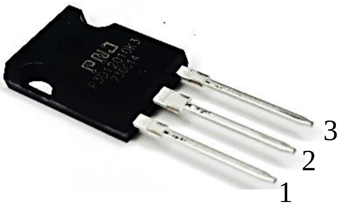
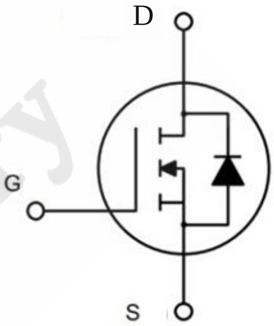
SiC MOS P3M06040K3

N-Channel Enhancement Mode



Features

- Qualified to AEC-Q101
- 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

TO-247-3

Gate	1
Drain	2
Source	3

Applications

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

RoHS

Halogen

Order Information

Part Number	Package	Marking
P3M06040K3	TO-247-3	P3M06040K3

Contents

1. Maximum Ratings

At T_J= 25℃, unless specified otherwise

Parameter	Symbol	Value	Unit	Test Conditions
Drain - Source Voltage	V_{DSmax}	650	V	V_{GS}= -3V I_D= 100μA
Gate - Source Voltage (dynamic)	V_{GSmax}	-8 / +20	V	AC (f>1 Hz)
Gate - Source Voltage (static)	V_{GSop}	-3 / +15	V	Static
Continuous Drain Current	I_D	61	A	V_{GS}= 15V T_C= 25℃
		42		V_{GS}= 15V T_C= 100℃
Power Dissipation	P_D	254	W	
Operating Junction	T_J	-55 To +175	℃	
Storage Temperature	T_{stg}	-55 To +175	℃	
Solder Temperature	T_L	260	℃	
Mounting Torque	M_d	1 8.8	Nm lbf-in	M3 or 6-32 screw

2. Electrical Characteristics

At T_J= 25℃, unless specified otherwise

Parameter	Symbol	Value			Unit	Test Conditions
		Min.	Typ.	Max.		
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	650	/	/	V	V_{GS}= -3V I_D= 100µA
Gate Threshold Voltage	$V_{GS(th)}$	1.8	2.2	/	V	V_{DS}= V_{GS} I_D= 40mA T_J = 25℃
		/	1.45	/	V	V_{DS}= V_{GS} I_D= 40mA T_J = 175℃
Reverse Bias Drain Current	I_{DSS}	/	1	10	µA	V_{GS}= -3V V_{DS}= 650V
Gate-Source Leakage Current	I_{GSS}	/	20	250	nA	V_{GS}= 15V V_{DS}= 0V
Drain-Source On-State Resistance	$R_{DS(on)}$	/	40	50	mΩ	V_{GS}= 15V I_D= 40A
		/	32	/	mΩ	V_{GS}= 18V I_D= 40A
Trans conductance	g_{fs}	/	20	/	S	V_{DS}= 20V I_{DS}= 40A T_J= 25℃
		/	21	/	S	V_{DS}= 20V I_{DS}= 40A T_J= 175℃
Input Capacitance	C_{iss}	/	3282	/	pF	V_{GS}= 0V V_{DS}= 400V f= 1MHz V_{AC}= 25mV
Output Capacitance	C_{oss}	/	246	/	pF	
Reverse Transfer Capacitance	C_{rss}	/	6.66	/	pF	
Coss Stored Energy	E_{oss}	/	38.5	/	µJ	

Parameter	Symbol	Value			Unit	Test Conditions
		Min.	Typ.	Max.		
Internal Gate Resistance	$R_{G(int)}$	/	1.45	/	Ω	f= 1MHz V_{AC}= 25mV
Gate to Source Charge	Q_{gs}	/	32.9	/	nC	V_{DS}= 400V I_{DS}= 40A V_{GS}= -3 to 15V I_G= 20mA
Gate to Drain Charge	Q_{gd}	/	18.3	/		
Total Gate Charge	Q_g	/	85.5	/		

3. Reverse Diode Characteristics

At T_J= 25℃, unless specified otherwise

Parameter	Symbol	Value		Unit	Test Conditions
		Typ.	Max.		
Diode Forward Voltage	V_{SD}	4.1	/	V	V_{GS}= -3V I_{SD}= 20A T_J= 25℃
		3.6	/	V	V_{GS}= -3V I_{SD}= 20A T_J= 175℃
Continuous Diode Forward Current	I_S	51.5	/	A	V_{GS}= -3V

4. Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance from Junction to Case	$R_{θJC}$	0.59	℃/W

5. Typical Performance

At T_J= 25℃, unless specified otherwise

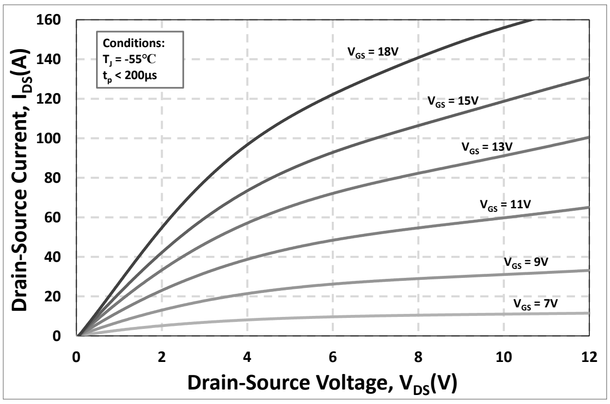


Figure 1. Output Characteristics T_J = -55℃

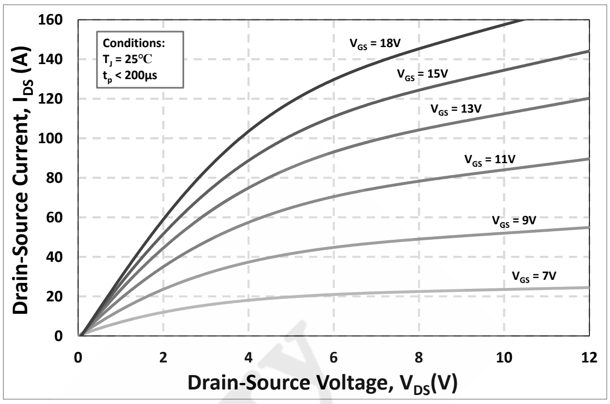


Figure 2. Output Characteristics T_J = 25℃

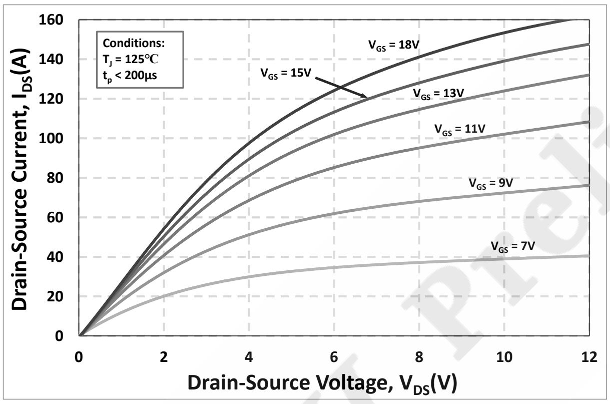


Figure 3. Output Characteristics T_J = 125℃

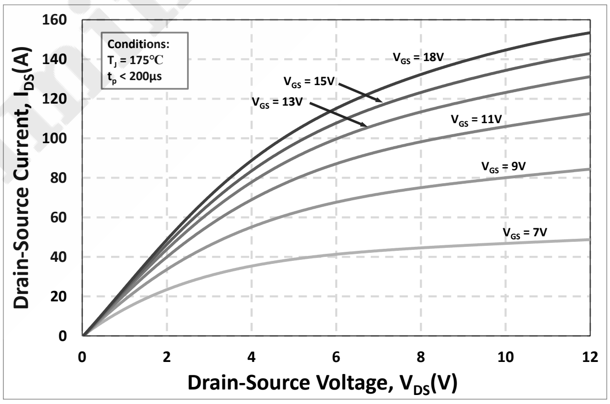


Figure 4. Output Characteristics T_J = 175℃

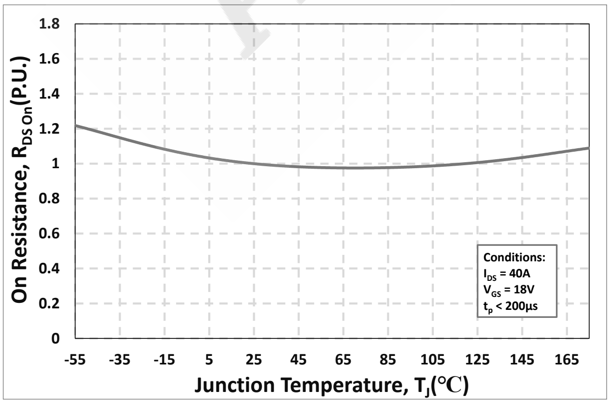


Figure 5. Normalized On-Resistance vs. Temperature

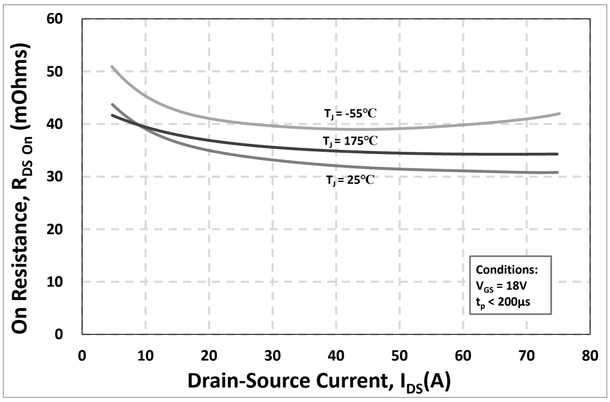


Figure 6. On-Resistance vs. Drain Current Various Temperatures

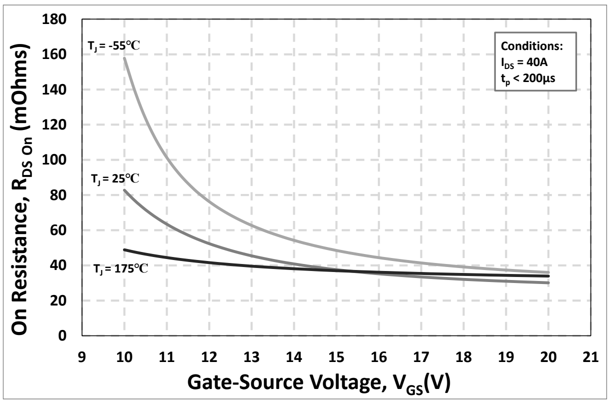


Figure 7. On-Resistance vs. Gate-Source Voltage

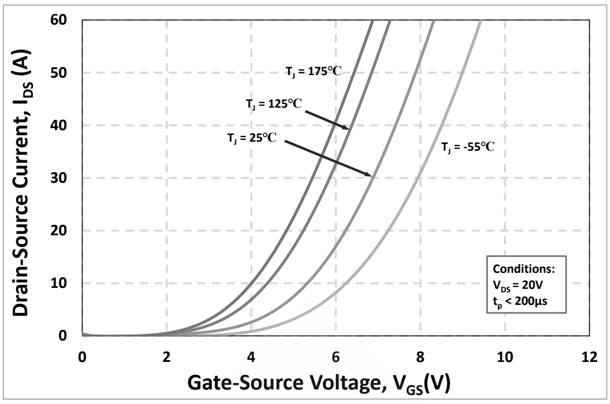


Figure 8. Transfer Characteristic for Various Junction Temperatures

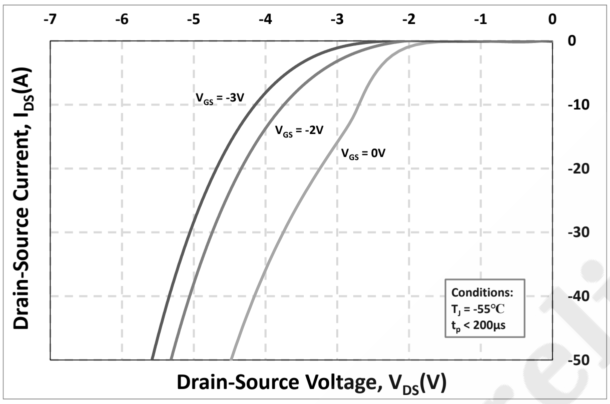


Figure 9. Body Diode Characteristic at -55℃

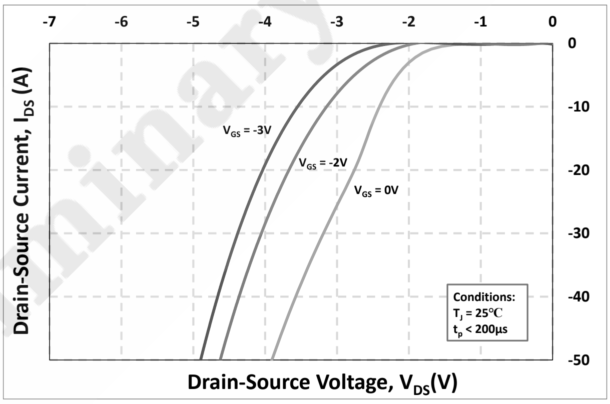


Figure 10. Body Diode Characteristic at 25℃

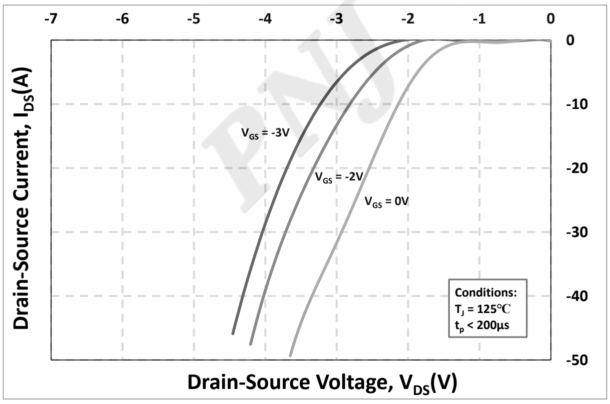


Figure 11. Body Diode Characteristic at 125℃

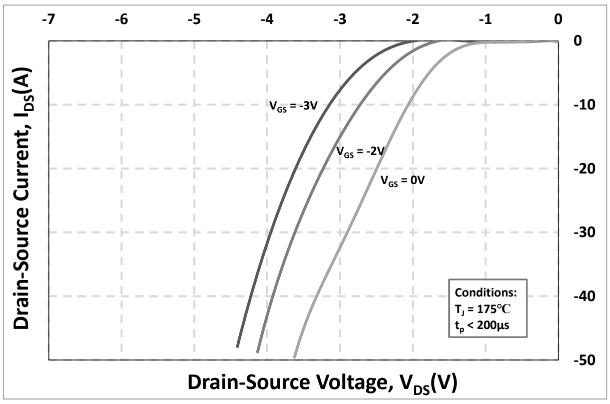


Figure 12. Body Diode Characteristic at 175℃

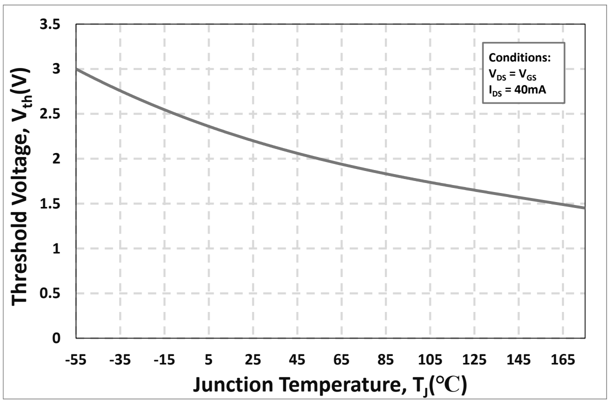


Figure 13. Threshold Voltage vs. Temperature

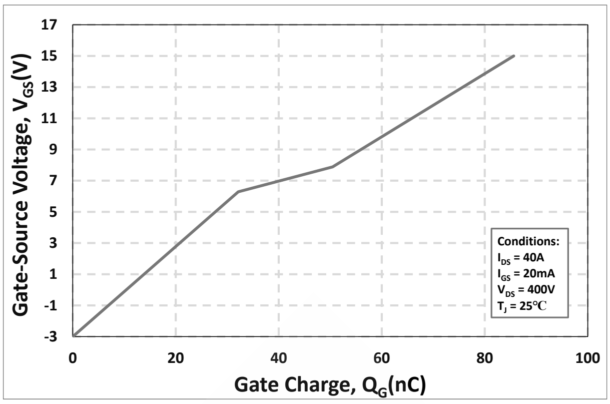


Figure 14. Gate Charge Characteristics

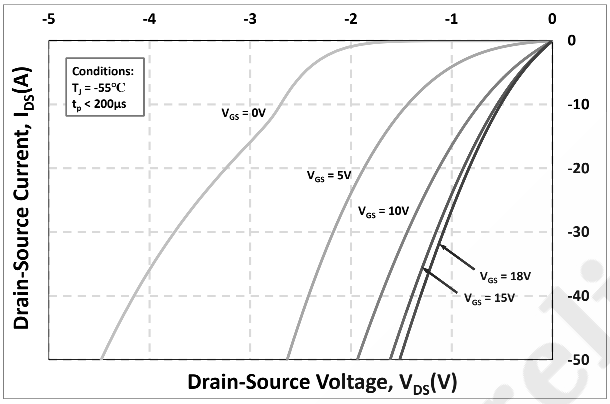


Figure 15. 3rd Quadrant Characteristic at -55℃

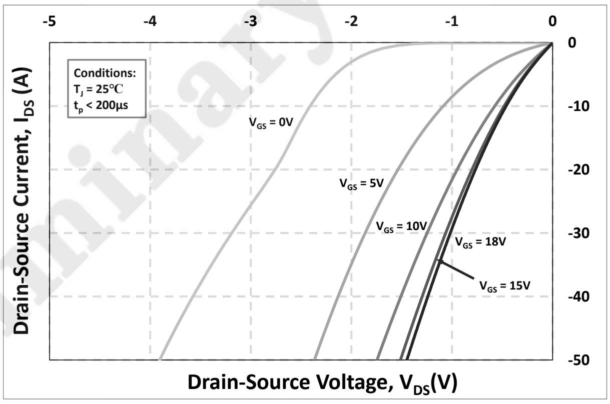


Figure 16. 3rd Quadrant Characteristic at 25℃

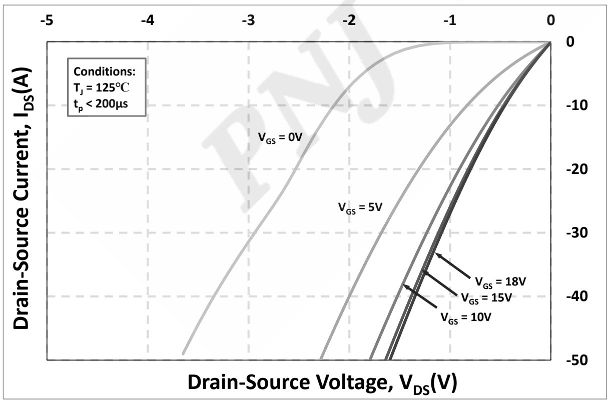


Figure 17. 3rd Quadrant Characteristic at 125℃

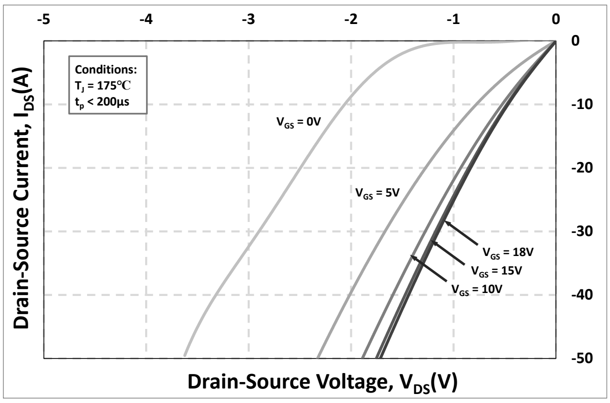


Figure 18. 3rd Quadrant Characteristic at 175ºC

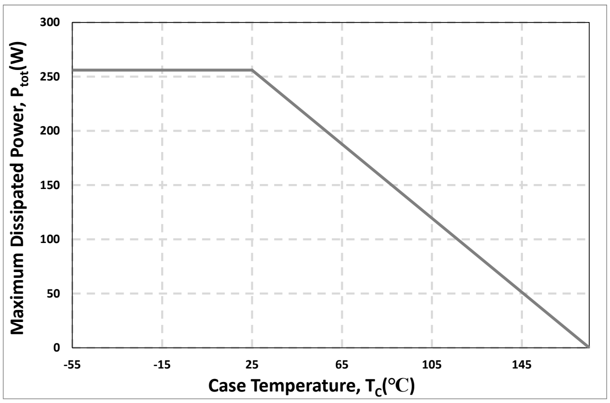


Figure 19. Maximum Power Dissipation Derating vs. Case Temperature

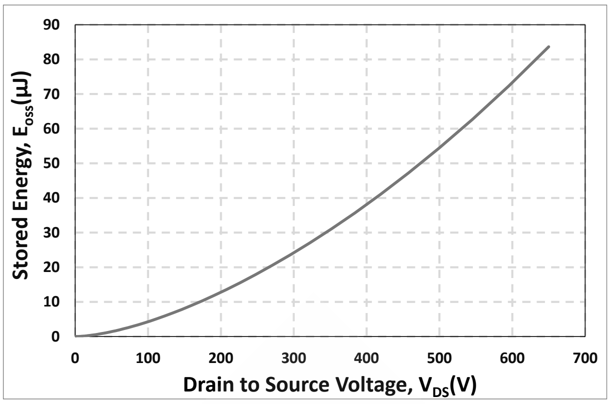


Figure 20. Output Capacitor Stored Energy

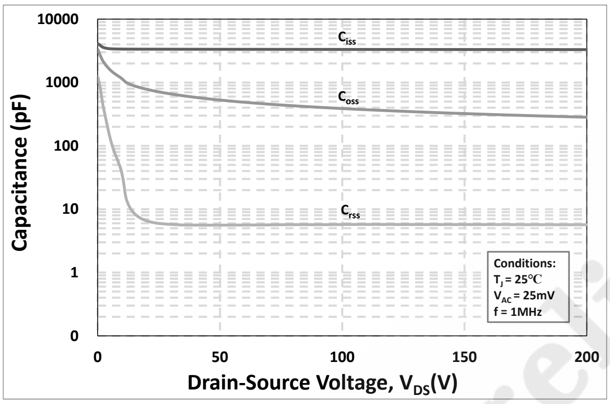


Figure 21. Capacitances vs. Drain-Source Voltage (0 - 200V)

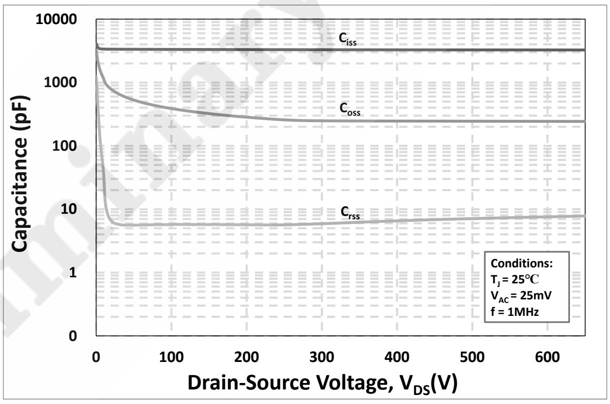


Figure 22. Capacitances vs. Drain-Source Voltage (0 - 650V)

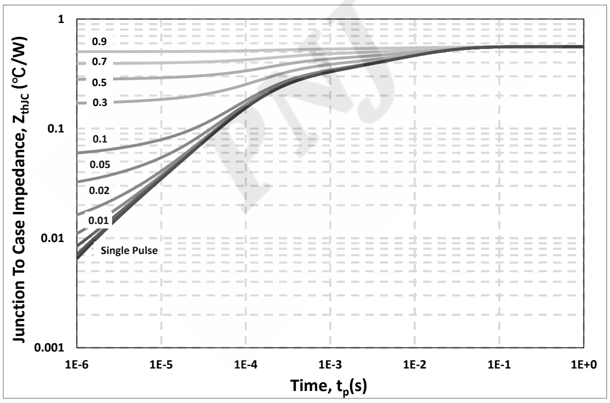


Figure 23. Transient Thermal Impedance (Junction - Case)

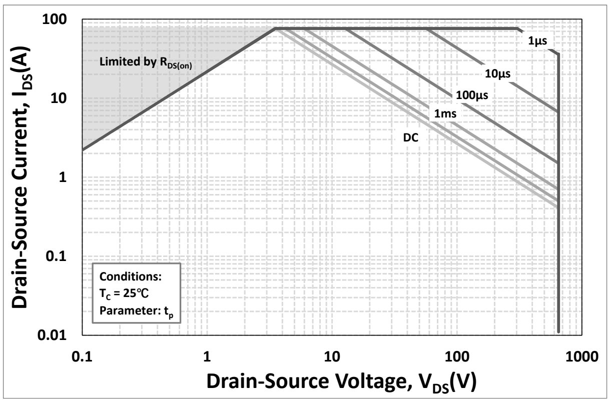
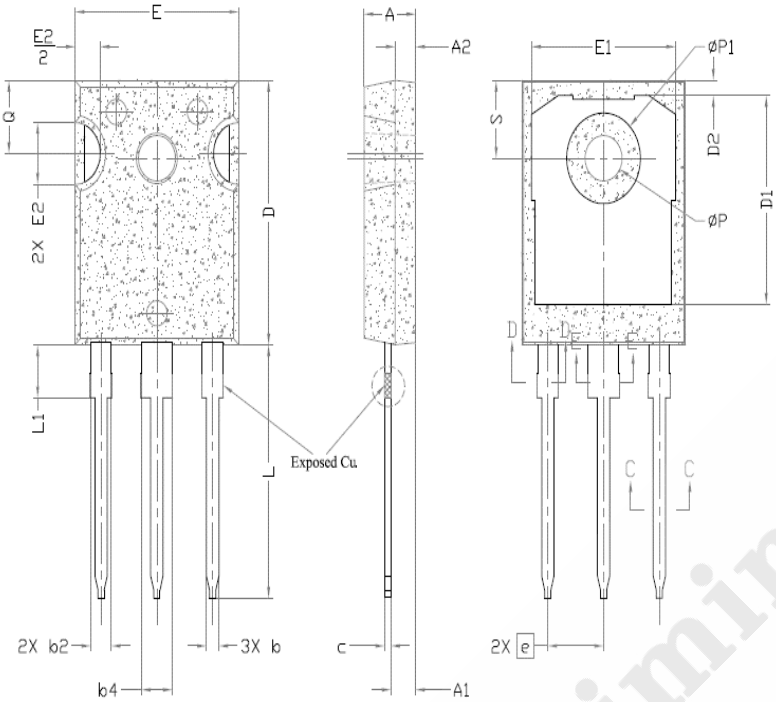


Figure 24. Safe Operating Area

6. Package Outlines



SYMBOL	DIMENSIONS			NOTES
	MIN.	NOM.	MAX.	
A	4.83	5.02	5.21	
A1	2,29	2,41	2,55	
A2	1,50	2,00	2,49	
b	1.12	1.20	1.33	
b1	1.12	1.20	1.28	
b2	1,91	2,00	2,39	6
b3	1,91	2,00	2,34	
b4	2.87	3.00	3.22	6, 8
b5	2.87	3.00	3.18	
c	0,55	0,60	0,69	6
c1	0.55	0.60	0.65	
D	20.80	20.95	21.10	4
D1	16,25	16,55	17,65	5
D2	0,51	1.19	1.35	
E	15.75	15.94	16.13	4
E1	13,46	14,02	14,16	5
E2	4.32	4,91	5,49	3
e	5.44BSC			
L	19,81	20,07	20,32	
L1	4.10	4,19	4.40	6
∅P	3.56	3.61	3.65	7
∅P1	7.19REF.			
Q	5,39	5,79	6,20	
S	6,04	6,17	6,30	

Drawing and Dimensions