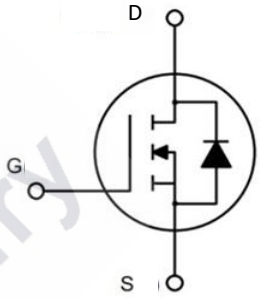
SiC MOS P3M173K0F3

N-Channel Enhancement Mode

Features

- Qualified to AEC-Q101
- High Blocking Voltage with Low On-Resistance
- High-Frequency Operation
- Full Isolated Package for Direct Heat Sinking
- Ultra-Small Q_{gd}
- 100% UIS tested



Standards Benefits

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

TO-220F-3

Gate	1
Drain	2
Source	3

Application

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

RoHS

Halogen

Order Information

Part number	Package	Marking
P3M173K0F3	TO-220F-3	P3M173K0F3

Contents

1. Maximum Ratings

At T_J= 25℃, unless specified otherwise

Parameter	Symbol	Value	Unit	Test Conditions
Drain - Source Voltage	V_{DSmax}	1700	V	V_{GS}= 0V I_D= 100μA
Gate - Source Voltage (Dynamic)	V_{GSmax}	-8 / +19	V	AC (f>1Hz)
Gate - Source Voltage (Static)	V_{GSop}	-4 / +15	V	Static
Continuous Drain Current	I_D	1.97	A	V_{GS}= 15V T_C= 25℃
		1.4		V_{GS}= 15V T_C= 100℃
Power Dissipation	P_D	19	W	
Operating Junction Temperature	T_J	-55 To +175	℃	
Storage Temperature	T_{stg}	-55 To +175	℃	
Solder Temperature	T_L	260	˚C	
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	$V_{(BR)DSS}$	1700	/	/	V	V_{GS}= 0V I_D= 0.1mA
Gate Threshold Voltage	$V_{GS(th)}$	/	2.2	/	V	V_{DS}= V_{GS} I_D= 1.5mA
		/	1.45	/	V	V_{DS}= V_{GS} I_D= 1.5mA T_J= 175ºC
Zero Gate Voltage Drain Current	I_{DSS}	/	/	100	μA	V_{GS}= 0V V_{DS}= 1700V
Gate-Source Leakage Current	I_{GSS}	/	2	125	nA	V_{GS}= 15V V_{DS}= 0V
Drain-Source On-State Resistance	$R_{DS(on)}$	/	3	3.6	Ω	V_{GS}= 15V I_D= 0.25A
Transconductance	g_{fs}	/	0.44	/	S	V_{DS}= 20V I_{DS}= 0.5A
		/	0.4	/	S	V_{DS}= 20V I_{DS}= 0.5A T_J= 175℃
Input Capacitance	C_{iss}	/	153	/	pF	V_{GS}= 0V V_{DS}= 1000V F= 1MHz V_{AC}= 25mV
Output Capacitance	C_{oss}	/	15.8	/	pF	
Reverse Transfer Capacitance	C_{rss}	/	1.87	/	pF	
Coss Stored Energy	E_{oss}	/	8.41	/	μJ	
Turn-on Energy	E_{on}	/	50.6	/	μJ	V_{DS}= 1200V V_{GS}= -4/15V I_{DS}= 0.5A R_G= 1Ω
Turn-off Energy	E_{off}	/	14.9	/		

Parameter	Symbol	Value			Unit	Test Conditions
		Min.	Typ.	Max.		
Turn-On Delay Time	$T_{d(on)}$	/	7.2	/	ns	V_{DS}= 1200V V_{GS}= -4/15V I_{DS}= 0.5A R_G= 1Ω
Rise Time	T_r	/	21.2	/		
Turn-Off Delay Time	$T_{d(off)}$	/	6.0	/		
Fall Time	T_f	/	61.6	/		
Internal Gate Resistance	$R_{G(int)}$	/	54	/	Ω	f= 0.1~3MHz V_{AC}= 25mV
Gate to Source Charge	Q_{gs}	/	2.05	/	nC	V_{DS}= 800V I_{DS}= 1A V_{GS}= 15V I_G= 1mA
Gate to Drain Charge	Q_{gd}	/	3.35	/		
Total Gate Charge	Q_g	/	8.14	/		

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}= -4V I_{SD}= 0.15A
		3.0	/	V	V_{GS}= -4V I_{SD}= 0.15A T_J= 175℃
Continuous Diode Forward Current	I_S	5	/	A	V_{GS}= -4V T_J= 25℃
Reverse Recover Time	t_{rr}	20.8	/	ns	V_{GS}= -4V I_{SD}= 2A V_R= 1200V d_{if}/d_t= 500A/μs T_J= 25℃
Reverse Recovery Charge	Q_{rr}	60	/	nC	
Peak Reverse Recovery Current	I_{mm}	4.8	/	A	

4. Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance from Junction to Case	$R_{\theta JC}$	7.8	℃/W

5. Typical Performance

At T_J= 25℃, unless specified otherwise

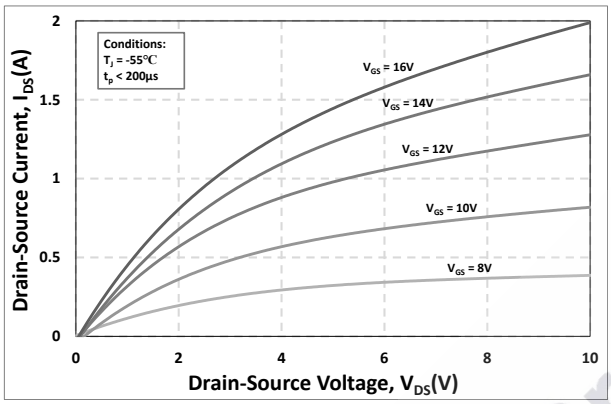


Figure 1. Output Characteristics T_J= -55°C

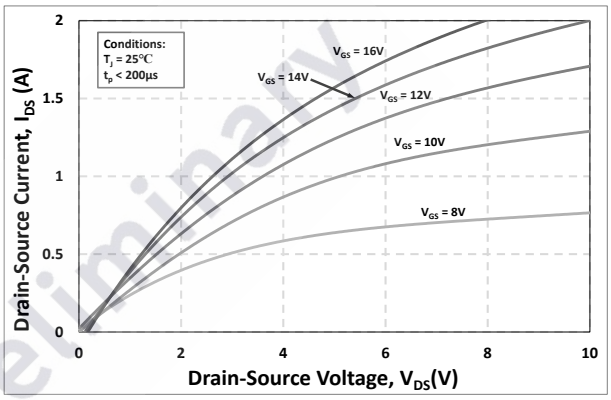


Figure 2. Output Characteristics T_J= 25°C

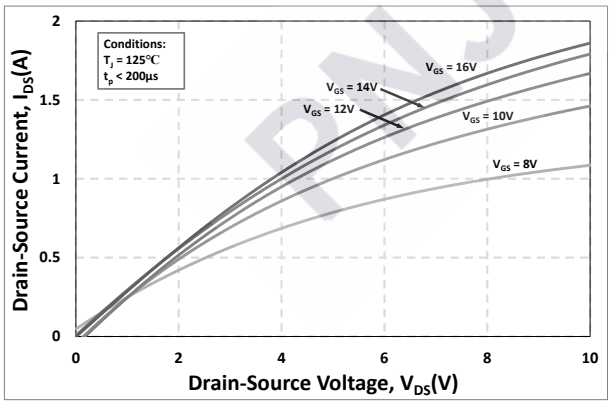


Figure 3. Output Characteristics T_J= 125°C

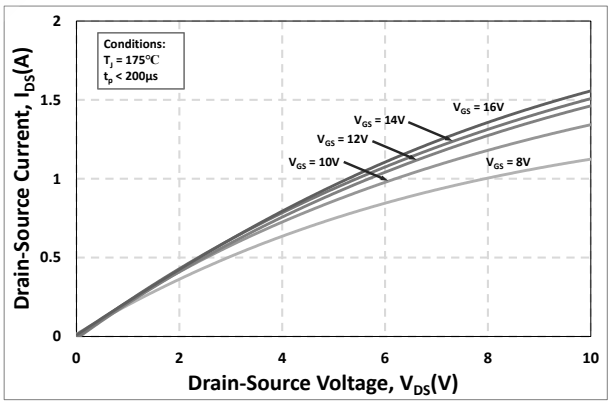


Figure 4. Output Characteristics T_J= 175°C

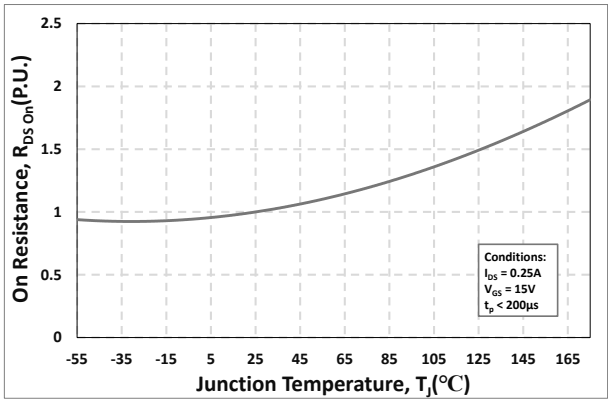


Figure 5. Normalized On-Resistance vs. Temperature

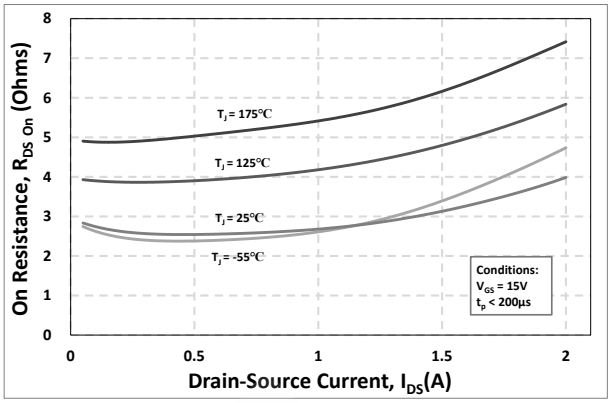


Figure 6. On-Resistance vs. Drain Current Various Temperatures

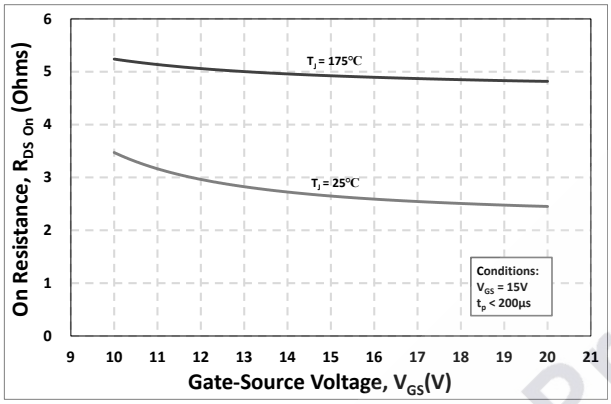


Figure 7. On-Resistance vs. Gate-Source Voltage

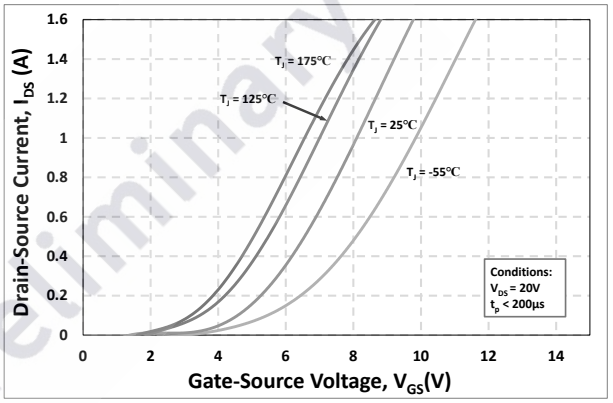


Figure 8. Transfer Characteristic for Various Junction Temperatures

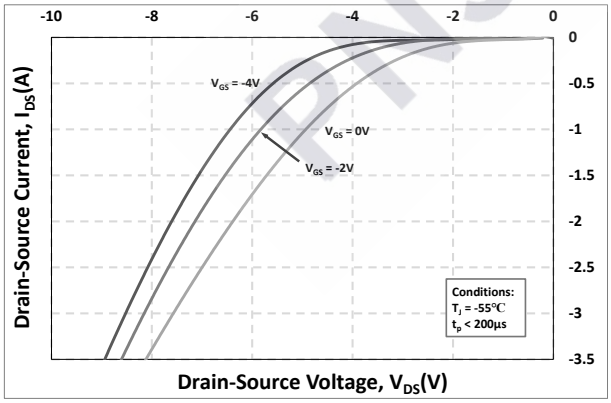


Figure 9. Body Diode Characteristic at -55°C

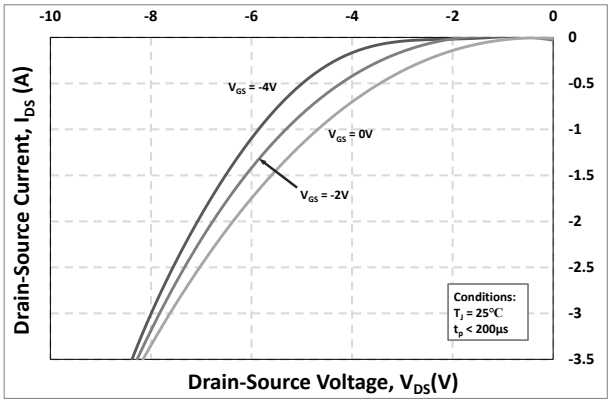


Figure 10. Body Diode Characteristic at 25°C

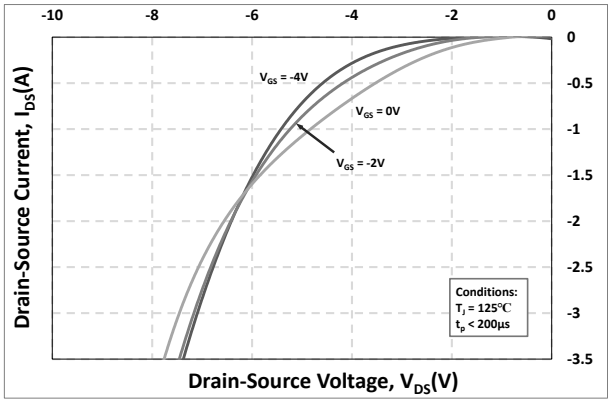


Figure 11. Body Diode Characteristic at 125°C

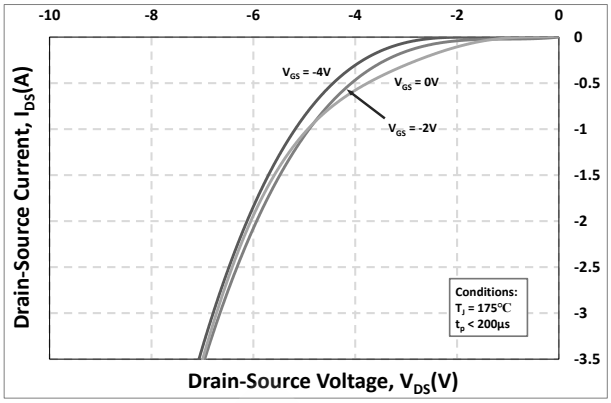


Figure 12. Body Diode Characteristic at 175°C

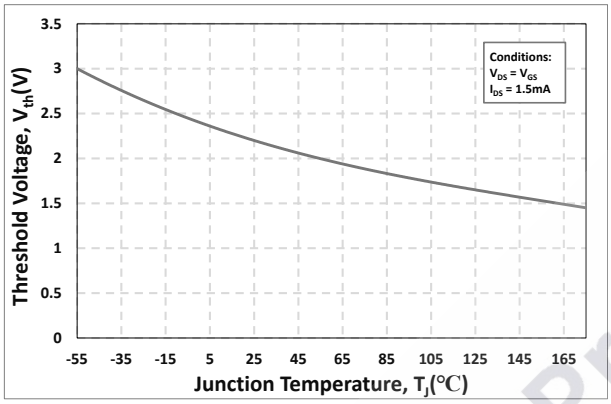


Figure 13. Threshold Voltage vs. Temperatures

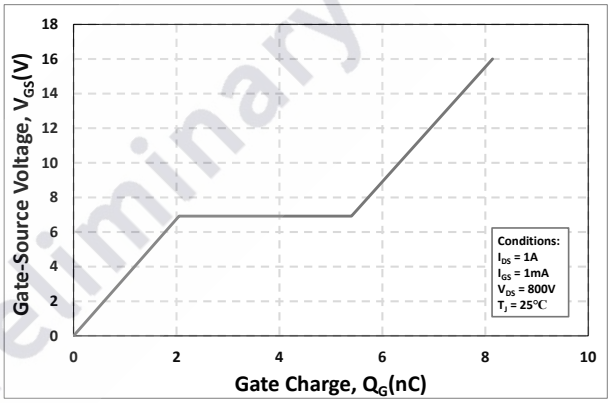


Figure 14. Gate Charge Characteristics

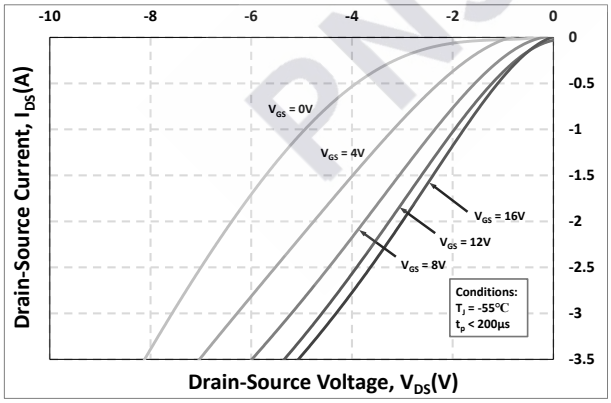


Figure 15. 3rd Quadrant Characteristic at -55°C

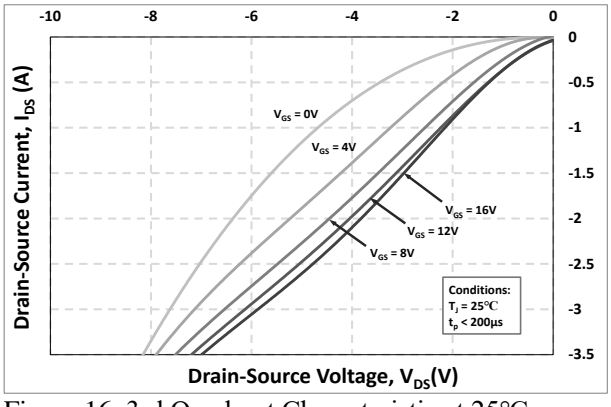


Figure 16. 3rd Quadrant Characteristic at 25°C

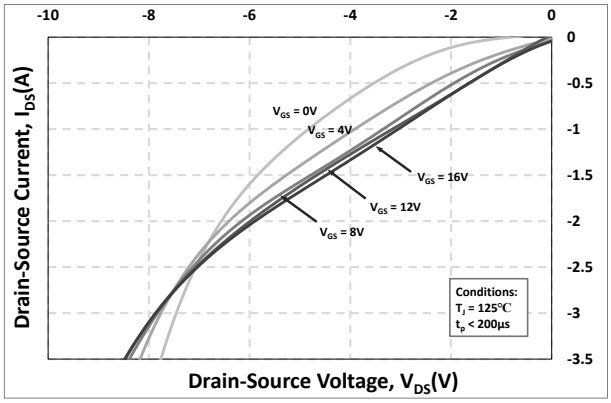


Figure 17. 3rd Quadrant Characteristic at 125°C

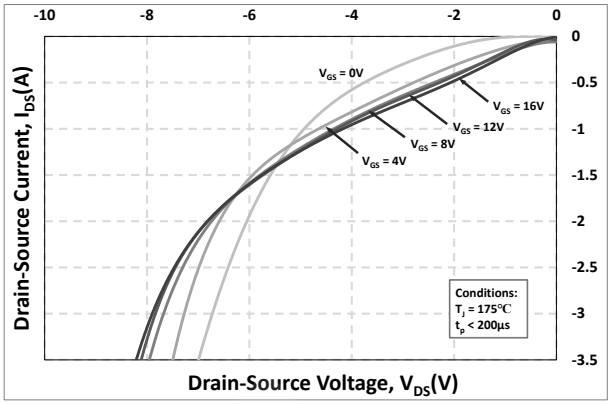


Figure 18. 3rd Quadrant Characteristic at 175°C

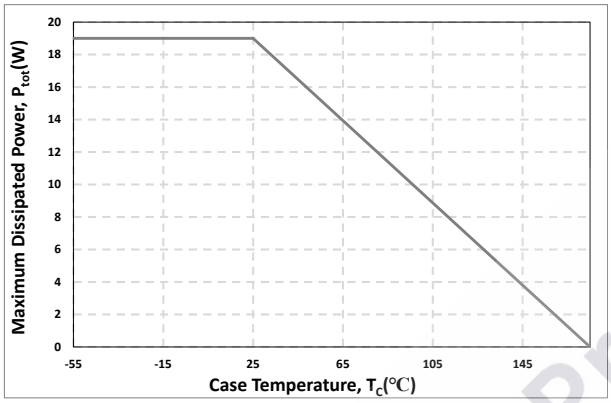


Figure 19. Maximum Power Dissipation Derating vs. Case Temperature

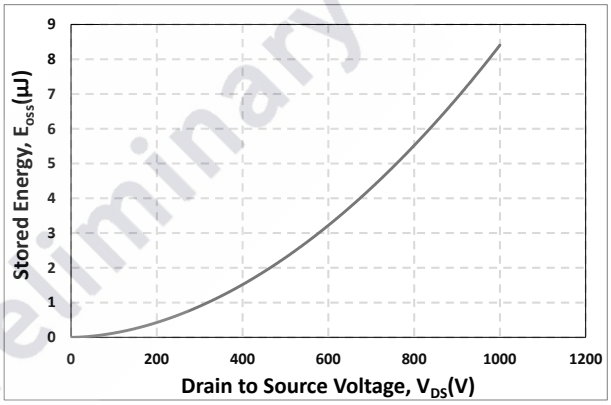


Figure 20. Output Capacitor Stored Energy

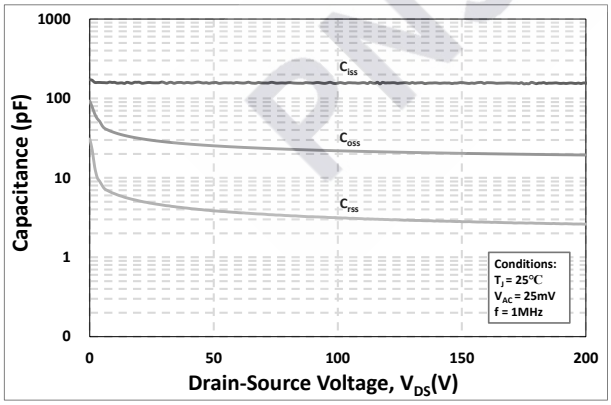


Figure 21. Capacitances vs. Drain-Source Voltage (0-200V)

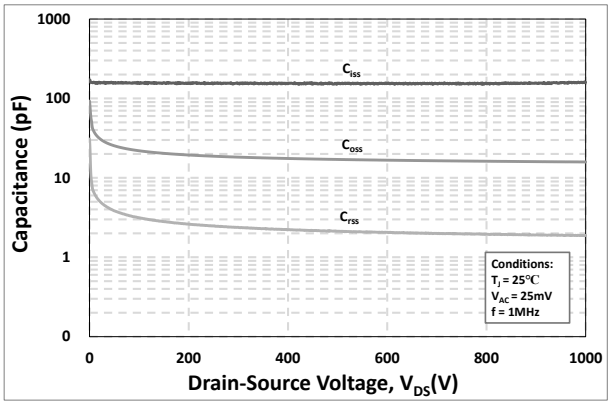
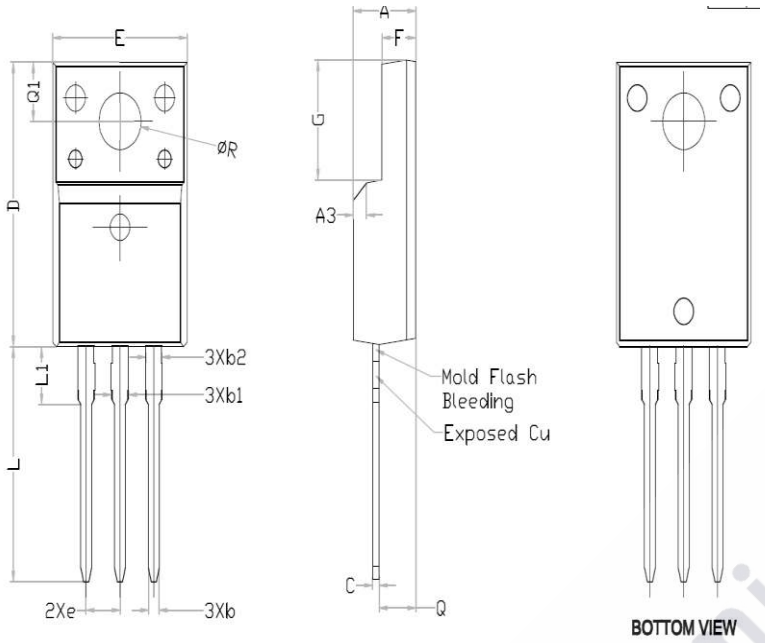


Figure 22. Capacitances vs. Drain-Source Voltage (0-1000V)

6. Package Outlines



SYMBOL	DIMENSIONS		
	Min.	Nom.	Max.
A	4.60	4.70	4.80
b	0.70	0.80	0.91
b1	1.20	1.30	1.47
b2	1.10	1.20	1.30
C	0.45	0.50	0.63
D	15.80	15.87	15.97
e		2.54	
E	10.00	10.10	10.30
F	2.44	2.54	2.64
G	6.50	6.70	6.90
L	12.90	13.10	13.30
L1	3.13	3.23	3.33
Q	2.65	2.75	2.85
Q1	3.20	3.30	3.40
ΦR	3.08	3.18	3.28

Drawing and dimensions