

NVMFS4C03N

Power MOSFET

30 V, 1.7 mΩ, 159 A, Single N-Channel
Logic Level, SO-8FL

Features

- Small Footprint (5x6 mm) for Compact Design
- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Q_G and Capacitance to Minimize Driver Losses
- NVMFS4C03NWF – Wettable Flanks Option for Enhanced Optical Inspection
- AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Parameter			Symbol	Value	Unit
Drain-to-Source Voltage			V_{DSS}	30	V
Gate-to-Source Voltage			V_{GS}	± 20	V
Continuous Drain Current $R_{\theta JC}$ (Notes 1, 2, 3)	Steady State	$T_C = 25^{\circ}\text{C}$	I_D	159	A
Power Dissipation $R_{\theta JC}$ (Notes 1, 2)		$T_C = 25^{\circ}\text{C}$	P_D	77	W
Continuous Drain Current $R_{\theta JA}$ (Notes 1, 2, 3)	Steady State	$T_A = 25^{\circ}\text{C}$	I_D	34.9	A
Power Dissipation $R_{\theta JA}$ (Notes 1, 2)		$T_A = 25^{\circ}\text{C}$	P_D	3.71	W
Pulsed Drain Current	$T_A = 25^{\circ}\text{C}$, $t_p = 10\ \mu\text{s}$		I_{DM}	900	A
Operating Junction and Storage Temperature			T_J , T_{stg}	-55 to 175	$^{\circ}\text{C}$
Source Current (Body Diode)			I_S	64	A
Single Pulse Drain-to-Source Avalanche Energy ($I_{L(pk)} = 11\text{ A}$)			E_{AS}	549	mJ
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)			T_L	260	$^{\circ}\text{C}$

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL RESISTANCE MAXIMUM RATINGS (Note 1)

Parameter	Symbol	Value	Unit
Junction-to-Case – Steady State (Note 2)	$R_{\theta JC}$	1.95	$^\circ\text{C/W}$
Junction-to-Ambient – Steady State (Note 2)	$R_{\theta JA}$	40	

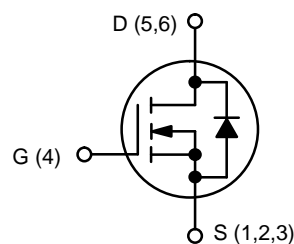
1. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
2. Surface-mounted on FR4 board using a 650 mm², 2 oz. Cu pad.
3. Maximum current for pulses as long as 1 second is higher but is dependent on pulse duration and duty cycle.



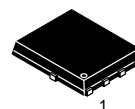
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$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	I_D MAX
30 V	1.7 mΩ @ 10 V	159 A
	2.4 mΩ @ 4.5 V	

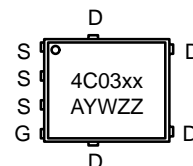


N-CHANNEL MOSFET



SO-8 FLAT LEAD
CASE 488AA
STYLE 1

MARKING DIAGRAM



4C03N = Specific Device Code for NVMFS4C03N

4C03WF = Specific Device Code for NVMFS4C03NWF

A = Assembly Location

Y = Year

W = Work Week

ZZ = Lot Traceability

ORDERING INFORMATION

Device	Package	Shipping†
NVMFS4C03NT1G	SO-8 FL (Pb-Free)	1500 / Tape & Reel
NVMFS4C03NT3G	SO-8 FL (Pb-Free)	5000 / Tape & Reel
NVMFS4C03NWFT1G	SO-8 FL (Pb-Free)	1500 / Tape & Reel
NVMFS4C03NWFT3G	SO-8 FL (Pb-Free)	5000 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

NVMFS4C03N

ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	30			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			18.2		mV/ $^\circ\text{C}$
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0\text{ V}, V_{DS} = 24\text{ V}$	$T_J = 25\text{ }^\circ\text{C}$		1	μA
			$T_J = 125^\circ\text{C}$		10	
Gate-to-Source Leakage Current	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = 20\text{ V}$			100	nA

ON CHARACTERISTICS (Note 4)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\text{ }\mu\text{A}$	1.3		2.2	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			4.8		mV/ $^\circ\text{C}$
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 30\text{ A}$		1.4	1.7	m Ω
		$V_{GS} = 4.5\text{ V}, I_D = 30\text{ A}$		2.0	2.4	
Forward Transconductance	g_{FS}	$V_{DS} = 3\text{ V}, I_D = 30\text{ A}$		136		S
Gate Resistance	R_G	$T_A = 25\text{ }^\circ\text{C}$		1.0		Ω

CHARGES AND CAPACITANCES

Input Capacitance	C_{ISS}	$V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = 15\text{ V}$		3071		pF
Output Capacitance	C_{OSS}			1673		
Reverse Transfer Capacitance	C_{RSS}			67		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V}; I_D = 30\text{ A}$		20.8		nC
Threshold Gate Charge	$Q_{G(TH)}$			4.9		
Gate-to-Source Charge	Q_{GS}			8.5		
Gate-to-Drain Charge	Q_{GD}			4.7		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 10\text{ V}, V_{DS} = 15\text{ V}, I_D = 30\text{ A}$		45.2		nC

SWITCHING CHARACTERISTICS (Note 5)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V}, I_D = 15\text{ A}, R_G = 3.0\text{ }\Omega$		14		ns
Rise Time	t_r			32		
Turn-Off Delay Time	$t_{d(OFF)}$			27		
Fall Time	t_f			17		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = 0\text{ V}, I_S = 10\text{ A}$	$T_J = 25^\circ\text{C}$		0.75	1.1	V
			$T_J = 125^\circ\text{C}$		0.6		
Reverse Recovery Time	t_{RR}	$V_{GS} = 0\text{ V}, dI_S/dt = 100\text{ A}/\mu\text{s}, I_S = 30\text{ A}$		47		ns	
Charge Time	t_a			23			
Discharge Time	t_b			24			
Reverse Recovery Charge	Q_{RR}			39		nC	

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

4. Pulse Test: pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.

5. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

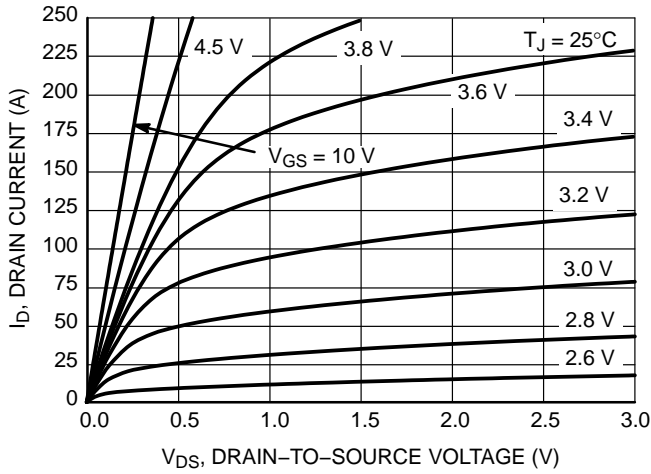


Figure 1. On-Region Characteristics

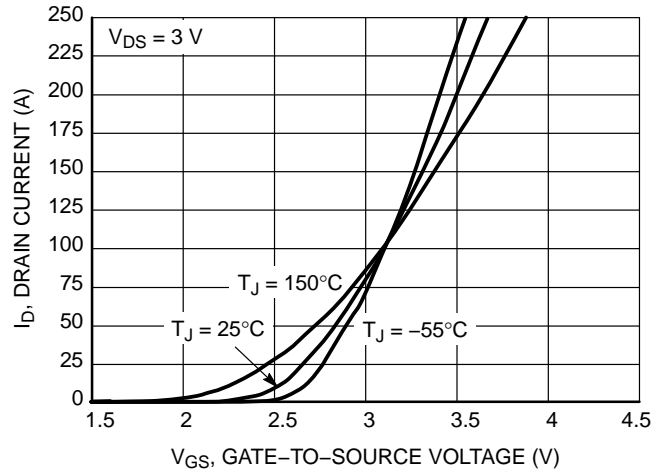


Figure 2. Transfer Characteristics

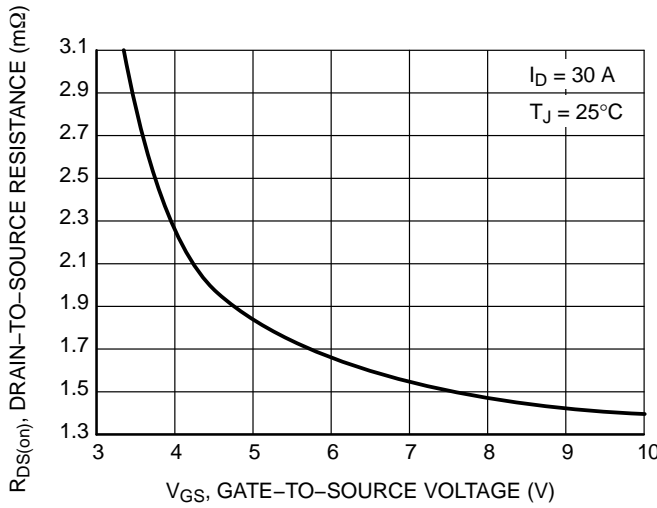


Figure 3. On-Resistance vs. V_{GS}

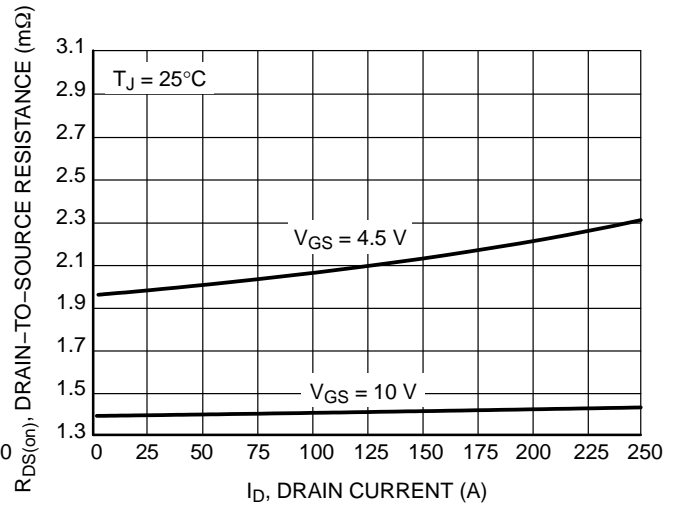


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

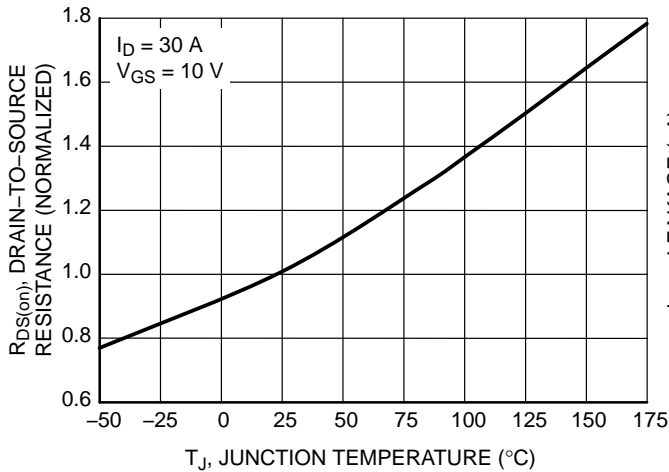


Figure 5. On-Resistance Variation with Temperature

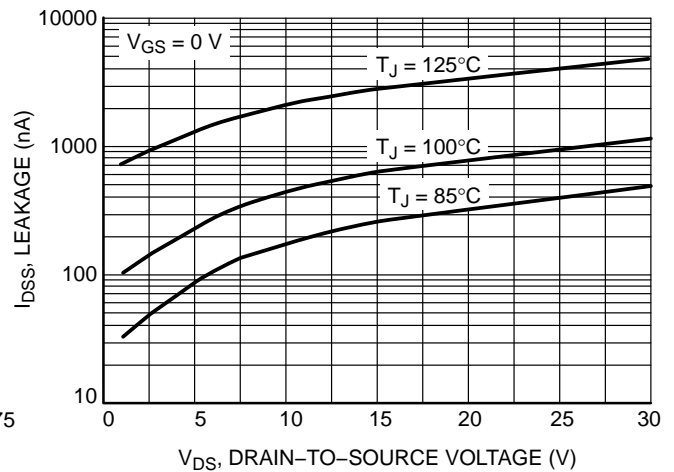


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

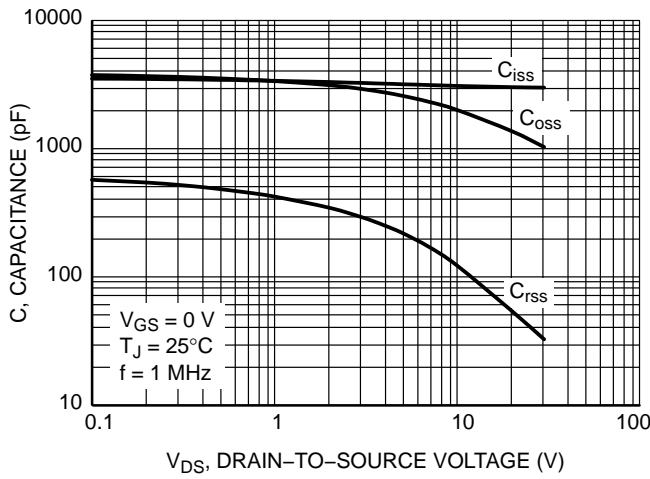


Figure 7. Capacitance Variation

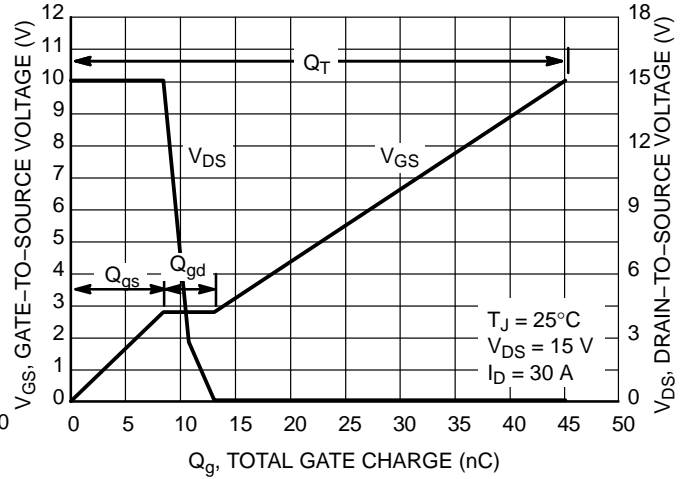


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

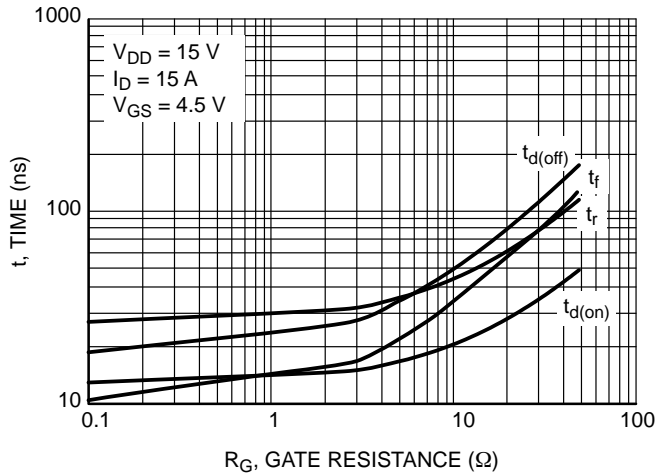


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

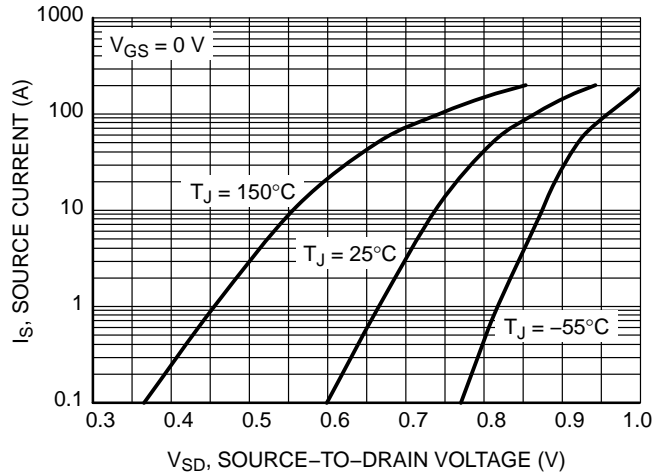


Figure 10. Diode Forward Voltage vs. Current

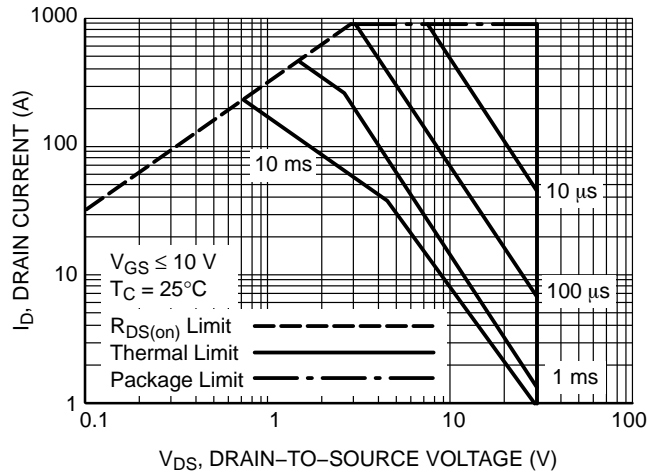
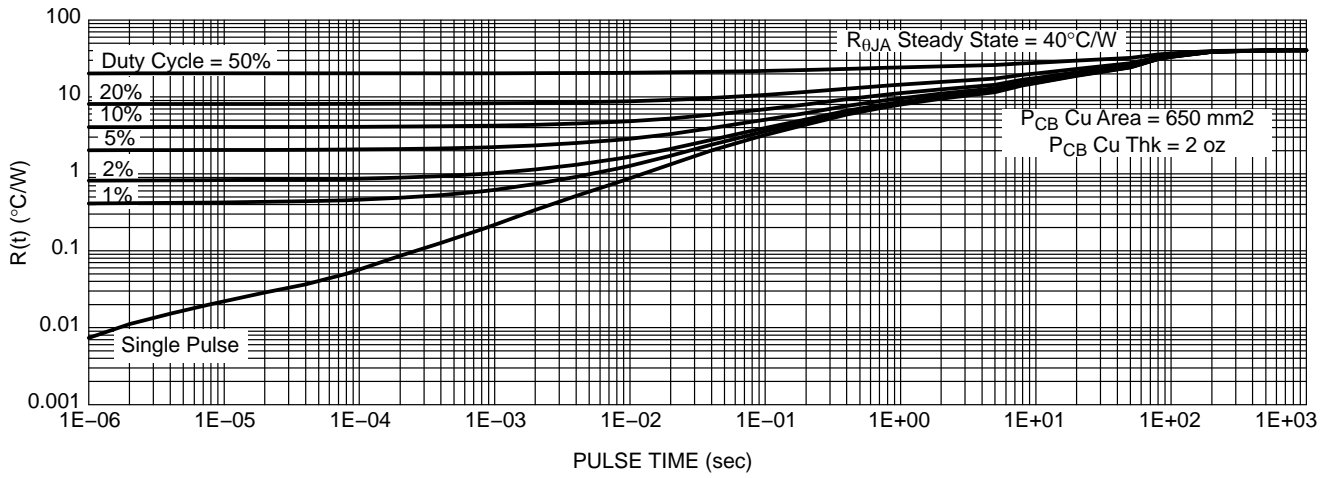


Figure 11. Maximum Rated Forward Biased Safe Operating Area

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TYPICAL CHARACTERISTICS



**Figure 12. Thermal Impedance
(Junction-to-Ambient)**

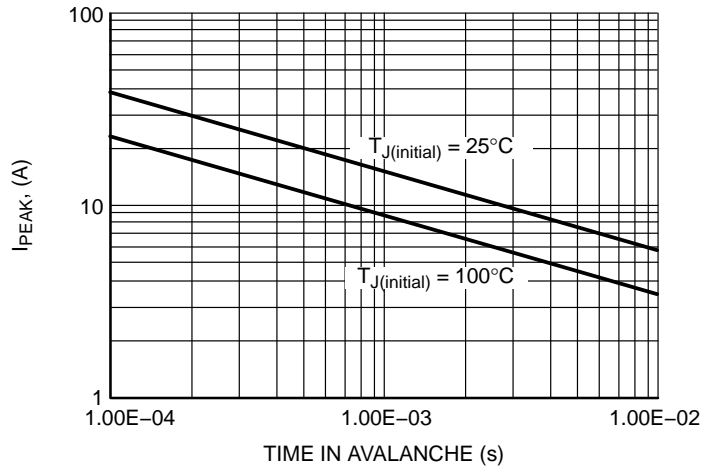


Figure 13. Avalanche Characteristics

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PACKAGE DIMENSIONS

DFN5 5x6, 1.27P
(SO-8FL)
CASE 488AA
ISSUE M

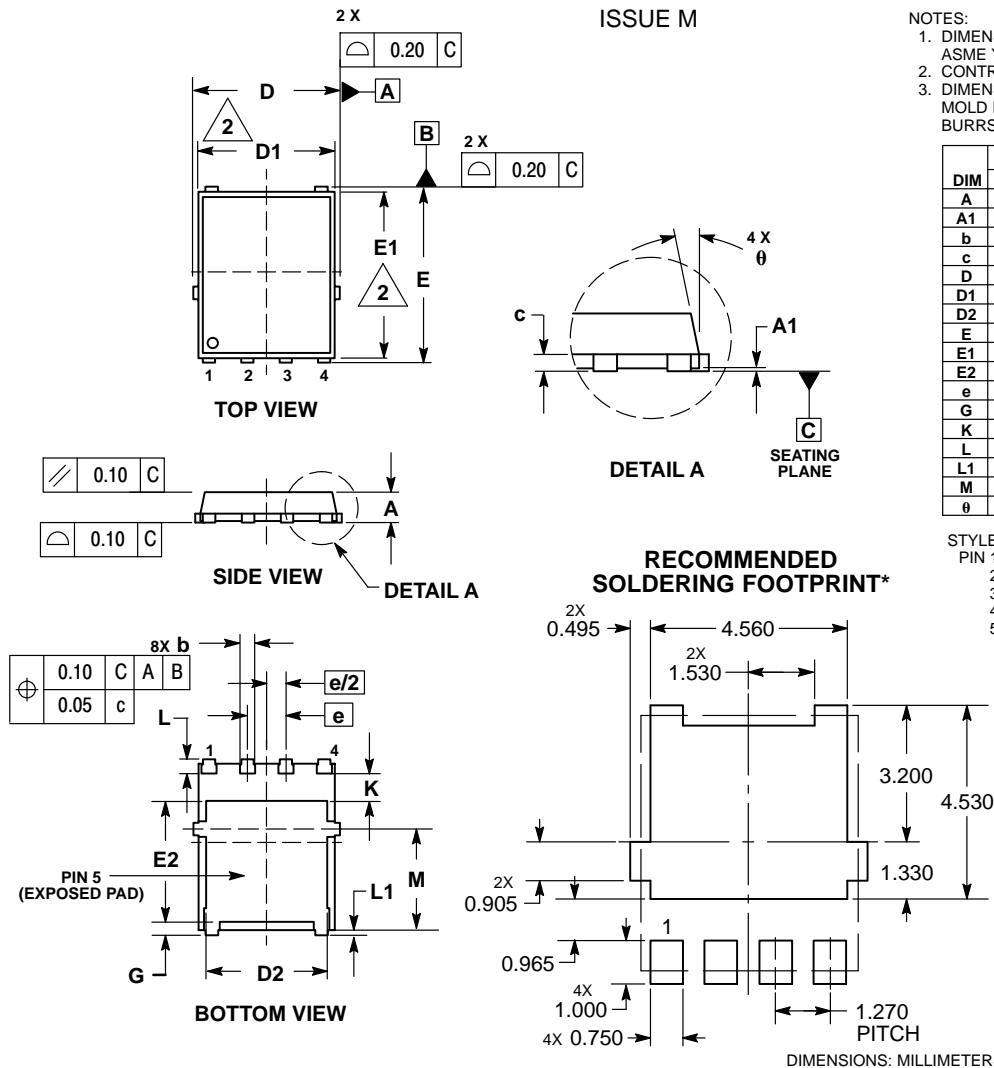
NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION D1 AND E1 DO NOT INCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS.

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.90	1.00	1.10
A1	0.00	—	0.05
b	0.33	0.41	0.51
c	0.23	0.28	0.33
D	5.00	5.15	5.30
D1	4.70	4.90	5.10
D2	3.80	4.00	4.20
E	6.00	6.15	6.30
E1	5.70	5.90	6.10
E2	3.45	3.65	3.85
e	1.27 BSC		
G	0.51	0.575	0.71
K	1.20	1.35	1.50
L	0.51	0.575	0.71
L1	0.125 REF		
M	3.00	3.40	3.80
θ	0 °	—	12 °

STYLE 1:

1. SOURCE
2. SOURCE
3. SOURCE
4. GATE
5. DRAIN



RECOMMENDED SOLDERING FOOTPRINT*

*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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