SEMICONDUCTOR

SC40N120P

1200V 65A N-Channel SIC Power 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

Product Summary			
V_{DS}	$R_{DS(on)}$(mΩ)Typ	I_D(A)	Qg(Typ)
1200V	40 @ 18V 20A	65	110nc

TO-247



Mechanical Data

- Case:TO-247 Package

Application

- Motor drivers
- Solar inverters
- Automotive DC/DC converters
- Automotive compressor inverters
- Switch mode power supplies

Pin Definition:

1. Gate
2. Drain
3. Source

Block Diagram

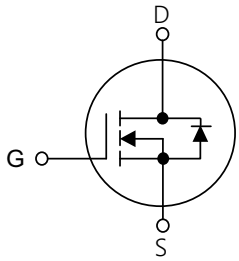


Table1 Absolute Maximum Ratings (T_C=25°C, unless otherwise specified)

Parameter		Symbol	Value	Unit
Drain-Source Voltage		V_{DS}	1200	V
Gate-Source Voltage(Max)		$V_{GS(DC)}$	-5/+20	V
Gate-Source Voltage(Max)		$V_{GS\ (Spike)}$	-10/+23	V
Continuous Drain Current	T_C=25°C	I_D	65	A
	T_C=100°C		48	
Pulsed Drain Current (Note 1)		I_{DM}	162	A
Recommended turn-on voltage		V_{GSon}	18±0.5	V
Recommended turn-off voltage		V_{GSoff}	-3.5/-2	V
Power Dissipation	T_C=25°C	P_D	417	W
Operating Junction and Storage Temperature		T_J/T_{STG}	-55 ~ +175	°C

Table 2.Thermal Characteristics

Parameter	Symbol	SC40N120P	Unit
Thermal resistance Junction to Case	$R_{\theta JC}$	0.36	°C/W

Table 3. Electrical Characteristics (T_J=25°C, unless otherwise specified)

Parameter		Symbol	Test Conditions	Min	Typ	Max	Unit
Off Characteristics							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS}=0V,I_D=100μA	1200	-	-	V
Drain-Source Leakage Current		I_{DSS}	V_{DS}=1200V,V_{GS}=0V	-	5	100	μA
Gate- Source Leakage Current	Forward	I_{GSS}	V_{GS}=20V,V_{DS}=0V	-	-	100	nA
	Reverse		V_{GS}=-5V,V_{DS}=0V	-	-	-100	nA
On Characteristics							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS}=V_{GS},I_D=9mA	1.8	2.8	4.5	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{GS}=18V,I_D=20A,T_J=25°C	-	40	52	mΩ
			V_{GS}=18V,I_D=20A,T_J=175°C	-	75	-	
Gate Resisitance		R_G	f=1MHz	-	2.1	-	Ω
Dynamic Characteristics							
Input Capacitance		C_{ISS}	V_{DS}=800V,V_{GS}=0V, f=1MHz,V_{AC}=25mV	-	2160	-	pF
Output Capacitance		C_{OSS}		-	100	-	pF
Reverse Transfer Capacitance		C_{RSS}		-	5.8	-	pF
Coss stored energy		E_{OSS}		-	40	-	μJ
Turn-on switching energy		E_{ON}	V_{DS}=800V,I_D=30A V_{GS}=-3.5/18V,R_G=3.3Ω, L=200μH,T_J=25°C	-	446.3	-	μJ
Turn-off switching energy		E_{OFF}		-	70	-	μJ
Turn-On Delay Time		td(on)		-	9.6	-	ns
Turn-On Rise Time		t_R		-	22.1	-	ns
Turn-Off Delay Time		td(off)		-	19.3	-	ns
Turn-Off Fall Time		tf		-	10.5	-	ns
Total Gate Charge		Q_G	V_{DD}=800V,I_D=30A, V_{GS}=-3/18V	-	110	-	nC
Gate-Source Charge		Q_{GS}		-	25	-	nC
Gate-Drain Charge		Q_{GD}		-	59	-	nC
Drain-Source Diode Characteristics and Maximum Ratings(Note 2)							
Drain-Source Diode Forward Voltage		V_{SD}	V_{GS}=0V,I_S=20A	-	4.2	-	V
Reverse Recovery Time		trr	V_{GS}=-3.5V/+18V, VR=800V, $R_{G(ext)}$=10Ω L=200μH I_{SD}=30A,diF/dt=3000A/μs	-	42	-	ns
Recovered charge		Qrr		-	198.1	-	nC
Peak reverse recovery current		Irrm		-	17.4	-	A

Notes: 1 RepetitiveRating Pulse width limited by maximum junction temperature

2 Pulse Test: Pulse width ≤300μS,Duty cycle≤2%

Typical Characteristics Diagrams

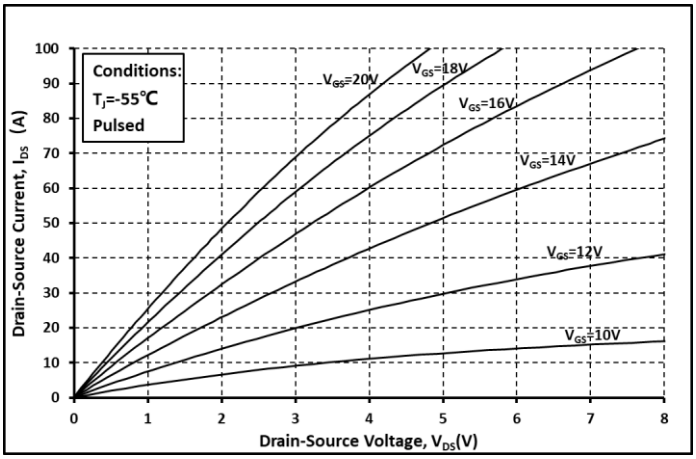


Fig. 1 Output Curve @ T_J=-55℃

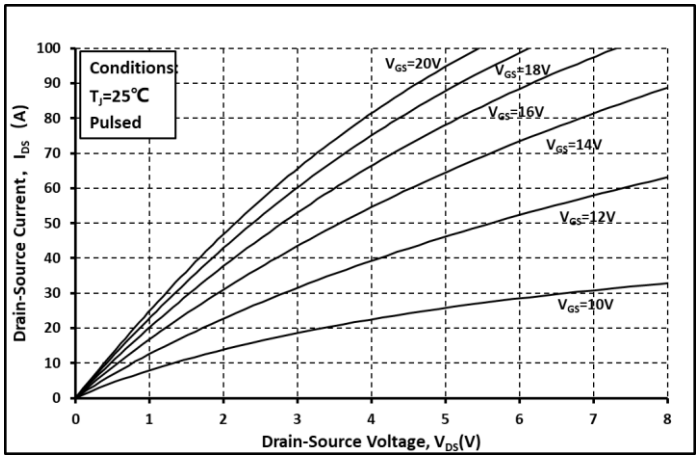


Fig. 2 Output Curve @ T_J=25℃

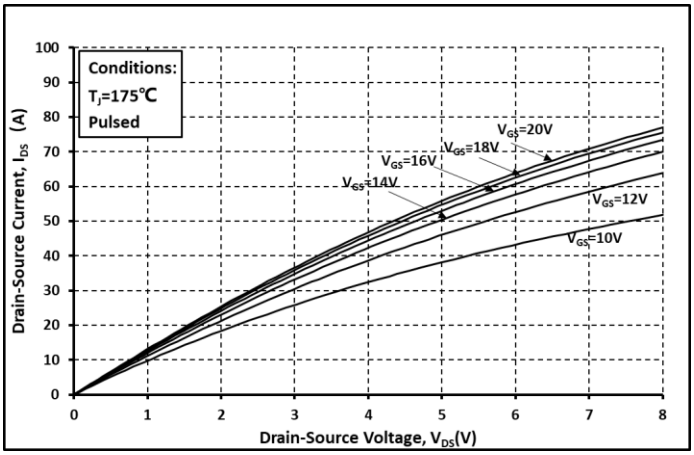


Fig. 3 Output Curve @ T_J=175℃

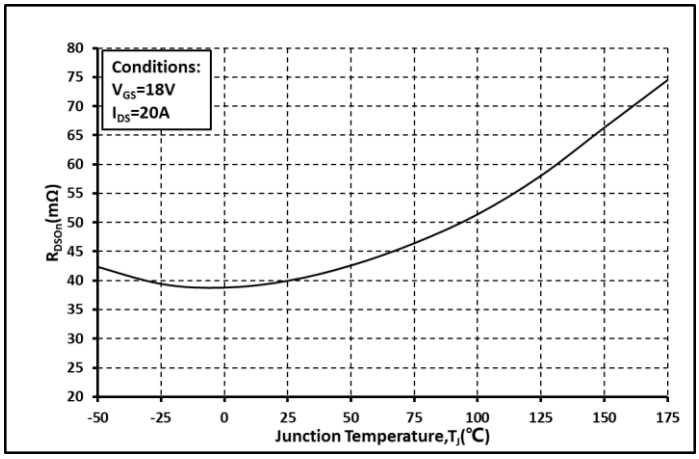


Fig. 4 Ron vs. Temperature

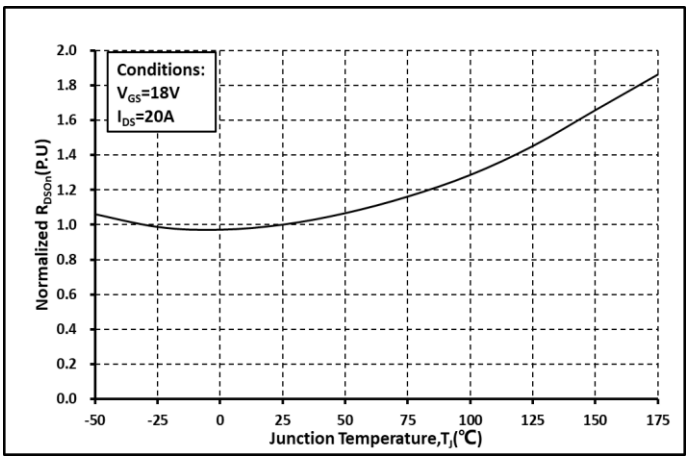


Fig. 5 Normalized Ron vs. Temperature

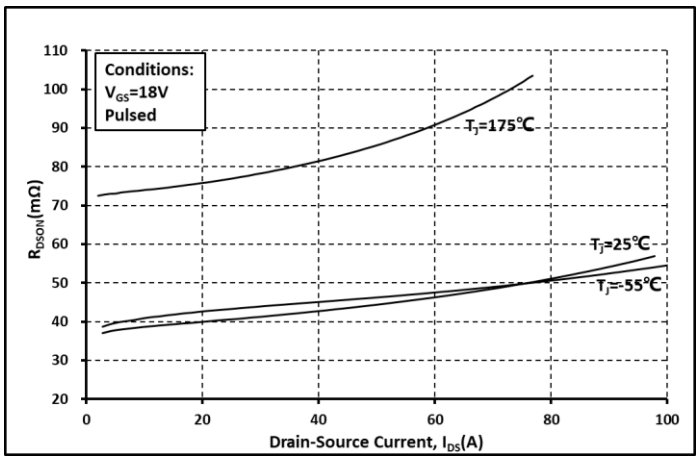


Fig. 6 Ron vs. I_{DS} @ Various Temperature

Typical Characteristics Diagrams

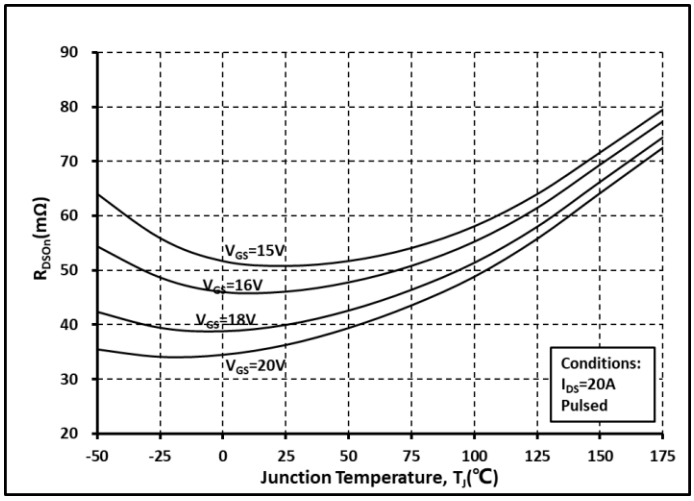


Fig. 7 Ron vs. Temperature @ Various V_{GS}

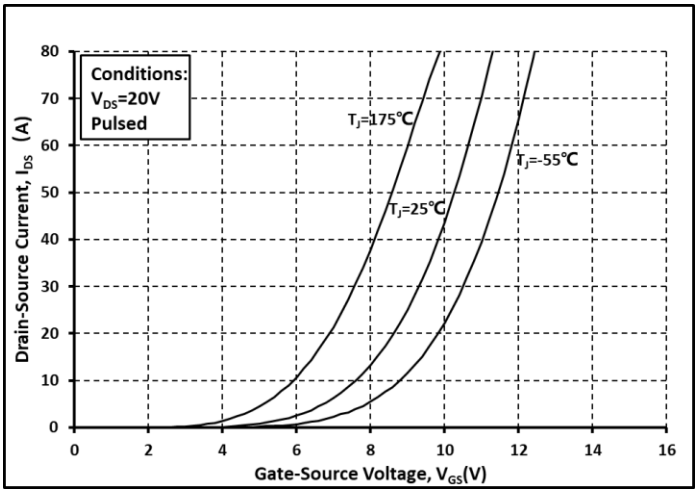


Fig. 8 Transfer Curves @ Various Temperature

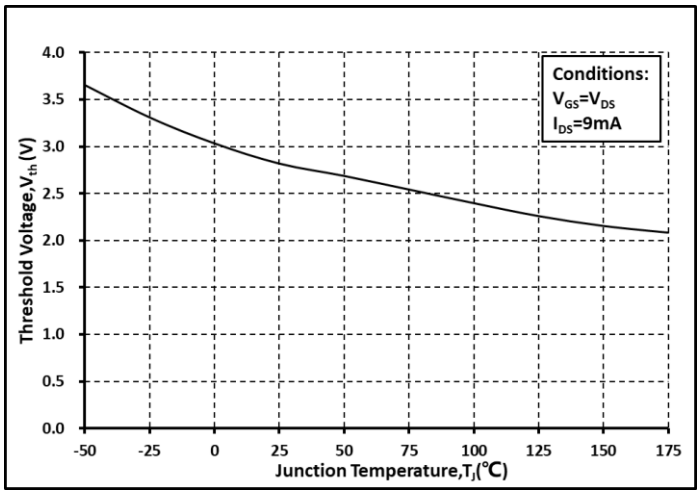


Fig. 9 Threshold Voltage vs. Temperature

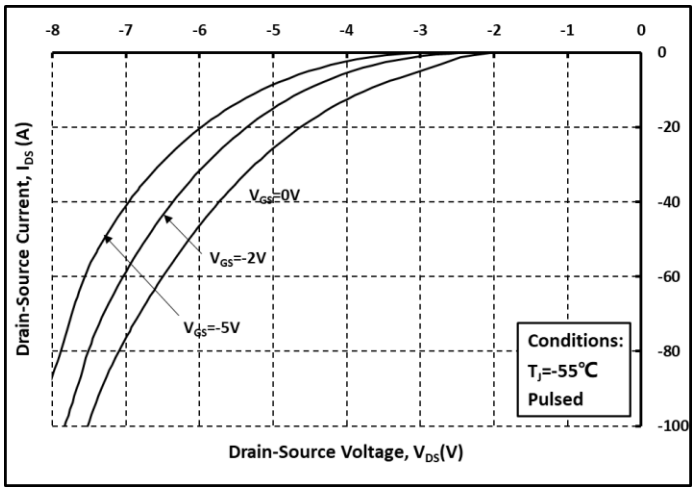


Fig. 10 Body Diode curves @ T_J=-55℃

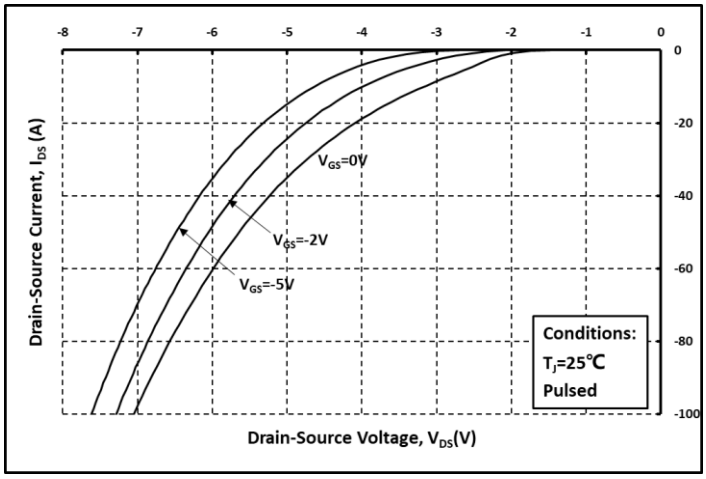


Fig. 11 Body Diode curves @ T_J=25℃

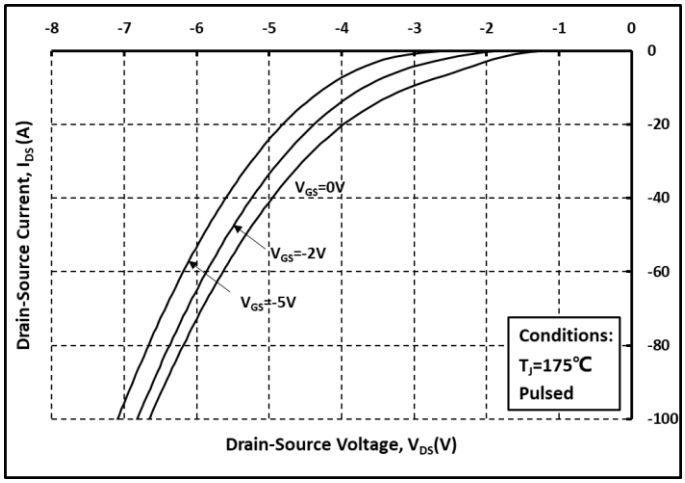


Fig. 12 Body Diode curves @ T_J=175℃

Typical Characteristics Diagrams

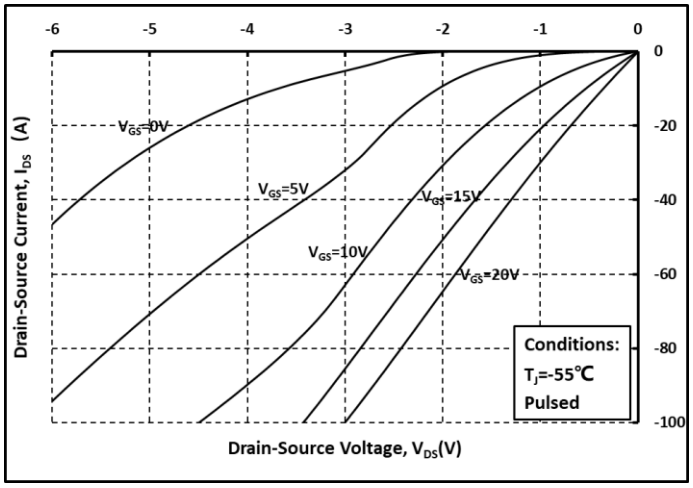


Fig. 13 3rd Quadrant curves @ T_J=-55°C

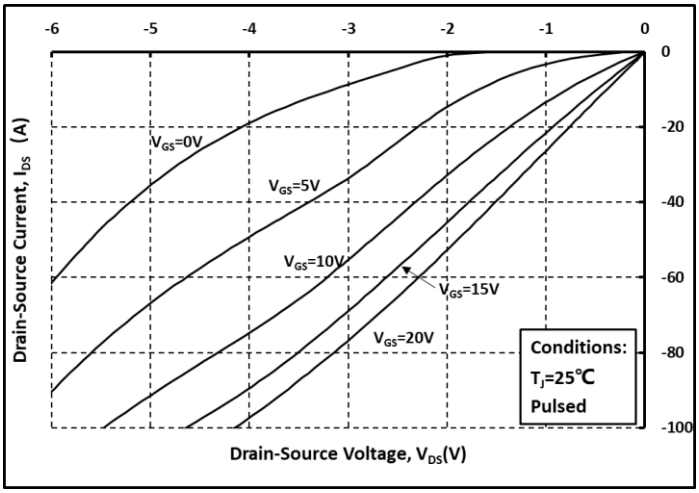


Fig. 14 3rd Quadrant curves @ T_J=25°C

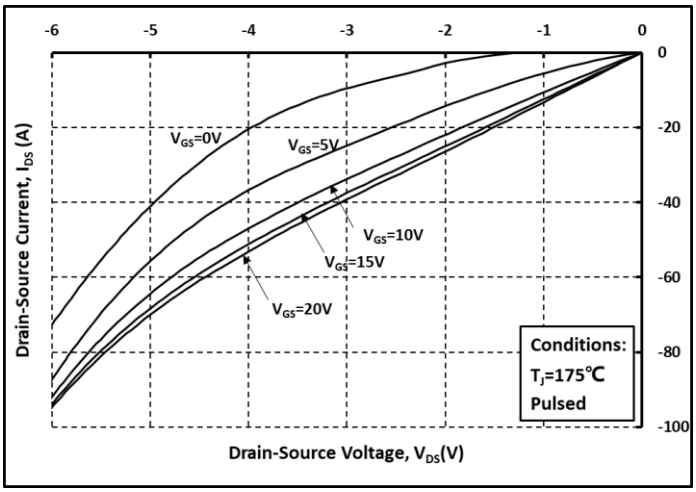


Fig. 15 3rd Quadrant curves @ T_J=175°C

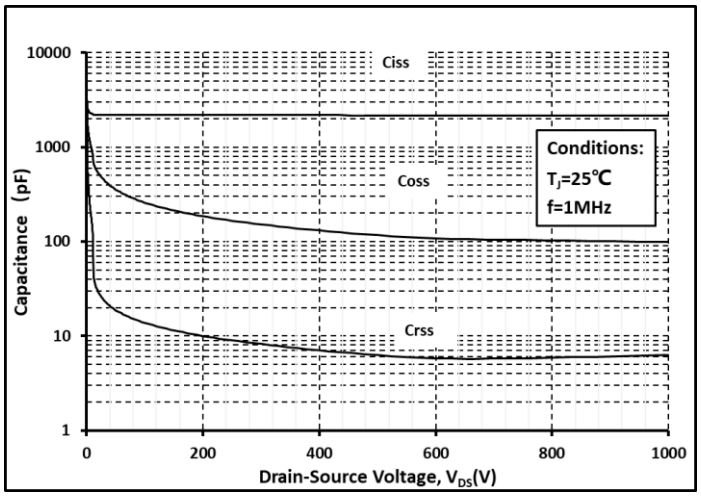


Fig. 16 Capacitance vs. V_{DS}

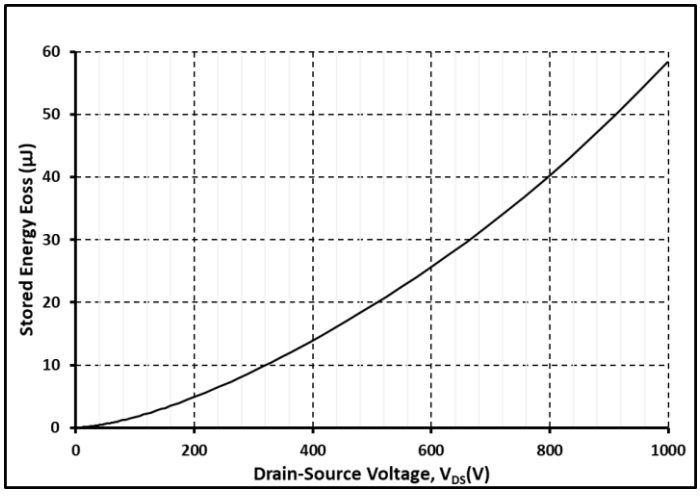


Fig. 17 Output Capacitor Stored Energy

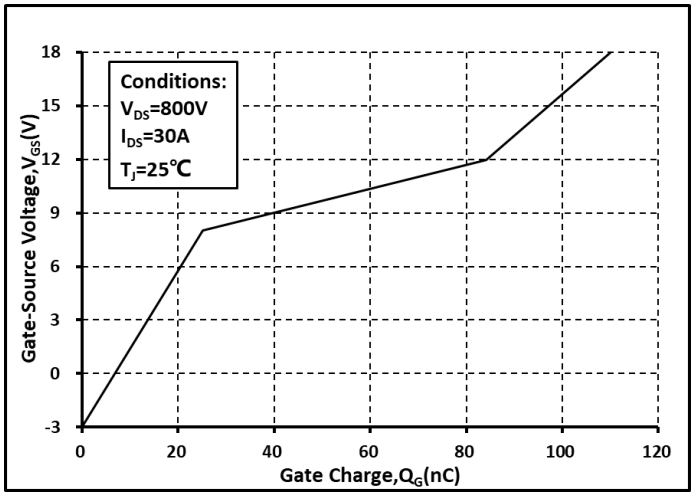


Fig. 18 Gate Charge Characteristics

Typical Characteristics Diagrams

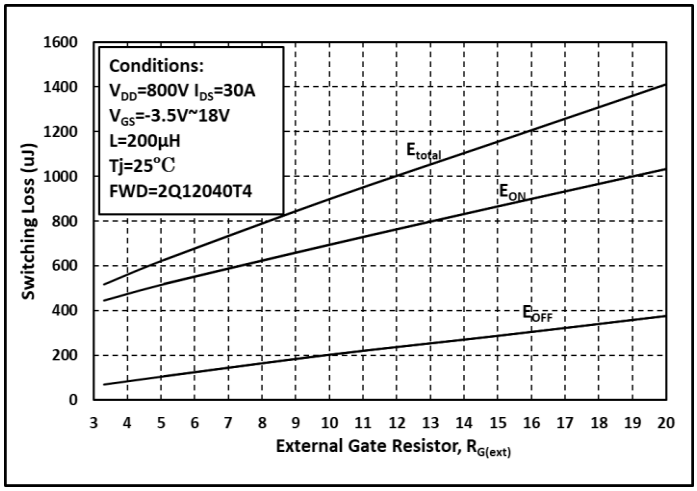


Fig. 19 Switching Energy vs. $R_{G(ext)}$

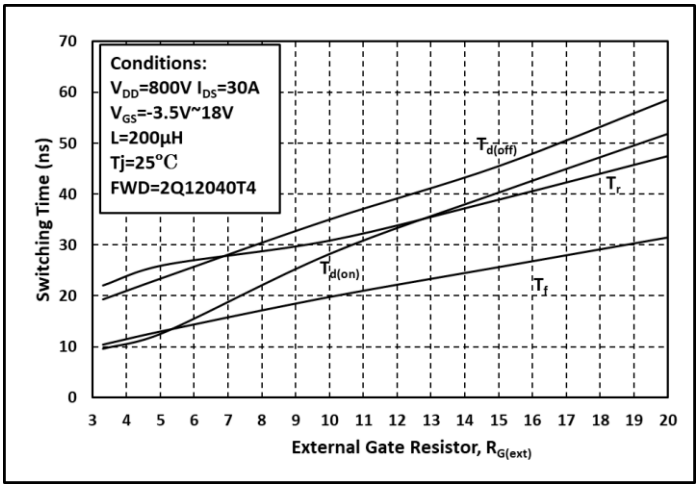


Fig. 20 Switching Times vs. $R_{G(ext)}$

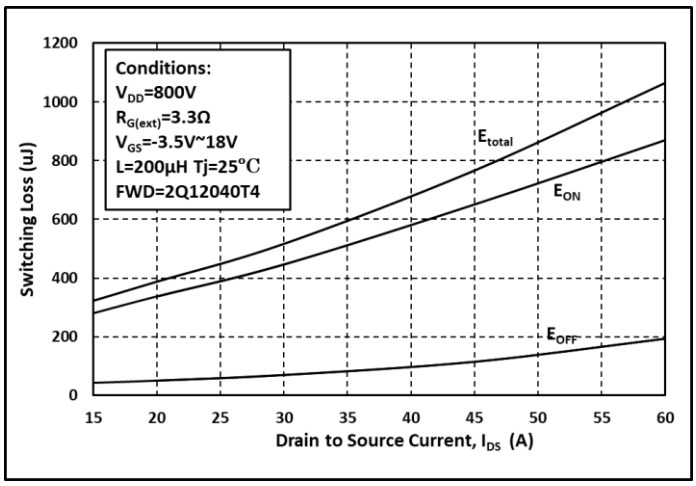


Fig. 21 Switching Energy vs. I_{DS}

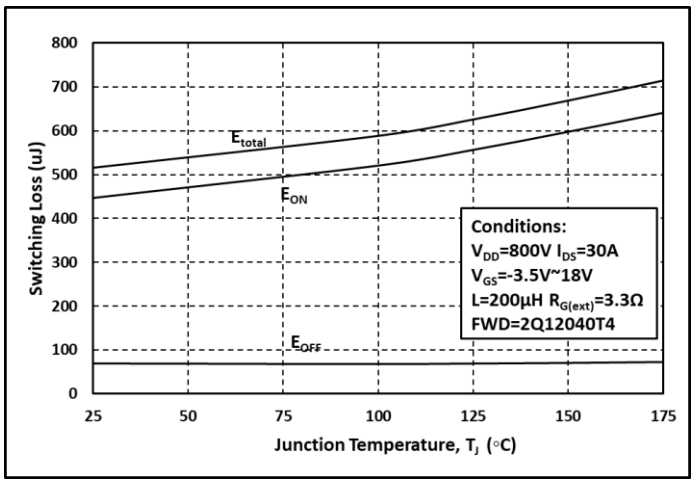


Fig. 22 Switching Energy vs. Temperature

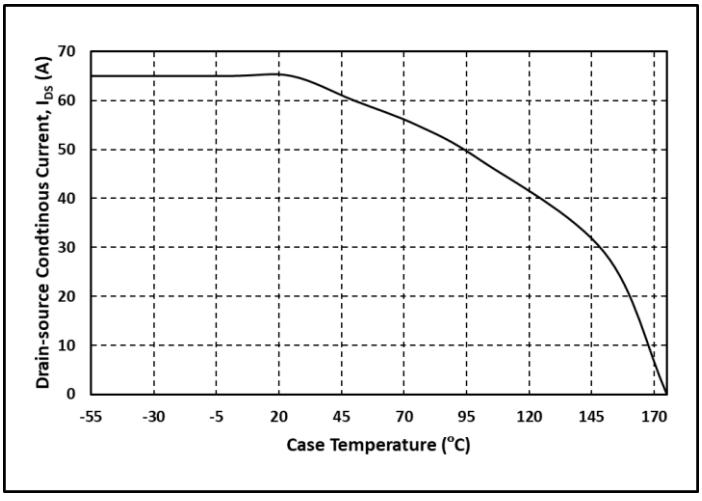


Fig. 23 Continuous Drain Current vs. Case Temperature

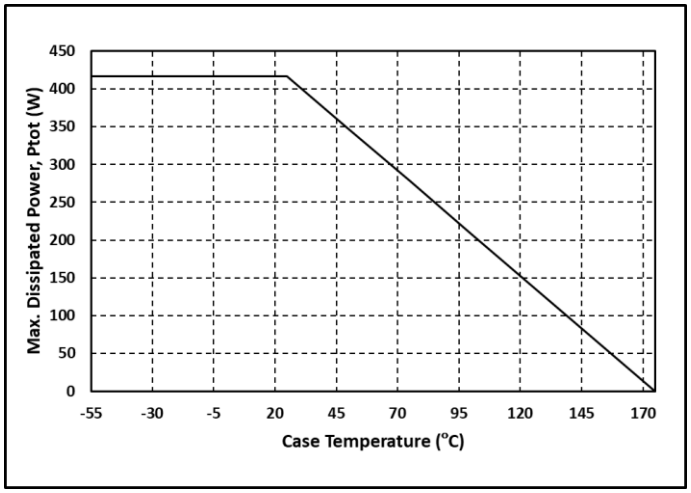


Fig. 24 Max. Power Dissipation Derating vs. Case Temperature

Typical Characteristics Diagrams

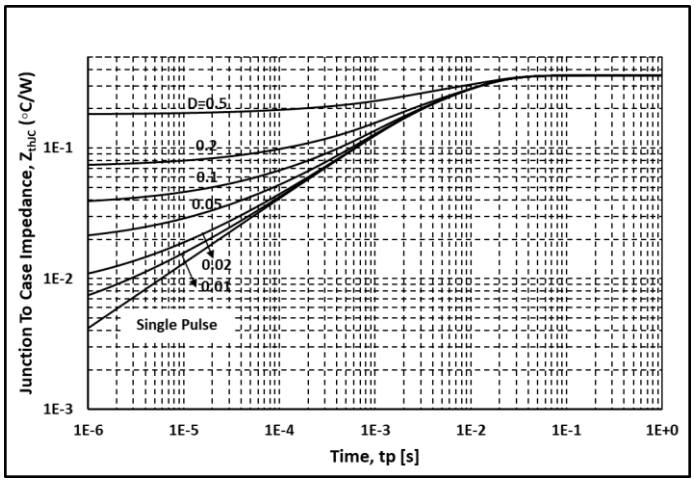


Fig. 25 Thermal impedance

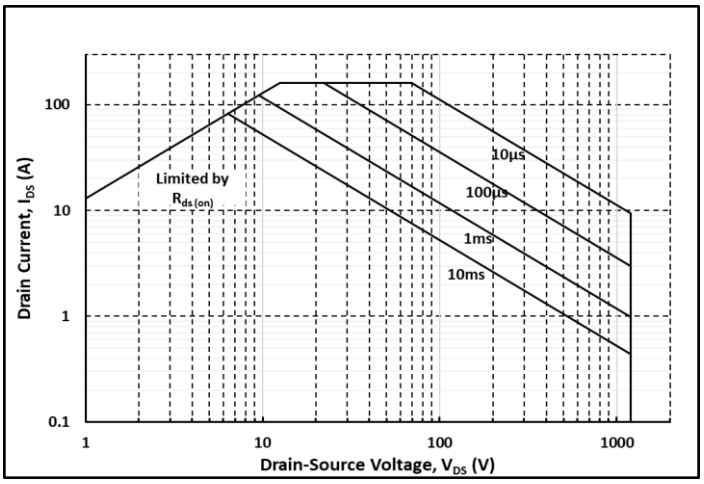
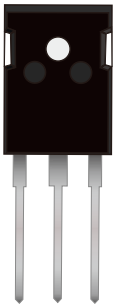
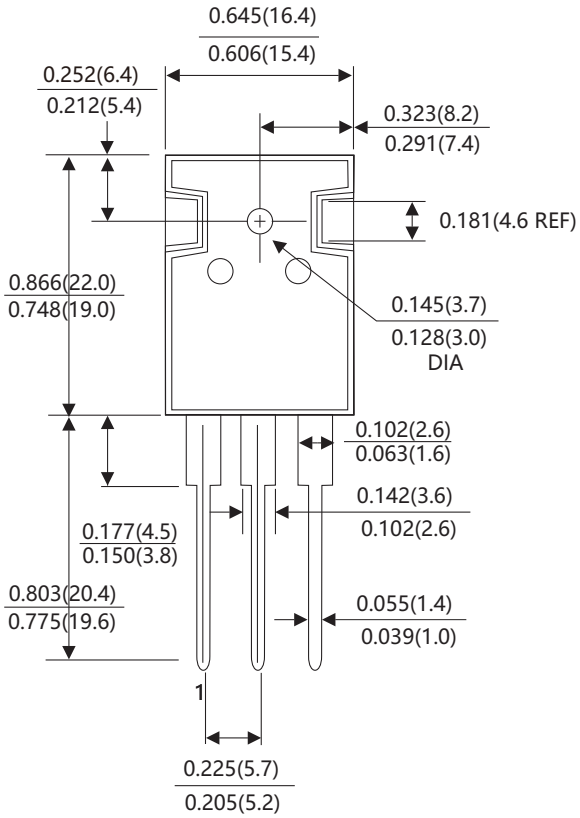


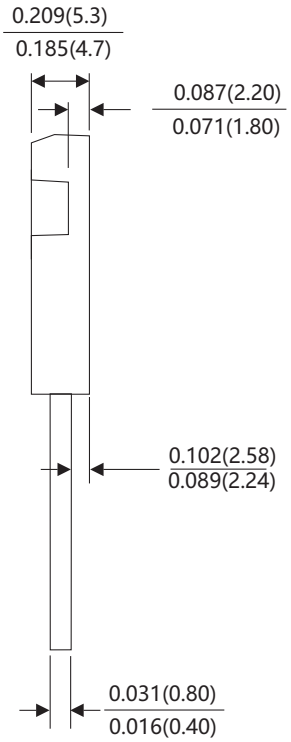
Fig. 26 Safe Operating Area

Dimensions

TO-247 package







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