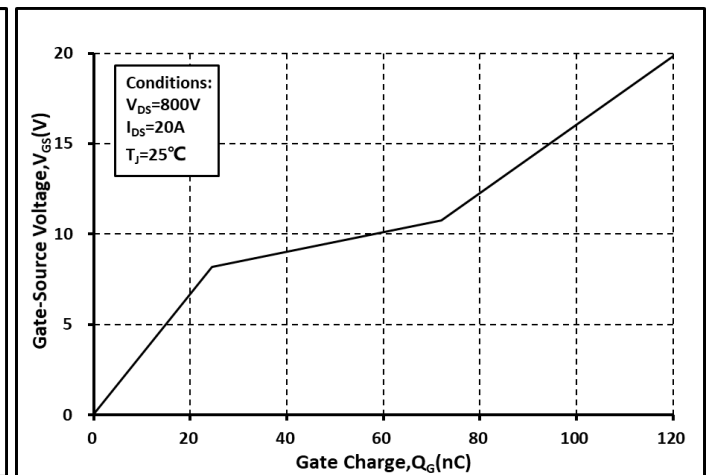


Fig. 18 Gate Charge Characteristics

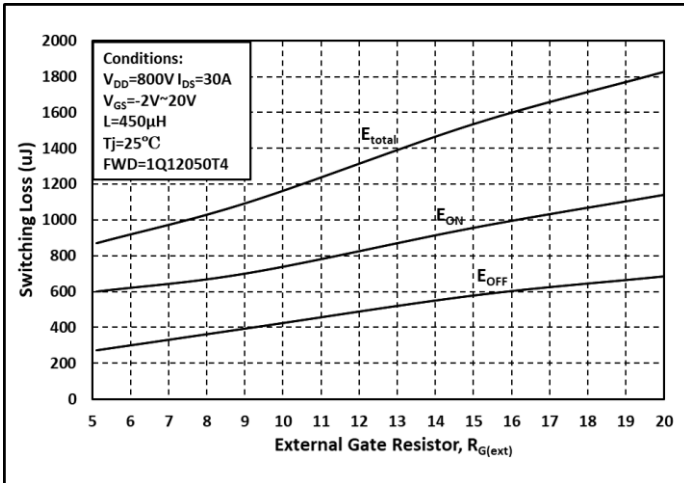


Fig. 19 Switching Energy vs. $R_{G(ext)}$

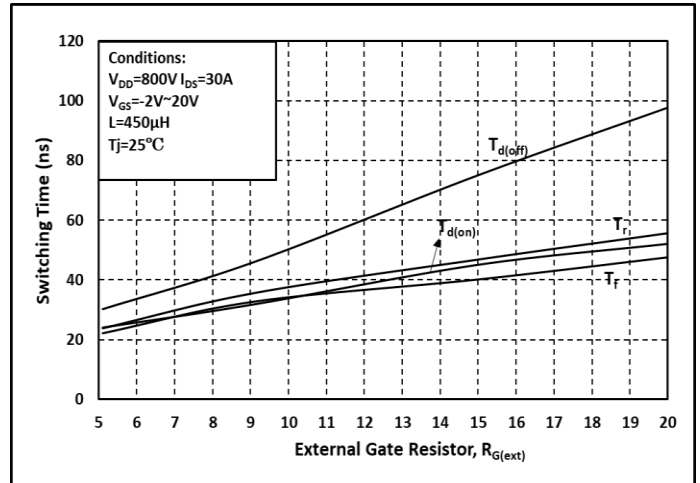


Fig. 20 Switching Times vs. $R_{G(ext)}$

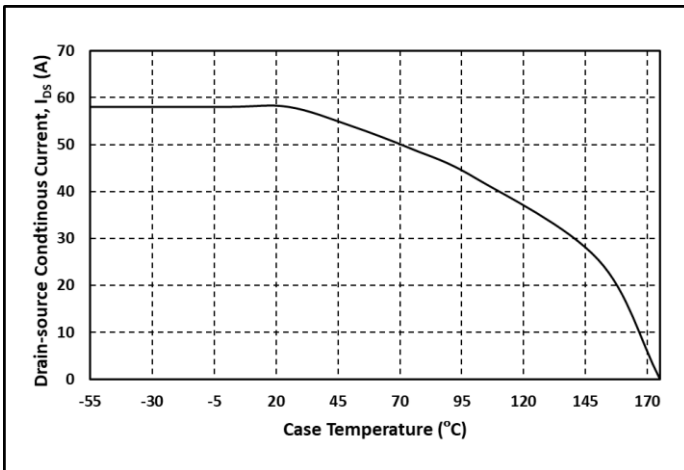


Fig. 21 Continuous Drain Current vs. Case Temperature

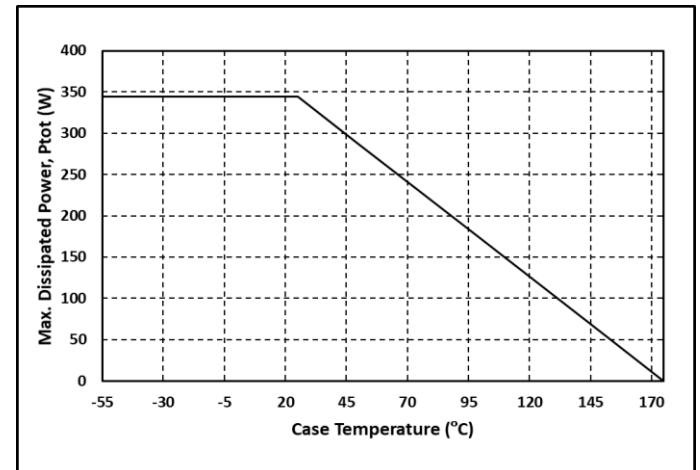


Fig. 22 Max. Power Dissipation Derating vs. Case Temperature

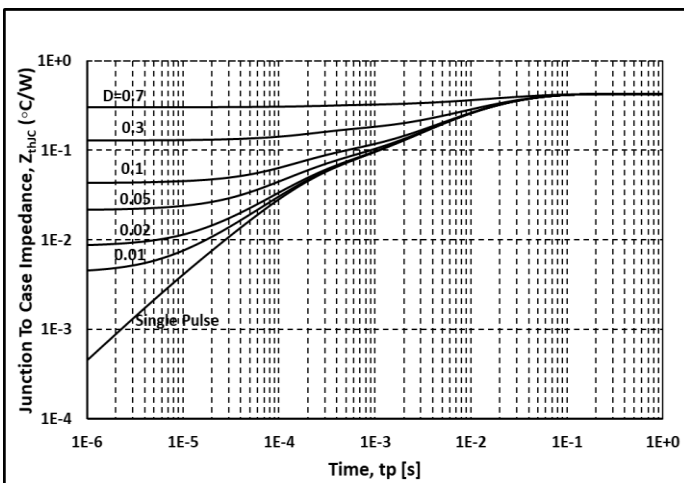


Fig. 23 Thermal Impedance

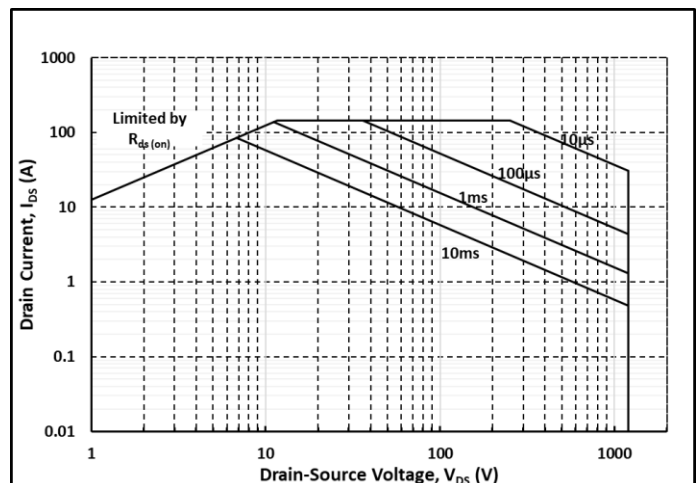
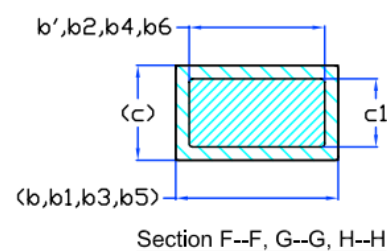
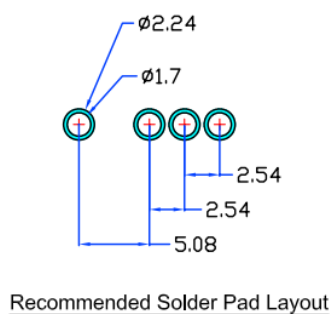
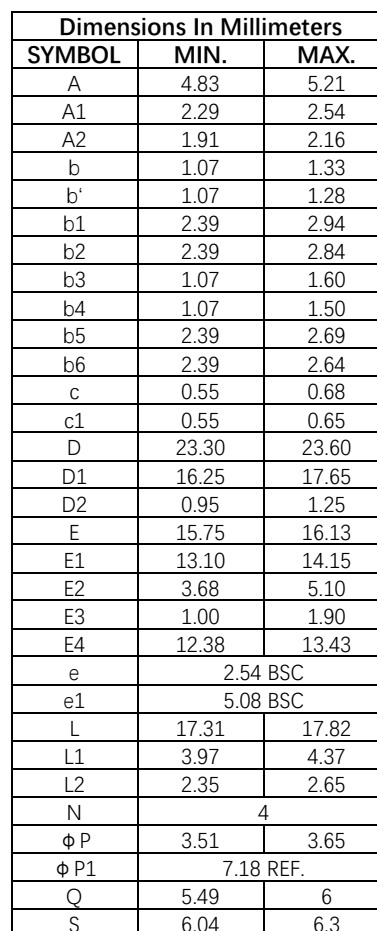


Fig. 24 Safe Operating Area

Package Dimensions



Note:

1. Package Reference: JEDEC TO247, Variation AD
2. All Dimensions are in mm
3. Slot Required, Notch May Be Rounded
4. Dimension D&E Do Not Include Mold Flash
5. Subject to Change Without Notice

Notes

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