Silicon Carbide (SiC)
2000V 17 mohm
A Boost Module with NTC
EasyPACK™ 3B
SC100DF20B3

The SC100DF20B3 is a boost module containing 17 mΩ / 2000 V SiC MOSFET with Si_3N_4 AMB in EasyPACK™ 3B package.

Features

- 17 mΩ / 2000 V SiC MOSFET
- Si_3N_4 AMB
- NTC Thermistor
- Low Inductive Layout
- High current density
- Isolated Base Plate

Typical Applications

- 1-phase string inverter solutions
- Energy Storage Systems
- EV charging
- Solar energy applications

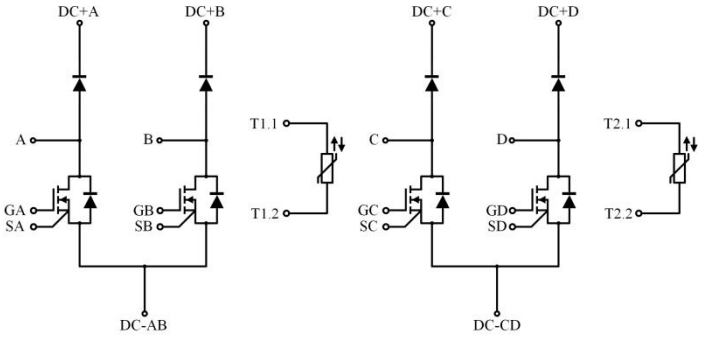
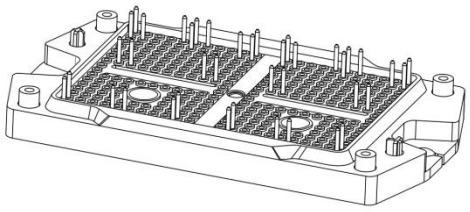


Figure 1. Schematic

Pin	Name	Description
1	DC+A	A, DC Positive Bus Connection
2	DC+B	B, DC Positive Bus Connection
3	DC-AB	A&B, DC Negative Bus Connection
4	DC+C	C, DC Positive Bus Connection
5	DC+D	D, DC Positive Bus Connection
6	DC-CD	C&D, DC Negative Bus Connection
7	A	Diode A Anode or MOS A Drain
8	B	Diode B Anode or MOS B Drain



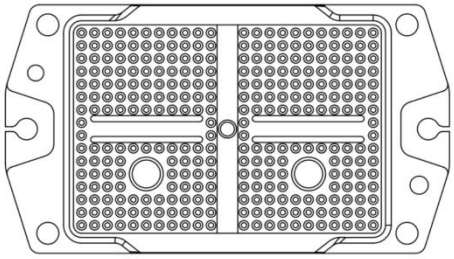
109.90 × 62.00 × 16.40

MARKING DIAGRAM



SC100DF20B3 = Device Code
XXXXXXX = Year, week and batch Code
XXXXX = Flow code

PIN ASSIGNMENTS



ORDERING INFORMATION

Device	Package
SC100DF20B3	EasyPACK™ 3B

PIN DESCRIPTION

Pin	Name	Description
9	C	Diode C Anode or MOS C Drain
10	D	Diode D Anode or MOS D Drain
11	GA	MOS A Gate
12	SA	MOS A Source
13	GB	MOS B Gate
14	SB	MOS B Source
15	GC	MOS C Gate
16	SC	MOS C Source
17	GD	MOS D Gate
18	SD	MOS D Source
19	T1.1、T1.2	Negative Temperature Coefficient 1
20	T2.1、T2.2	Negative Temperature Coefficient 2

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
SiC MOSFET			
Drain−Source Voltage	V_{DSS}	2000	V
Gate−Source Voltage	V_{GS}	+ 18 /− 4	V
Continuous Drain Current @ T_C = 80 °C (T_J = 175 °C)	I_{DS}	60	A
Pulsed Drain Current (T_J = 175°C)	I_{Dpluse}	120	A
Maximum Power Dissipation @ T_C = 80°C (T_J = 175 °C)	P_{tol}	380	W
Minimum Operating Junction Temperature	T_{JMIN}	− 40	°C
Maximum Operating Junction Temperature	T_{JMAX}	175	°C

ELECTRICAL CHARACTERISTICS (T_J = 25 ℃ unless otherwise noted)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
SiC MOSFET CHARACTERISTICS						
Zero Gate Voltage Drain Current	V_{GS} = 0 V, V_{DS} = 2000 V	I_{DSS}	-	-	1	mA
Drain−Source On Resistance	V_{GS} = 18 V, I_{DS} = 60 A, T_J = 25°C	$R_{DS(ON)}$	-	16.4		mΩ
	V_{GS} = 18 V, I_{DS} = 60 A, T_J = 125°C		-	23.0	-	
	V_{GS} = 18 V, I_{DS} = 60 A, T_J = 175°C		-	29.6	-	
Gate−Source Threshold Voltage	V_{GS} = V_{DS} , I_{DS} = 34 mA, T_J = 25°C	$V_{GS(TH)}$	2.30	2.87	3.40	V
Gate Resistance	V_{GS} = 0V, f = 100 kHz	R_g	-	1.65	-	Ω
Gate Leakage Current	V_{GS} = -10 / 20 V,V_{DS} = 0 V	I_{GSS}	-800	-	+800	nA
Input Capacitance	V_{DS} = 1200 V, V_{GS} = 0 V, f = 100 kHz	C_{ISS}	-	21.7	-	nF
Reverse Transfer Capacitance		C_{RSS}	-	414	-	pF
Output Capacitance		C_{OSS}	-	35.4	-	pF
Total Gate Charge	V_{DS} = 1200 V, V_{GS} = -4 / 18 V, I_D = 60 A	$Q_{G(TOTAL)}$	-	795	-	nC
Gate-Source Charge		Q_{GS}		198		
Gate-Drain Charge		Q_{GD}		597		
Turn−on Delay Time	V_{DS} = 1200 V, I_{DS} = 60 A V_{GS} = -4 / 18 V, R_G = 1.5 Ω L_S = 27 uH, T_J = 25 °C	$T_{d(on)}$	-	49.9	-	ns
Rise Time		t_r	-	43.5	-	ns
Turn−off Delay Time		$T_{d(off)}$	-	88.0	-	ns
Fall Time		t_f	-	29.8	-	ns
Turn−on Switching Loss per Pulse		E_{ON}	-	1.59	-	mJ
Turn−off Switching Loss per Pulse		E_{OFF}	-	1.04	-	mJ
Turn−on Delay Time	V_{DS} = 1200 V, I_{DS} = 60 A V_{GS} = -4 / 18 V, R_G = 1.5 Ω L_S = 27 uH, T_J = 125 °C	$T_{d(on)}$	-	41.6	-	ns
Rise Time		t_r	-	43.2	-	ns
Turn−off Delay Time		$T_{d(off)}$	-	103.4	-	ns
Fall Time		t_f	-	32.3	-	ns
Turn−on Switching Loss per Pulse		E_{ON}	-	1.87	-	mJ
Turn−off Switching Loss per Pulse		E_{OFF}	-	1.22	-	mJ
Turn−on Delay Time	V_{DS} = 1200 V, I_{DS} = 60 A V_{GS} = -4 / 18 V, R_G = 1.5 Ω L_S = 27 uH, T_J = 175 °C	$T_{d(on)}$		39.4		ns
Rise Time		t_r		45.8		ns
Turn−off Delay Time		$T_{d(off)}$		111.7		ns
Fall Time		t_f		33.9		ns
Turn−on Switching Loss per Pulse		E_{ON}		2.16		mJ
Turn−off Switching Loss per Pulse		E_{OFF}		1.30		mJ
Thermal Resistance, Junction to Case (MOSFET)		R_{thJC}	-	0.399	-	°C/W

ELECTRICAL CHARACTERISTICS (T_J = 25℃ unless otherwise noted) (continued)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
BODY DIODE CHARACTERISTICS						
Diode Forward Voltage	I_{SD} = 60 A, V_{GS} = -4V, T_J = 25 °C	V_{SD}	-	3.98	4.50	V
	I_{SD} = 60 A, V_{GS} = -4V, T_J = 125 °C		-	3.48	-	
	I_{SD} = 60 A, V_{GS} = -4V, T_J = 175 °C		-	3.34	-	
Diode Reverse Recovery Charge	V_R = 1200 V, I_{SD} = 60 A V_{GS} = -4 V, R_G = 1.5 Ω di/dt = 2890 A/us L_S = 27 uH, T_J = 25 °C	Q_r	-	1.08	-	uC
Peak Reverse Recovery Current		I_{rrm}	-	69.2	-	A
Reverse Recovery Energy		E_{rr}	-	0.44	-	mJ
Diode Reverse Recovery Charge	V_R = 1200 V, I_{SD} = 60 A V_{GS} = -4 V, R_G = 1.5 Ω di/dt = 2920 A/us L_S = 27 uH, T_J = 125 °C	Q_r	-	3.07	-	uC
Peak Reverse Recovery Current		I_{rrm}	-	120.7	-	A
Reverse Recovery Energy		E_{rr}	-	1.77	-	mJ
Diode Reverse Recovery Charge	V_R = 1200 V, I_{SD} = 60 A V_{GS} = -4 V, R_G = 1.5 Ω di/dt = 3080 A/us L_S = 27 uH, T_J = 175 °C	Q_r	-	4.34	-	uC
Peak Reverse Recovery Current		I_{rrm}	-	179.4	-	A
Reverse Recovery Energy		E_{rr}	-	2.65	-	mJ
Thermal Resistance, Junction to Case (Body Diode)		R_{thJC}	-	0.797	-	°C/W
DIODE CHARACTERISTICS						
Diode Forward Voltage	I_{SD} = 40 A, V_{GS} = 0V, T_J = 25 °C	V_{SD}	-	1.67	-	V
	I_{SD} = 40 A, V_{GS} = 0V, T_J = 125 °C		-	2.08	-	
	I_{SD} = 40 A, V_{GS} = 0V, T_J = 175 °C		-	2.49	-	
THERMISTOR CHARACTERISTICS						
Rated Resistance		R_{25}	-	5.0	-	K Ω
Deviation of R_{100}	T_C = 100°C, R_{100} = 493.3Ω	ΔR/R	-5	-	5	%
Power Dissipation		P_{25}	-	-	20.0	mW
B-value	$R_2 = R_{25}\exp[B_{25/50}(1/T_2-1/(298.15K))]$	$B_{25/50}$	-	3375	-	K
B-value	$R_2 = R_{25}\exp[B_{25/80}(1/T_2-1/(298.15K))]$	$B_{25/80}$	-	3411	-	K

MODULE

Storage Temperature Range	T_{stg}	-40 to 150	°C
Module Operating Junction Temperature	T_J	-40 to 150	°C
Isolation Test Voltage, t = 1 s, 50 Hz	V_{iso}	3200	V
Mounting torque to main terminals(M5 screw)	M_H	1.3-1.5	N.m
Stray Inductance	L_{DS}	14	nH
Weight of Module	G	80	g

TYPICAL CHARACTERISTIC

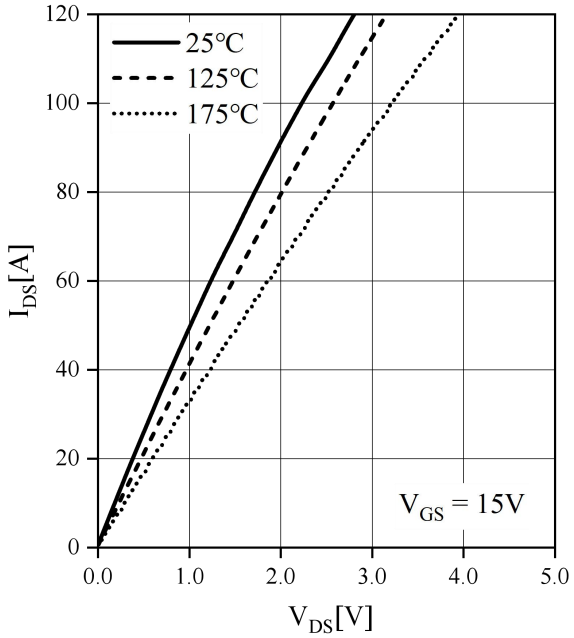


Figure 2. MOSFET Typical Output Characteristic

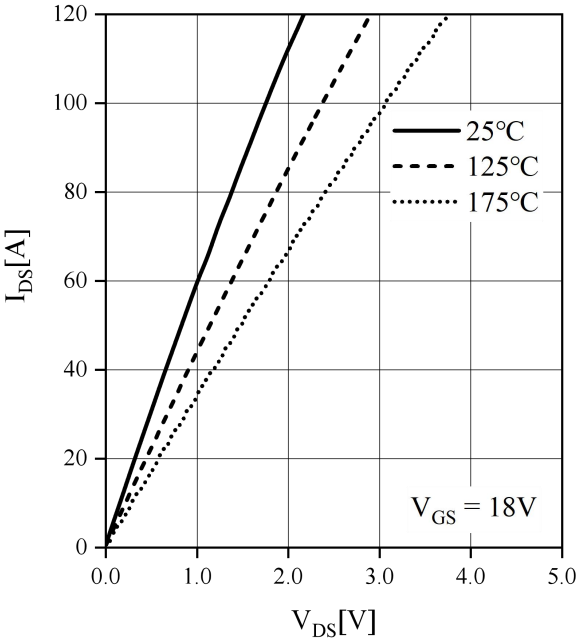


Figure 3. MOSFET Typical Output Characteristic

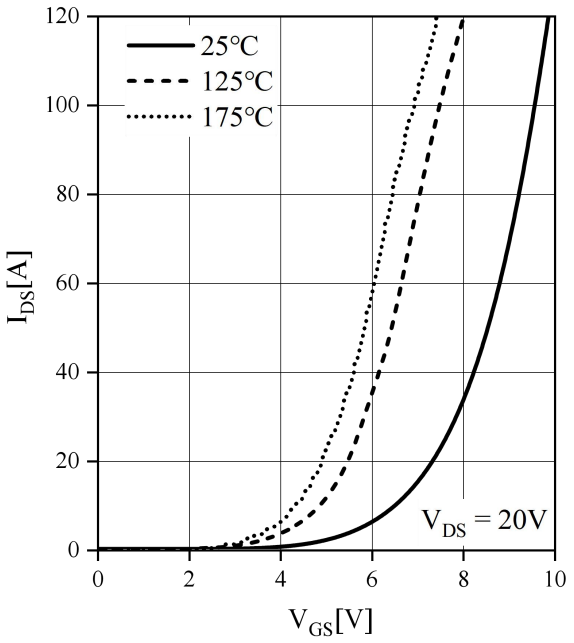


Figure 4. MOSFET Typical Transfer Characteristic

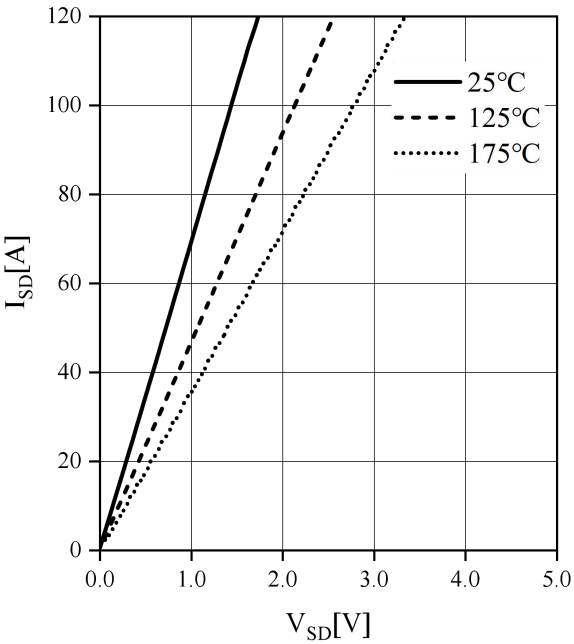


Figure 5. Body Diode Forward Characteristic

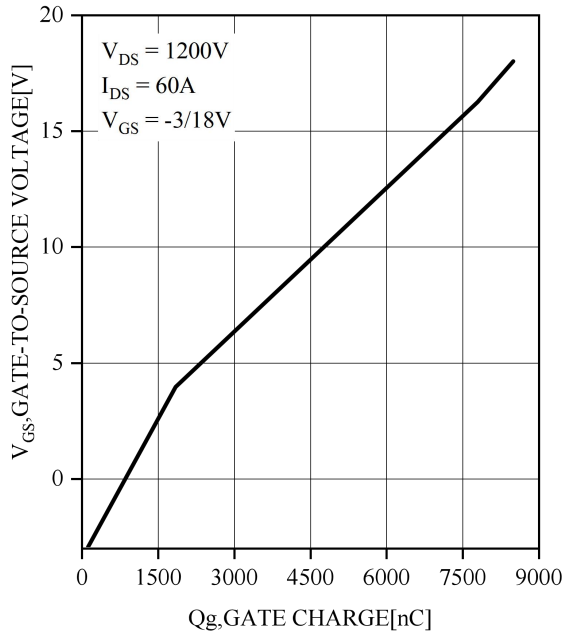


Figure 6. Gate−to−Source Voltage vs. Total Charge

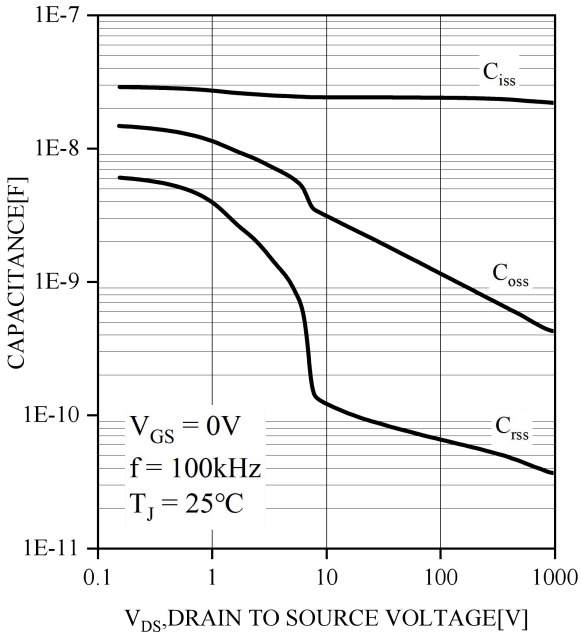


Figure 7. Capacitance vs. Drain−to−Source Voltage

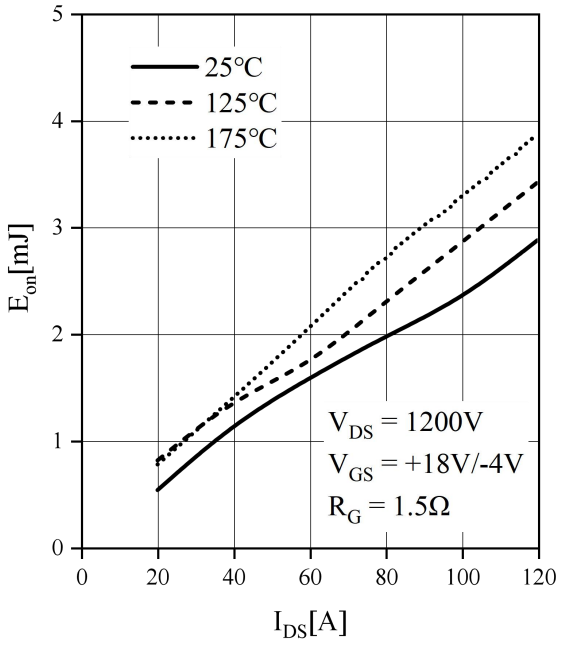


Figure 8. Typical Switching Loss E_{on} vs. I_{DS}

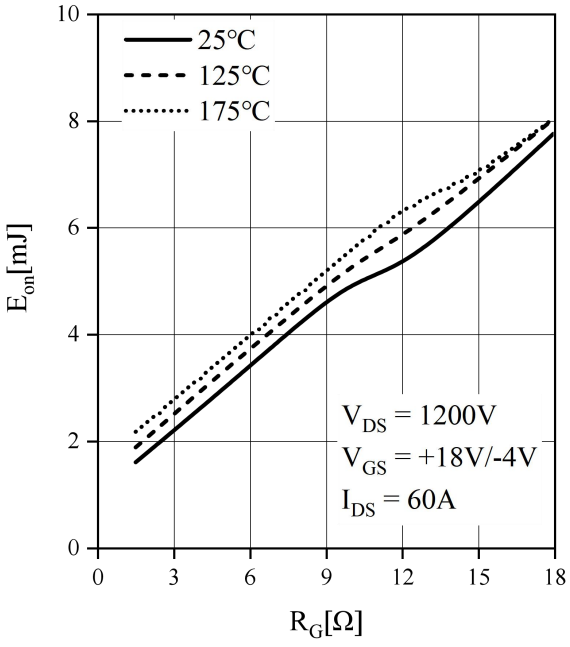


Figure 9. Typical Switching Loss E_{on} vs. R_G

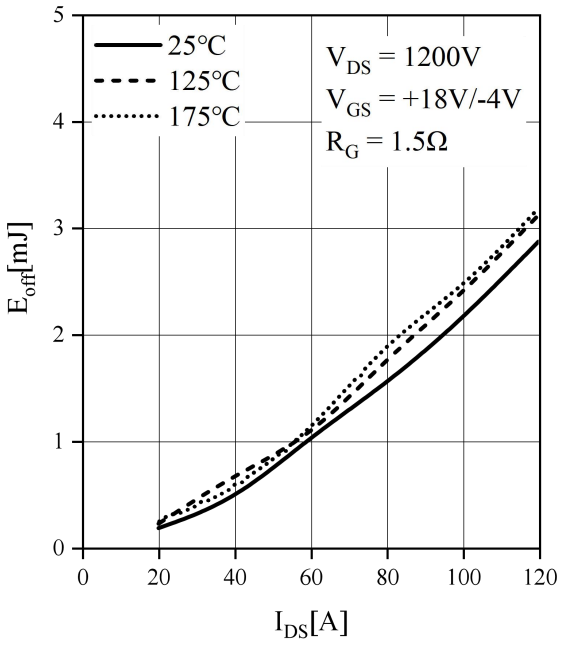


Figure 10. Typical Switching Loss E_{off} vs. I_{DS}

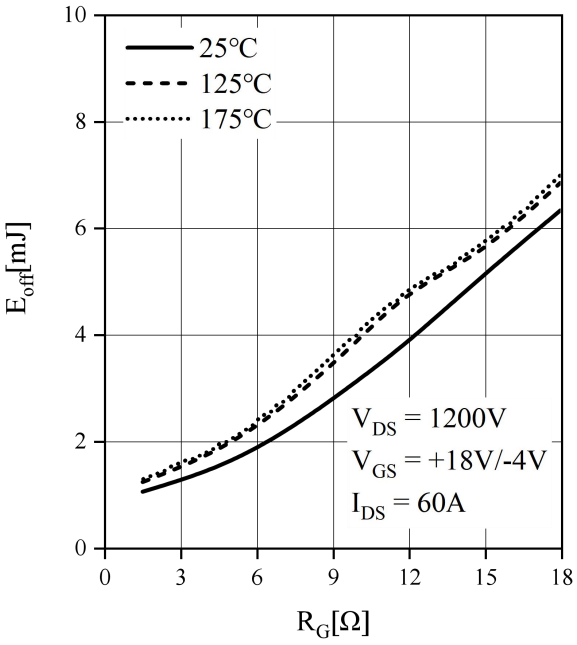


Figure 11.Typical Switching Loss E_{off} vs. R_G

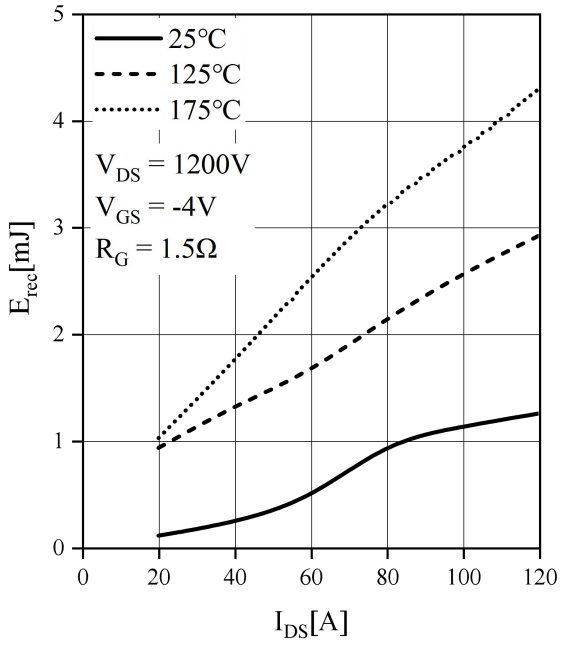


Figure 12. Typical Switching Loss E_{rec} vs. I_{DS}

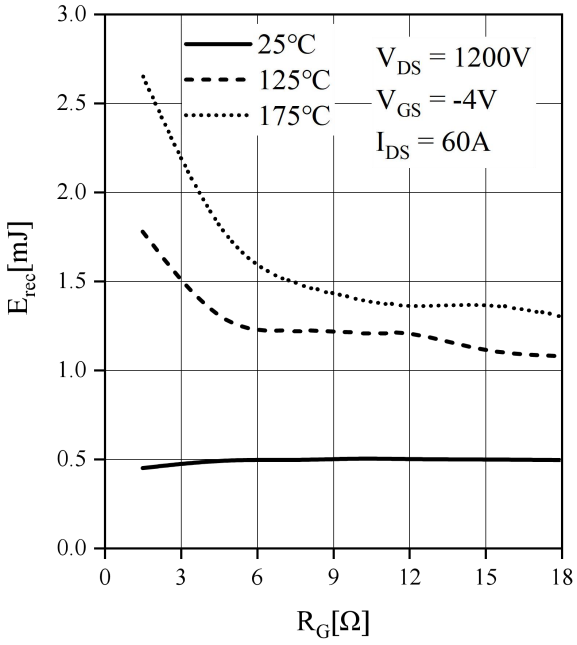


Figure 13. Typical Switching Loss E_{rec} vs. R_G

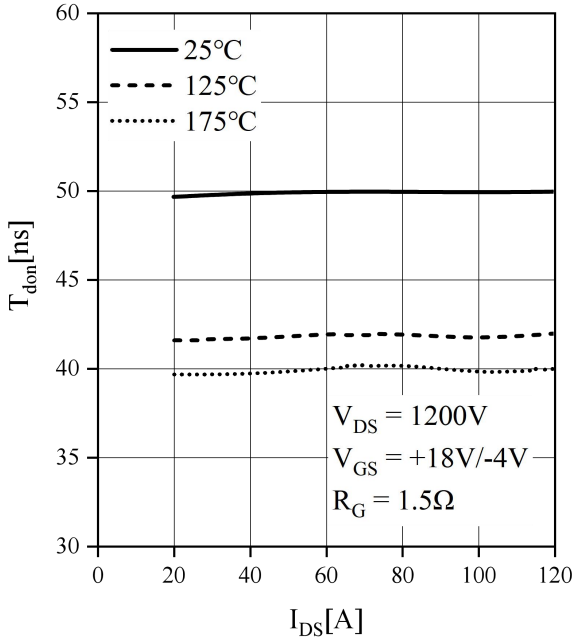


Figure 14. Typical Switching Loss $T_{d(on)}$ vs. I_{DS}

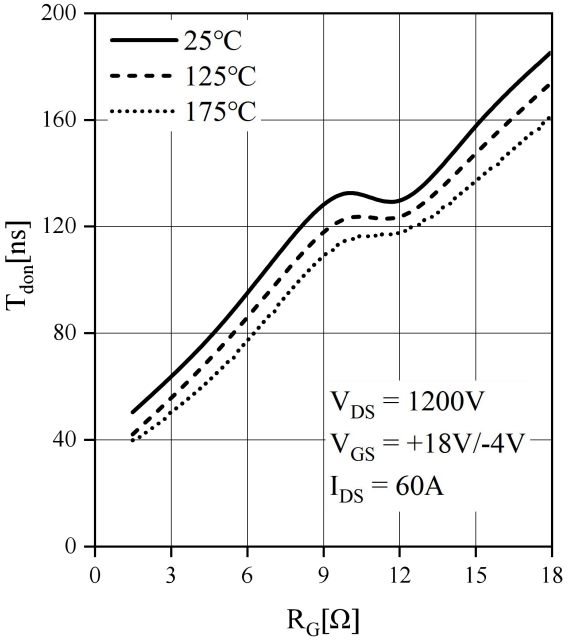


Figure 15. Typical Switching Loss $T_{d(on)}$ vs. R_G

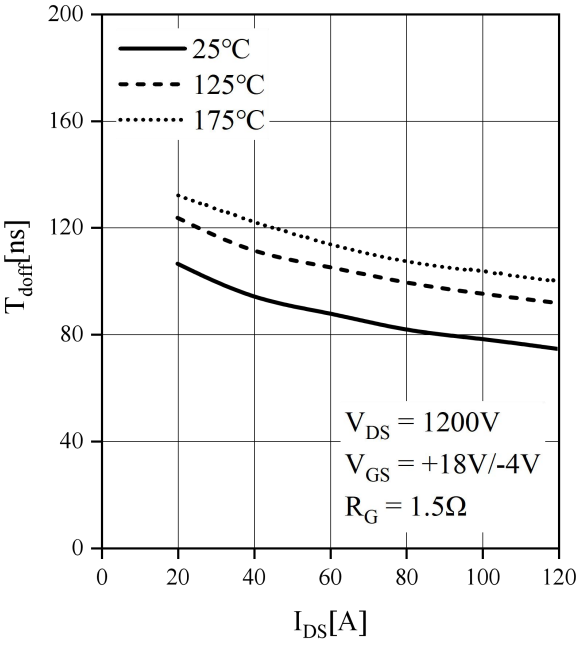


Figure 16. Typical Switching Loss $T_{d(off)}$ vs. I_{DS}

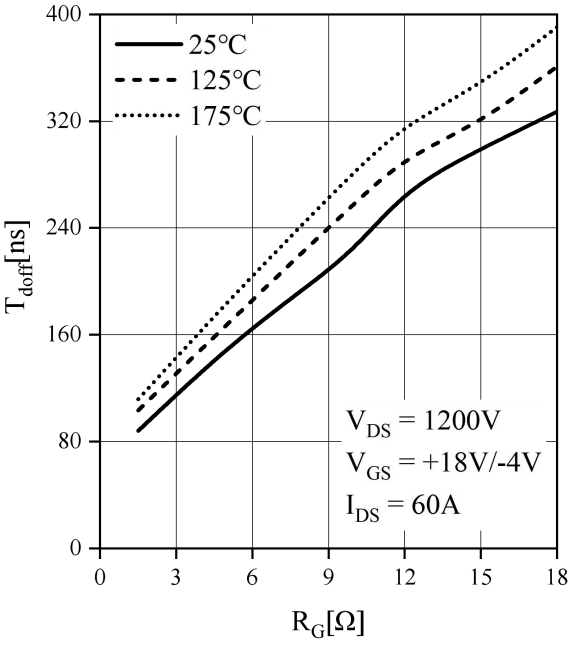


Figure 17. Typical Switching Loss $T_{d(off)}$ vs. R_G

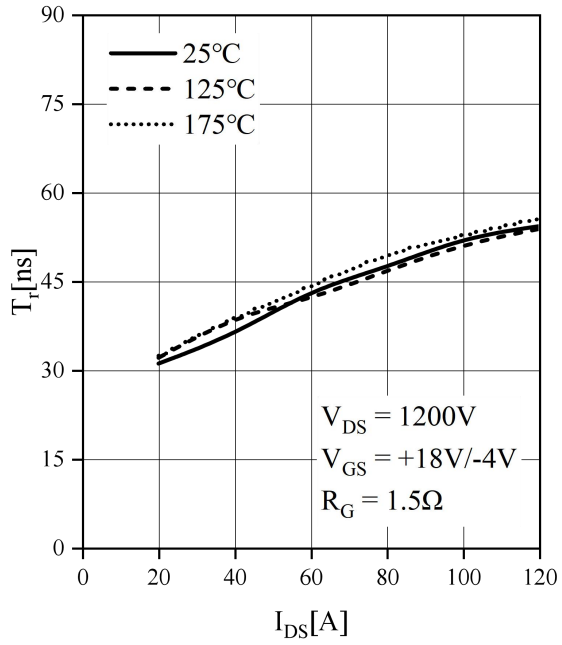


Figure 18. Typical Switching Loss T_r vs. I_{DS}

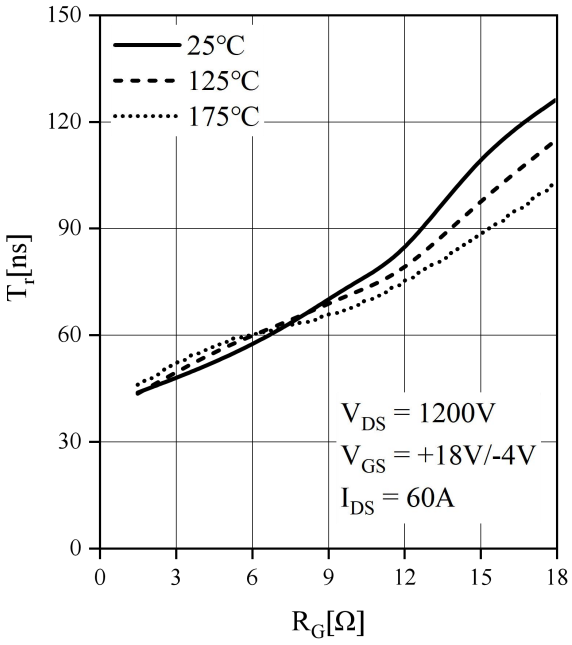


Figure 19. Typical Switching Loss T_r vs. R_G

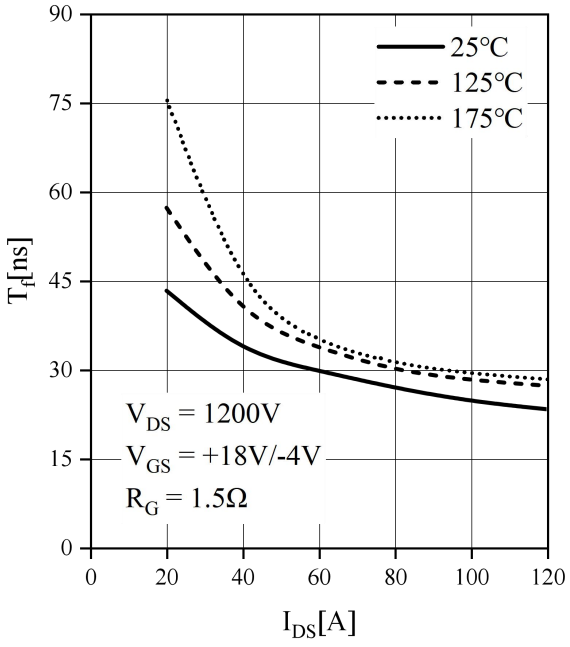


Figure 20. Typical Switching Loss T_f vs. I_{DS}

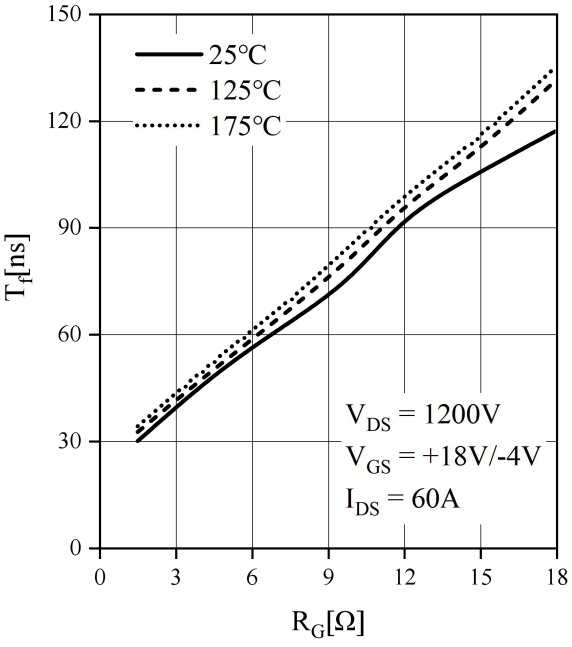


Figure 21. Typical Switching Loss T_f vs. R_G

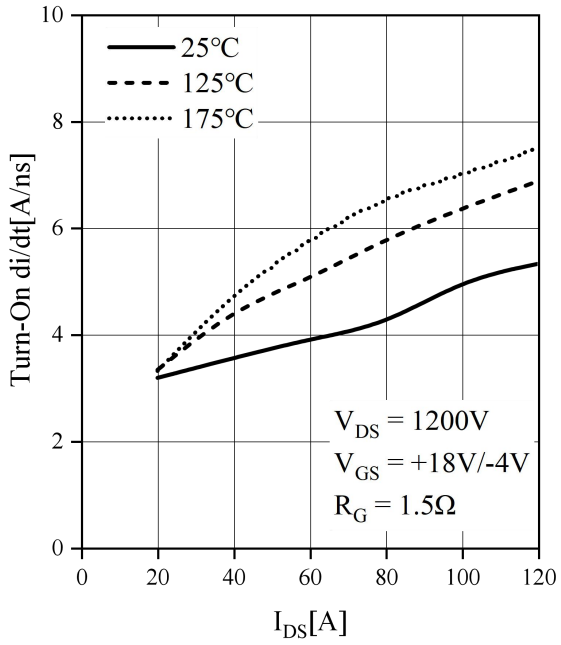


Figure 22. di/dt ON vs. I_{DS}

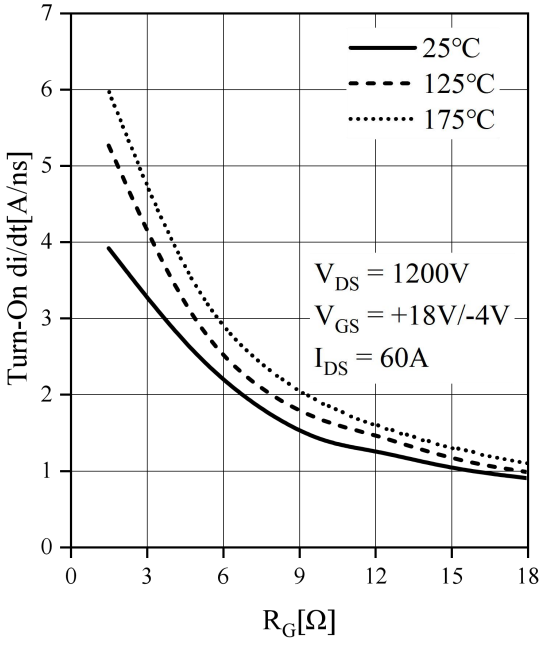


Figure 23. di/dt ON vs. R_G

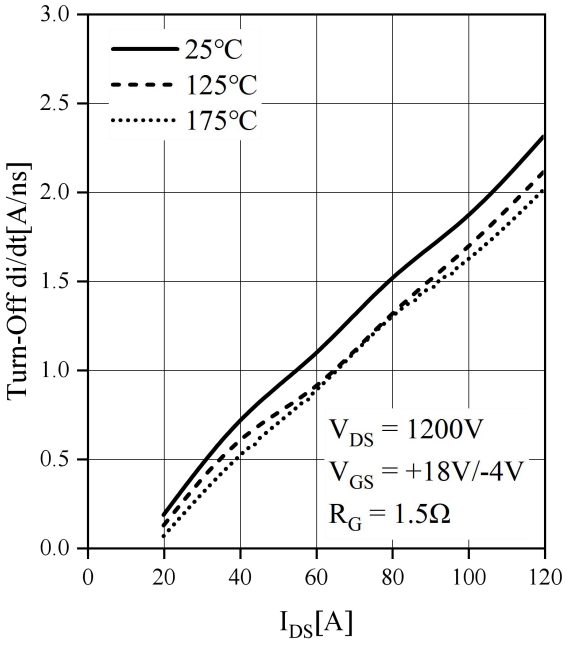


Figure 24. di/dt OFF vs. I_{DS}

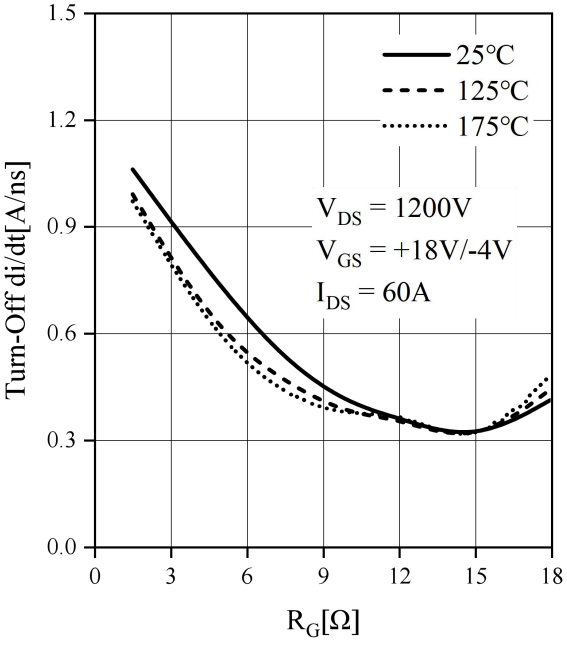


Figure 25. di/dt OFF vs. R_G

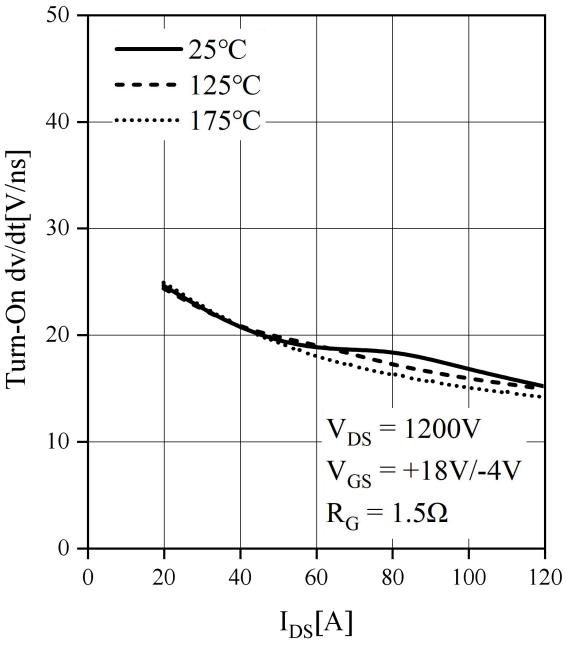


Figure 26. dV/dt ON vs. I_{DS}

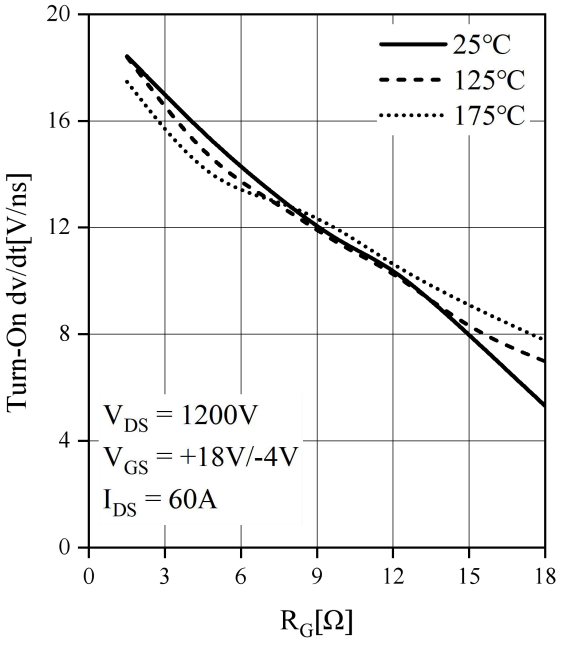


Figure 27. dV/dt ON vs. R_G

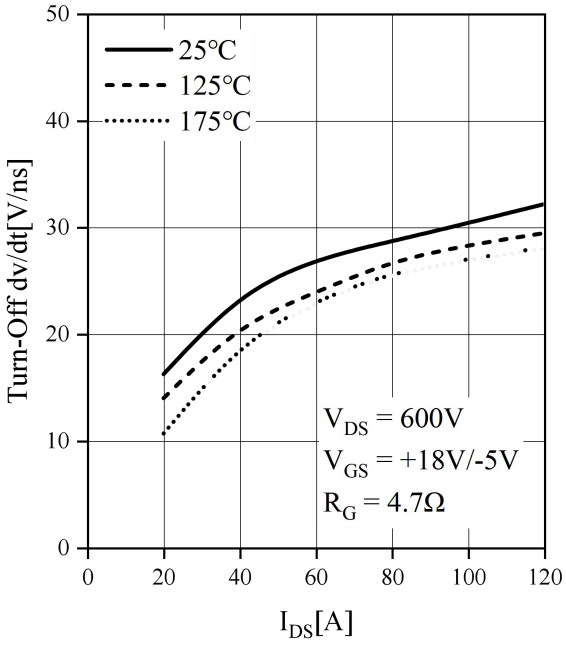


Figure 28. dV/dt OFF vs. I_{DS}

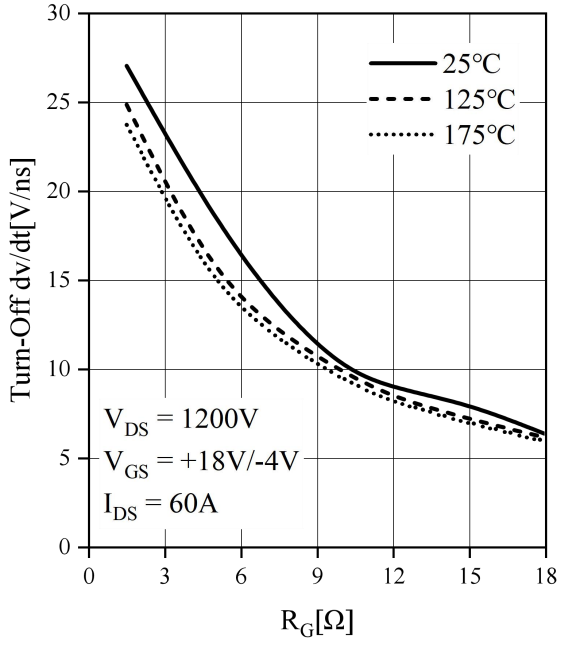


Figure 29. dV/dt OFF vs. R_G

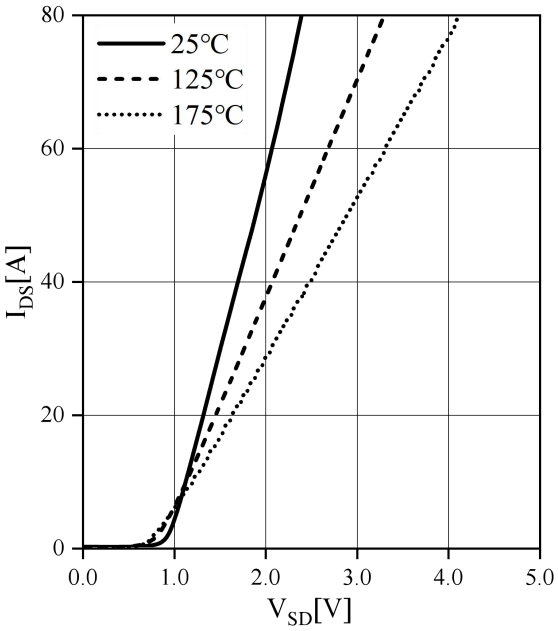


Figure 30. Diode Forward Characteristic

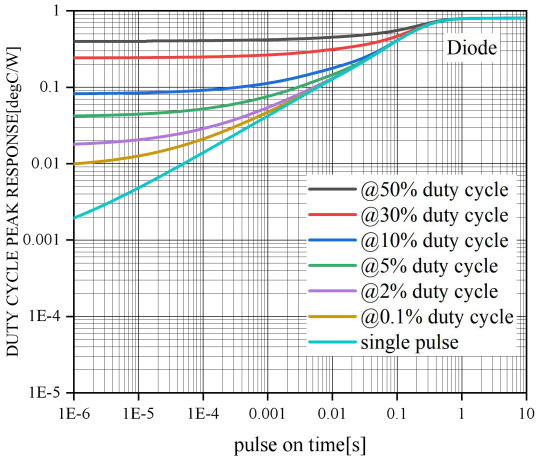


Figure 31. Diode Junction−to−Case Transient Thermal Impedance

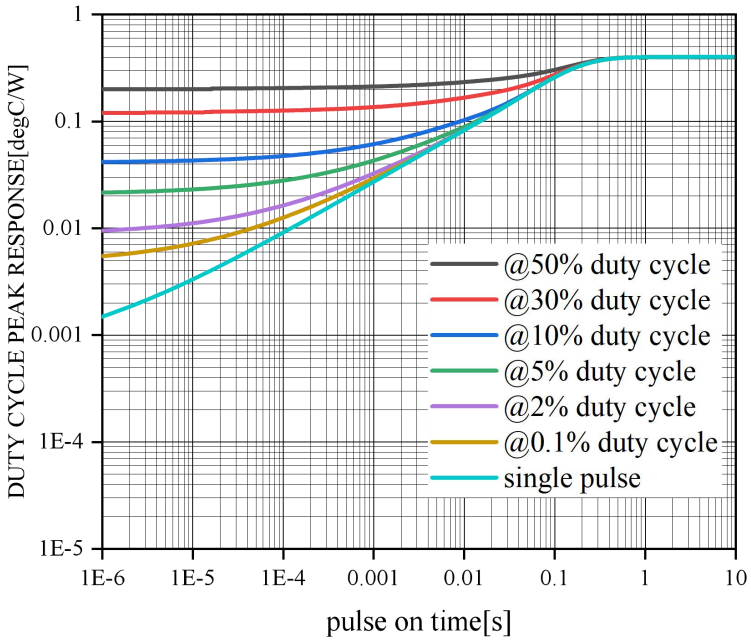
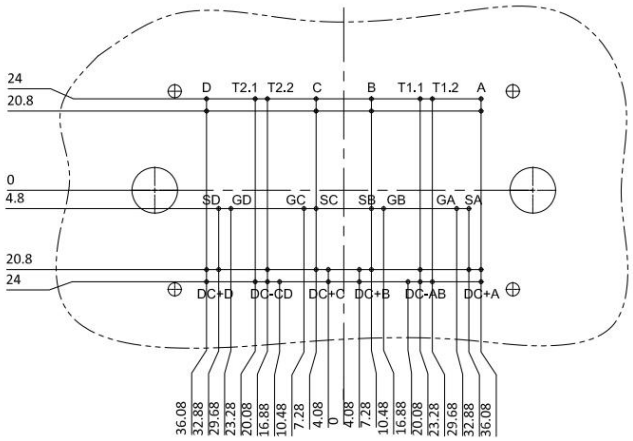
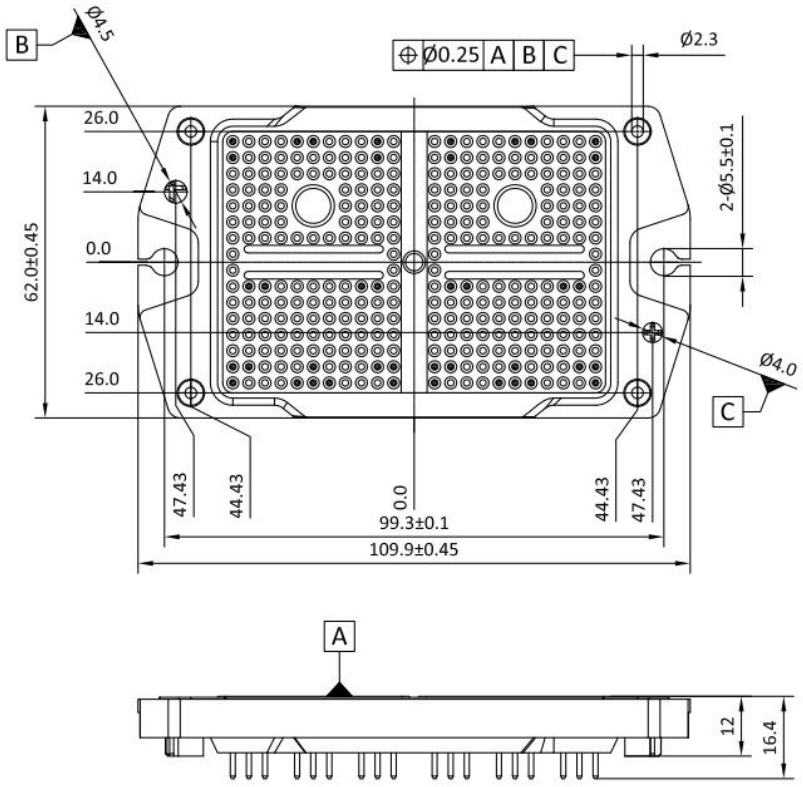


Figure 32. MOSFET Junction−to−Case Transient Thermal Impedance

Package Drawing





UNIT:mm