SEMICONDUCTOR

SC80N120P

1200V 41A 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	80 @ 20V 10A	41	66nc

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

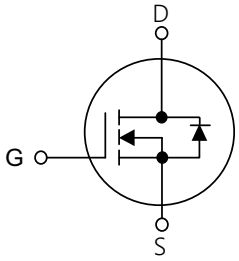


Table1 Absolute Maximum Ratings (T_C=25°C, unless otherwise specified)

Parameter		Symbol	Value	Unit
Drain-Source Voltage		V_{DS}	1200	V
Gate-Source Voltage(Max)		$V_{GS(max)}$	-10/+25	V
Recommend Gate-Source Voltage		V_{GSop}	-5/+20	V
Continuous Drain Current	T_C=25°C	I_D	41	A
	T_C=100°C		28	
Pulsed Drain Current (Note 1)		I_{DM}	80	A
Power Dissipation	T_C=25°C	P_D	208	W
Operating Junction and Storage Temperature		T_J/T_{STG}	-55 ~ +150	°C

Table 2.Thermal Characteristics

Parameter	Symbol	SC80N120P	Unit
Thermal resistance Junction to Case	$R_{\theta JC}$	0.72	°C/W
Thermal resistance Junction to Ambient	$R_{\theta JA}$	40	°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	-	1	100	μA
Gate- Source Leakage Current	Forward	I_{GSS}	V_{GS}=20V,V_{DS}=0V	-	-	250	nA
	Reverse		V_{GS}=-5V,V_{DS}=0V	-	-	-250	nA
On Characteristics							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS}=V_{GS},I_D=5mA	1.8	3.0	5.0	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{GS}=20V,I_D=20A,T_J=25°C	-	80	100	mΩ
			V_{GS}=20V,I_D=20A,T_J=175°C	-	130	-	
Gate Resisitance		R_G	f=1MHz	-	2.0	-	Ω
Dynamic Characteristics							
Input Capacitance		C_{ISS}	V_{DS}=1000V,V_{GS}=0V, f=1MHz,V_{AC}=25mV	-	1374	-	pF
Output Capacitance		C_{OSS}		-	63	-	pF
Reverse Transfer Capacitance		C_{RSS}		-	3.5	-	pF
Total switching energy		E_{TOT}	V_{DS}=800V,I_D=20A V_{GS}=-4/+20V,R_G=5.0Ω, L=276nH,T_J=25°C	-	218	-	μJ
Turn-on switching energy		E_{ON}		-	73	-	μJ
Turn-off switching energy		E_{OFF}		-	145	-	μJ
Turn-On Delay Time		td(on)		-	8.2	-	ns
Turn-On Rise Time		t_R		-	10.8	-	ns
Turn-Off Delay Time		td(off)		-	16.7	-	ns
Turn-Off Fall Time		tf		-	10.5	-	ns
Total Gate Charge		Q_G	V_{DD}=800V,I_D=20A, V_{GS}=-5to20V	-	66	-	nC
Gate-Source Charge		Q_{GS}		-	15	-	nC
Gate-Drain Charge		Q_{GD}		-	30	-	nC
Drain-Source Diode Characteristics and Maximum Ratings(Note 2)							
Drain-Source Diode Forward Voltage		V_{SD}	V_{GS}=-4V,I_S=10A	-	3.7	-	V
Reverse Recovery Time		trr	V_{GS}=-4V, VR=800V, I_{SD}=20A,diF/dt=2800A/μs	-	29.3	-	ns
Recovered charge		Qrr		-	156.5	-	nC
Peak reverse recovery current		Irrm		-	9.5	-	A

Notes: 1 RepetitiveRating Pulse width limited by maximum junction temperature

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

Typical Characteristics Diagrams

Figure 1. Output characteristics at Tj=25°C

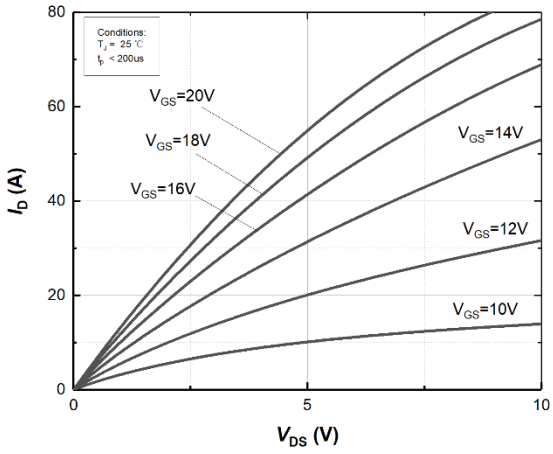


Figure 2. Output characteristics at Tj=175°C

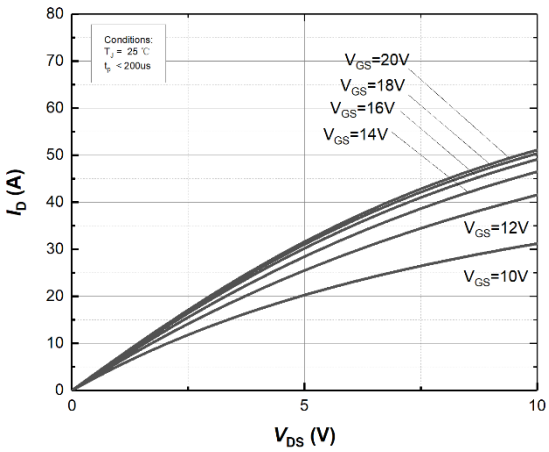


Figure 3. Normalized On-Resistance vs. Temperature

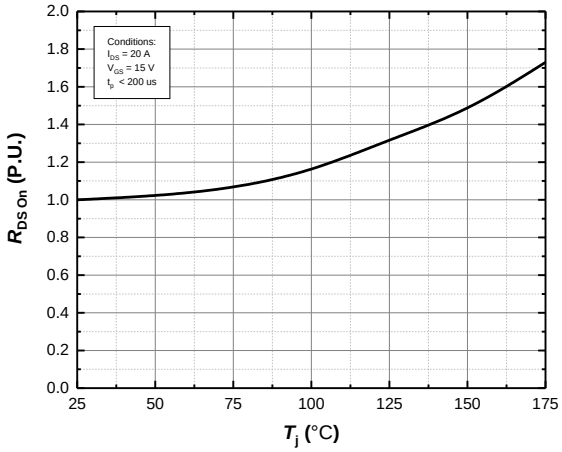


Figure 4. On-Resistance vs. Drain current for Various Temperature

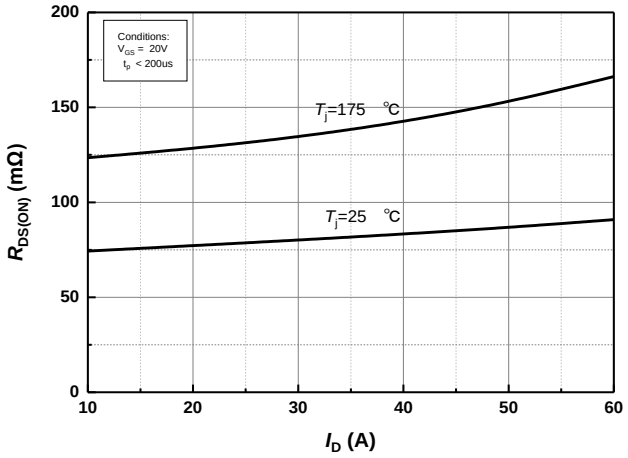


Figure 5. On-Resistance vs. Temperature for Various Gate Voltage

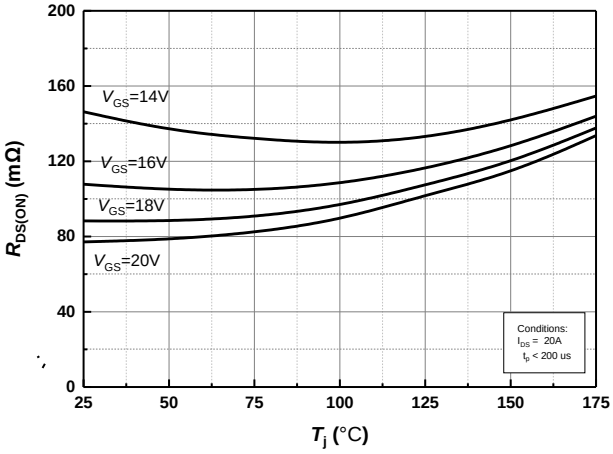
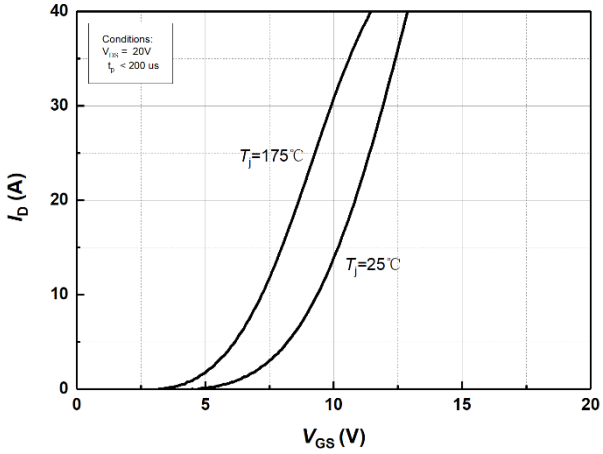


Figure 6. Transfer Characteristics for Various Junction Temperatures



Typical Characteristics Diagrams

Figure 7. Body Diode Characteristics at Tj=25°C

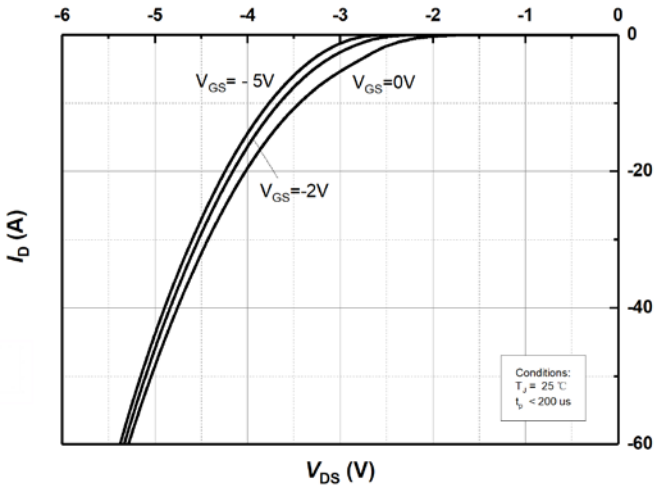


Figure 8. Body Diode Characteristics at Tj=175°C

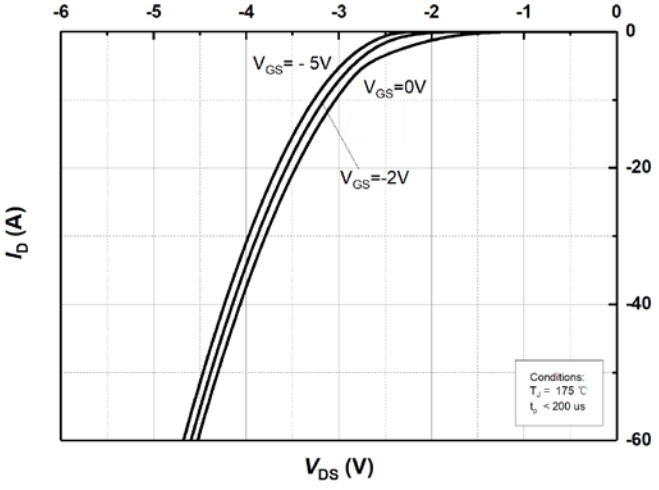


Figure 9. Threshold Voltage vs. Temperature

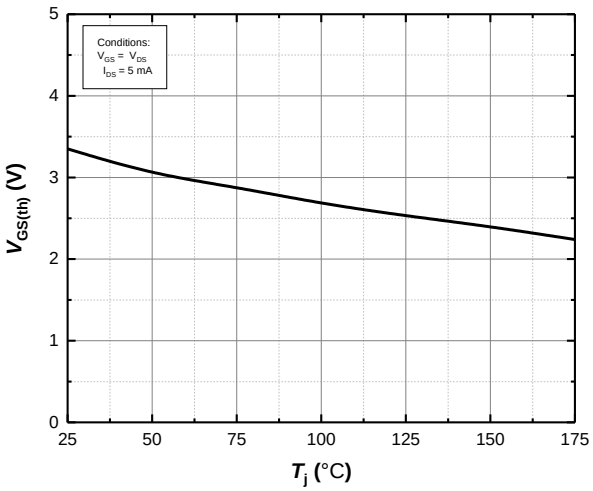


Figure 10 Gate Charge Characteristics

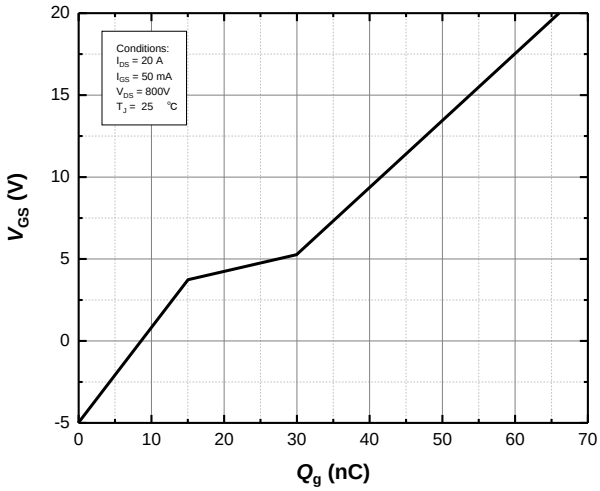


Figure 11. 3rd Quadrant Characteristic at Tj=25°C

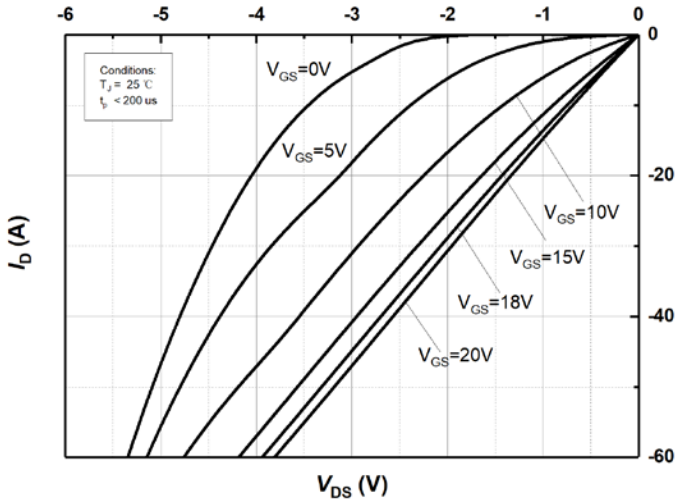
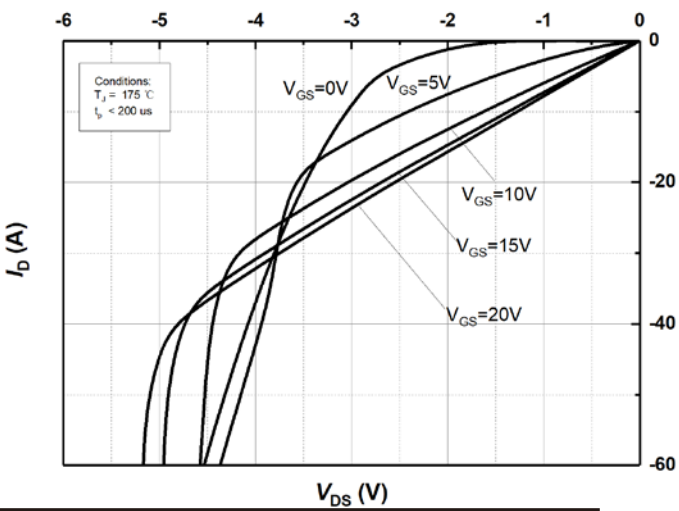


Figure 12. 3rd Quadrant Characteristic at Tj=175°C



Typical Characteristics Diagrams

Figure 13. Capacitances vs. Drain-Source Voltage (0 – 1000V)

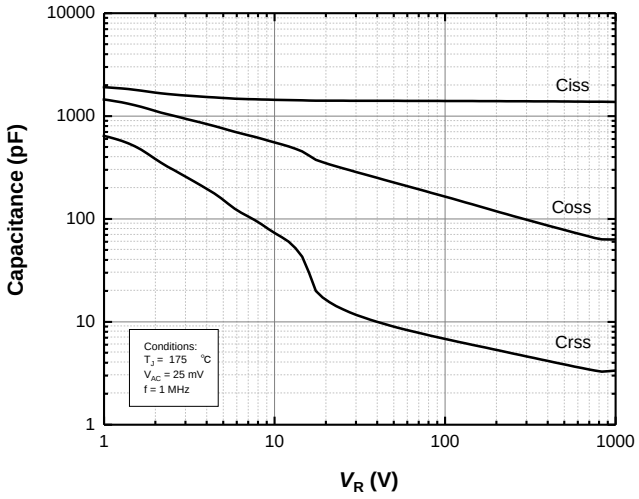


Figure 14. Continuous Drain Current Derating vs Case Temperature

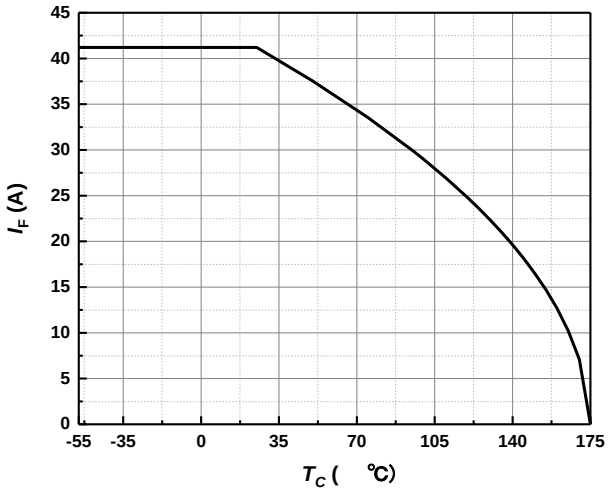


Figure 15.Transient Thermal Impedance (Junction – Case)

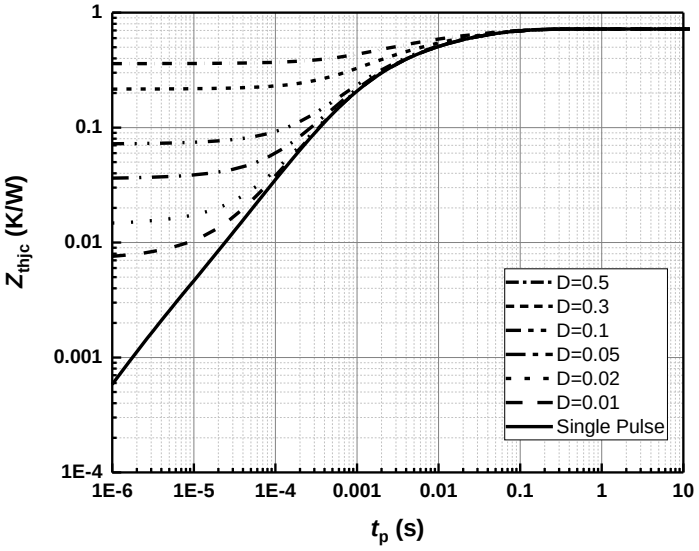


Figure 16. Maximum Power Dissipation Derating vs. Case Temperature

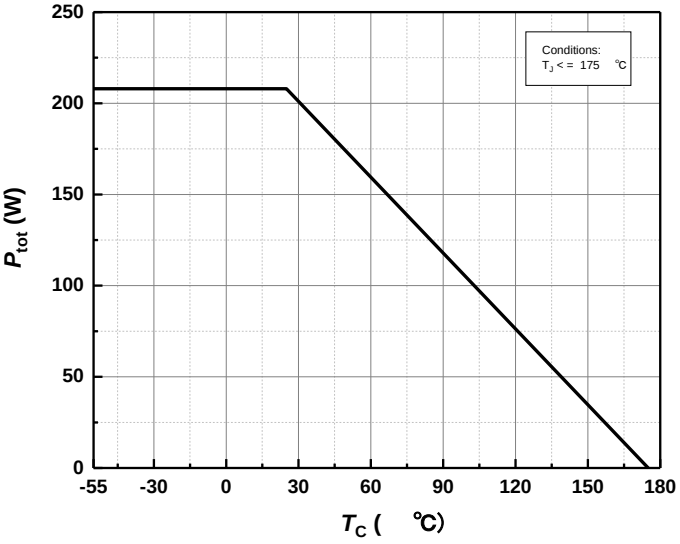


Figure 17. Output Capacitor Stored Energy

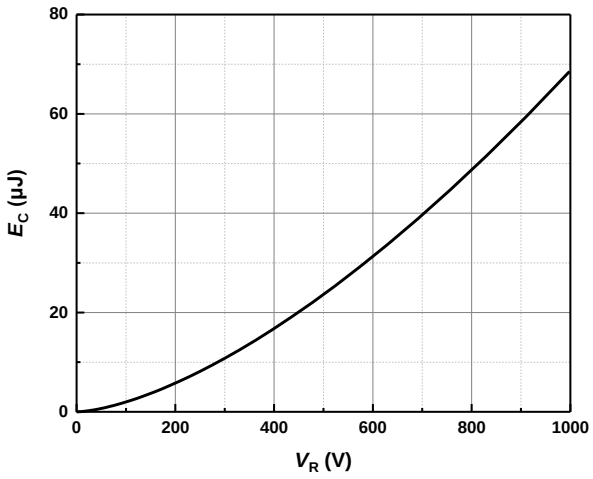
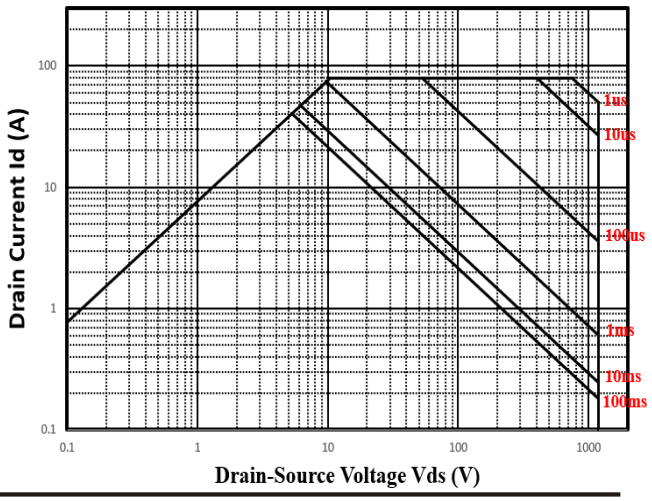


Figure 18. Safe Operating Area



Typical Characteristics Diagrams

Figure 19. Clamped Inductive Switching Energy vs. Drain Current(V_{DD} = 800V)

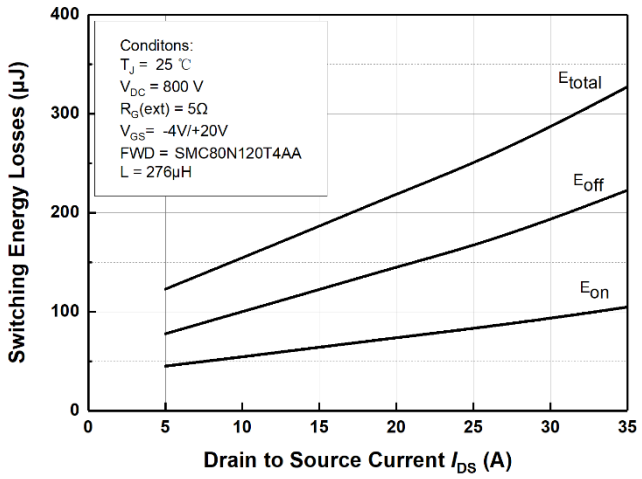


Figure 20. Clamped Inductive Switching Energy vs. Drain Current(V_{DD} = 600V)

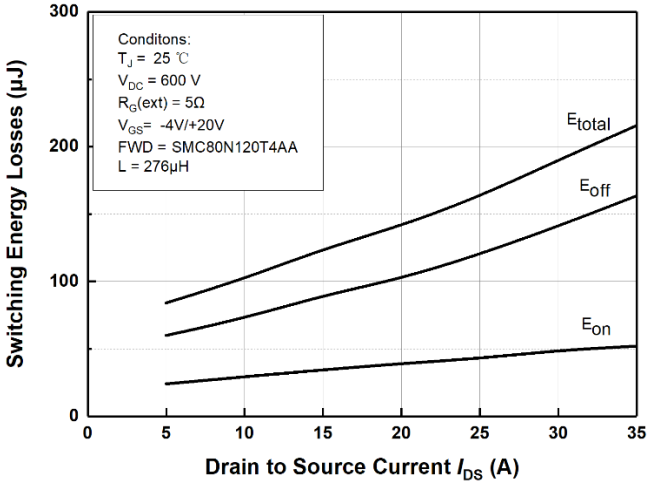


Figure 21. Clamped Inductive Switching Energy vs. $R_{G(ext)}$

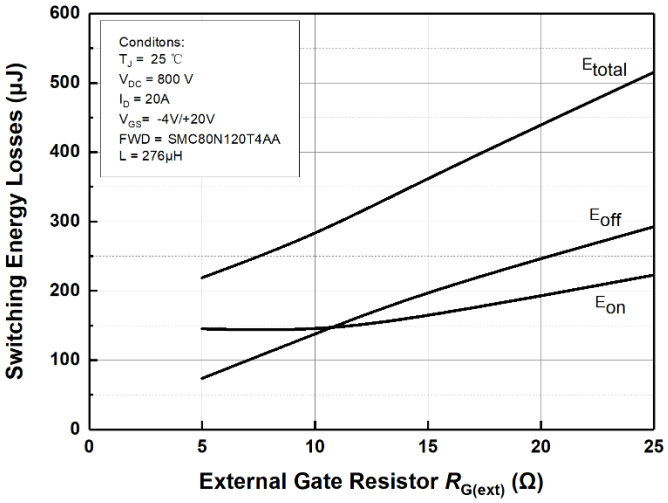
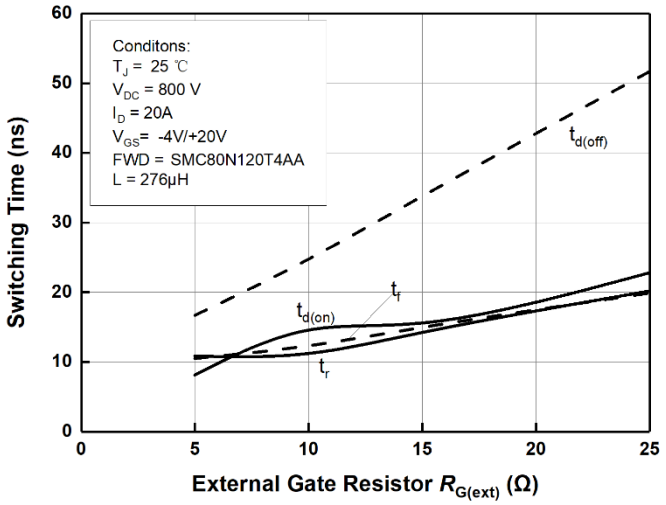
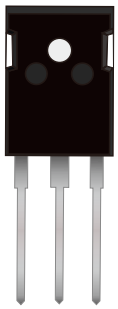


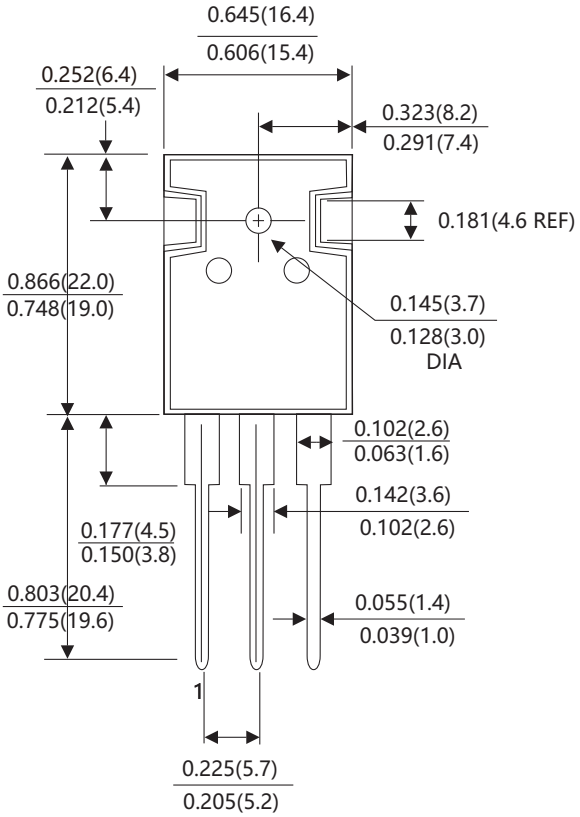
Figure 22. Switching Times vs. $R_{G(ext)}$

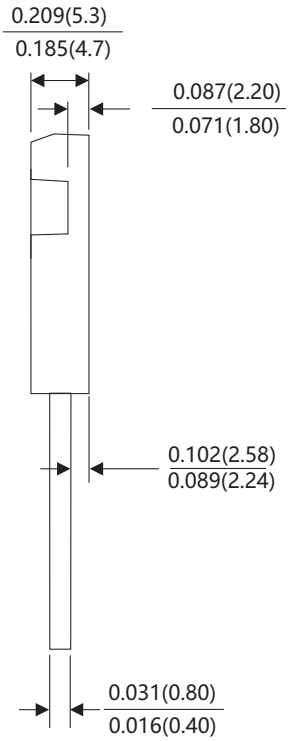


Dimensions

TO-247 package







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