

SiC MOS P3M12017K4

N-Channel Enhancement Mode

Features

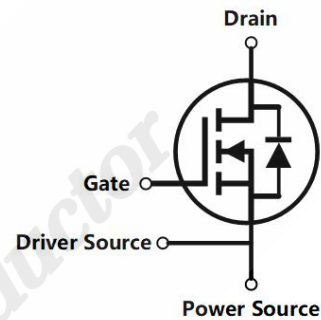
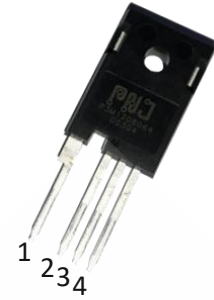
- High Blocking Voltage with Low On-Resistance
- High-Frequency Operation
- Ultra-Small Q_{gd}
- 100% UIS tested

Standards Benefits

- Improve System Efficiency
- Increase Power Density
- Reduce Heat Sink Requirements
- Reduction of System Cost

Application

- Solar Inverters
- EV Battery Chargers
- High Voltage DC/DC Converters
- Switch Mode Power Supplies



TO-247-4

Drain	1
Power Source	2
Driver Source	3
Gate	4



Order Information

Part number	Package	Marking
P3M12017K4	TO-247-4	P3M12017K4



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1. Maximum Ratings

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

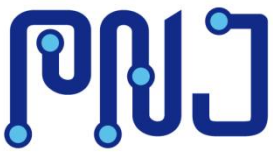
Parameter	Symbol	Value	Unit	Test Conditions
Drain - Source Voltage	V_{DSmax}	1200	V	$V_{GS} = 0V$ $I_D = 100\mu A$
Gate - Source Voltage (Dynamic)	V_{GSmax}	-8 / +21	V	AC ($f > 1\text{Hz}$)
Gate - Source Voltage (Static)	V_{GSop}	-3 / +15	V	Static
Continuous Drain Current	I_D	154	A	$V_{GS} = 15V$ $T_C = 25^\circ\text{C}$
		109		$V_{GS} = 15V$ $T_C = 100^\circ\text{C}$
Pulsed Drain Current	$I_{D(pulse)}$	270	A	
Power Dissipation	P_D	789	W	
Operating Junction Temperature	T_J	-55 To +175	$^\circ\text{C}$	
Storage Temperature	T_{stg}	-55 To +175	$^\circ\text{C}$	
Solder Temperature	T_L	260	$^\circ\text{C}$	
Mounting Torque	M_d	1 8.8	Nm lbf-in	M3 or 6-32 screw



2. Electrical Characteristics

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

Parameter	Symbol	Value			Unit	Test Conditions
		Min.	Typ	Max.		
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	1200	/	/	V	$V_{GS} = 0V$ $I_D = 100\mu A$
Gate Threshold Voltage	$V_{GS(th)}$	1.8	2.6	/	V	$V_{DS} = V_{GS}$ $I_D = 23mA$ $T_J = 25^\circ\text{C}$
		/	1.9	/	V	$V_{DS} = V_{GS}$ $I_D = 23mA$ $T_J = 175^\circ\text{C}$
Reverse Bias Drain Current	I_{DSS}	/	1	100	μA	$V_{GS} = 0V$ $V_{DS} = 1200V$
Gate-Source Leakage Current	I_{GSS}	/	20	250	nA	$V_{GS} = 15V$ $V_{DS} = 0V$
/Drain-Source On-State Resistance	$R_{DS(on)}$	/	17	23	m Ω	$V_{GS} = 15V$ $I_D = 75A$ $T_J = 25^\circ\text{C}$
		/	17	/	m Ω	$V_{GS} = 15V$ $I_D = 75A$ $T_J = 125^\circ\text{C}$
		/	20	/	m Ω	$V_{GS} = 15V$ $I_D = 75A$ $T_J = 175^\circ\text{C}$
Trans conductance	g_{fs}	/	48	/	S	$V_{DS} = 20V$ $I_{DS} = 75A$ $T_J = 25^\circ\text{C}$
		/	47	/	S	$V_{DS} = 20V$ $I_{DS} = 75A$ $T_J = 175^\circ\text{C}$



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Parameter	Symbol	Value			Unit	Test Conditions	
		Min.	Typ	Max.			
Input Capacitance	C_{iss}	/	7330	/	pF	$V_{GS} = 0V$ $V_{DS} = 800V$ $f = 250kHz$ $V_{AC} = 25mV$	
Output Capacitance	C_{oss}	/	282	/	pF		
Reverse Transfer Capacitance	C_{rss}	/	21	/	pF		
Coss Stored Energy	E_{oss}	/	216	/	μJ		
Turn-on Energy	E_{on}	/	2062	/	μJ	$V_{DS} = 800V$ $V_{GS} = -3/15V$ $I_{DS} = 75A$ $R_G = 1\Omega$	
Turn-off Energy	E_{off}	/	1114	/			
Turn-On Delay Time	$T_{d(on)}$	/	19	/	ns		
Rise Time	T_r	/	62	/			
Turn-Off Delay Time	$T_{d(off)}$	/	78	/			
Fall Time	T_f	/	30	/			
Internal Gate Resistance	$R_{G(int)}$	/	4.3	/	Ω		$f = 1MHz$ $V_{AC} = 25mV$
Gate to Source Charge	Q_{gs}	/	102	/	nC		$V_{DS} = 800V$ $I_{DS} = 75A$ $V_{GS} = 0 \text{ to } 15V$ $I_G = 50mA$
Gate to Drain Charge	Q_{gd}	/	62	/			
Total Gate Charge	Q_g	/	213	/			

3. Reverse Diode Characteristics

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

Parameter	Symbol	Value		Unit	Test Conditions
		Typ.	Max.		
Diode Forward Voltage	V_{SD}	4.8	/	V	$V_{GS} = -3V$ $I_{SD} = 37.5A$ $T_J = 25^\circ\text{C}$
		5.1	/	V	$V_{GS} = -3V$ $I_{SD} = 37.5A$ $T_J = 175^\circ\text{C}$
Continuous Diode Forward Current	I_S	131	/	A	$V_{GS} = -3V$
Reverse Recover Time	t_{rr}	25	/	ns	$V_{GS} = -3/15V$ $I_{SD} = 75A$ $V_R = 800V$ $d_i/d_t = 4800A/\mu s$ $T_J = 25^\circ\text{C}$
Reverse Recovery Charge	Q_{rr}	521	/	nC	
Peak Reverse Recovery Current	I_{rrm}	35	/	A	

4. Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance from Junction to Case	$R_{\theta JC}$	0.19	$^\circ\text{C}/\text{W}$

5. Typical Performance

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

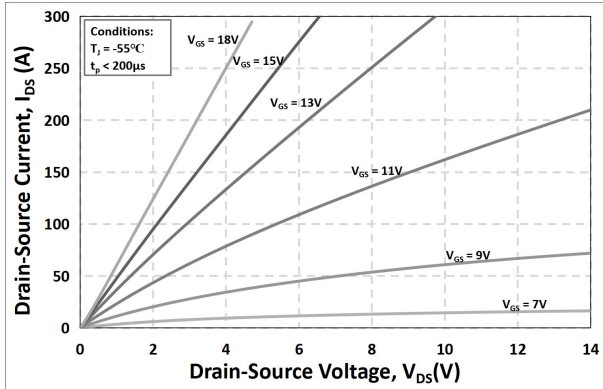


Figure 1. Output Characteristics $T_J = -55^\circ\text{C}$

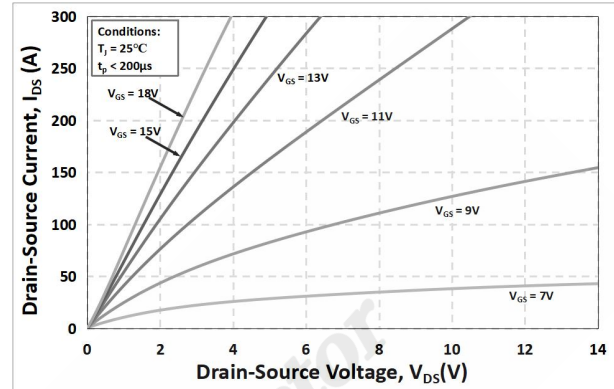


Figure 2. Output Characteristics $T_J = 25^\circ\text{C}$

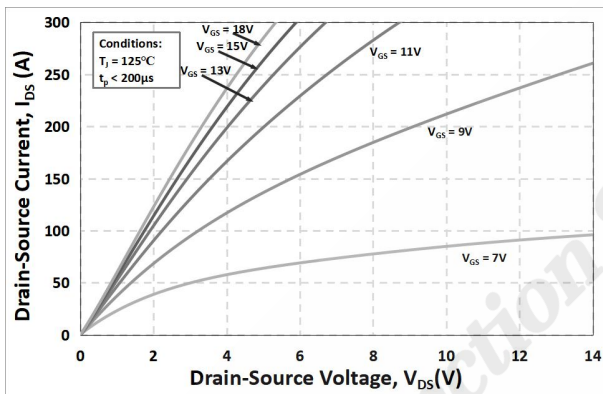


Figure 3. Output Characteristics $T_J = 125^\circ\text{C}$

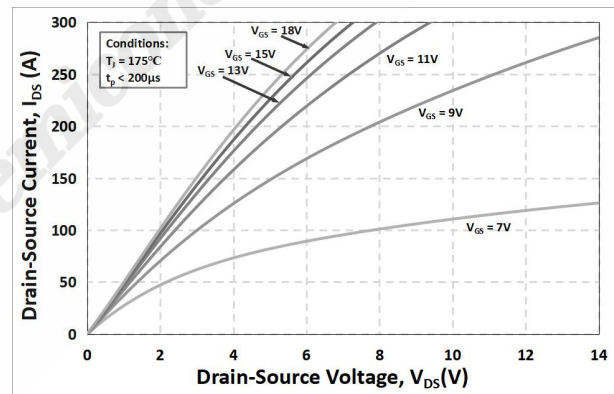


Figure 4. Output Characteristics $T_J = 175^\circ\text{C}$

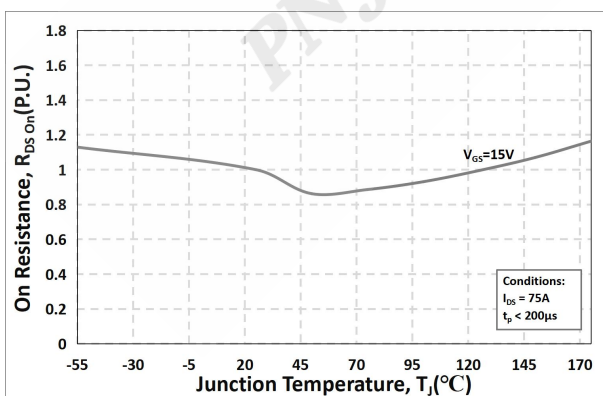


Figure 5. Normalized On-Resistance vs. Temperature

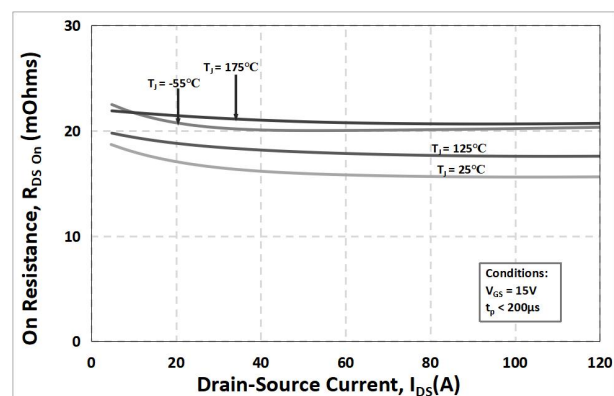


Figure 6. On-Resistance vs. Drain Current Various Temperatures

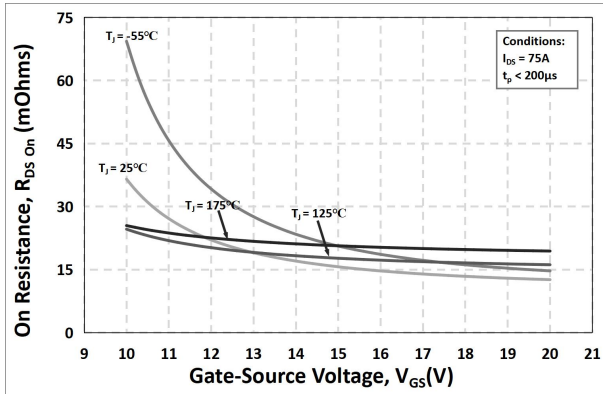


Figure 7. On-Resistance vs. Gate-Source Voltage

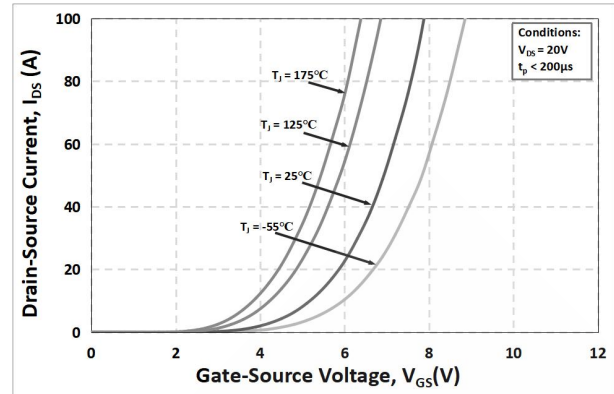


Figure 8. Transfer Characteristic for Various Junction Temperatures

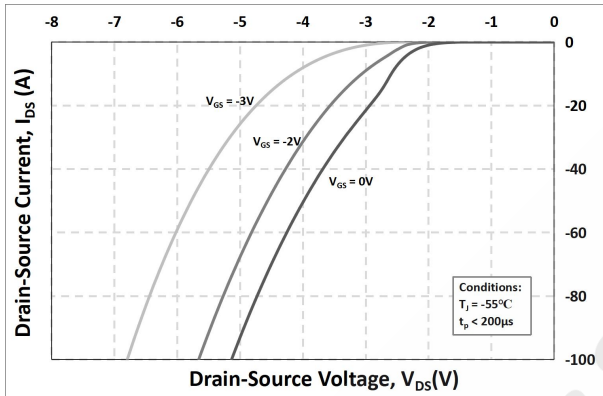


Figure 9. Body Diode Characteristic at -55°C

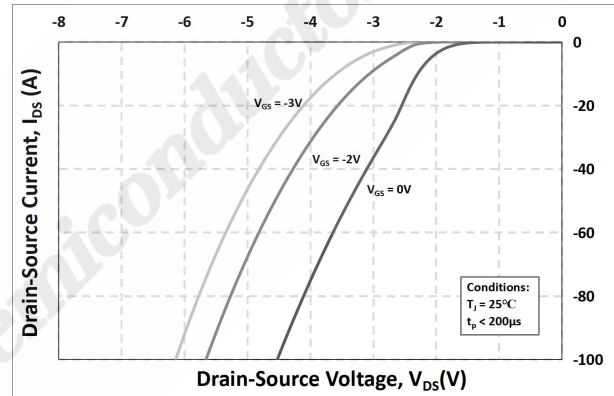


Figure 10. Body Diode Characteristic at 25°C

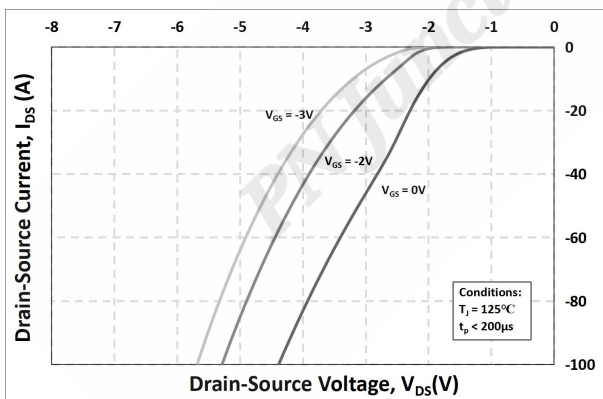


Figure 11. Body Diode Characteristic at 125°C

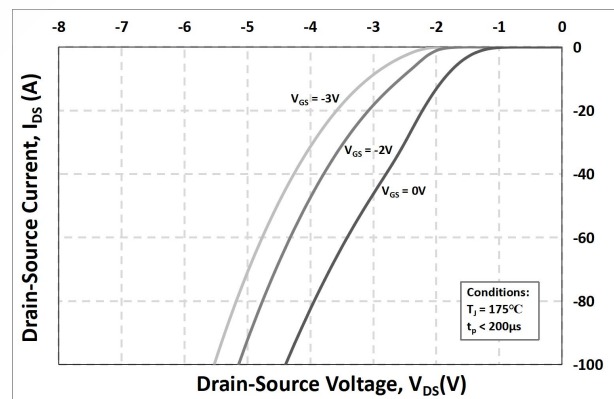


Figure 12. Body Diode Characteristic at 175°C

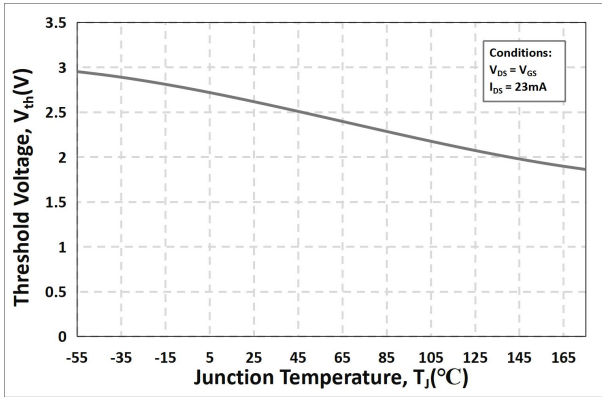


Figure 13. Threshold Voltage vs. Temperature

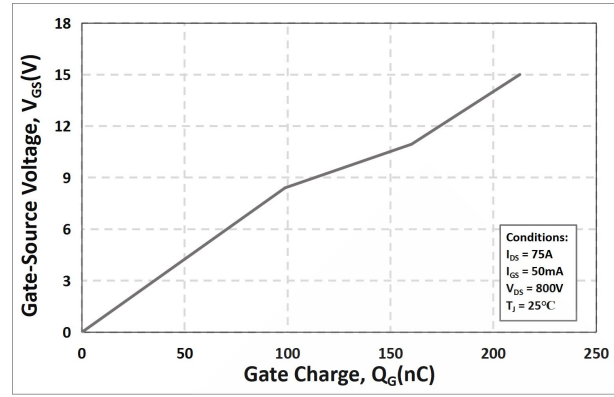


Figure 14. Gate Charge Characteristics

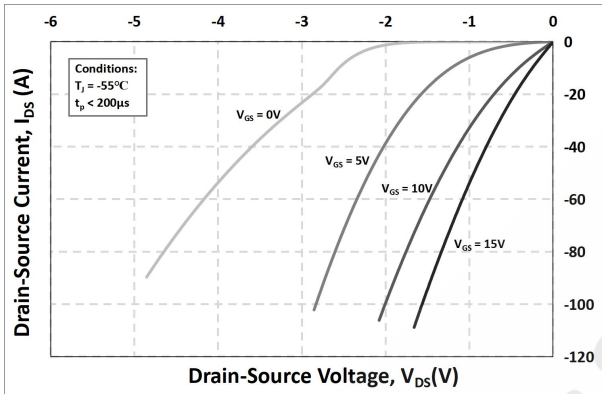


Figure 15. 3rd Quadrant Characteristic at -55°C

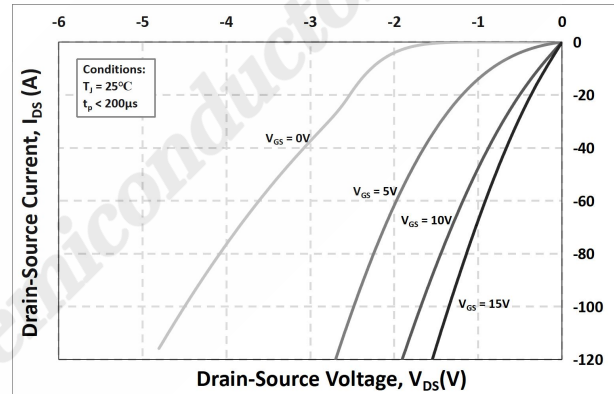


Figure 16. 3rd Quadrant Characteristic at 25°C

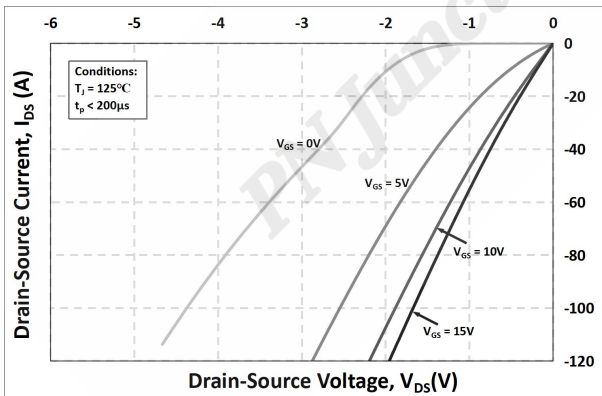


Figure 17. 3rd Quadrant Characteristic at 125°C

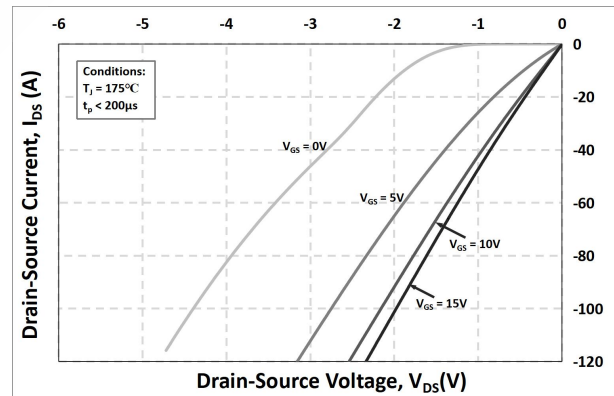
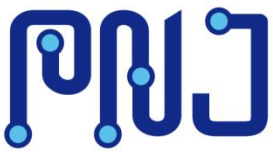


Figure 18. 3rd Quadrant Characteristic at 175°C



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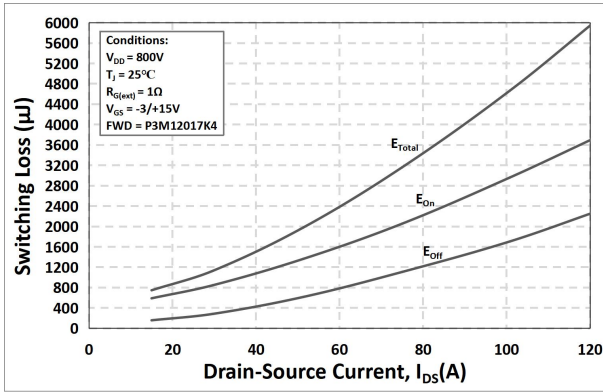


Figure 19. Clamped Inductive Switching Energy vs. Drain Current ($V_{DD} = 800V$)

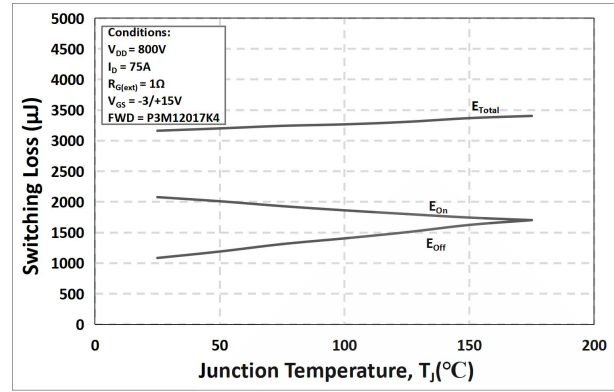


Figure 20. Clamped Inductive Switching Energy vs. $R_{G(ext)}$

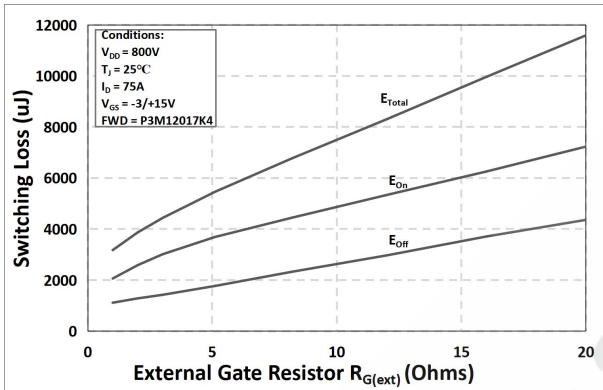


Figure 21. Clamped Inductive Switching Energy vs. Temperature

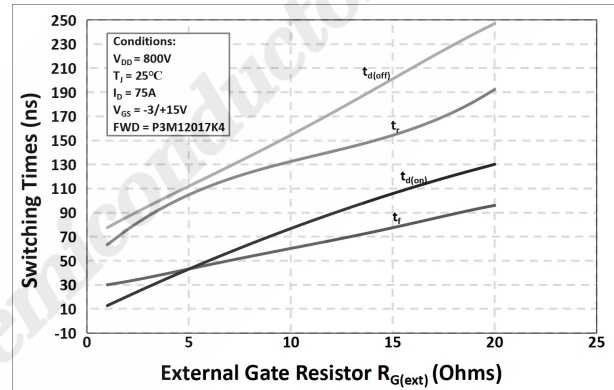


Figure 22. Switching Times vs. $R_{G(ext)}$

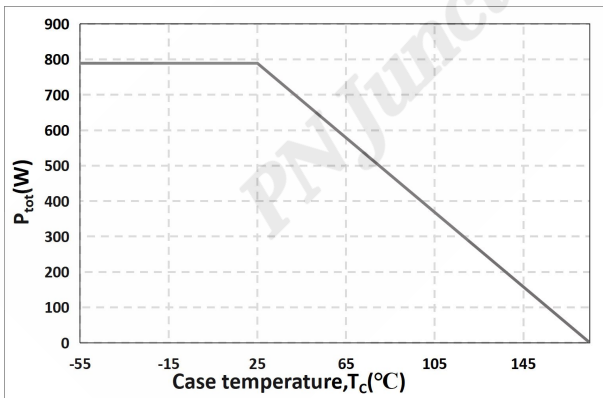


Figure 23. Maximum Power Dissipation Derating vs. Case Temperature

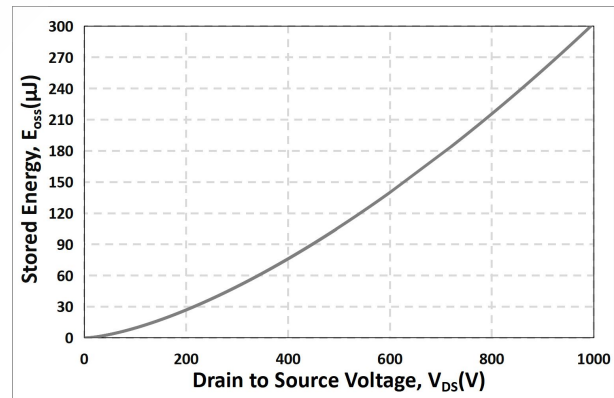


Figure 24. Output Capacitor Stored Energy

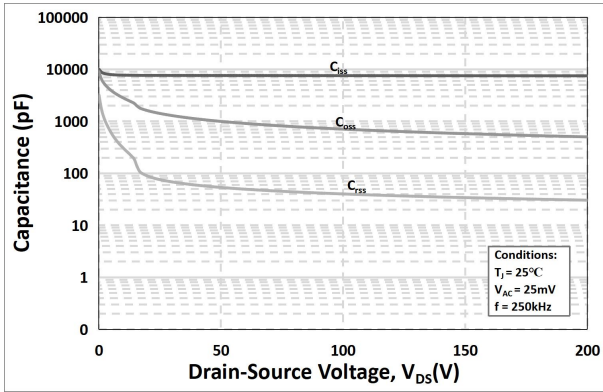


Figure 25. Capacitances vs. Drain-Source Voltage (0 - 200V)

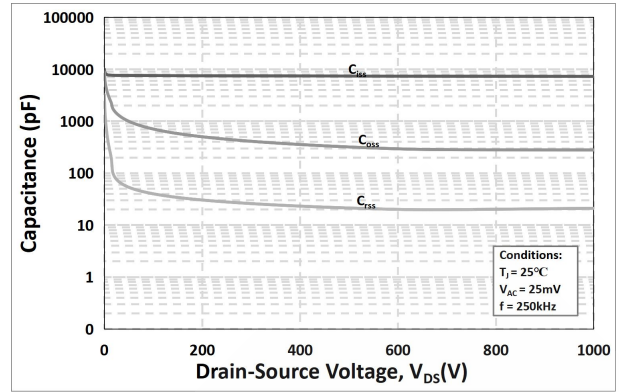


Figure 26. Capacitances vs. Drain-Source Voltage (0 - 1000V)

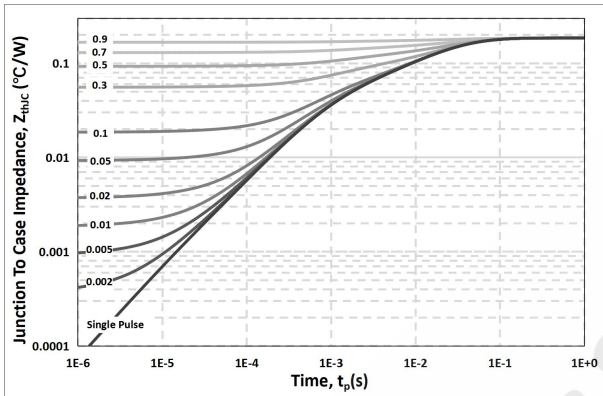


Figure 27. Transient Thermal Impedance (Junction - Case)

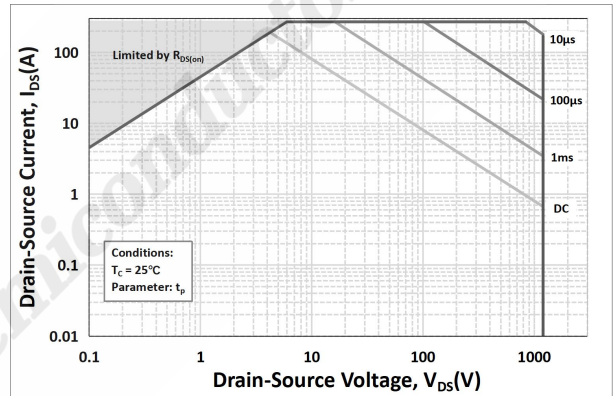
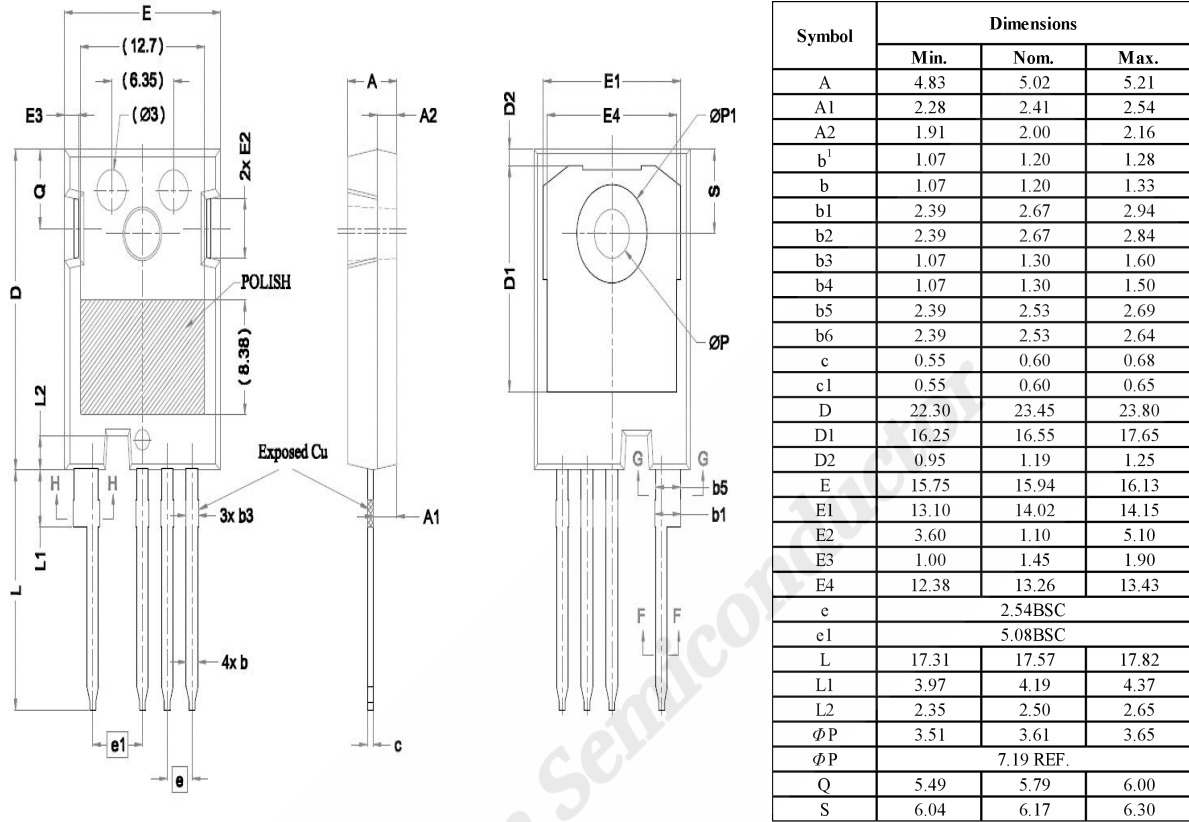


Figure 28. Safe Operating Area

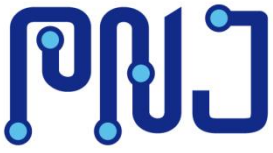
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6. Package Outlines



Drawing and dimensions

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