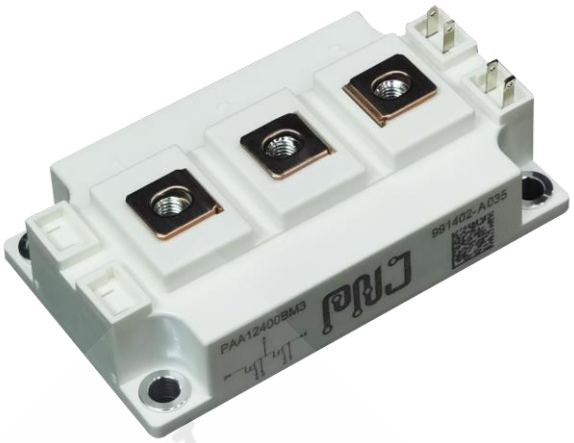
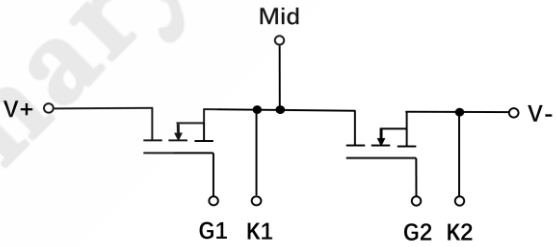
SiC Half-Bridge Module
PAA12400BM3



Features

- Industry Standard 62 mm Footprint
- High Junction Temperature(175℃) Operation
- Copper Baseplate



Applications

- Railway & Traction
- Solar
- EV Chargers
- Industrial Automation & Testing

Standards Benefits

- Fast Time-to-Market with Minimal Development Required for Transition from 62mm Si IGBT Packages
- Increased System Efficiency, due to Low Switching & Conduction Losses of SiC

Order Information

Part Number	Package	Marking
PAA12400BM3	62mm	PAA12400BM3

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1. Maximum Ratings

At T_J= 25℃, unless specified otherwise

Parameter	Symbol	Value	Unit	Test Conditions
Drain - Source Voltage	V_{DSmax}	1200	V	V_{GS}= -3V I_D= 100μA
Gate - Source Voltage (Dynamic)	V_{GSmax}	-10 / +25	V	AC (f >1Hz)
Gate - Source Voltage (Static)	V_{GSop}	-5 / +20	V	Static
Continuous Drain Current	I_D	350	A	V_{GS} = 20V T_C= 25℃
		248		V_{GS} = 20V T_C= 100℃
Operating Junction Temperature	T_J	-40 To +175	℃	

2. Electrical Characteristics

At T_J= 25℃, unless specified otherwise (Per Position)

Parameter	Symbol	Value			Unit	Test Conditions
		Min.	Typ	Max.		
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	1200	/	/	V	V_{GS}= -3V
Gate Threshold Voltage	$V_{GS(th)}$	1.8	2.0	5	V	V_{DS}= V_{GS} I_D= 100mA T_J= 25℃
		/	1.3	/	V	V_{DS}= V_{GS} I_D= 100mA T_J= 175℃

Parameter	Symbol	Value			Unit	Test Conditions
		Min.	Typ	Max.		
Reverse Bias Drain Current	I_{DSS}	/	5	50	μA	V_{GS}= -3V V_{DS}= 1200V
Gate-Source Leakage Current	I_{GSS}	/	20	250	nA	V_{GS}= 20V V_{DS}= 0V
Drain-Source On-State Resistance	$R_{DS(on)}$	/	5.6	7.3	mΩ	V_{GS}= 20V I_D= 300A
Transconductance	g_{fs}	/	123	/	S	V_{DS}= 20V I_{DS}= 300A T_J= 25℃
		/	130	/	S	V_{DS}= 20V I_{DS}= 300A T_J= 175℃
Turn-on Energy	E_{on}	/	11.3	/	mJ	V_{DS}= 600V I_{DS}= 400A V_{GS}= -5V/20V R_G= 3.0Ω L= 10μH
Turn-off Energy	E_{off}	/	6.0	/		
Turn-On Delay Time	$T_{d(on)}$	/	69.0	/	nS	
Rise Time	T_r	/	77.3	/		
Turn-Off Delay Time	$T_{d(off)}$	/	153.6	/		
Fall Time	T_f	/	41.8	/		
Internal Gate Resistance	$R_{G(int)}$	/	0.84	/	Ω	f= 100kHz V_{AC}= 25mV

Parameter	Symbol	Value			Unit	Test Conditions
		Min.	Typ	Max.		
Input Capacitance	C_{iss}	/	29.5	/	nF	V_{GS}= -3V V_{DS}= 1000V f= 100kHz V_{AC}= 25mV
Output Capacitance	C_{oss}	/	1.16	/	nF	
Reverse Transfer Capacitance	C_{rss}	/	85.3	/	pF	
Thermal Resistance from Junction to Case	$R_{\theta JC}$	/	0.145	/	℃/W	

3. Reverse Diode Characteristics

At T_J= 25℃, unless specified otherwise (Per Position)

Parameter	Symbol	Value		Unit	Test Conditions
		Typ.	Max.		
Diode Forward Voltage	V_{SD}	6.3	/	V	V_{GS}= -5V I_{SD}= 150A T_J= 25℃
		5.8	/	V	V_{GS}= -5V I_{SD}= 150A T_J= 175℃
Reverse Recover Time	t_{rr}	32.5	/	ns	V_{GS}= -5V I_{SD}= 400A V_R= 600V d_{if}/d_t= 6700A/μs T_J= 25℃
Reverse Recovery Charge	Q_{rr}	3.3	/	μC	
Peak Reverse Recovery Current	I_{rrm}	168.8	/	A	

Reverse Recovery Energy	E_{RR}	0.34	/	mJ	V_{DS}= 600V I_{DS}= 400A V_{GS}= -5V/20V R_G= 3.0Ω L= 10μH

4. Module Physical Characteristics

Parameter	Symbol	Value			Unit	Test Conditions
		Min.	Typ	Max.		
Package Resistance, M1	R_{3-1}	/	1	/	mΩ	T_J= 125℃
Package Resistance, M2	R_{1-2}	/	1	/	mΩ	T_J= 125℃
Case Temperature	T_C	-40	/	125	℃	
Weight	W	/	300	/	g	
Mounting Torque	M_S	4.5	5	5.5	N-m	Baseplate, M6 bolts
		4.5	5	5.5		Power Terminals, M6 bolts
Case Isolation Voltage	V_{isol}	/	/	5.5	kV	AC, 50Hz, 1min
Comparative Tracking Index	CTI	/	600	/		

5. Typical Performance

At T_J= 25℃, unless specified otherwise (Per Position)

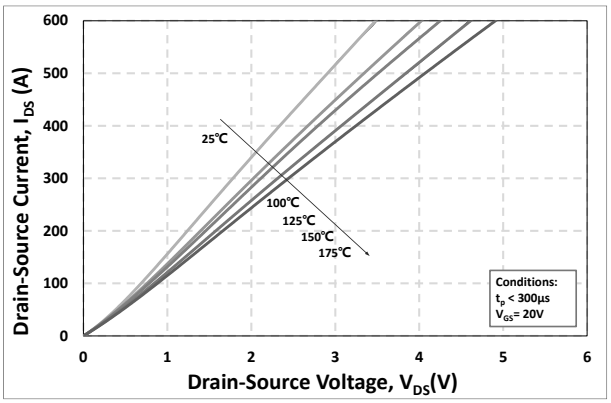


Figure 1. Output Characteristics for Various Junction Temperatures

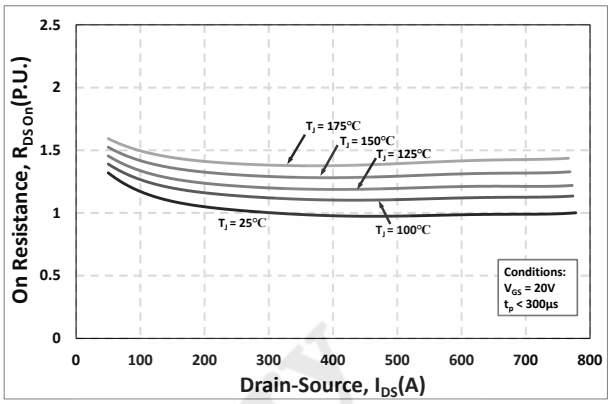


Figure 2. Normalized On-State Resistance vs. Drain Current for Various Junction Temperatures

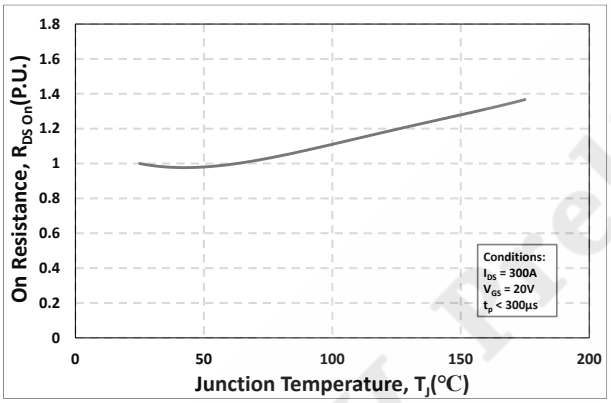


Figure 3. Normalized On-State Resistance vs. Junction Temperature

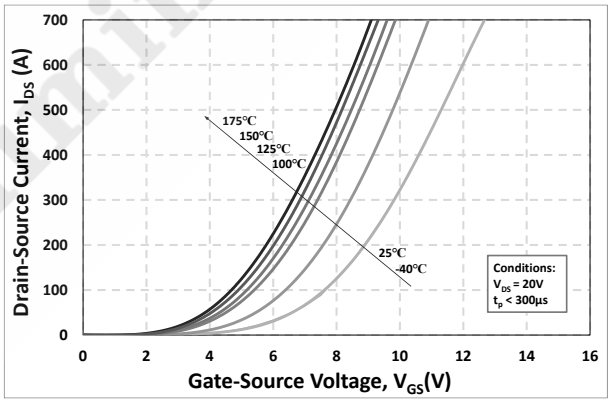


Figure 4. Transfer Characteristic for Various Junction Temperatures

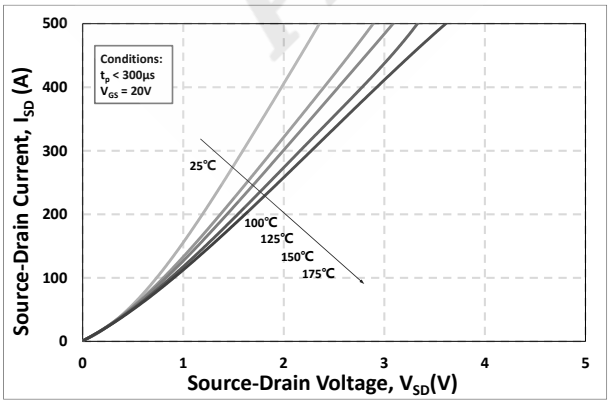


Figure 5. 3rd Quadrant Characteristic vs. Junction Temperatures at V_{GS} = 20V

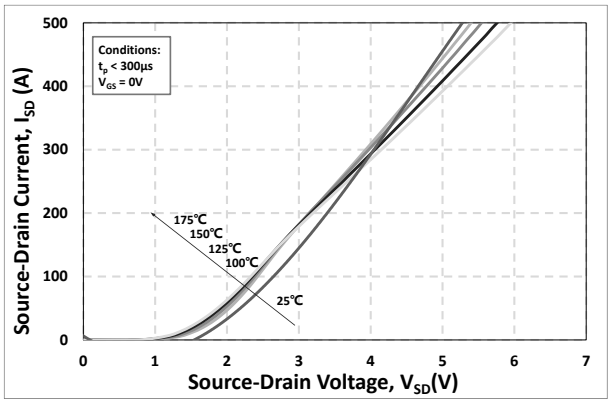


Figure 6. 3rd Quadrant Characteristic vs. Junction Temperatures at V_{GS} = 0V (Body Diode)

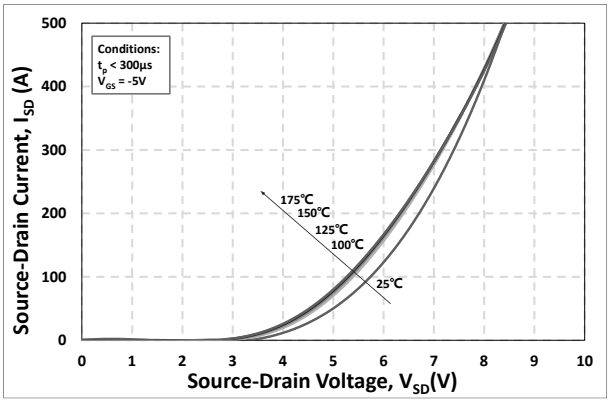


Figure 7. 3rd Quadrant Characteristic vs. Junction Temperatures at V_{GS} = -5V (Body Diode)

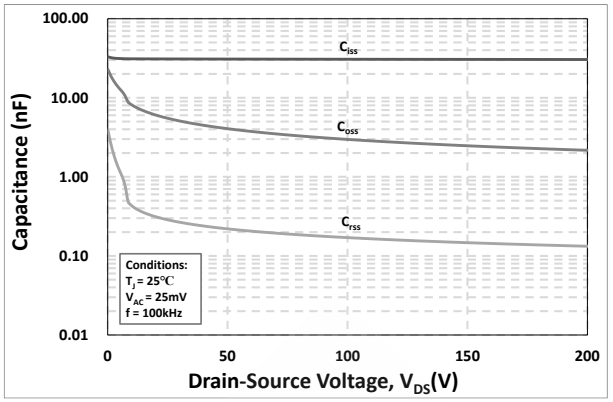


Figure 8. Capacitances vs. Drain-Source Voltage (0 - 200V)

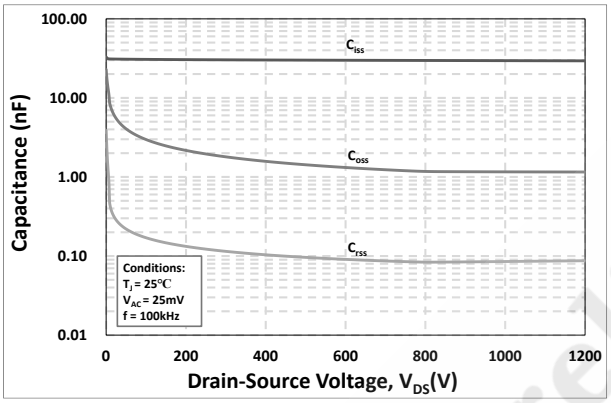


Figure 9. Capacitances vs. Drain-Source Voltage (0 - 1200V)

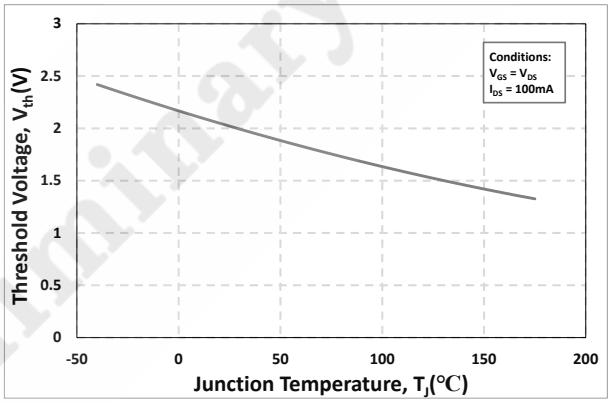


Figure 10. Threshold Voltage vs. Junction Temperature

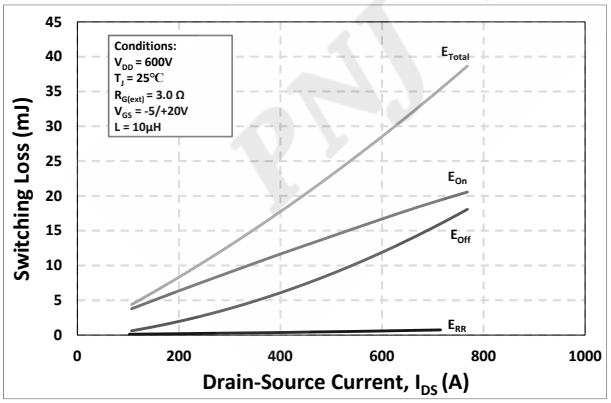


Figure 11. Switching Loss vs. Drain-Source Current (V_{DS} = 600 V)

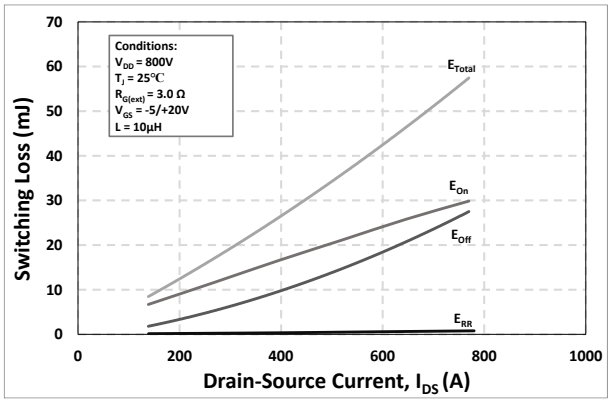


Figure 12. Switching Loss vs. Drain-Source Current (V_{DS} = 800 V)

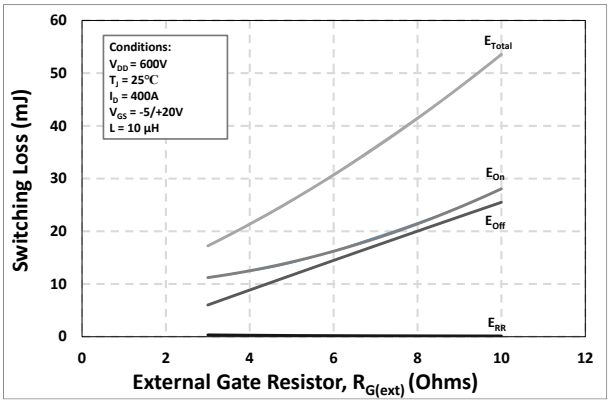


Figure 13. Switching Loss vs. External Gate Resistance

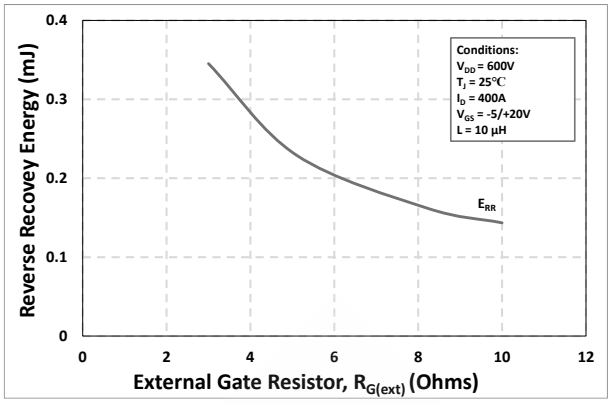


Figure 14. Reserve Recovery Energy vs. External Gate Resistance

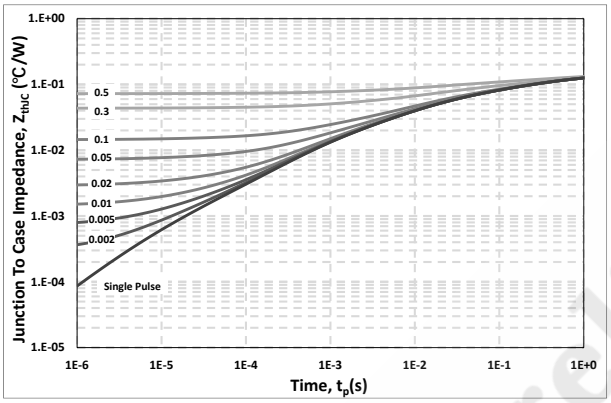


Figure 15. MOSFET Junction to Case Transient Thermal Impedance, Z_{thJC} (°C/W)

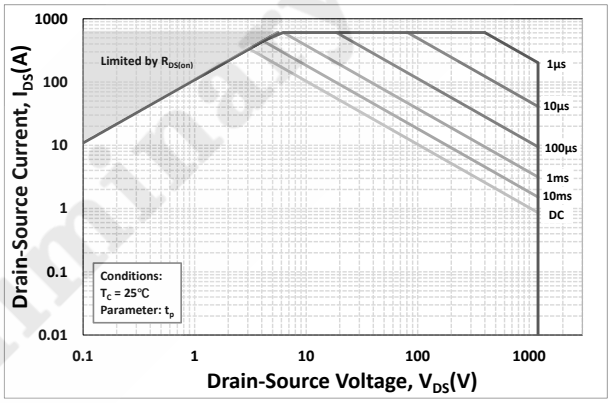


Figure 16. Forward Bias Safe Operating Area (FBSOA)

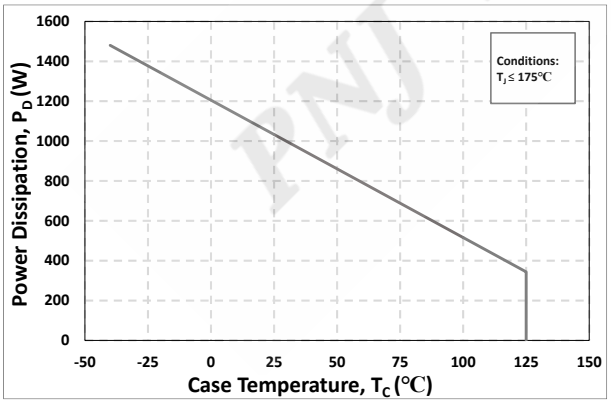


Figure 17. Maximum Power Dissipation Derating vs. Case Temperature

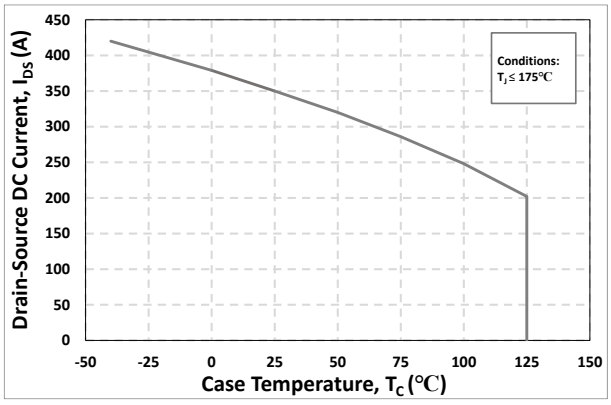


Figure 18. Continuous Drain Current Derating vs. Case Temperature

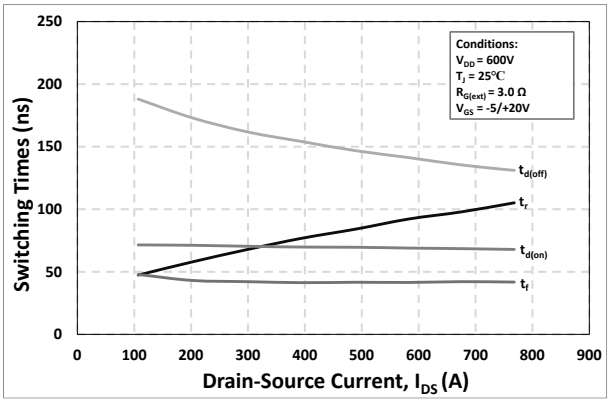


Figure 19. Switching Times vs. Drain-Source Current

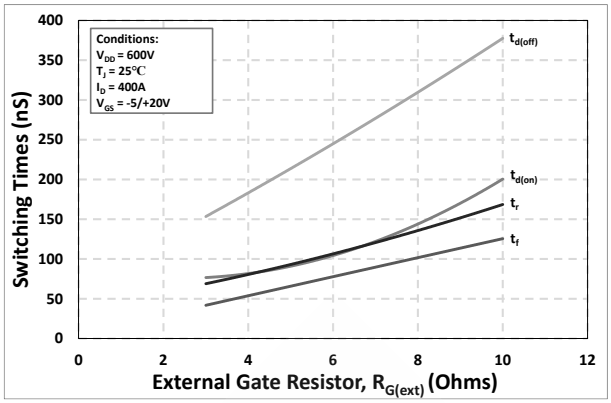


Figure 20. Switching Times vs. External Gate Resistance

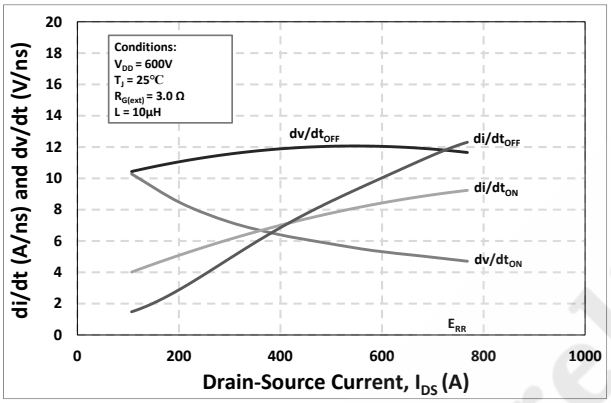


Figure 21. dv/dt and di/dt vs. Source Current

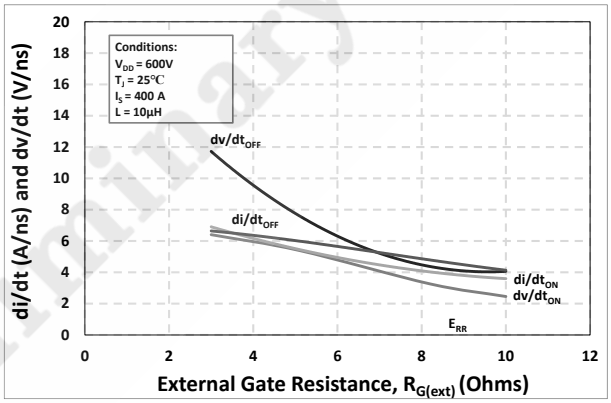
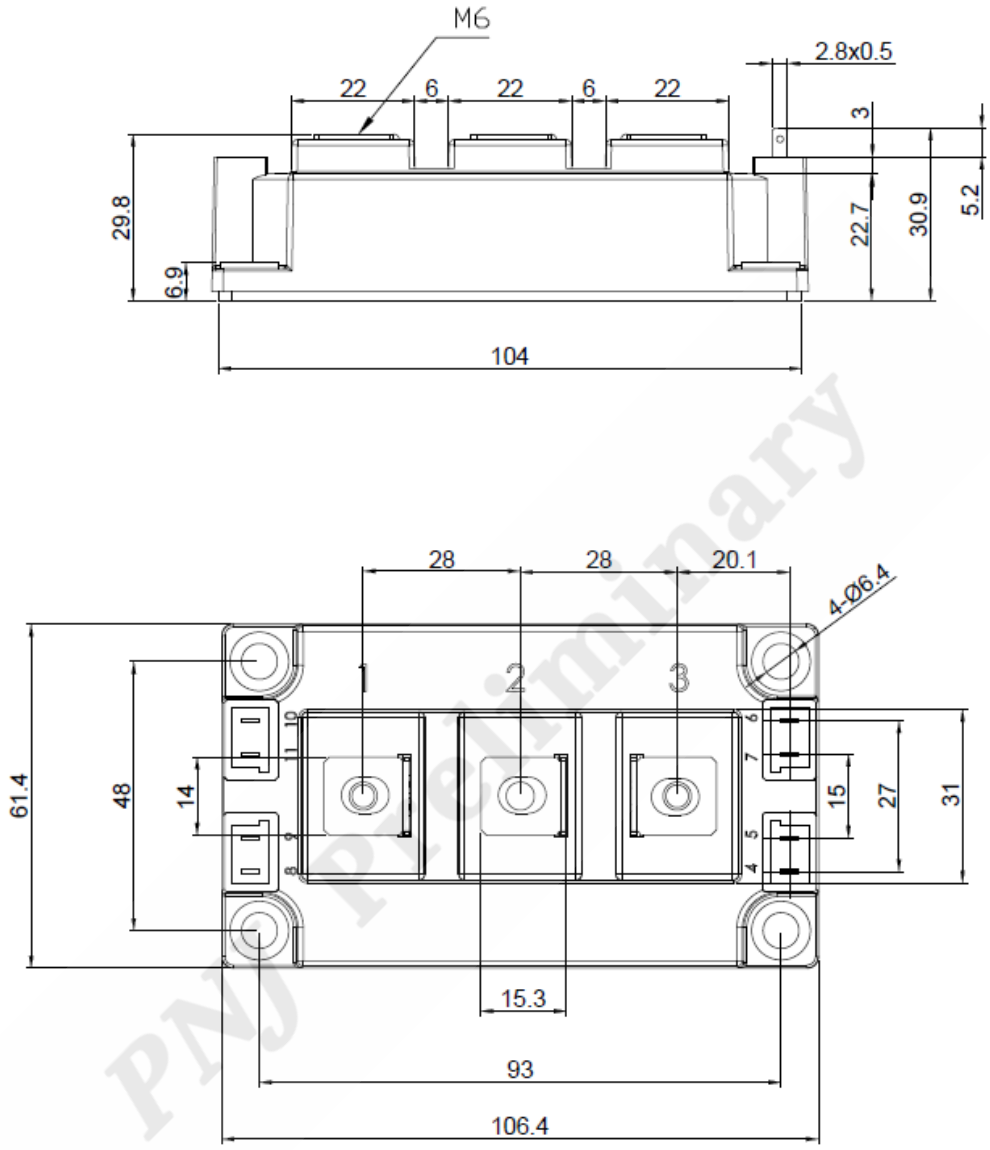


Figure 22. dv/dt and di/dt vs. External Gate Resistance

6. Package Dimensions



Drawing and Dimensions