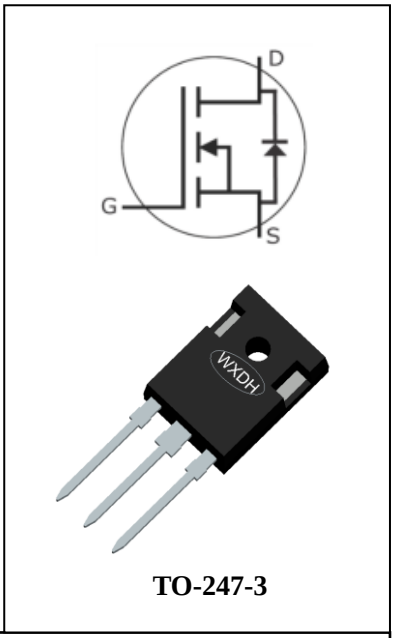
40A 1200V N-channel SiC Power MOSFET

1 Description

This product family offers state of the art performance. It is designed for high frequency applications where high efficiency and high reliability are required.



TO-247-3

V_{DSS} = 1200V

$R_{DS(on)\ (TYP)}$= 75mΩ

I_D = 41A

2 Features

- Higher System Efficiency
- Reduced Cooling Requirements
- Increased Power Density
- Increased System Switching Frequency

3 Applications

- Power Supplies.
- High Voltage DC/DC Converters.
- Motor Drives.
- Switch Mode Power Supplies
- Pulsed Power applications

4 Electrical Characteristics

4.1 Absolute Maximum Rating (Tc=25℃,unless otherwise noted)

Parameter	Symbol	Test Conditions	Value	Units
Drian-to-Source Voltage	V_{DSmax}	V_{GS}=0V, I_D=100μA	1200	V
Gate-Source Voltage	V_{GSmax}	Absolute maximum values	-10/+25	V
Gate-Source Voltage	V_{GSop}	Recommended operational values	-5/+20	V
Continuous Drain Current	I_D	V_{GS}=20V,T_C=25℃	41	A
		V_{GS}=20V,T_C=100℃	28	A
Pulsed Drain Current(1)	$I_{D(PULSE)}$	Pulse width tp limited by T_{Jmax}	80	A
Power Dissipation	P_D	Tc=25℃, T_J=175℃	208	W
Junction Temperature Range	T_j		-55～175	℃
Storage Temperature Range	T_{stg}		-55～175	℃

4.2 Thermal Characteristics

Parameter	Symbol	Rating	Unit
Thermal Resistance,Junction to Case-sink	R_{thJC}	0.72	℃/W
Thermal Resistance,Junction to Ambient	R_{thJA}	40	℃/W

4.3 Electrical Characteristics（Tc=25℃,unless otherwise noted）

Parameter	Symbol	Test Condition	Value			Units
			Min	Typ	Max	
Drain-to-Source Breakdown Voltage	BV_{DSS}	I_D=100uA,V_{GS}=0V	1200	--	--	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=1200V,V_{GS}=0V	--	1	50	μA
Gate-to-Source Leakage	I_{GSS+}	V_{DS}=0V,V_{GS}=20V	--	5	250	nA
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=5mA	--	3	--	V
		V_{DS}=V_{GS},I_D=5mA,T_J=175℃	--	2.3	--	V
Drain-to-Source on-state Resistance	$R_{DS(on)}$	V_{GS}=18V,I_D=20A	--	75	--	mΩ
		V_{GS}=18V,I_D=20A,T_J=175℃	--	125	--	
Transconductance	g_{fs}	V_{GS}=20V,I_D=20A	--	9	--	S
		V_{GS}=20V,I_D=20A,T_J=175℃	--	7	--	
Input Capacitance	C_{iss}	V_{GS}=0V, V_{DS}=1000V, f=1.0MHz, VAC=25mV	--	1374	--	pF
Output Capacitance	C_{oss}		--	63	--	
Reverse Transfer Capacitance	C_{rss}		--	3.5	--	
Turn-On Switching Energy	E_{ON}	V_{DS}=800V, V_{GS}=-4V/20V I_D=20A, $R_{G(ext)}$= 5Ω, L=276μH	--	73	--	μJ
Turn-Off Switching Energy	E_{OFF}		--	145	--	
Turn-on Delay Time	$t_{d(on)}$	V_{DS}=800V, V_{GS}=-4V/20V, I_D=20A, $R_{G(ext)}$= 5Ω, R_L=30Ω	--	8.7	--	nS
Turn-on Rise Time	t_r		--	18.3	--	
Turn-off Delay Time	$t_{d(off)}$		--	17.2	--	
Turn-off Fall Time	t_f		--	9.8	--	
Internal Gate Resistance	$R_{G(int)}$	f=1MHz, V_{AC}=25mV	--	2	--	Ω
Total Gate Charge	Q_g	V_{DS}=800V, V_{GS}=-5V/20V, I_D=20A	--	66	--	nC
Gate-to-Source Charge	Q_{gs}		--	15	--	
Gate-to-Drain(“Miller”) Charge	Q_{gd}		--	30	--	
Drain-Source Diode Characteristics						
Diode Forward Voltage(3)	V_{SD}	V_{GS}=-4V, I_{SD}=10A	--	3.7	--	V
		V_{GS}=-4V, I_{SD}=10A, T_J=175℃	--	3.1	--	V
Diode Forward Current	I_S	V_{GS}=-4V ,T_C=25℃	--	35	--	A
Reverse Recovery Time(3)	t_{rr}	V_R=800V, I_{SD}=20A	--	36	--	nS
Reverse Recovery Charge(3)	Q_{rr}		--	145	--	nC
Peak Reverse Recovery Current	I_{rrm}		--	7.1	--	A

Notes：

1: Repetitive rating, pulse width limited by maximum junction temperature.

2: Surface mounted on FR4 Board, t≤10sec.

3: Pulse width ≤ 300μs, duty cycle ≤ 2%.

5 Typical characteristics diagrams

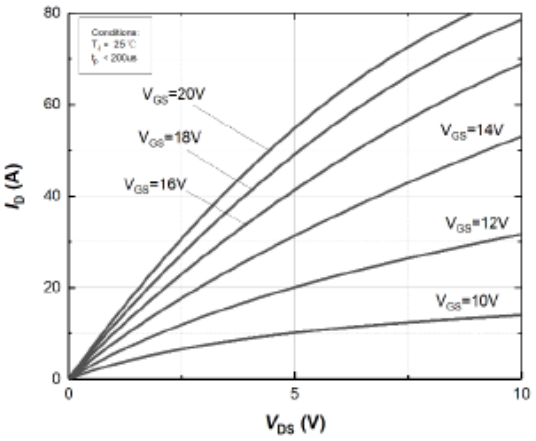


Figure 1. Output characteristics at Tj=25℃

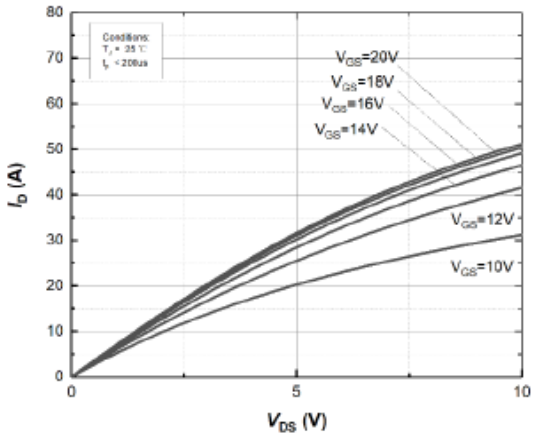


Figure 2. Output characteristics at Tj=175℃

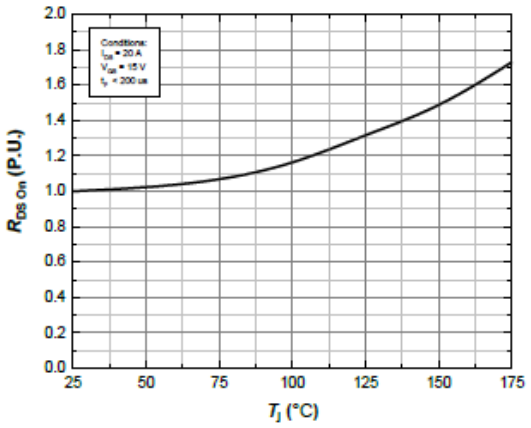


Figure 3. Normalized On-Resistance vs. Temperature

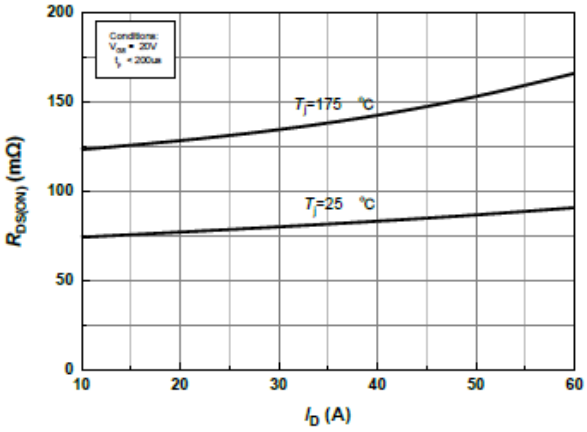


Figure 4. On-Resistance vs. Drain current for Various Temperature

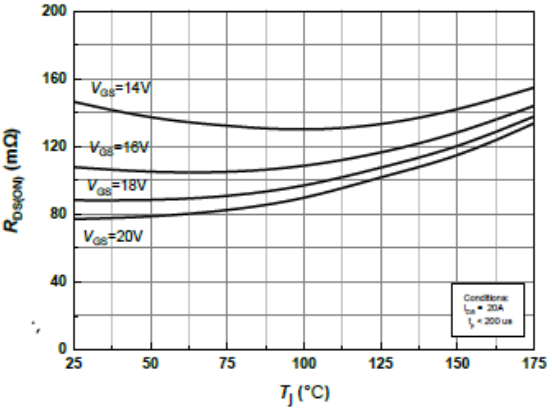


Figure 5. On-Resistance vs. Temperature for Various Gate Voltage

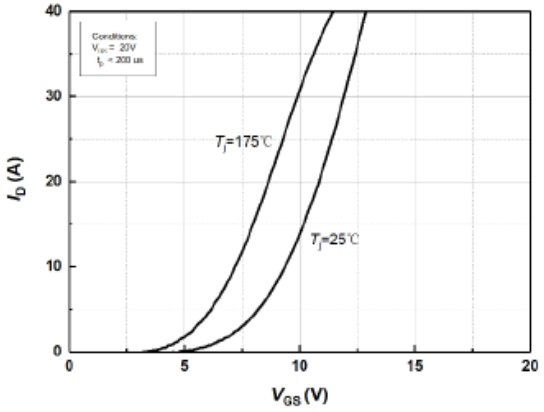


Figure 6. Transfer Characteristics for Various Junction Temperatures

5 Typical characteristics diagrams(continues)

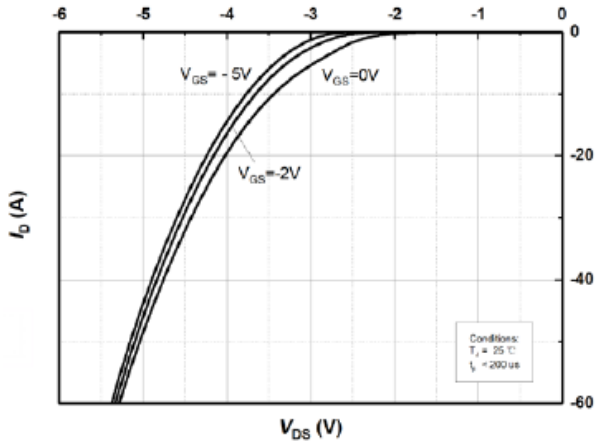


Figure 7. Body Diode Characteristics at Tj=25℃

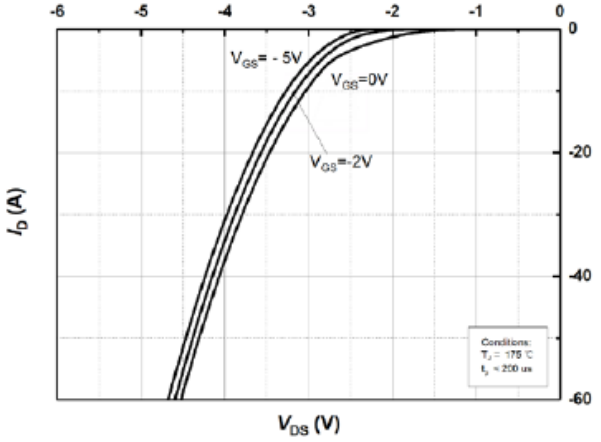


Figure 8. Body Diode Characteristics at Tj=175℃

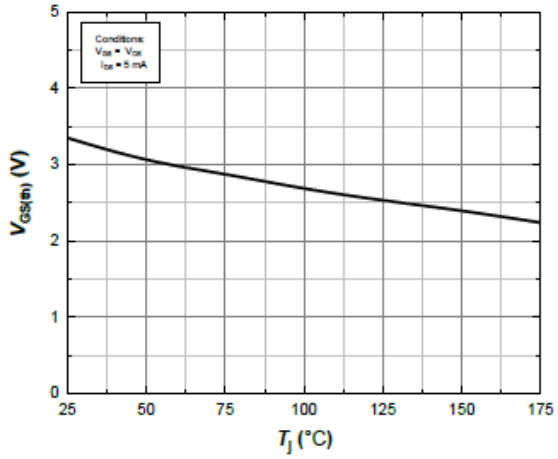


Figure 9. Threshold Voltage vs. Temperature

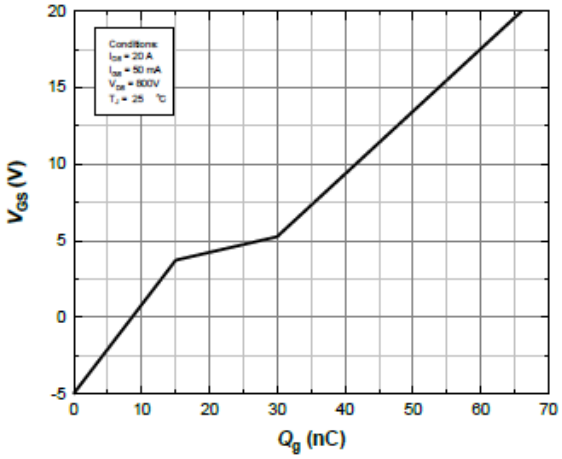


Figure 10 Gate Charge Characteristics

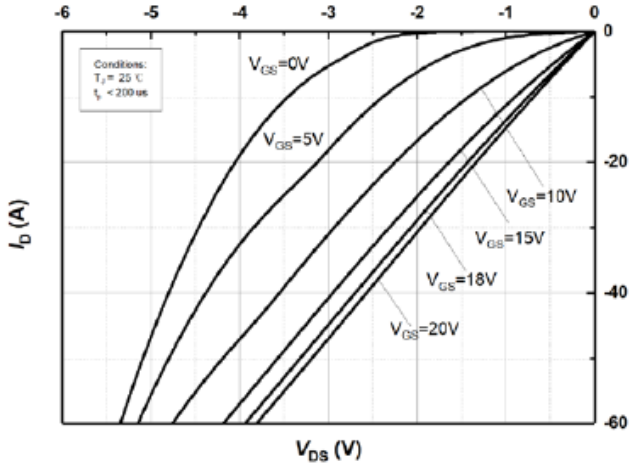


Figure 11. 3rd Quadrant Characteristic at Tj=25℃

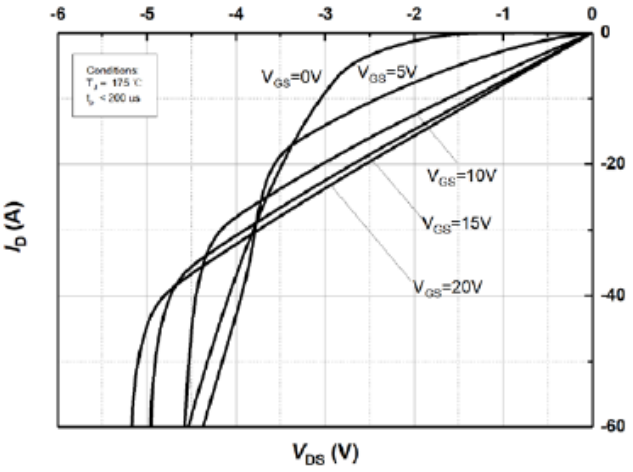


Figure 12. 3rd Quadrant Characteristic at Tj=175℃

5 Typical characteristics diagrams(continues)

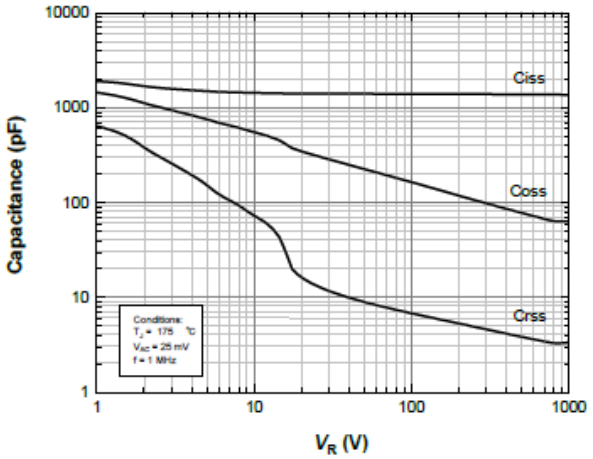


Figure 13. Capacitances vs. Drain-Source Voltage (0 – 1000V)

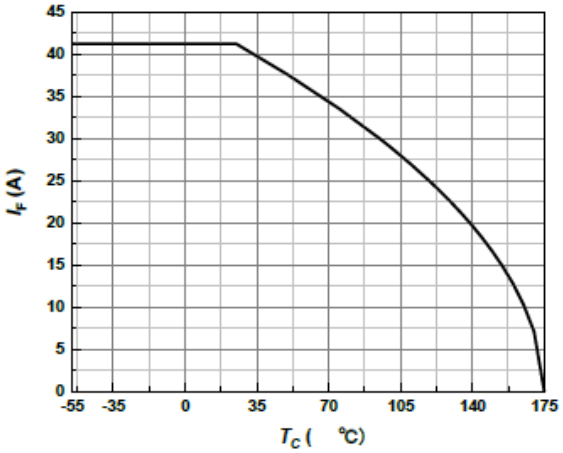


Figure 14. Continuous Drain Current Derating vs Case Temperature

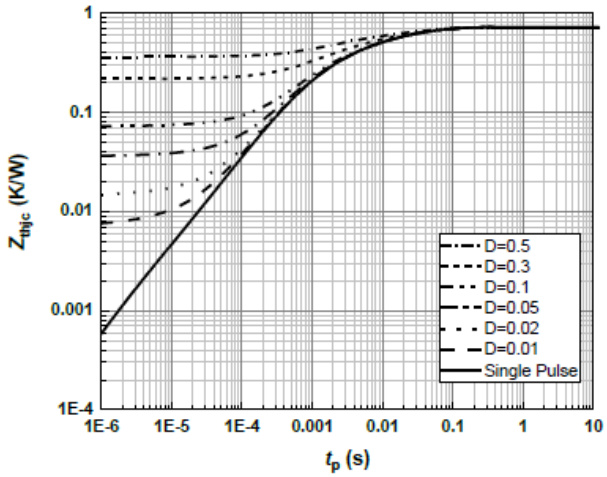


Figure 15.Transient Thermal Impedance (Junction – Case)

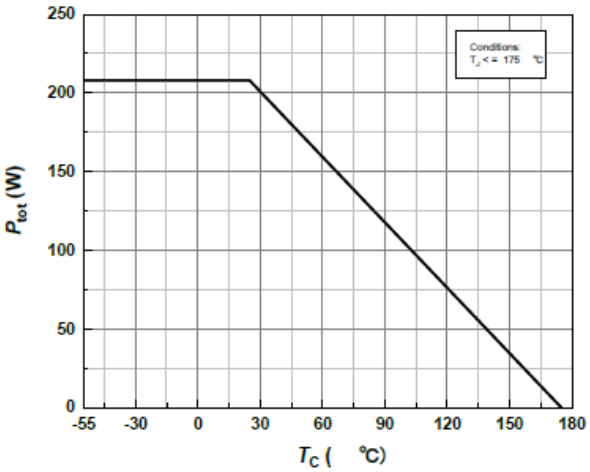


Figure 16. Maximum Power Dissipation Derating vs. Case Temperature

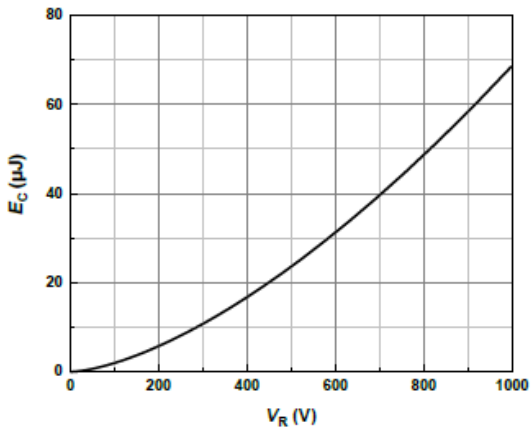


Figure 17. Output Capacitor Stored Energy

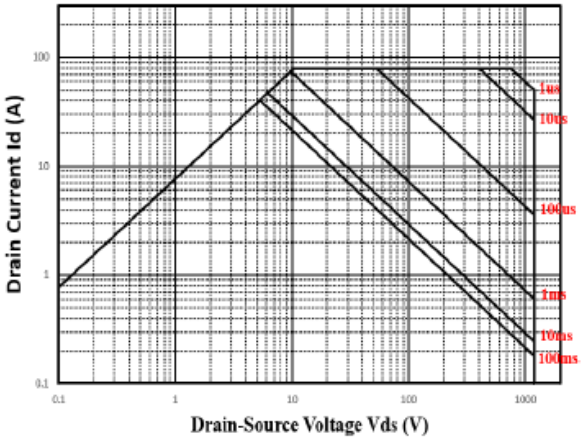


Figure 18. Safe Operating Area

5 Typical characteristics diagrams(continues)

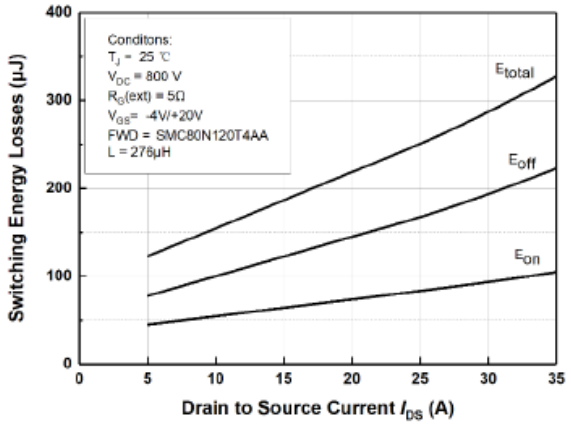


Figure 19. Clamped Inductive Switching Energy vs. Drain Current(V_{DD} = 800V)

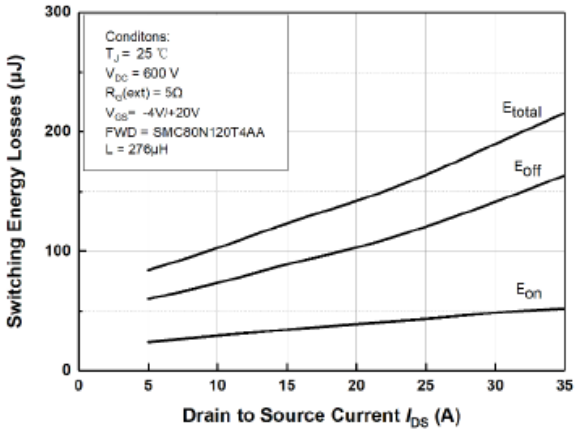


Figure 20. Clamped Inductive Switching Energy vs. Drain Current(V_{DD} = 600V)

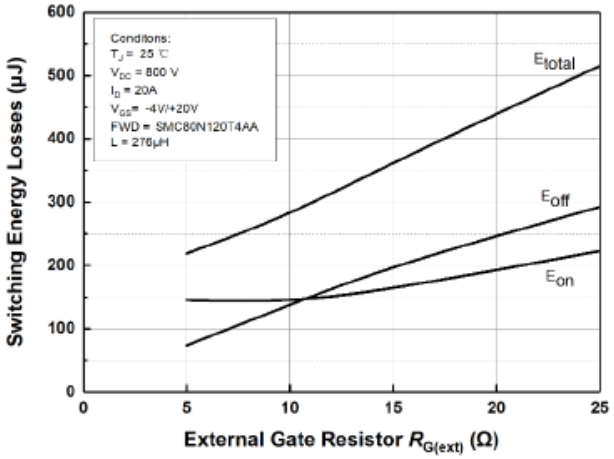


Figure 21. Clamped Inductive Switching Energy vs. $R_{G(ext)}$

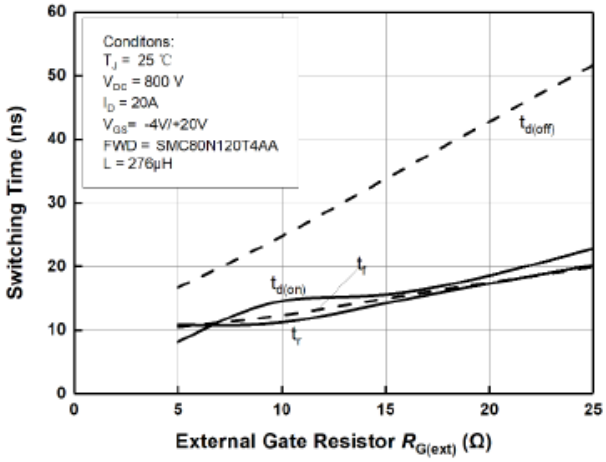


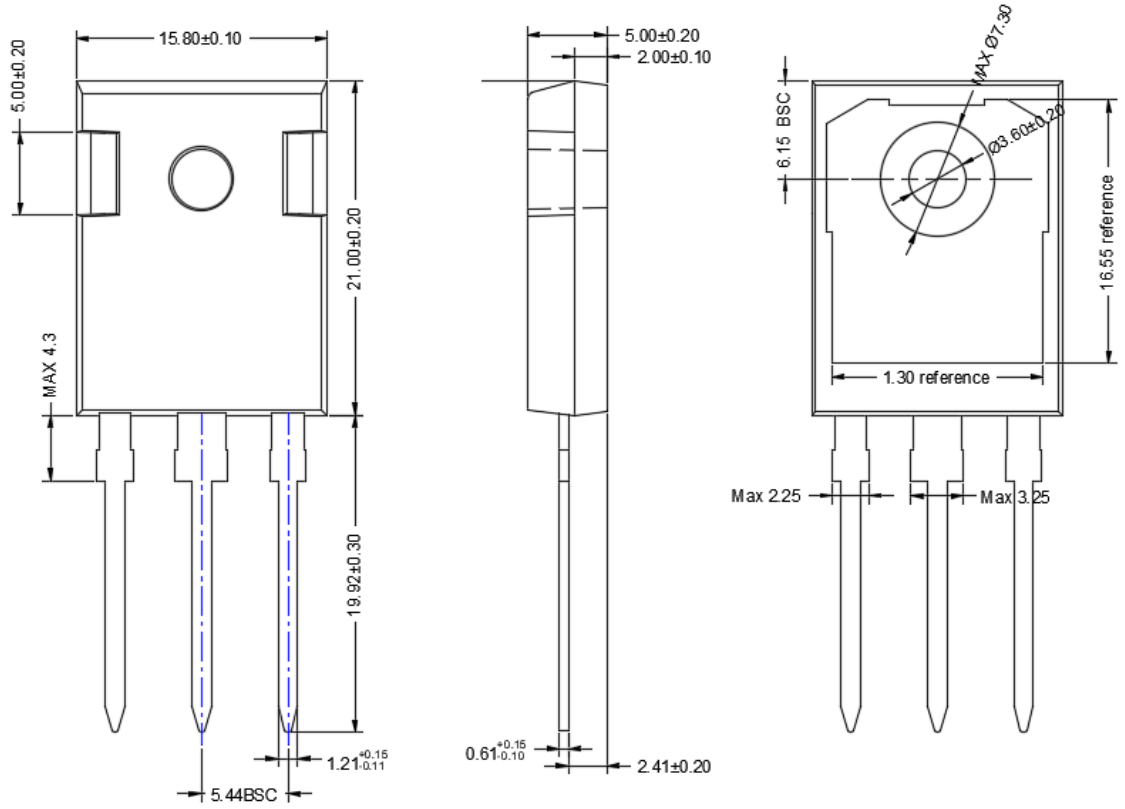
Figure 22. Switching Times vs. $R_{G(ext)}$

6 Product Specifications and Packaging Models

DCC075M120G2C	TO-247-3	DCC075M120G2C

7 Dimensions

TO-247-3 PACK OUTLINE DIMENSIONS



8 Attentions

- Jiangsu Donghai Semiconductor Technology CO.,LTD. reserves the right to change the specification without prior notice! The customer should obtain the latest version of the information before making the order and verify that the information is complete and up to date.
- It is the responsibility of the purchaser for any failure or failure of any semiconductor product under certain conditions. It is the responsibility of the purchaser to comply with safety standards and to take safety measures in the system design and machine manufacturing of Donghai products in order to avoid potential risk of failure. Injury or property damage.
- Product promotion is endless, our company will be dedicated to provide customers with better products.

9 Appendix

Revision history:

Date	REV.	Description	Page
2023.03.19	1.0	Original	7