

SiC MOS I3M12016SM

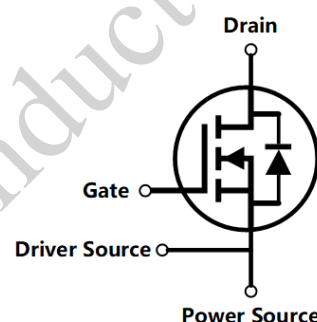
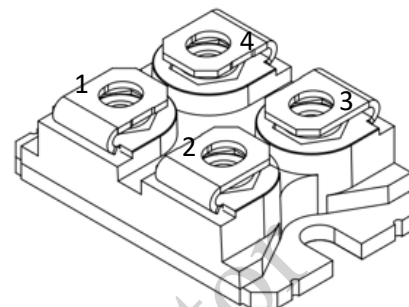
N-Channel Enhancement Mode

Features

- High Blocking Voltage with Low $R_{DS(on)}$
- Low Switching Losses
- Internal Isolation
- High Speed Switching
- Easy to Drive and Parallel

Applications

- High-frequency Switching Application
- DC/DC Converters
- Motor Drives
- Solar Inverters
- EV Charging
- UPS



Drain	3
Power Source	4
Driver Source	1
Gate	2

Standards Benefits

- Improve System Efficiency
- Improve Power Density
- Reduce System Size



Order Information

Part Number	Package	Marking
I3M12016SM	SOT-227	I3M12016SM



Contents

Features	1
Applications.....	1
Standards Benefits.....	1
Order Information.....	1
Contents	2
1. Maximum Ratings.....	3
2. Electrical Characteristics.....	4
3. Reverse Diode Characteristics	6
4. Thermal Characteristics	6
5. Typical Performance	7
6. Package Outlines	12

PNJunction Semiconductor



1. Maximum Ratings

At $T_J = 25^\circ\text{C}$, unless specified otherwise

Parameter	Symbol	Value	Unit	Test Conditions
Drain - Source Voltage	V_{DSmax}	1200	V	$V_{GS} = -3V$ $I_D = 100\mu A$
Gate - Source Voltage (Dynamic)	V_{GSmax}	-8 / +21	V	AC ($f > 1\text{Hz}$)
Gate - Source Voltage(static) turn-on gate voltage turn-off gate voltage	$V_{GS,on}$ $V_{GS,off}$	+15/+18 -3	V	Static
Continuous Drain Current	I_D	100	A	$V_{GS} = 18V$ $T_C = 25^\circ\text{C}$ $T_J = 150^\circ\text{C}$
		66		$V_{GS} = 18V$ $T_C = 100^\circ\text{C}$ $T_J = 150^\circ\text{C}$
Power Dissipation	P_D	400	W	
Operating Junction Temperature	T_J	-50 To +150	$^\circ\text{C}$	
Storage Temperature	T_{stg}	-50 To +150	$^\circ\text{C}$	



2. Electrical Characteristics

At $T_J = 25^\circ\text{C}$, unless specified otherwise (Per Position)

Parameter	Symbol	Value			Unit	Test Conditions
		Min.	Typ.	Max.		
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	1200	/	/	V	$V_{GS} = -3V$ $I_D = 100\mu A$
Gate Threshold Voltage	$V_{GS(th)}$	1.8	2.4	/	V	$V_{DS} = V_{GS}$ $I_D = 20mA$
Reverse Bias Drain Current	I_{DSS}	/	1	300	μA	$V_{GS} = -3V$ $V_{DS} = 1200V$
Gate-Source Leakage Current	I_{GSS}	/	1	300	nA	$V_{GS} = 18V$ $V_{DS} = 0V$
Drain-Source On-State Resistance	$R_{DS(on)}$	/	16	26	m Ω	$V_{GS} = 18V$ $I_D = 50A$ $T_J = 25^\circ\text{C}$
		/	26	/		$V_{GS} = 18V$ $I_D = 50A$ $T_J = 125^\circ\text{C}$
		/	16	23		$V_{GS} = 18V$ $I_D = 50A$ $T_J = 150^\circ\text{C}$
		/	20	/		$V_{GS} = 15V$ $I_D = 50A$ $T_J = 25^\circ\text{C}$
Internal Gate Resistance	$R_{G(int)}$	/	1.1	/	Ω	$f = 1MHz$ $V_{AC} = 25mV$
Coss Stored Energy	E_{oss}	/	110	/	μJ	$V_{DS} = 800V$ $f = 500kHz$
Input Capacitance	C_{iss}	/	7740	/	pF	$V_{GS} = 0V$ $V_{DS} = 800V$
Output Capacitance	C_{oss}	/	280	/	pF	$f = 500kHz$ $V_{AC} = 25mV$



I3M12016SM SiC MOS

N-Channel Enhancement Mode

Parameter	Symbol	Value			Unit	Test Conditions
		Min.	Typ.	Max.		
Reverse Transfer Capacitance	C _{rss}	/	18	/	pF	V _{DS} = 800V I _{DS} = 50A V _{GS} = -3 to 18V I _G = 10mA
Gate to Source Charge	Q _{gs}	/	81	/	nC	
Gate to Drain Charge	Q _{gd}	/	80	/		
Total Gate Charge	Q _g	/	249	/		
Turn-on Energy	E _{on}	/	558	/	μJ	V _{DS} = 800V I _{DS} = 50A V _{GS} = -3V/18V R _G = 1.0Ω L= 100μH
Turn-off Energy	E _{off}	/	128	/		
Turn-On Delay Time	T _{d(on)}	/	25.8	/	ns	
Rise Time	T _r	/	30	/		
Turn-Off Delay Time	T _{d(off)}	/	46.4	/		
Fall Time	T _f	/	15.2	/		

3. Reverse Diode Characteristics

At $T_J = 25^\circ\text{C}$, unless specified otherwise (Per Position)

Parameter	Symbol	Value		Unit	Test Conditions
		Typ.	Max.		
Diode Forward Voltage	V_{SD}	6	/	V	$V_{GS} = -3\text{V}$ $I_{SD} = 50\text{A}$ $T_J = 25^\circ\text{C}$
		5.1	/	V	$V_{GS} = -3\text{V}$ $I_{SD} = 50\text{A}$ $T_J = 150^\circ\text{C}$
Reverse Recover Time	t_{rr}	27	/	ns	$V_{GS} = -3/18\text{V}$ $I_{SD} = 50\text{A}$ $V_{DS} = 800\text{V}$ $d_{if}/d_t = 4000\text{A}/\mu\text{s}$ $R_G = 1.0\Omega$ $T_J = 25^\circ\text{C}$
Reverse Recovery Charge	Q_{rr}	1178	/	μC	
Peak Reverse Recovery Current	I_{rrm}	70	/	A	
Reverse Recovery Energy	E_{RR}	707	/	μJ	

4. Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance from Junction to Case	$R_{\theta JC}$	0.31	$^\circ\text{C}/\text{W}$

5. Typical Performance

At $T_J = 25^\circ\text{C}$, unless specified otherwise

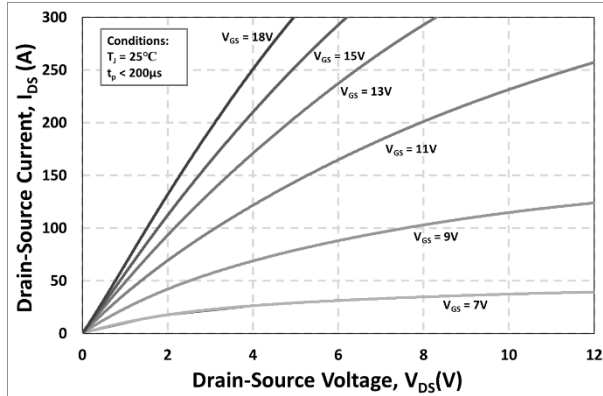


Figure 1. Output Characteristics $T_J = 25^\circ\text{C}$

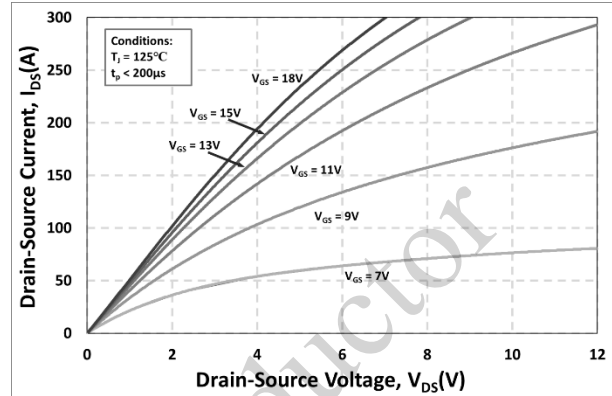


Figure 2. Output Characteristics $T_J = 125^\circ\text{C}$

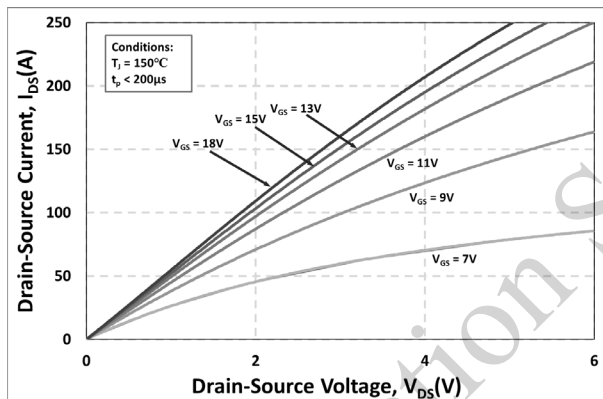


Figure 3. Output Characteristics $T_J = 150^\circ\text{C}$

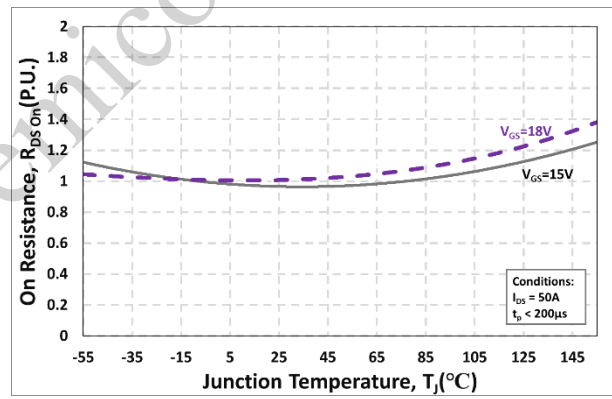


Figure 4. Normalized On-Resistance vs. Temperature

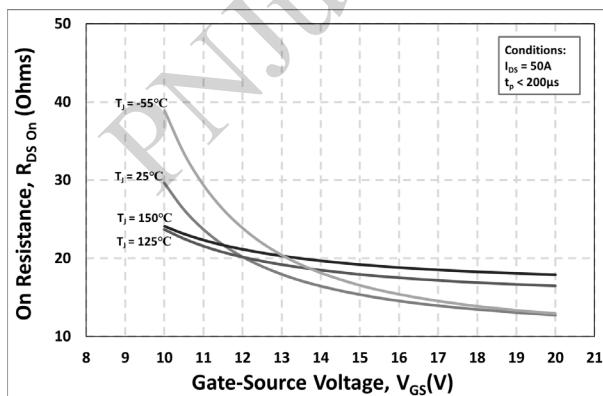


Figure 5. On-Resistance vs. Gate-Source Voltage

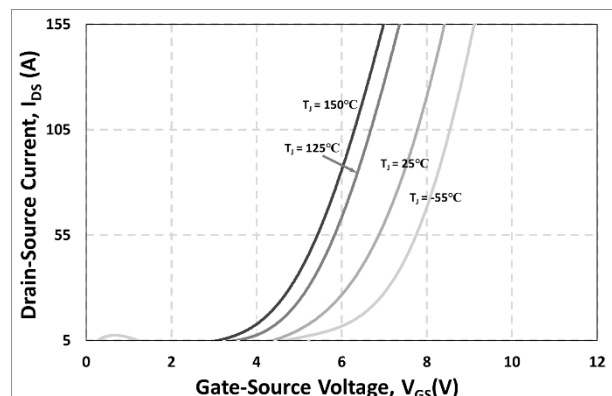


Figure 6. Transfer Characteristic for Various Junction Temperatures

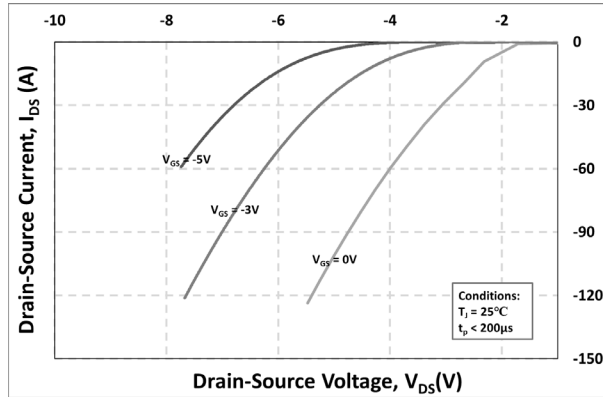


Figure 7. Body Diode Characteristic at 25°C

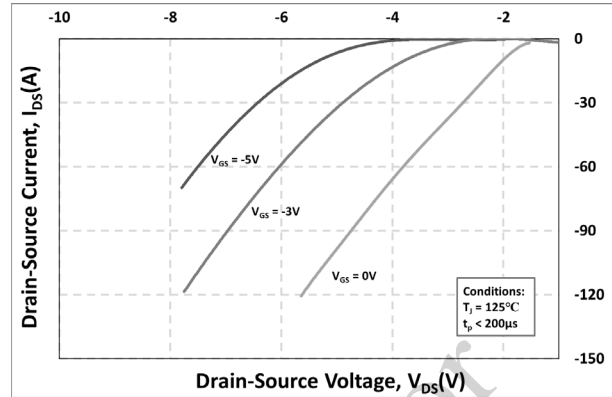


Figure 8. Body Diode Characteristic at 125°C

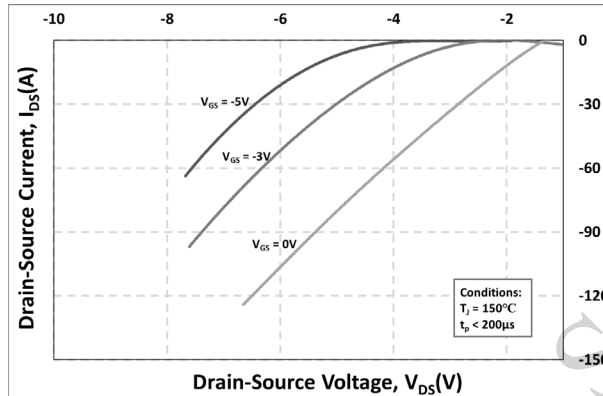


Figure 9. Body Diode Characteristic at 150°C

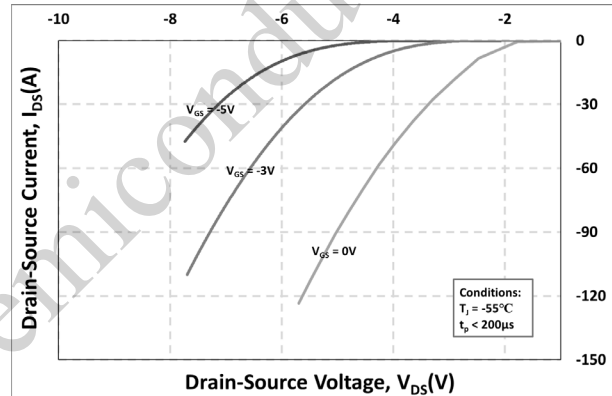


Figure 10. Body Diode Characteristic at -55°C

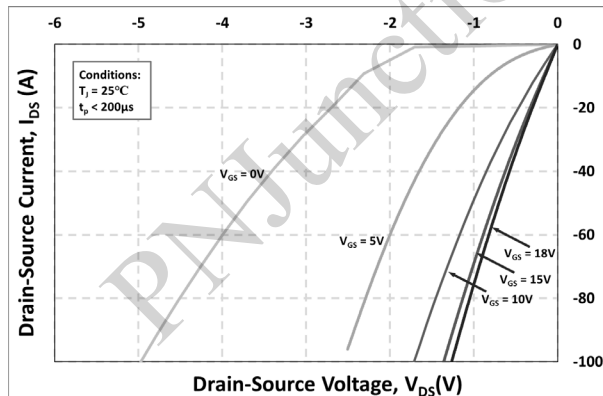


Figure 11. 3rd Quadrant Characteristic at 25°C

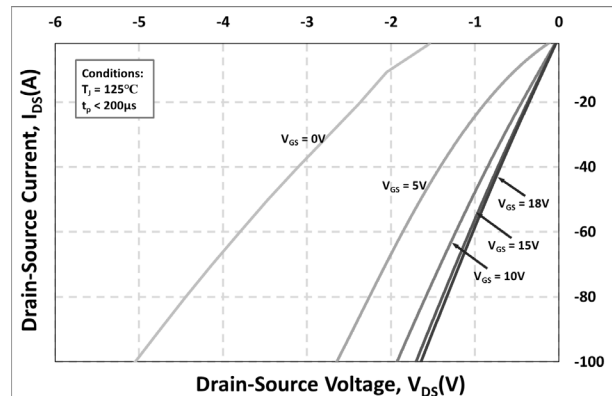


Figure 12. 3rd Quadrant Characteristic at 125°C

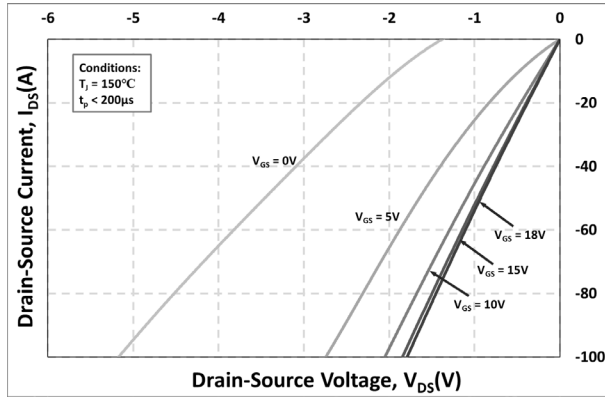


Figure 13. 3rd Quadrant Characteristic at 150°C

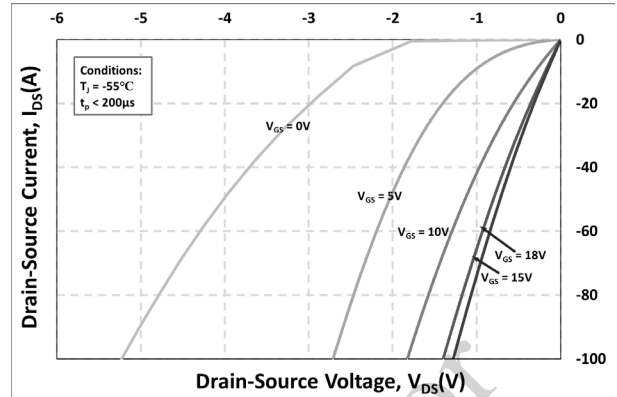


Figure 14. 3rd Quadrant Characteristic at -55°C

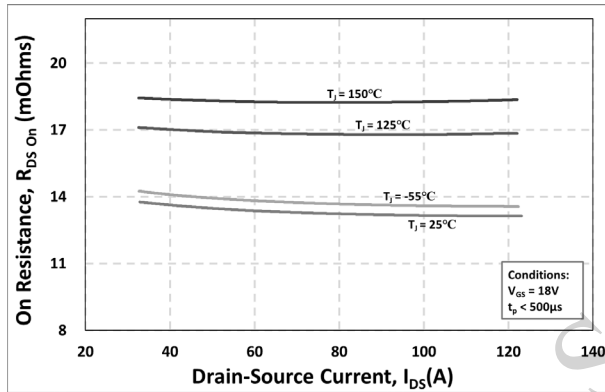


Figure 15. On-Resistance vs. Drain Current Various Temperatures

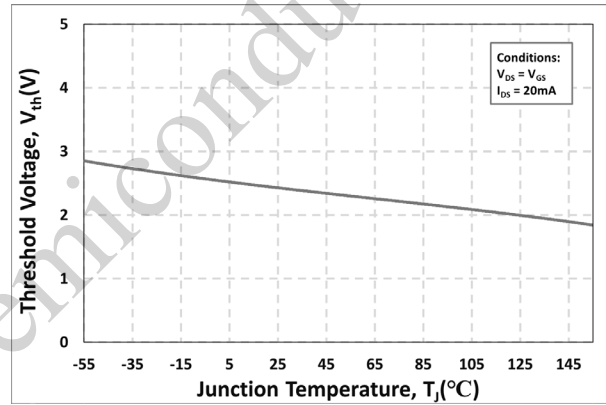


Figure 16. Threshold Voltage vs. Temperature

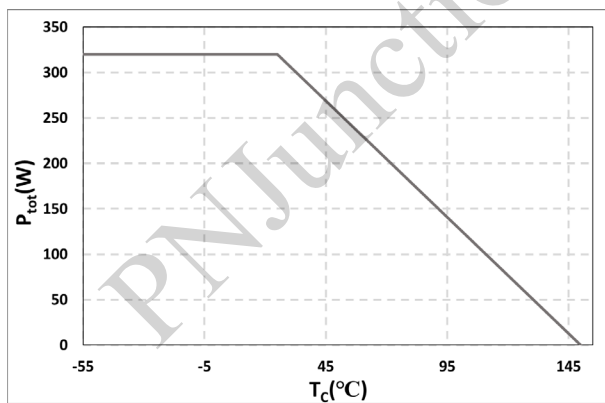


Figure 17. Maximum Power Dissipation Derating vs. Case Temperature

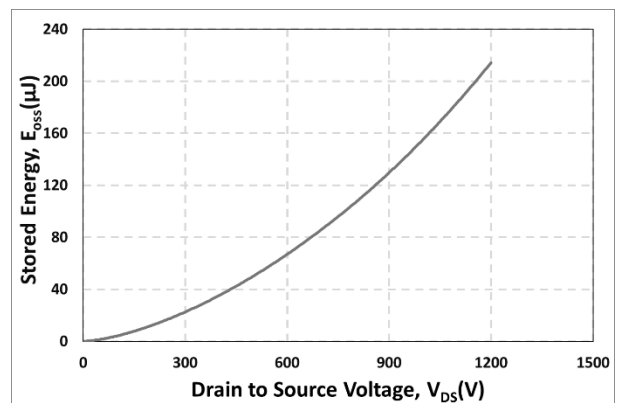


Figure 18. Output Capacitor Stored Energy

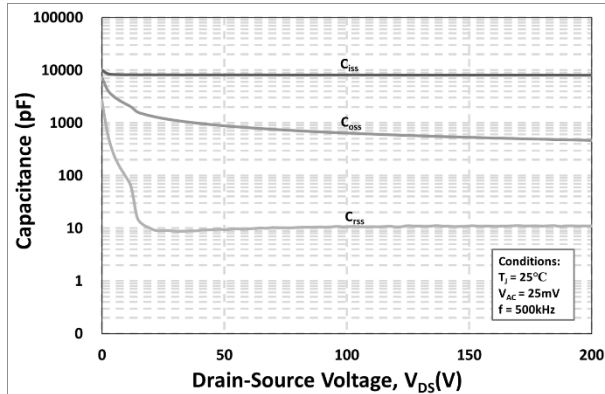


Figure 19. Capacitances vs. Drain-Source Voltage (0 - 200V)

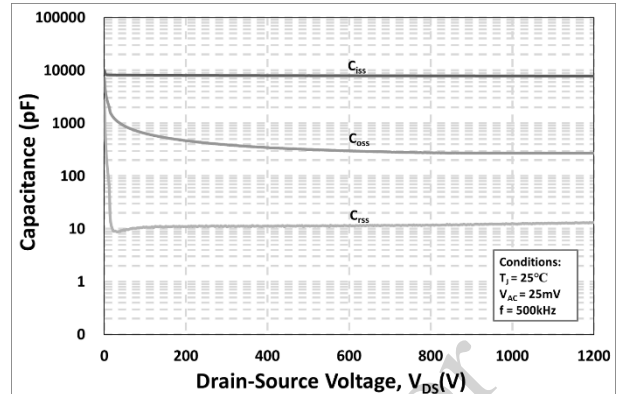


Figure 20. Capacitances vs. Drain-Source Voltage (0 - 1200V)

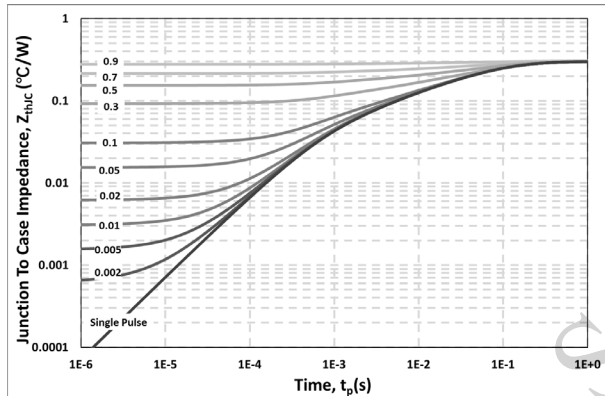


Figure 21. Transient Thermal Impedance (Junction - Case)

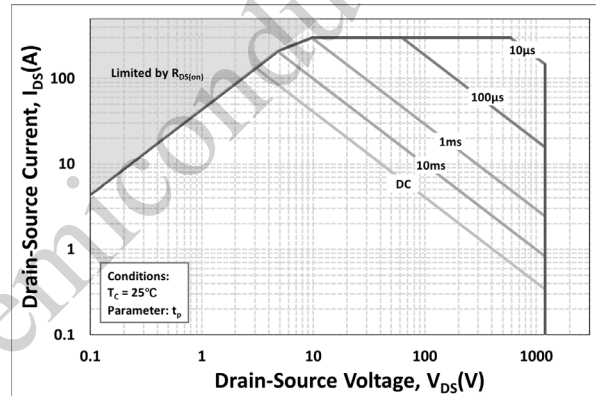


Figure 22. Forward Bias Safe Operating Area (FBSOA)

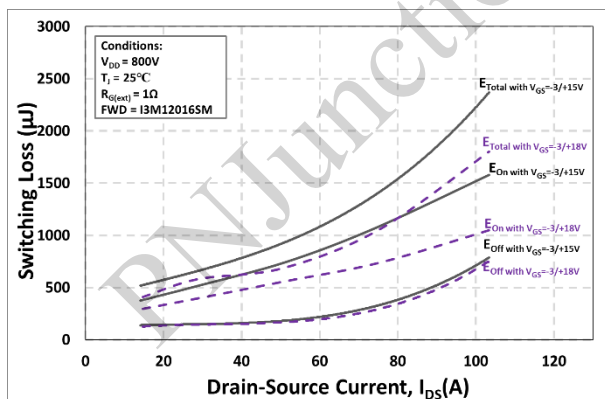


Figure 23. Switching Loss vs. Drain-Source Current (VDS = 800 V)

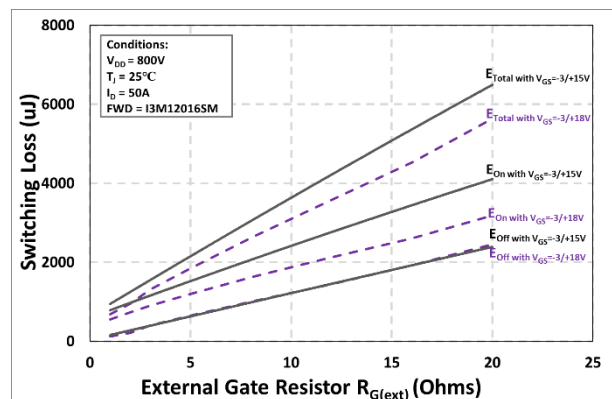


Figure 24. Switching Loss vs. External Gate Resistance

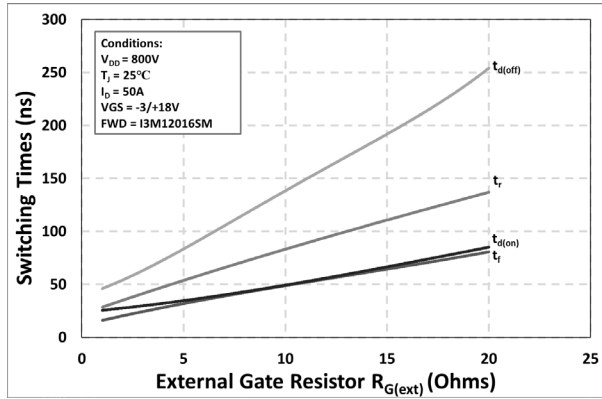


Figure 25. Switching Times vs. External Gate Resistance

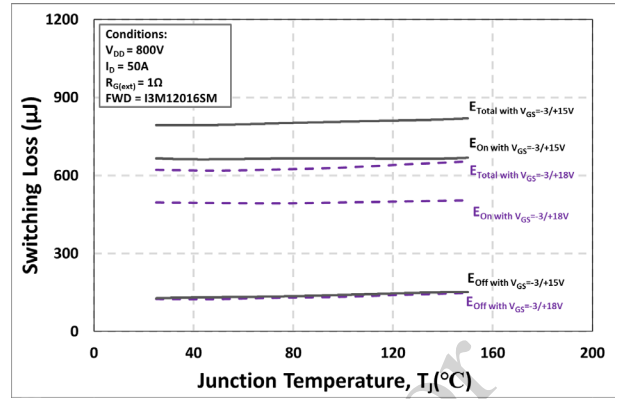
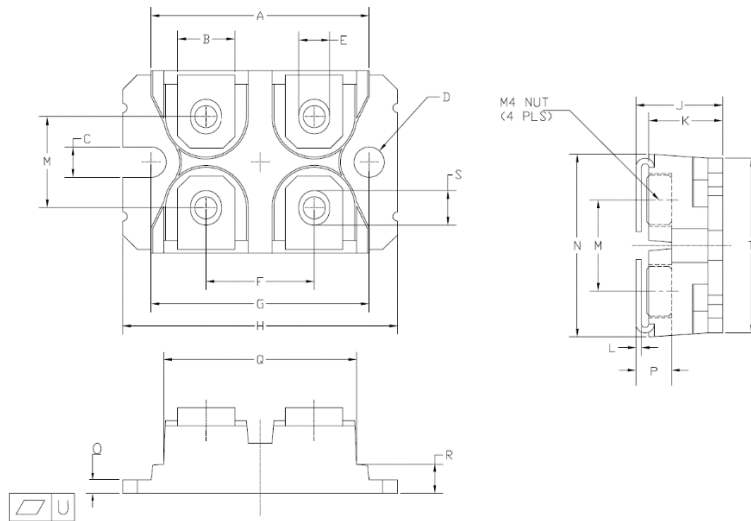


Figure 26. Clamped Inductive Switching Energy vs. Temperature

PNJunction Semiconductor

6. Package Outlines



SYMBOL	MIN.	NOM.	MAX.
A	31.50	31.69	31.88
B	7.80	8.00	8.20
C	4.09	4.19	4.29
D	4.09	4.19	4.29
E	4.09	4.19	4.29
F	14.91	15.01	15.11
G	30.12	30.21	30.30
H	38.00	38.11	38.23
J	11.68	11.95	12.22
K	8.92	9.26	9.60
L	0.76	0.80	0.84
M	12.60	12.73	12.85
N	25.15	25.29	25.42
O	2.00	2.06	2.13
P	4.95	5.46	5.97
Q	26.54	26.72	26.90
R	3.94	4.18	4.42
S	4.72	4.79	4.85
T	24.59	24.83	25.07
U	-0.05	0.03	0.10

Drawing and Dimensions



Important Notice

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics. With respect to any examples, hints or any typical values stated herein and/or any information regarding the application of the product, PN Junction hereby disclaims any and all warranties and liabilities of any kind, including without limitation warranties of non-infringement of intellectual property rights of any third party.

PN Junction reserves the right to make changes at any time to any products or information herein, without notice. "Typical" parameters which may be provided in PN Junction data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typical" must be validated for each customer application by customer's technical experts.

In addition, any information given in this document is subject to customer's compliance with its obligations stated in this document and any applicable legal requirements, norms and standards concerning customer's products and any use of the product of PN Junction in customer's applications. The data contained in this document is exclusively intended for technically trained staff. It is the responsibility of customer's technical departments to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to such application.

For further information on the product, technology, delivery terms and conditions and prices please contact your nearest PN Junction office (www.pnjsemi.com).

Warnings

Due to technical requirements products may contain dangerous substances. For information on the types in question please contact your nearest PN Junction office.

Except as otherwise explicitly approved by PN Junction in a written document signed by authorized representatives of PN Junction, PN Junction's products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury.