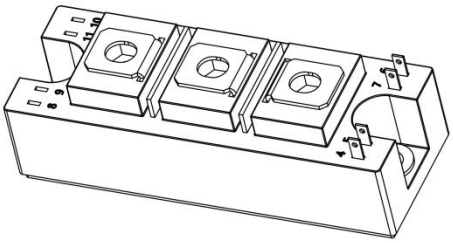
Silicon Carbide (SiC)
1200V 7.5 mohm
Half-Bridge MOSFET Module
34mm
SC180HB12C2



PIM7, 94.00 × 34.00 × 29.00

The SC180HB12C2 is a power module containing 7.5 mΩ / 1200 V SiC MOSFET half-bridge and a thermistor with Si_3N_4 AMB in an 34mm package.

Features

- 7.5 mΩ / 1200 V SiC MOSFET Half-Bridge
- Si_3N_4 AMB
- Low Inductive Layout
- Solderable Pins
- Isolated Base Plate

Typical Applications

- Motor Drives
- Vehicle Fast Chargers
- Renewable energy
- Uninterruptible Power Supply Systems (UPS)

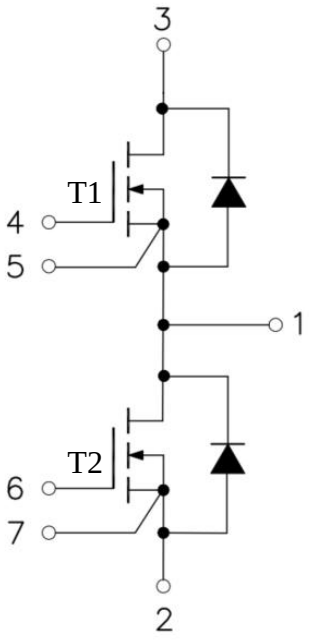
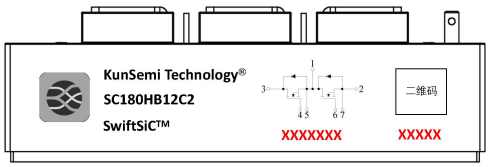


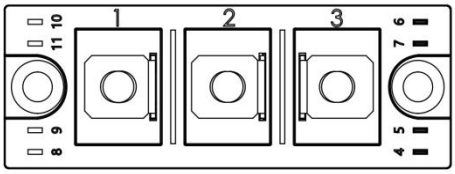
Figure 1. Schematic

MARKING DIAGRAM



SC180HB12C2 = Device Code
XXXXXXX = Year, week and batch Code
XXXXX = Flow code

PIN ASSIGNMENTS



ORDERING INFORMATION

Device	Package
SC180HB12C2	34mm

PIN DESCRIPTION

Pin	Name	Description
1	OUT	Center Point of Half Bridge
2	DC-	DC Negative Bus Connection
3	DC+	DC Positive Bus Connection
4	G1	T1 Gate
5	S1	T1 Source
6	G2	T2 Gate
7	S2	T2 Source

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
SiC MOSFET			
Drain−Source Voltage	V_{DSS}	1200	V
Gate−Source Voltage	V_{GS}	+ 22 / - 10	V
Continuous Drain Current @ T_C = 80 °C (T_J = 175 °C)	I_{DS}	180	A
Pulsed Drain Current (T_J = 175°C)	I_{Dpluse}	360	A
Maximum Power Dissipation @ T_C = 80°C (T_J = 175 °C)	P_{tol}	930	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} = 1200 V	I_{DSS}	-	-	1	mA
Drain−Source On Resistance	V_{GS} = 18 V, I_{DS} = 180 A, T_J = 25°C	$R_{DS(ON)}$	-	7.28	-	mΩ
	V_{GS} = 18 V, I_{DS} = 180 A, T_J = 125°C		-	9.57	-	
	V_{GS} = 18 V, I_{DS} = 180 A, T_J = 175°C		-	12.10	-	
Gate−Source Threshold Voltage	V_{GS} = V_{DS}, I_{DS} = 74 mA, T_J = 25°C	$V_{GS(TH)}$	1.80	2.72	3.00	V
Gate Resistance	V_{GS} = 0 V, f = 1 MHz	R_g	-	3.24	-	Ω
Gate Leakage Current	V_{GS} = 22 V,V_{DS} = 0 V	I_{GSS}	-	-	200	nA
Input Capacitance	V_{DS} = 800 V, V_{GS} = 0 V, f = 100 kHz	C_{ISS}	-	9.53	-	nF
Reverse Transfer Capacitance		C_{RSS}	-	36.10	-	pF
Output Capacitance		C_{OSS}	-	0.60	-	nF
Total Gate Charge	V_{DS} = 800 V, V_{GS} = -5 / 20 V, I_D = 180 A	$Q_{G(TOTAL)}$	-	504	-	nC
Gate-Source Charge		Q_{GS}		201		
Gate-Drain Charge		Q_{GD}		187		
Turn−on Delay Time	V_{DS} = 600 V, I_{DS} = 180 A V_{GS} = -5 / 18 V, R_G = 2.35 Ω L_S = 27 uH, T_J = 25 °C	$T_{d(on)}$	-	45.76	-	ns
Rise Time		t_r	-	43.84	-	ns
Turn−off Delay Time		$T_{d(off)}$	-	88.00	-	ns
Fall Time		t_f	-	21.12	-	ns
Turn−on Switching Loss per Pulse		E_{ON}	-	1.34	-	mJ
Turn−off Switching Loss per Pulse		E_{OFF}	-	2.37	-	mJ
Turn−on Delay Time	V_{DS} = 600 V, I_{DS} = 180 A V_{GS} = -5 / 18 V, R_G = 2.35 Ω L_S = 27 uH, T_J = 125 °C	$T_{d(on)}$	-	40.96	-	ns
Rise Time		t_r	-	43.52	-	ns
Turn−off Delay Time		$T_{d(off)}$	-	101.76	-	ns
Fall Time		t_f	-	21.44	-	ns
Turn−on Switching Loss per Pulse		E_{ON}	-	1.29	-	mJ
Turn−off Switching Loss per Pulse		E_{OFF}	-	2.52	-	mJ
Turn−on Delay Time	V_{DS} = 600 V, I_{DS} = 180 A V_{GS} = -5 / 18 V, R_G = 2.35 Ω L_S = 27 uH, T_J = 175 °C	$T_{d(on)}$		39.04		ns
Rise Time		t_r		43.20		ns
Turn−off Delay Time		$T_{d(off)}$		108.16		ns
Fall Time		t_f		21.76		ns
Turn−on Switching Loss per Pulse		E_{ON}		1.27		mJ
Turn−off Switching Loss per Pulse		E_{OFF}		2.61		mJ
Thermal Resistance, Junction to Case (MOSFET)		R_{thJC}	-	0.162	-	°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} = 180 A, T_J = 25 °C	V_{SD}	-	3.85	-	V
	I_{SD} = 180 A, T_J = 125 °C		-	3.44	-	
	I_{SD} = 180 A, T_J = 175 °C		-	3.31	-	
Diode Reverse Recovery Charge	V_R = 600 V, I_{SD} = 180 A V_{GS} = -5 V, R_G = 2.35 Ω L_S = 27 uH, T_J = 25 °C	Q_r	-	1.34	-	uC
Peak Reverse Recovery Current		I_{rrm}	-	113.84	-	A
Reverse Recovery Time		t_{rr}		20.80		ns
Reverse Recovery Energy		E_{rr}	-	1.14	-	mJ
Diode Reverse Recovery Charge	V_R = 600 V, I_{SD} = 180 A V_{GS} = -5 V, R_G = 2.35 Ω L_S = 27 uH, T_J = 125 °C	Q_r	-	2.98	-	uC
Peak Reverse Recovery Current		I_{rrm}	-	214.38	-	A
Reverse Recovery Time		t_{rr}		28.48		ns
Reverse Recovery Energy		E_{rr}	-	2.77	-	mJ
Diode Reverse Recovery Charge	V_R = 600 V, I_{SD} = 180 A V_{GS} = -5 V, R_G = 2.35 Ω L_S = 27 uH, T_J = 175 °C	Q_r		4.18		uC
Peak Reverse Recovery Current		I_{rrm}		267.24		A
Reverse Recovery Time		t_{rr}		33.92		ns
Reverse Recovery Energy		E_{rr}		3.86		mJ
Thermal Resistance, Junction to Case (Body Diode)		R_{thJC}	-	0.217	-	°C/W

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}	2500	V
Mounting torque to main terminals(M6 screw)	M_T	6.0	N.m
Mounting torque to main terminals(M5 screw)	M_H	6.0	N.m
Stray Inductance	L_{DS}	13.5	nH
Weight of Module	G	155	g

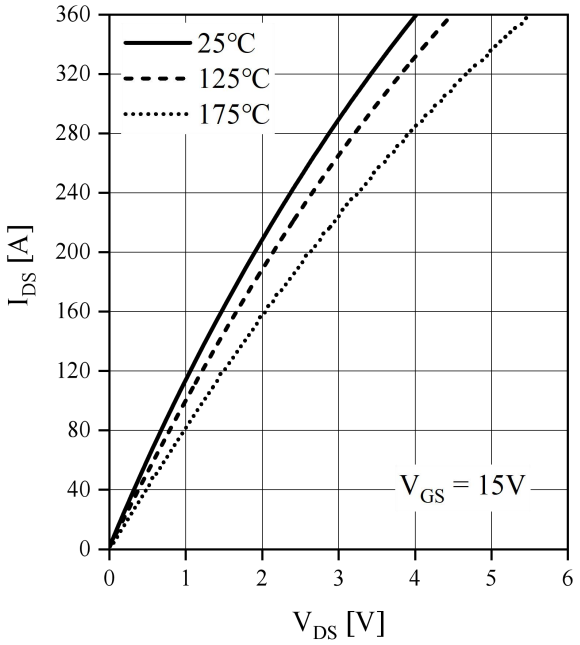


Figure 2. MOSFET Typical Output Characteristic

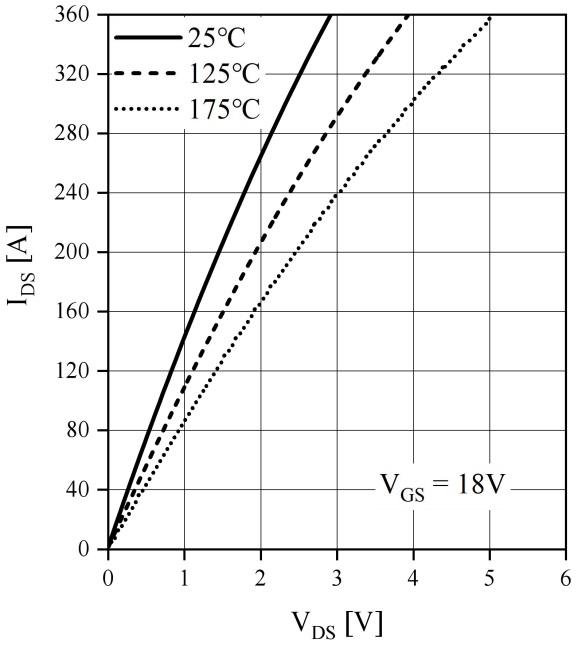


Figure 3. MOSFET Typical Output Characteristic

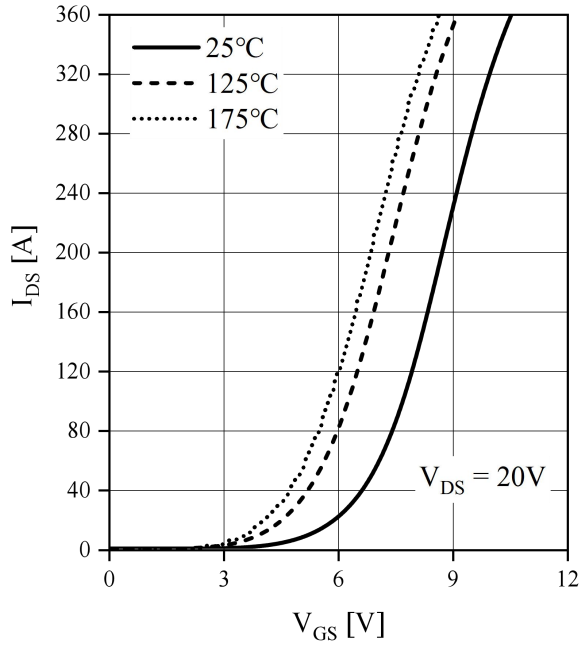


Figure 4. MOSFET Typical Transfer Characteristic

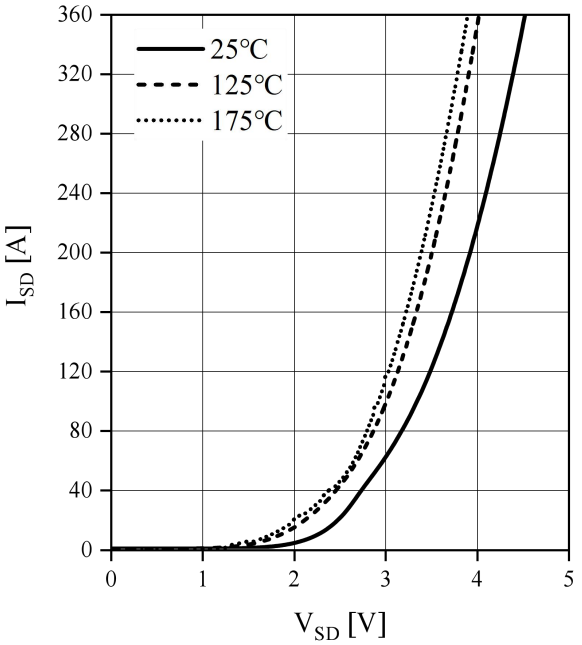


Figure 5. Body Diode Forward Characteristic

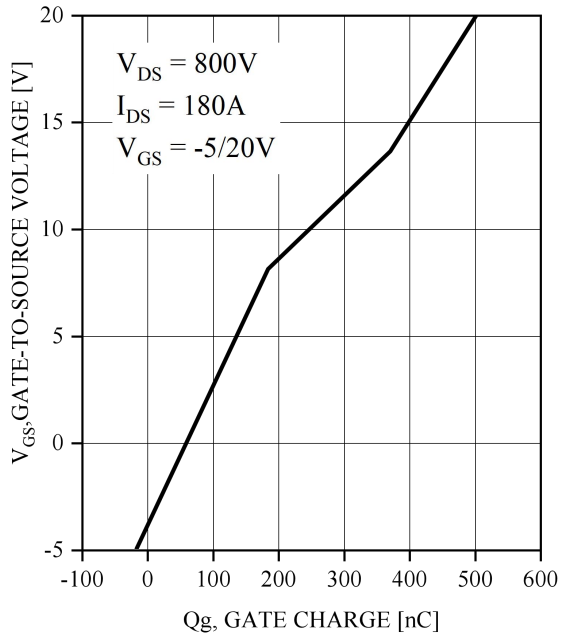


Figure 6. Gate−to−Source Voltage vs. Total Charge

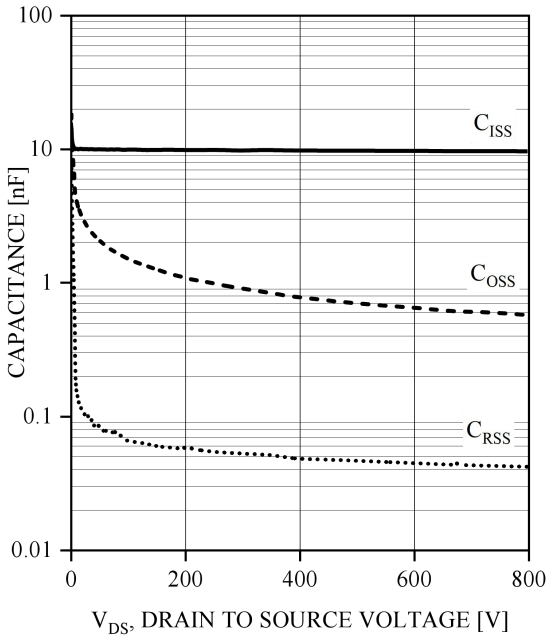


Figure 7. Capacitance vs. Drain−to−Source Voltage

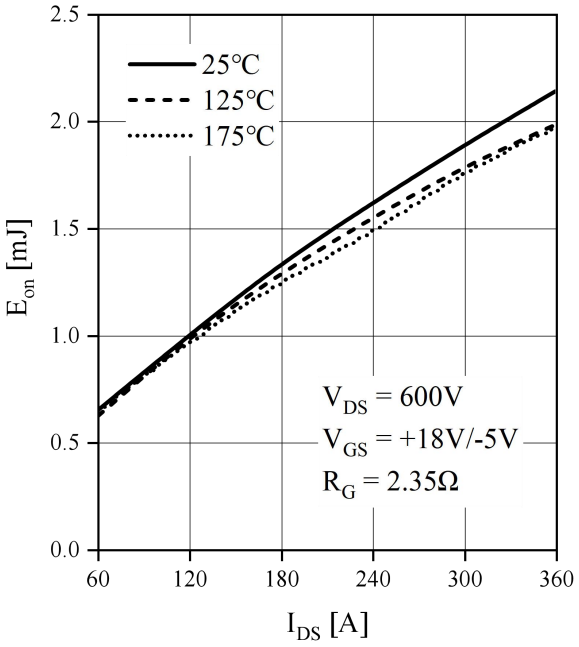


Figure 8. Typical Switching Loss E_{on} vs. I_{DS}

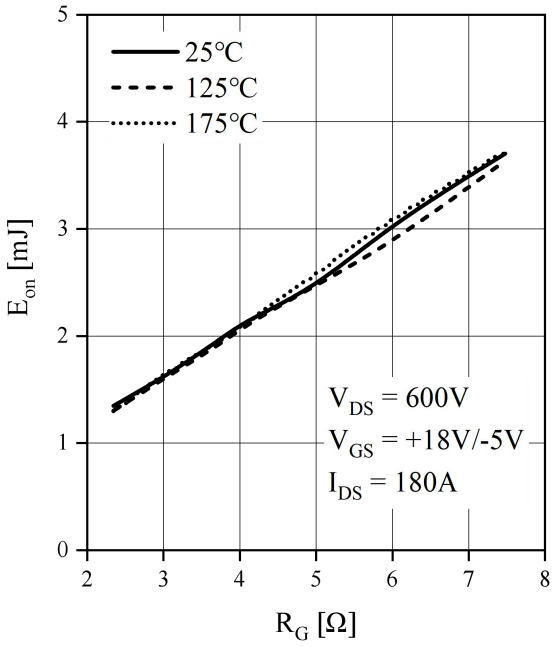


Figure 9. Typical Switching Loss E_{on} vs. R_G

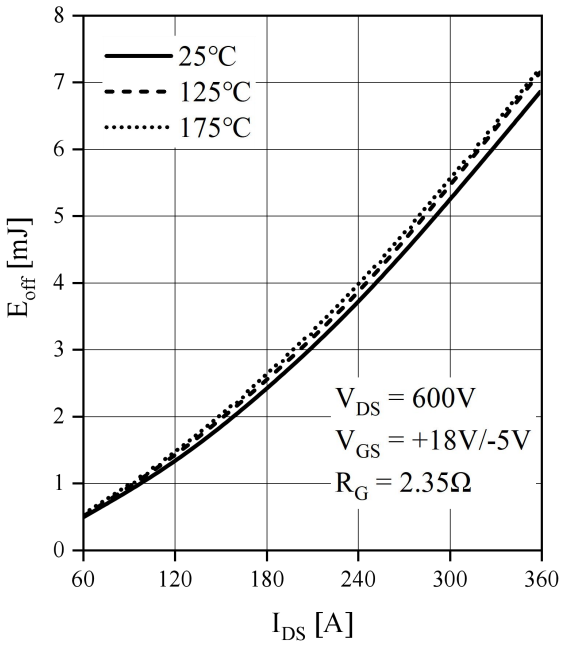


Figure 10. Typical Switching Loss E_{off} vs. I_{DS}

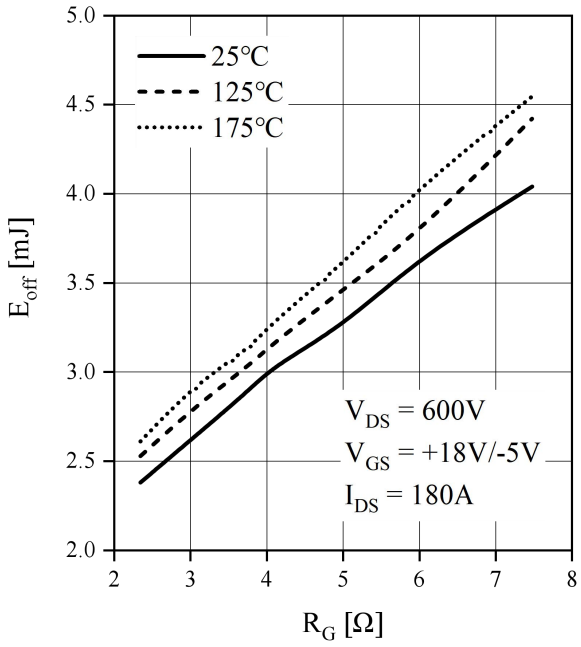


Figure 11.Typical Switching Loss E_{off} vs. R_G

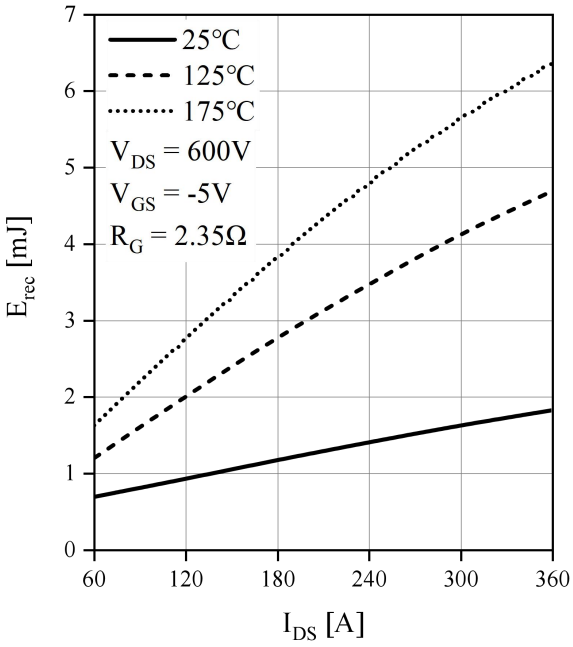


Figure 12. Typical Switching Loss E_{rec} vs. I_{DS}

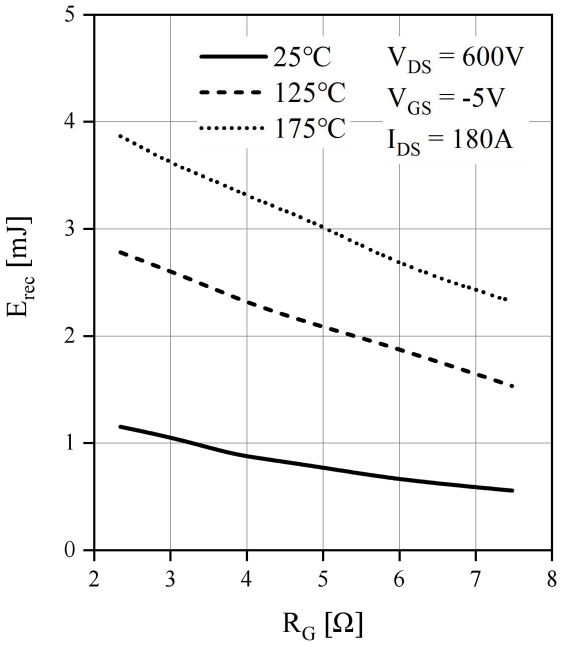


Figure 13. Typical Switching Loss E_{rec} vs. R_G

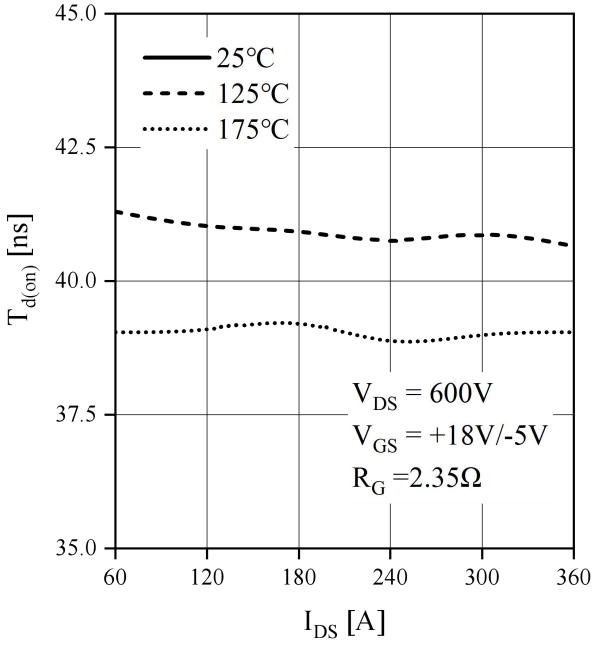


Figure 14. Typical Switching Loss $T_{d(on)}$ vs. I_{DS}

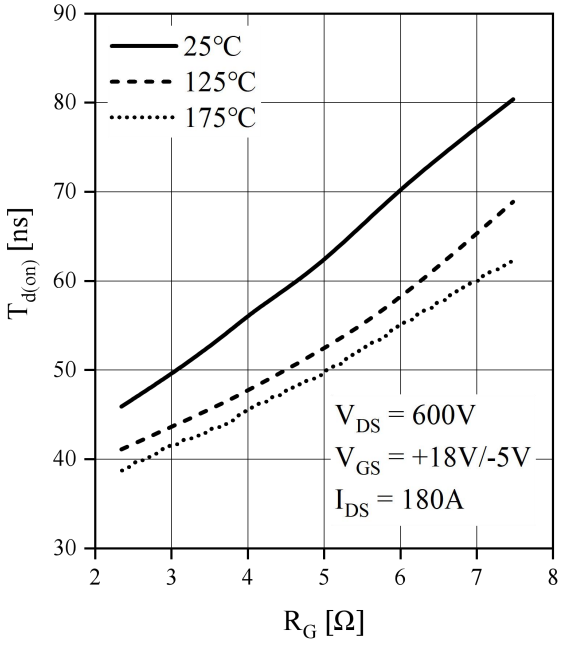


Figure 15. Typical Switching Loss $T_{d(on)}$ vs. R_G

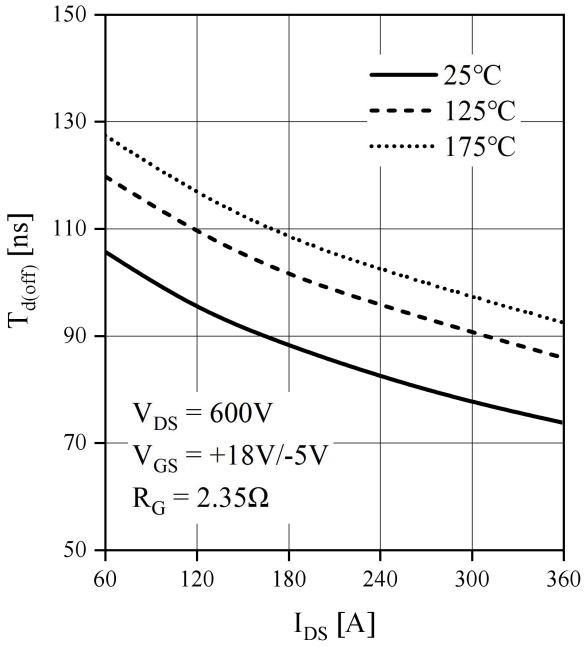


Figure 16. Typical Switching Loss $T_{d(off)}$ vs. I_{DS}

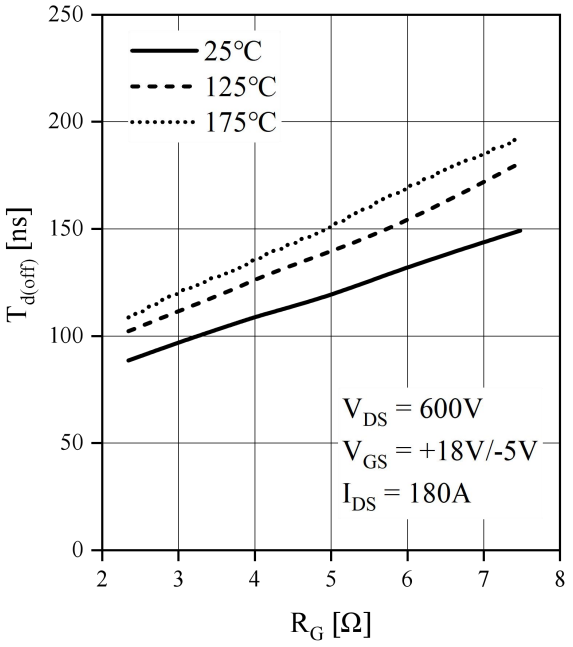


Figure 17. Typical Switching Loss $T_{d(off)}$ vs. R_G

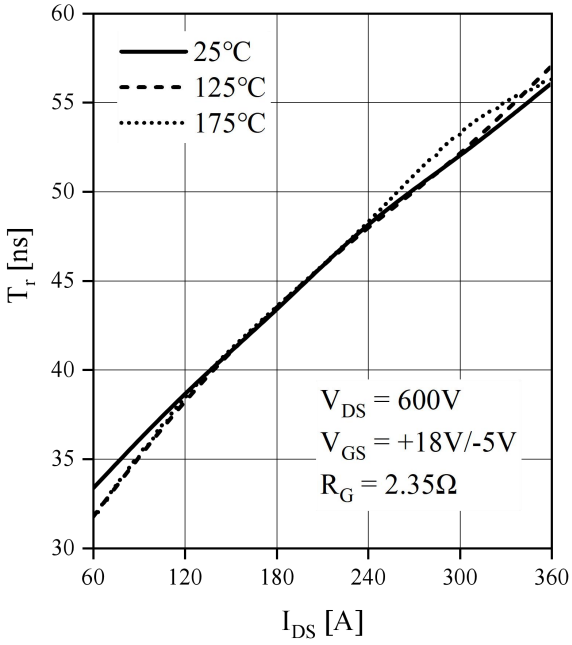


Figure 18. Typical Switching Loss T_r vs. I_{DS}

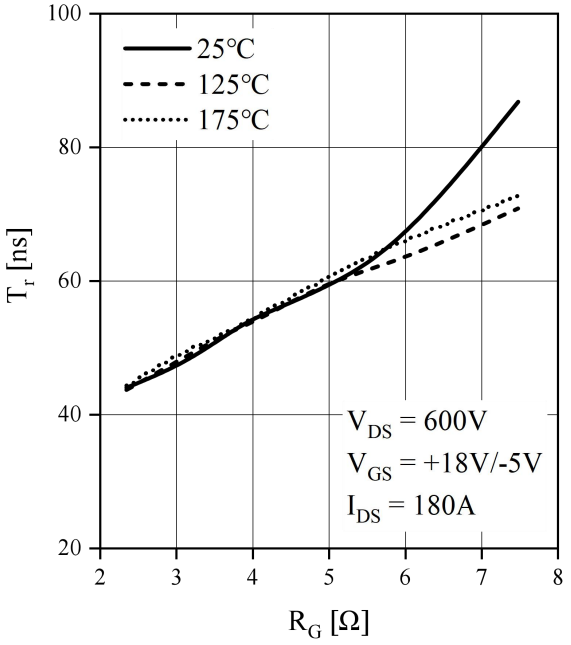


Figure 19. Typical Switching Loss T_r vs. R_G

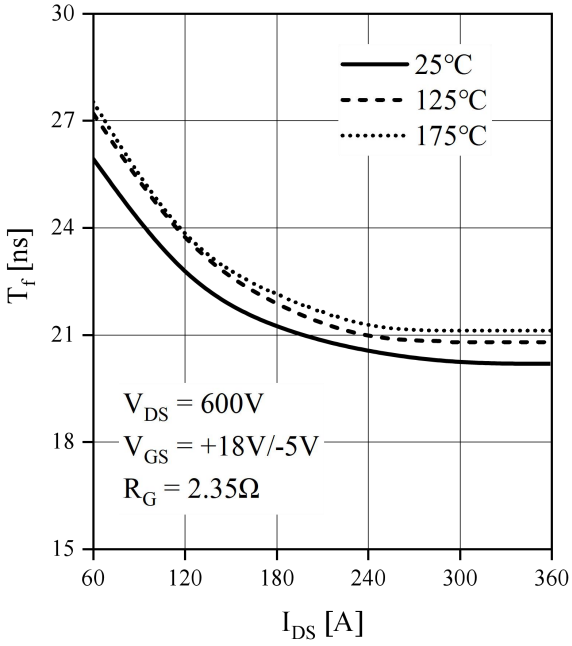


Figure 20. Typical Switching Loss T_f vs. I_{DS}

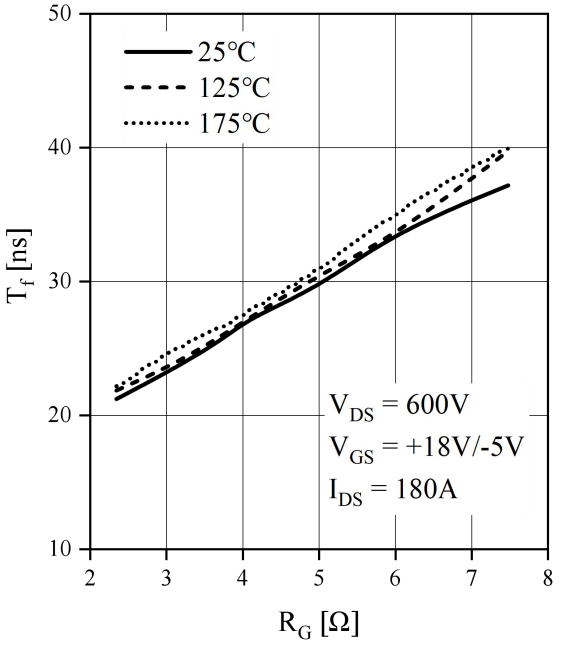


Figure 21. Typical Switching Loss T_f vs. R_G

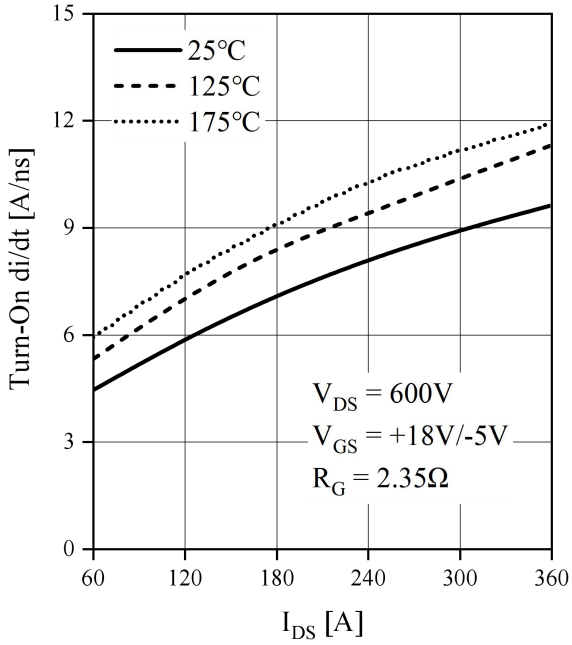


Figure 22. di/dt ON vs. I_{DS}

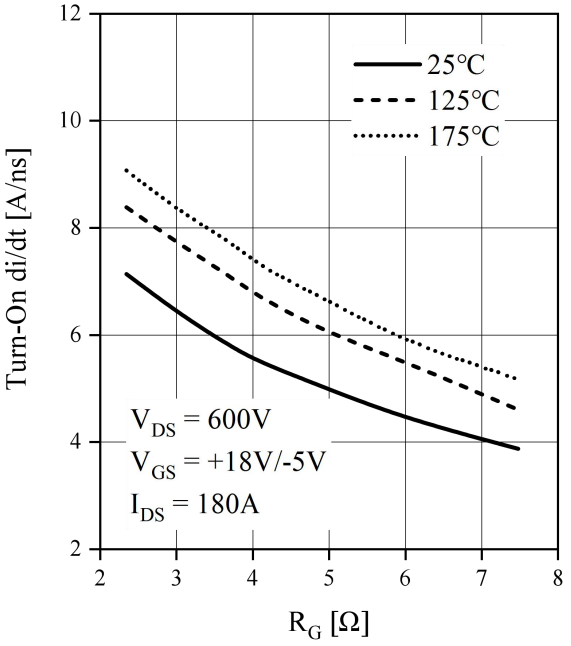


Figure 23. di/dt ON vs. R_G

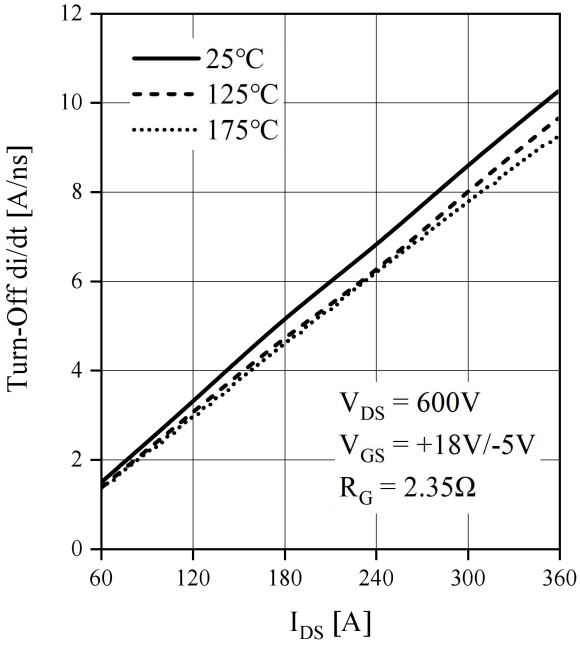


Figure 24. di/dt OFF vs. I_{DS}

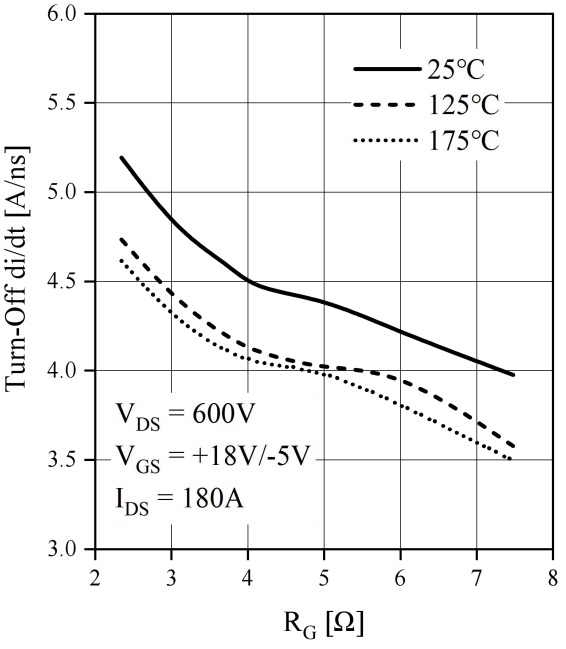


Figure 25. di/dt OFF vs. R_G

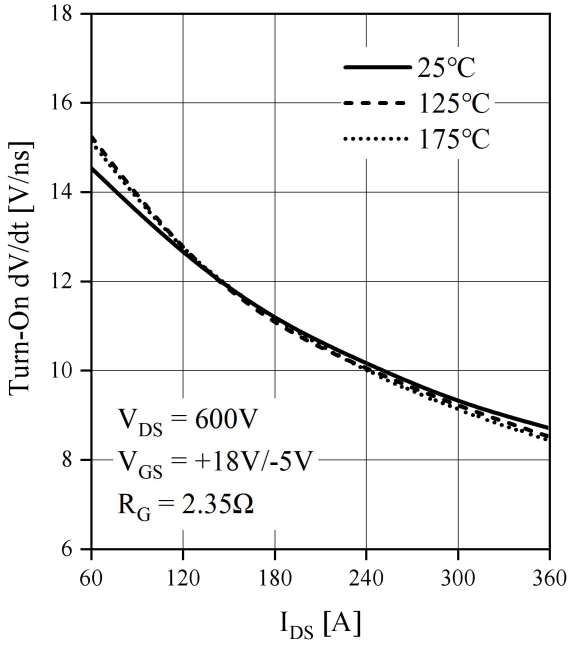


Figure 26. dV/dt ON vs. I_{DS}

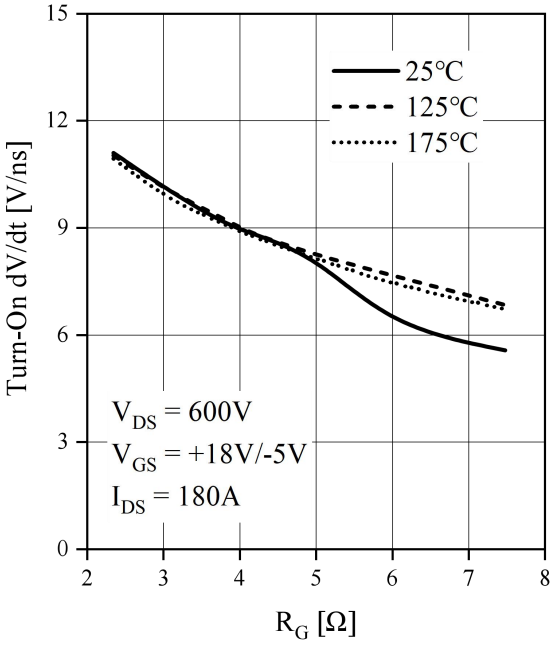


Figure 27. dV/dt ON vs. R_G

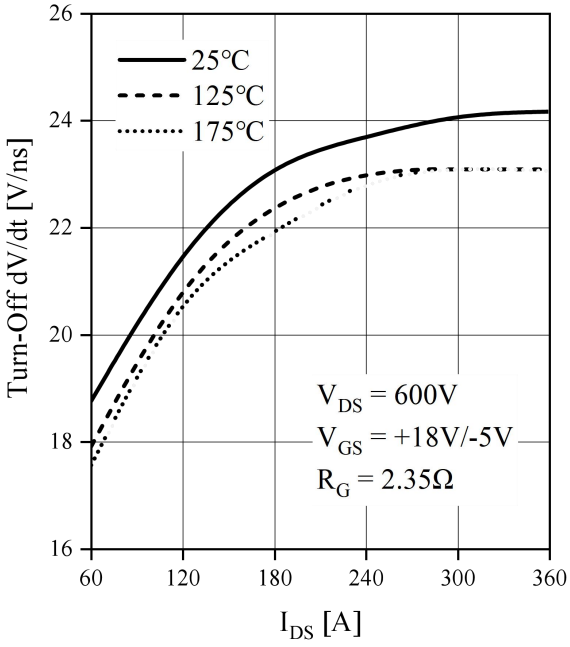


Figure 28. dV/dt OFF vs. I_{DS}

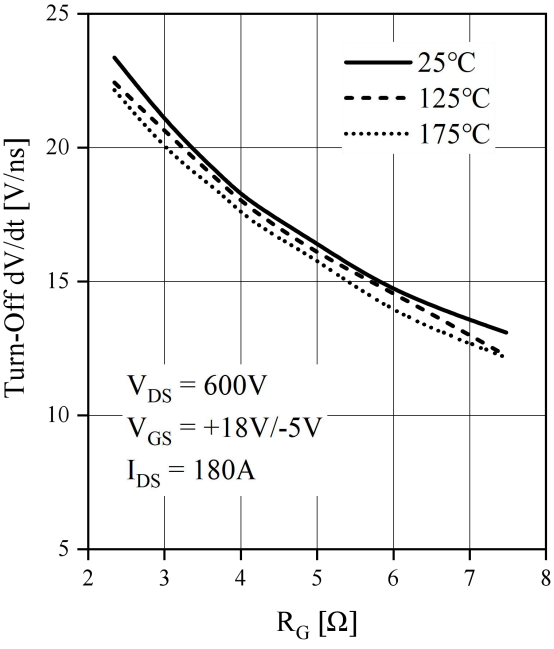


Figure 29. dV/dt OFF vs. R_G

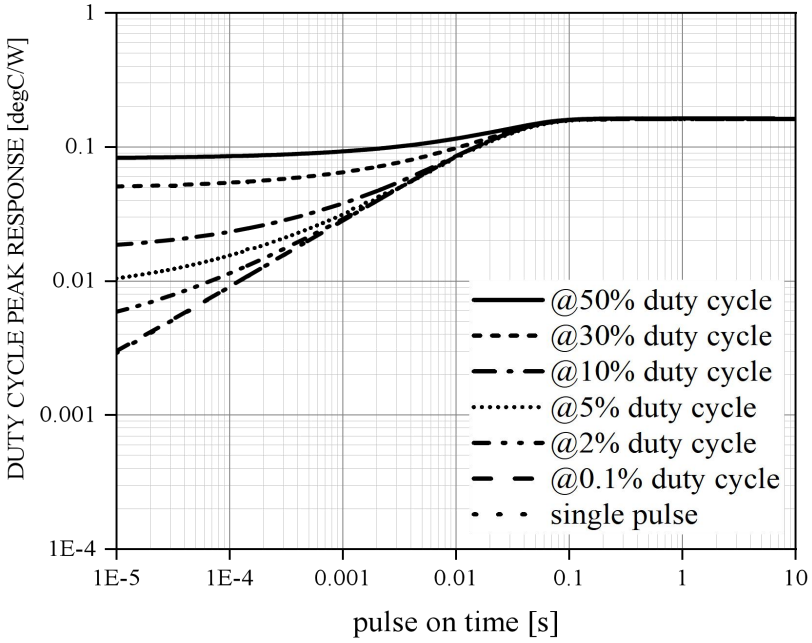
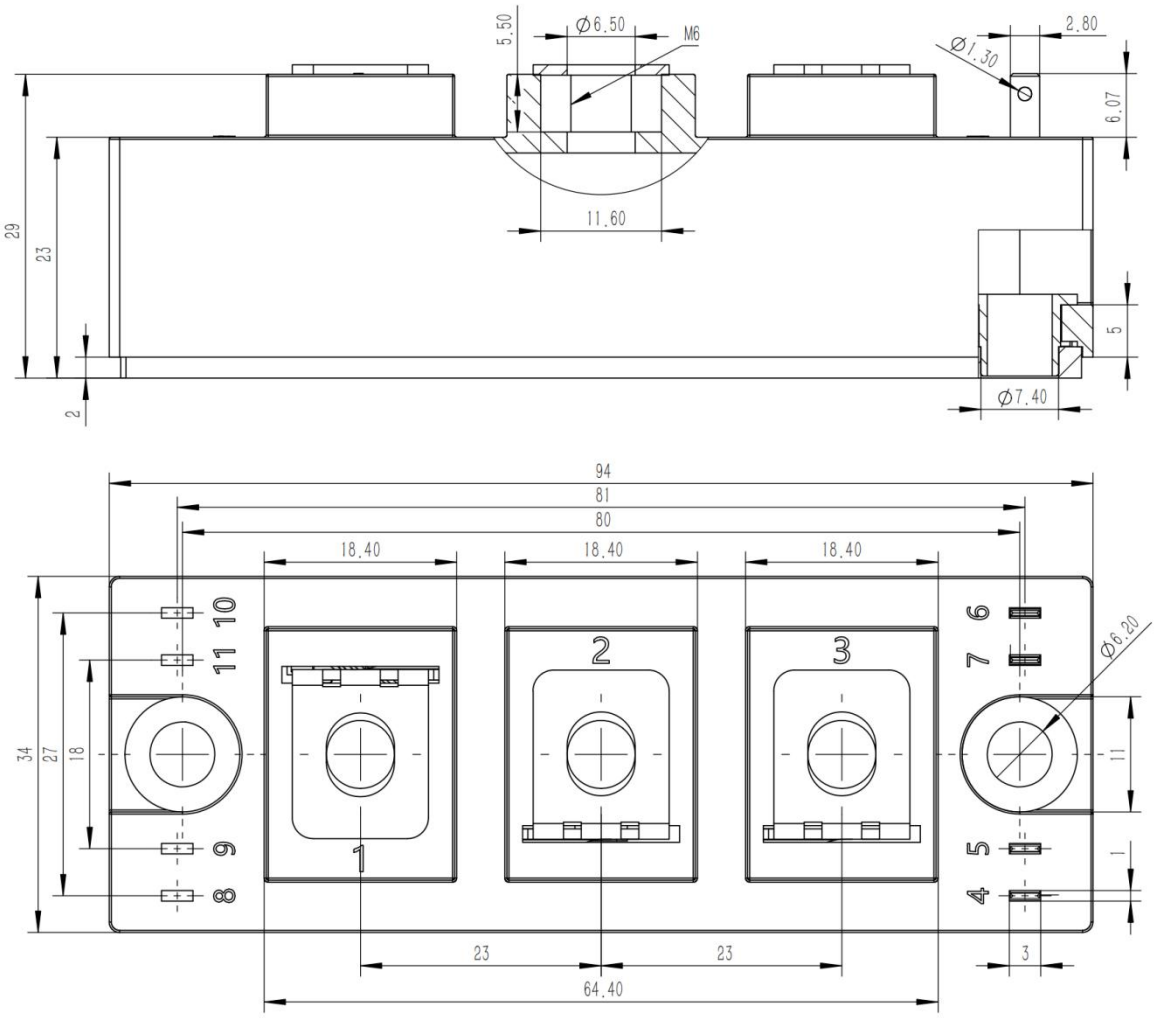


Figure 30. MOSFET Junction−to−Case Transient Thermal Impedance

Package Drawing



UNIT:mm