



# C2M1000170D

## Silicon Carbide Power MOSFET Z-FET™ MOSFET

N-Channel Enhancement Mode

### Features

- High Speed Switching with Low Capacitances
- High Blocking Voltage with Low  $R_{DS(on)}$
- Easy to Parallel and Simple to Drive
- Resistant to Latch-Up
- Halogen Free, RoHS Compliant

### Benefits

- Higher System Efficiency
- Increased System Switching Frequency
- Reduced Cooling Requirements
- Increased System Reliability

### Applications

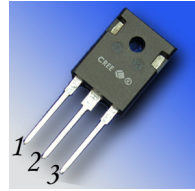
- Auxiliary Power Supplies
- Switch Mode Power Supplies

$V_{DS}$  1700 V

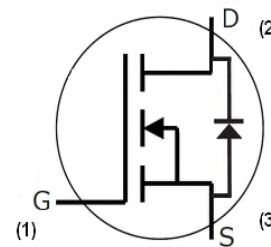
$I_D @ 25^\circ C$  4.9 A

$R_{DS(on)}$  1.0  $\Omega$

### Package



TO-247-3



Part Number	Package
C2M1000170D	TO-247-3

### Maximum Ratings ( $T_C = 25^\circ C$ unless otherwise specified)

Symbol	Parameter	Value	Unit	Test Conditions	Note
$I_{DS(DC)}$	Continuous Drain Current	4.9	A	$V_{GS} = 20 V, T_C = 25^\circ C$	Fig. 14
		3.0		$V_{GS} = 20 V, T_C = 100^\circ C$	
$I_{DS(pulse)}$	Pulsed Drain Current	5.0	A	Pulse width $t_p$ limited by $T_{jmax}$ $T_C = 25^\circ C$	Fig. 16
$V_{GS}$	Gate Source Voltage	-10/+25	V		
$P_{tot}$	Power Dissipation	69	W	$T_C = 25^\circ C, T_J = 150^\circ C$	Fig. 13
$T_J, T_{stg}$	Operating Junction and Storage Temperature	-55 to +150	$^\circ C$		
$T_L$	Solder Temperature	260	$^\circ C$	1.6 mm (0.063") from case for 10s	
$M_d$	Mounting Torque	1	Nm lbf-in	M3 or 6-32 screw	
		8.8			



## Electrical Characteristics (T<sub>c</sub> = 25°C unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
V <sub>(BR)DSS</sub>	Drain-Source Breakdown Voltage	1700			V	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 100 μA	
V <sub>GS(th)</sub>	Gate Threshold Voltage	2.0	2.4		V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 100 μA	Fig. 9
		1.4	1.8		V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 100 μA T <sub>J</sub> = 150 °C	
I <sub>DSS</sub>	Zero Gate Voltage Drain Current			30	nA	V <sub>DS</sub> = 1700 V, V <sub>GS</sub> = 0 V	
				100		V <sub>DS</sub> = 1700 V, V <sub>GS</sub> = 0 V T <sub>J</sub> = 150 °C	
I <sub>GSS</sub>	Gate-Source Leakage Current			20	nA	V <sub>GS</sub> = 20 V, V <sub>DS</sub> = 0 V	
R <sub>DS(on)</sub>	Drain-Source On-State Resistance		0.95	1.1	Ω	V <sub>GS</sub> = 20 V, I <sub>D</sub> = 2 A	Fig. 6, 7, 8
			2.1	2.9		V <sub>GS</sub> = 20 V, I <sub>D</sub> = 2 A, T <sub>J</sub> = 150 °C	
g <sub>fs</sub>	Transconductance		0.9		S	V <sub>DS</sub> = 20 V, I <sub>DS</sub> = 2 A	Fig. 5
			0.8			V <sub>DS</sub> = 20 V, I <sub>DS</sub> = 2 A, T <sub>J</sub> = 150 °C	
C <sub>iss</sub>	Input Capacitance		191		pF	V <sub>GS</sub> = 0 V V <sub>DS</sub> = 1000 V f = 1 MHz	Fig. 12
C <sub>oss</sub>	Output Capacitance		12				
C <sub>rss</sub>	Reverse Transfer Capacitance		1.3				
E <sub>oss</sub>	C <sub>oss</sub> Stored Energy		6.0		μJ	V <sub>AC</sub> = 25 mV	Fig. 10
t <sub>d(on)v</sub>	Turn-On Delay Time		9		ns	V <sub>DD</sub> = 1000 V, V <sub>GS</sub> = -5/20 V I <sub>D</sub> = 2 A R <sub>G(ext)</sub> = 0 Ω, R <sub>L</sub> = 40 Ω Timing relative to V <sub>DS</sub>	Fig. 7
t <sub>rv</sub>	Rise Time		46				
t <sub>d(off)v</sub>	Turn-Off Delay Time		15				
t <sub>fv</sub>	Fall Time		9				
R <sub>G</sub>	Internal Gate Resistance		24.8		Ω	f = 1 MHz, V <sub>AC</sub> = 25 mV, ESR of C <sub>ISS</sub>	

## Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
R <sub>θJC</sub>	Thermal Resistance from Junction to Case	1.7	1.8	°C/W		Fig. 15

## Gate Charge Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
Q <sub>gs</sub>	Gate to Source Charge	2.7		nC	V <sub>DS</sub> = 1000 V, V <sub>GS</sub> = -5/20 V I <sub>D</sub> = 1 A Per JEDEC24 pg 27	Fig. 18
Q <sub>gd</sub>	Gate to Drain Charge	5.4				
Q <sub>g</sub>	Gate Charge Total	13				

## Typical Performance

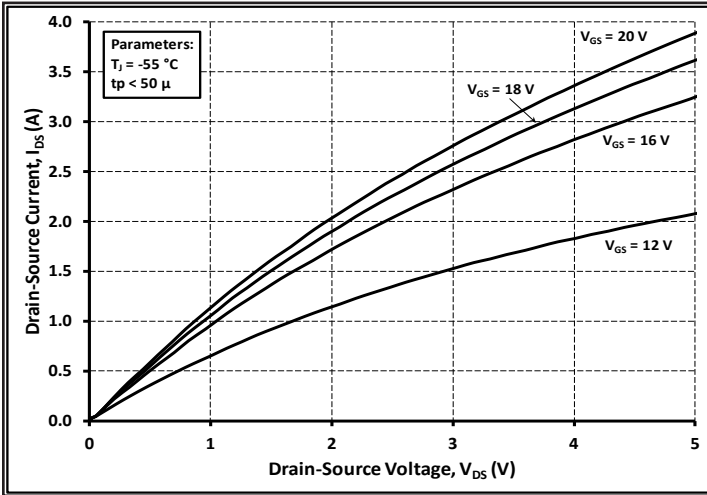


Figure 1. Typical Output Characteristics  $T_j = -55\text{ }^\circ\text{C}$

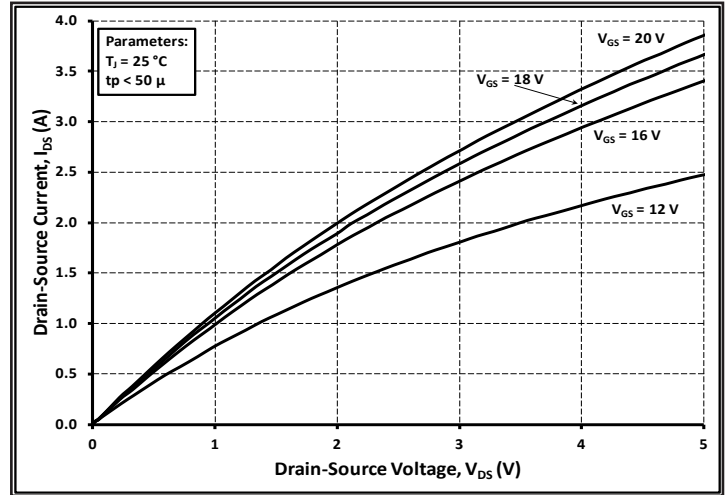


Figure 2. Typical Output Characteristics  $T_j = 25\text{ }^\circ\text{C}$

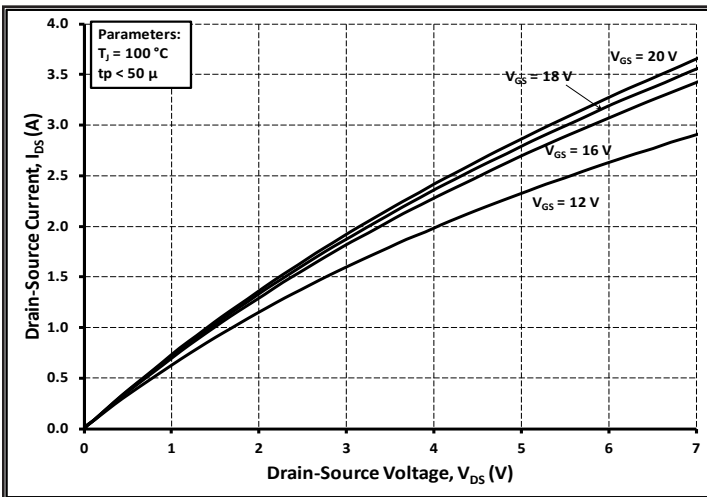


Figure 3. Typical Output Characteristics  $T_j = 100\text{ }^\circ\text{C}$

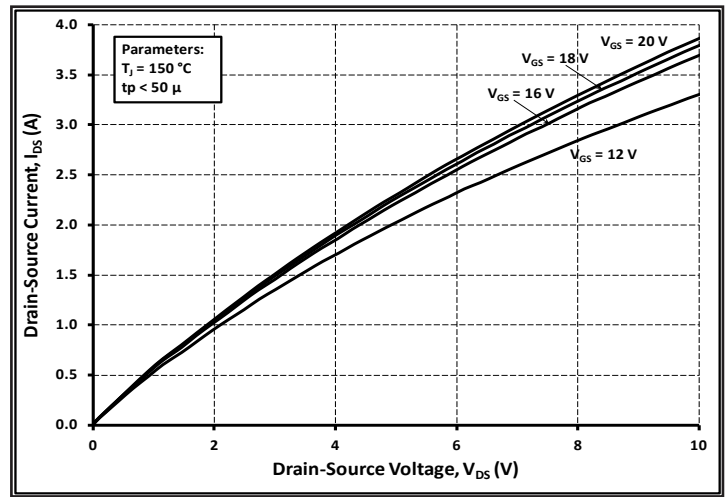


Figure 4. Typical Output Characteristics  $T_j = 150\text{ }^\circ\text{C}$

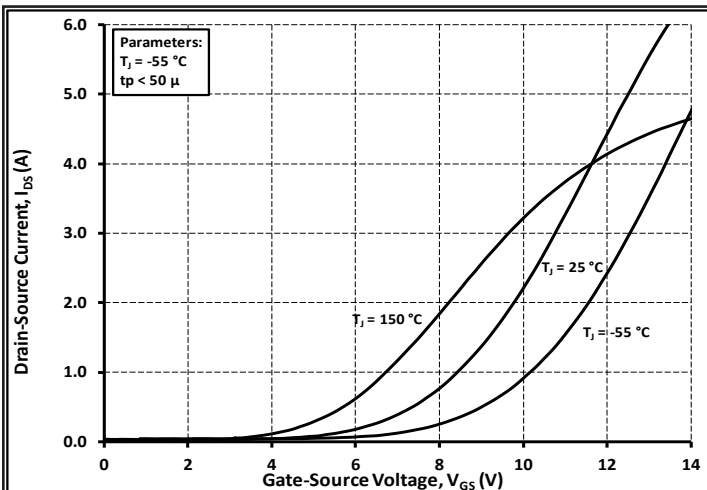


Figure 5. Typical Transfer Characteristics

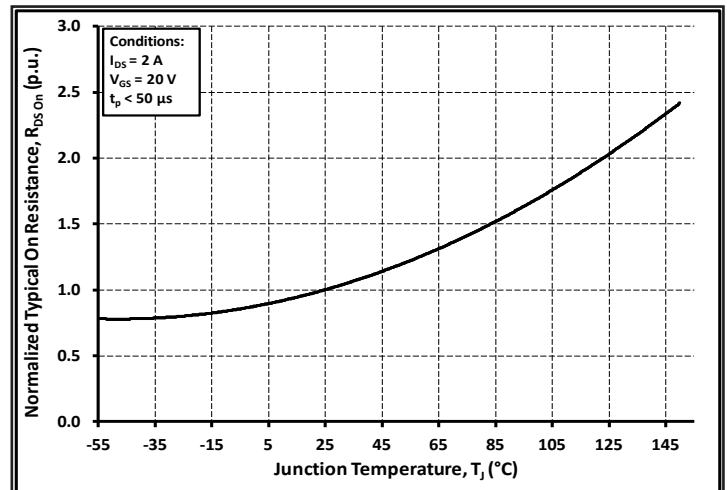


Figure 6. Normalized On-Resistance vs. Temperature

# Typical Performance

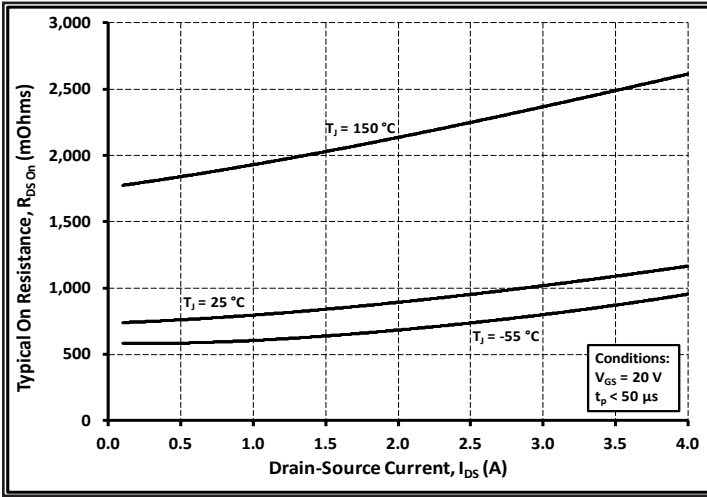


Figure 7. Typical On-Resistance vs. Drain Current

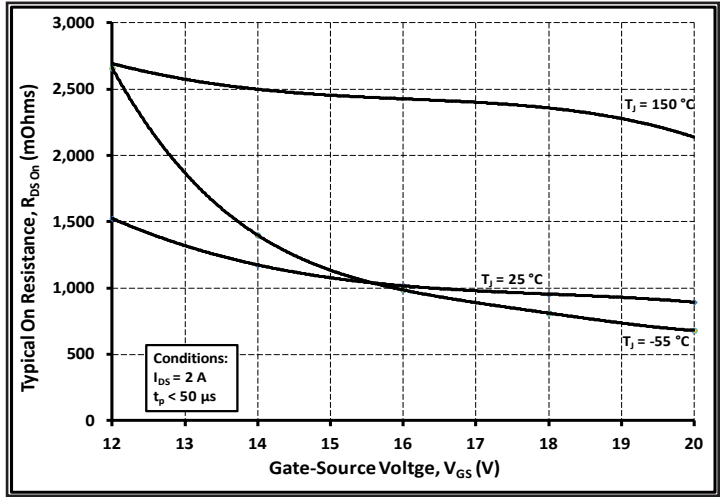


Figure 8. Typical On-Resistance vs. Gate Voltage

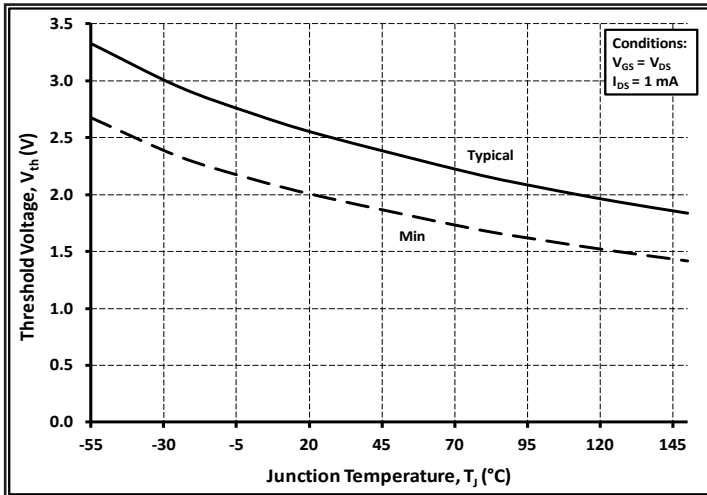


Figure 9. Typical Threshold Voltage vs. Temperature

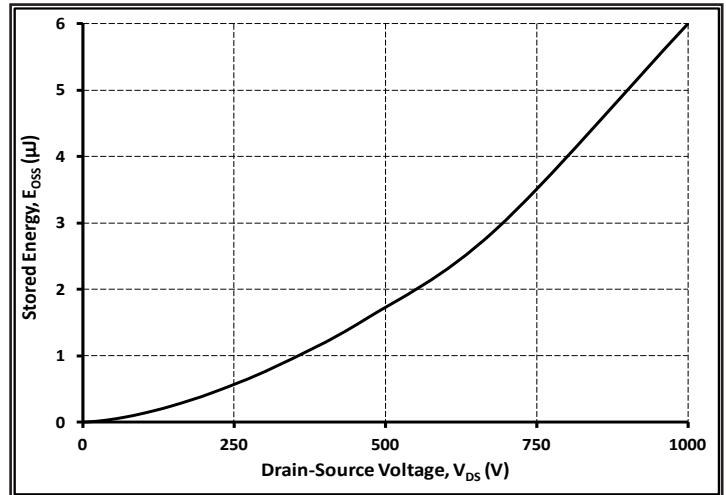


Figure 10. Typical transfer Characteristics

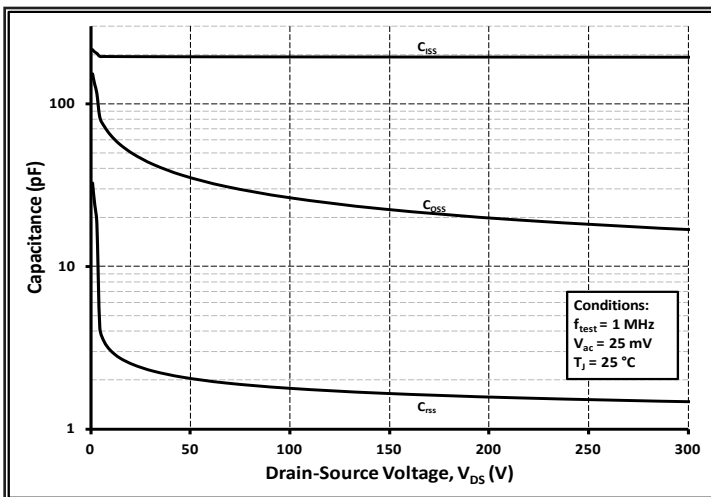


Figure 11. Typical Capacitances vs Drain Voltage (0-300 V)

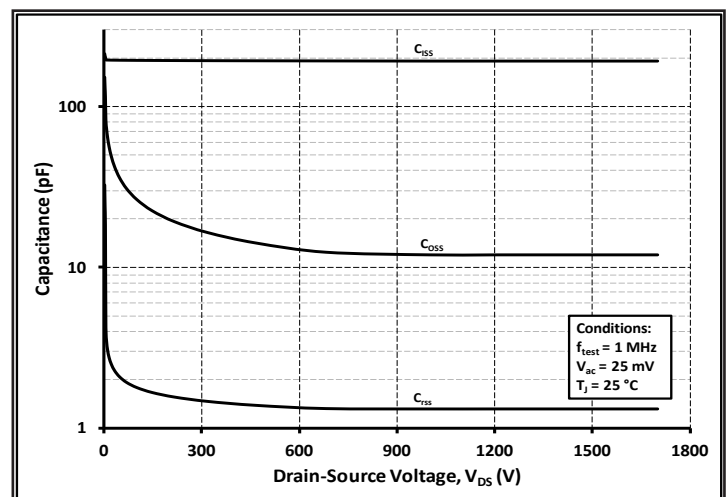


Figure 12. Typical Capacitances vs Drain Voltage (0-1200 V)

## Typical Performance

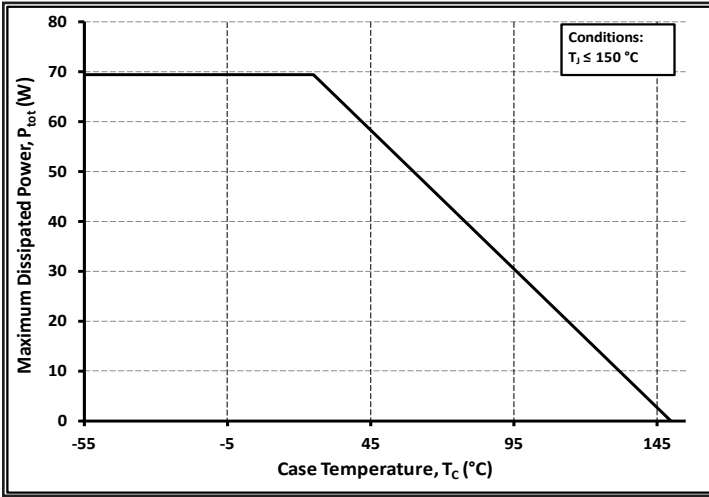


Figure 13. Power Dissipation Derating Curve

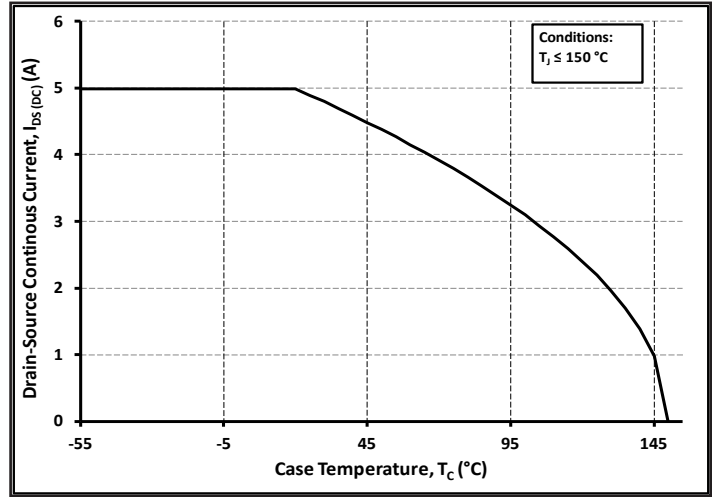


Figure 14. Continuous  $I_{DS}$  Current derating curve

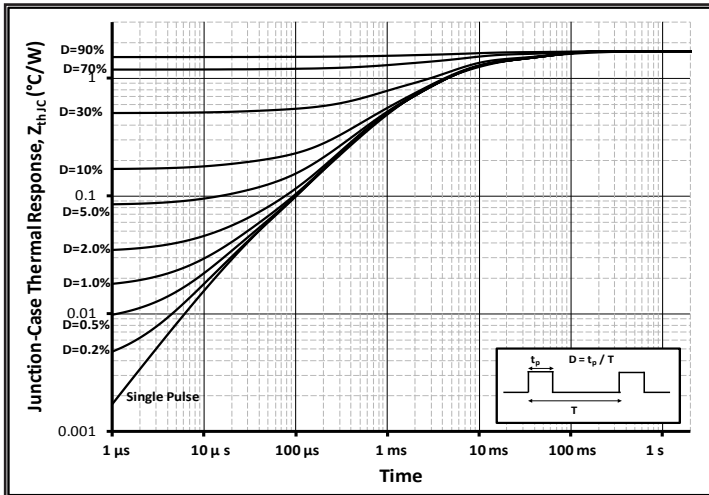


Figure 15. Typical Transient Thermal Impedance (Junction - Case) with Duty Cycle

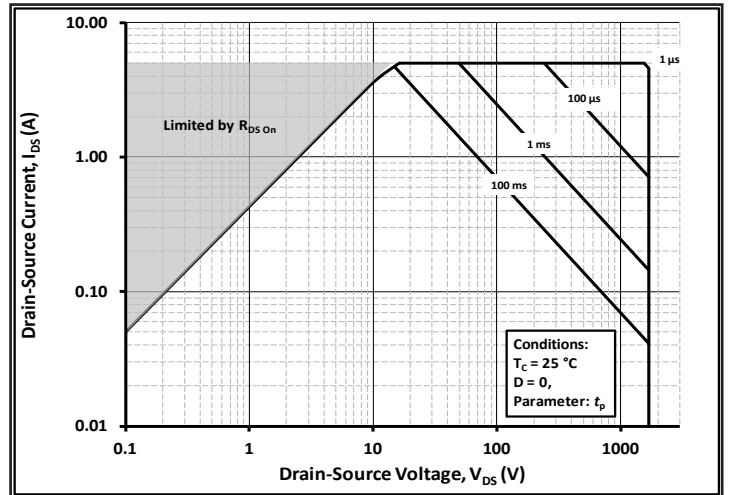


Figure 16. Safe Operating Area,  $T_j = 25\text{ °C}$

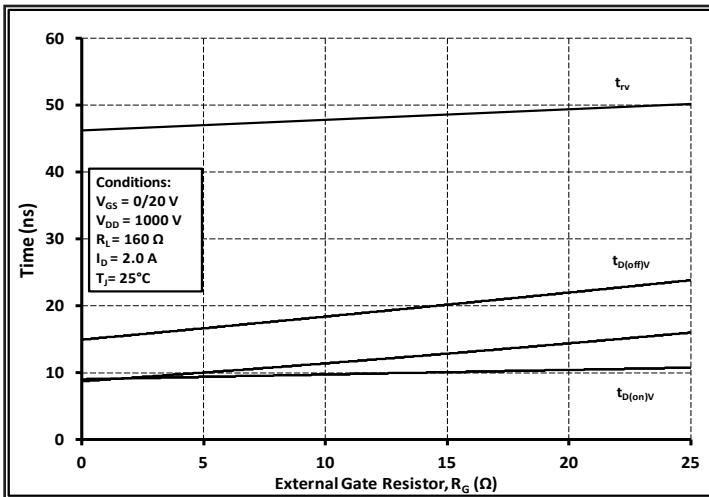


Figure 17. Resistive Switching Times vs.  $R_G$

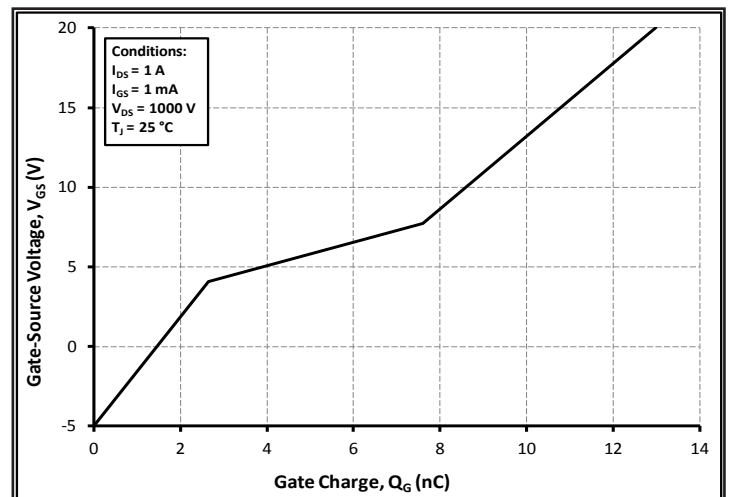


Figure 18. Typical Gate Charge

## Typical Performance

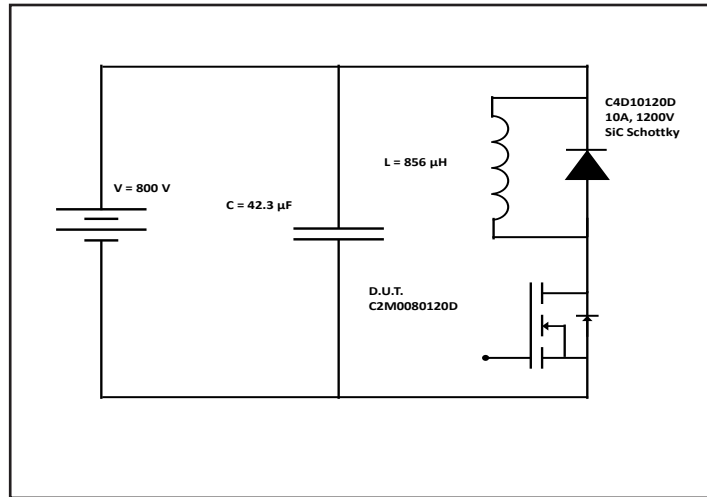


Figure 24. Clamped Inductive Switching Waveform Test Circuit

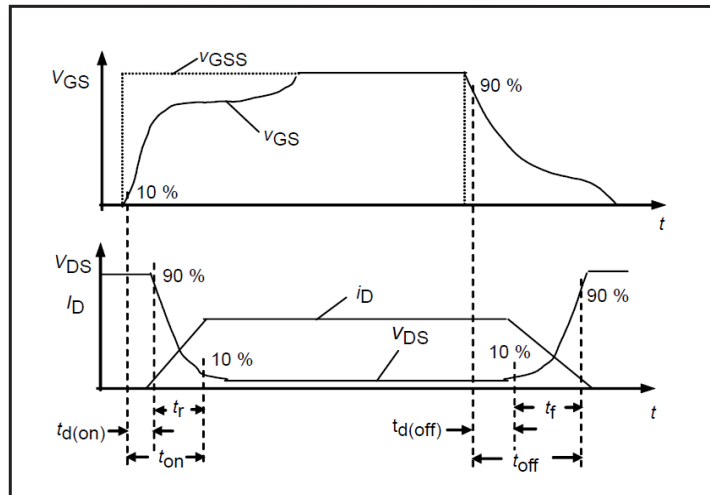


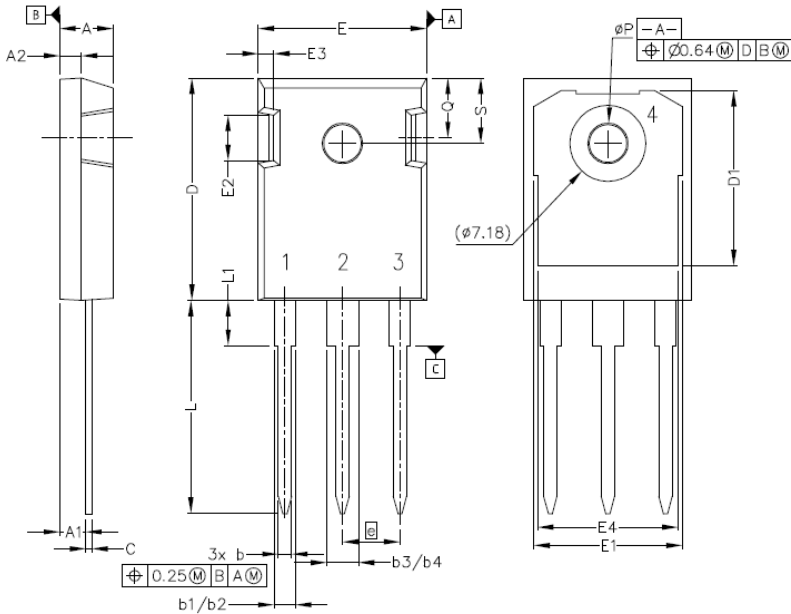
Figure 25. Switching Test Waveforms for Transition Times

## ESD Ratings

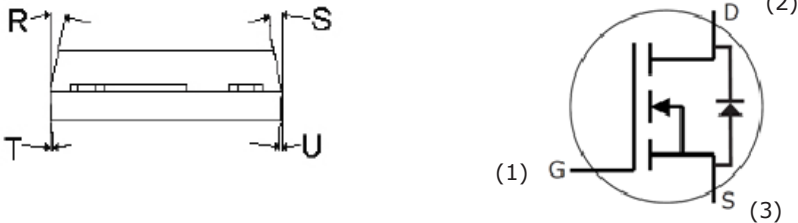
ESD Test	Total Devices Sampled	Resulting Classification
ESD-HBM	All Devices Passed 1000V	2 (>2000V)
ESD-MM	All Devices Passed 400V	C (>400V)
ESD-CDM	All Devices Passed 1000V	IV (>1000V)

## Package Dimensions

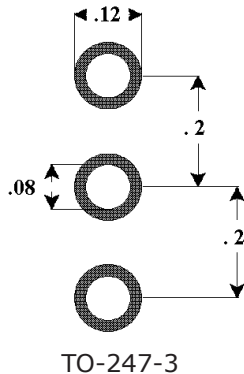
Package TO-247-3



POS	Inches		Millimeters	
	Min	Max	Min	Max
A	.190	.205	4.83	5.21
A1	.090	.100	2.29	2.54
A2	.075	.085	1.91	2.16
b	.042	.052	1.07	1.33
b1	.075	.095	1.91	2.41
b2	.075	.085	1.91	2.16
b3	.113	.133	2.87	3.38
b4	.113	.123	2.87	3.13
c	.022	.027	0.55	0.68
D	.819	.831	20.80	21.10
D1	.640	.695	16.25	17.65
D2	.037	.049	0.95	1.25
E	.620	.635	15.75	16.13
E1	.516	.557	13.10	14.15
E2	.145	.201	3.68	5.10
E3	.039	.075	1.00	1.90
E4	.487	.529	12.38	13.43
e	.214 BSC		5.44 BSC	
N	3		3	
L	.780	.800	19.81	20.32
L1	.161	.173	4.10	4.40
ØP	.138	.144	3.51	3.65
Q	.216	.236	5.49	6.00
S	.238	.248	6.04	6.30



## Recommended Solder Pad Layout



Part Number	Package	Marking
C2M1000170D	TO-247-3	C2M1000170D

This product has not been designed or tested for use in, and is not intended for use in, applications implanted into the human body nor in applications in which failure of the product could lead to death, personal injury or property damage, including but not limited to equipment used in the operation of nuclear facilities, life-support machines, cardiac defibrillators or similar emergency medical equipment, aircraft navigation or communication or control systems, air traffic control systems, or weapons systems.

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