MOSFET – Power, Single N-Channel, SO8FL

60 V, 19.6 mΩ, 28 A

NTMFS020N06C

V(BR)DSS	RDS(ON) MAX	ID MAX
60 V	19.6 mΩ @ 10 V	28 A

N–CHANNEL MOSFET

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
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

- Power Tools, Battery Operated Vacuums
- UAV/Drones, Material Handling
- BMS/Storage, Home Automation

SO−8 FLAT LEAD CASE 488AA STYLE 1

MARKING DIAGRAM

```
20N06C
AYWZZ
```

A	= Assembly Location
Y	= Year
W	= Work Week
ZZ	= Lot Traceabililty

MAXIMUM RATINGS (T_J = 25°C unless otherwise stated)

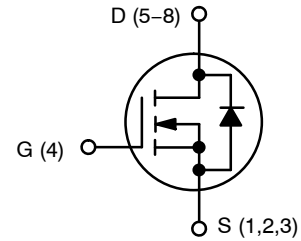| Parameter			Symbol	Value	Unit
Drain−to−Source Voltage			V_{DSS}	60	V
Gate−to−Source Voltage			V_{GS}	±20	V
Continuous Drain Current $R_{\theta JC}$ (Notes 1, 3)	Steady State	T_C = 25°C	I_D	28	A
		T_C = 100°C		19	
Power Dissipation $R_{\theta JC}$ (Note 1)	Steady State	T_C = 25°C	P_D	31	W
		T_C = 100°C		15	
Continuous Drain Current $R_{\theta JA}$ (Notes 1, 2, 3)	Steady State	T_A = 25°C	I_D	9	A
		T_A = 100°C		6	
Power Dissipation $R_{\theta JA}$ (Notes 1, 2)	Steady State	T_A = 25°C	P_D	3.4	W
		T_A = 100°C		1.7	
Pulsed Drain Current	T_A = 25°C, t_p = 10 μs		I_{DM}	181	A
Operating Junction and Storage Temperature Range			T_J, T_{STG}	−55 to +175	°C
Source Current (Body Diode)			I_S	25	A
Single Pulse Drain−to−Source Avalanche Energy (I_L = 5.6 A_{pk})			E_{AS}	15	mJ
Lead Temperature Soldering Reflow for Soldering Purposes (1/8″ from case for 10 s)			T_L	260	°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.
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.

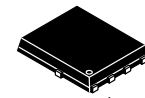### ORDERING INFORMATION

Device	Package	Shipping†
NTMFS020N06CT1G	SO−8 FL (Pb−Free)	1500 / 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.

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Value	Unit
Junction−to−Case − Steady State (Note 2)	$R_{\theta JC}$	4.8	°C/W
Junction−to−Ambient − Steady State (Note 2)	$R_{\theta JA}$	43.2	

NTMFS020N06C

ELECTRICAL CHARACTERISTICS (T_J = 25°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 V, I_D = 250 μA		60			V
Drain−to−Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$	I_D = 250 μA, ref to 25°C			29		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V, V_{DS} = 60 V	T_J = 25°C			10	μA
			T_J = 125°C			250	
Gate−to−Source Leakage Current	I_{GSS}	V_{DS} = 0 V, V_{GS} = 20 V				100	nA
ON CHARACTERISTICS (Note 4)							
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = 20 μA		2.0		4.0	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$	I_D = 20 μA, ref to 25°C			−7.8		mV/°C
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 4 A			16.3	19.6	mΩ
Forward Transconductance	g_{FS}	V_{DS} = 5 V, I_D = 4 A			12		S
Gate Resistance	R_G	T_A = 25°C			1.0		Ω
CHARGES AND CAPACITANCES							
Input Capacitance	C_{ISS}	V_{GS} = 0 V, f = 1 MHz, V_{DS} = 30 V			355		pF
Output Capacitance	C_{OSS}				260		
Reverse Transfer Capacitance	C_{RSS}				4.9		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 10 V, V_{DS} = 30 V, I_D = 4 A			5.8		nC
Threshold Gate Charge	$Q_{G(TH)}$				1.4		
Gate−to−Source Charge	Q_{GS}				2.3		
Gate−to−Drain Charge	Q_{GD}				0.53		
SWITCHING CHARACTERISTICS, V_{GS} = 10 V (Note 5)							
Turn−On Delay Time	$t_{d(ON)}$	V_{GS} = 10 V, V_{DS} = 30 V, I_D = 4 A, R_G = 6 Ω			6.5		ns
Rise Time	t_r				1.4		
Turn−Off Delay Time	$t_{d(OFF)}$				9.7		
Fall Time	t_f				4.0		
DRAIN−SOURCE DIODE CHARACTERISTICS							
Forward Diode Voltage	V_{SD}	V_{GS} = 0 V, I_S = 4 A	T_J = 25°C		0.81	1.2	V
			T_J = 125°C		0.67		
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, dI_S/dt = 100 A/μs, V_{DS} = 30 V, I_S = 4 A			24		ns
Charge Time	t_a				12		
Discharge Time	t_b				12		
Reverse Recovery Charge	Q_{RR}				12		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 ≤ 300 μs, duty cycle ≤ 2%.
5. Switching characteristics are independent of operating junction temperatures.
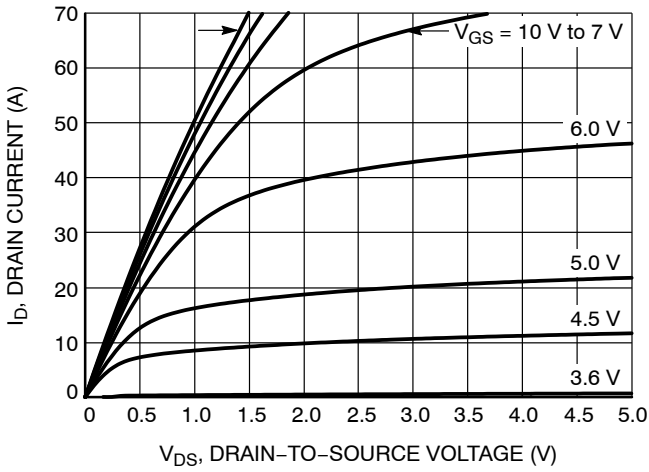
NTMFS020N06C

TYPICAL CHARACTERISTICS

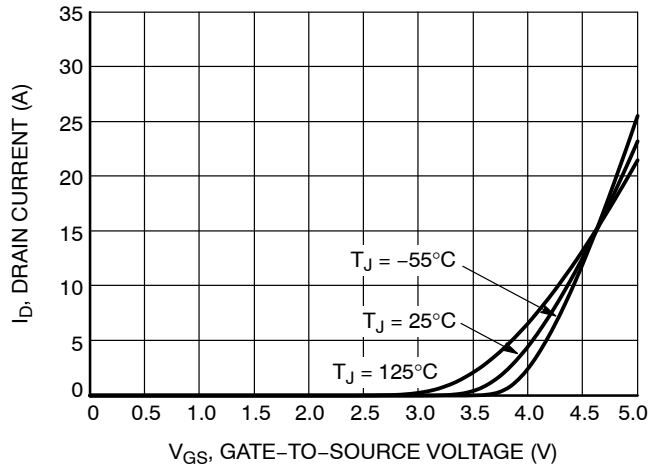Figure 1. On−Region Characteristics

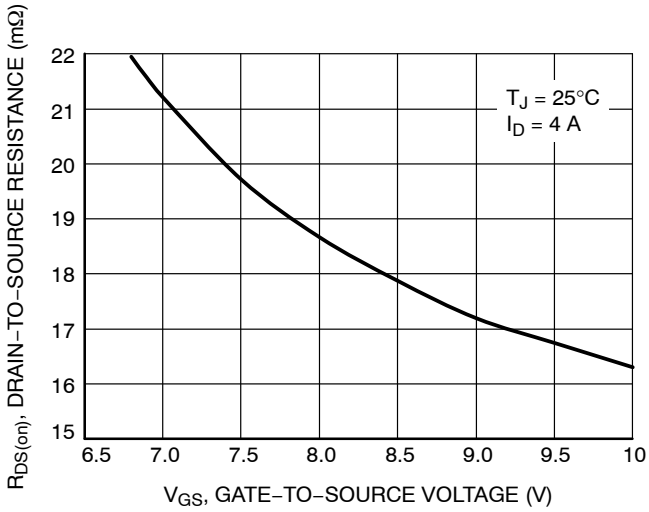Figure 2. Transfer Characteristics

Figure 3. On−Resistance vs. Gate−to−Source Voltage
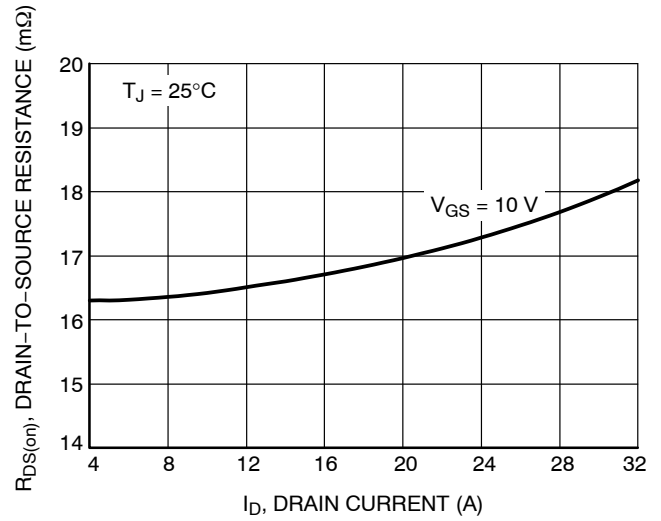

Figure 4. On−Resistance vs. Drain Current and Gate Voltage
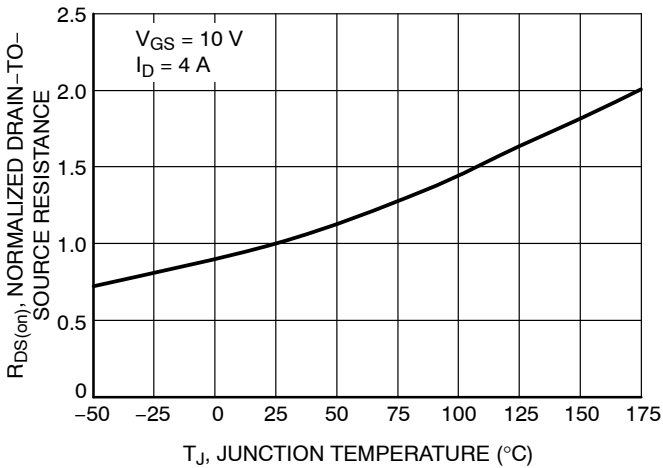

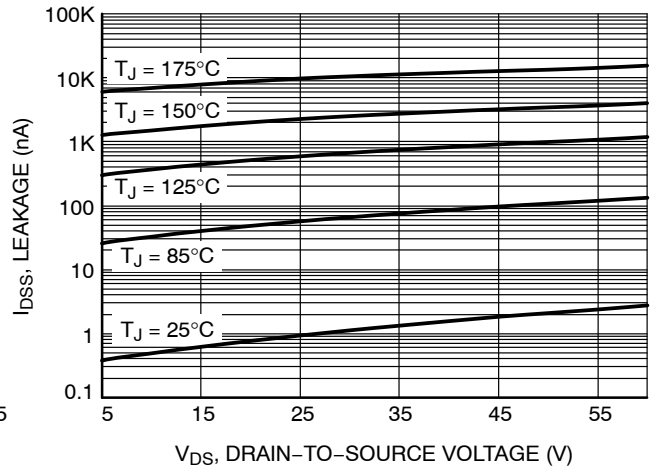Figure 5. On−Resistance Variation with Temperature

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

NTMFS020N06C
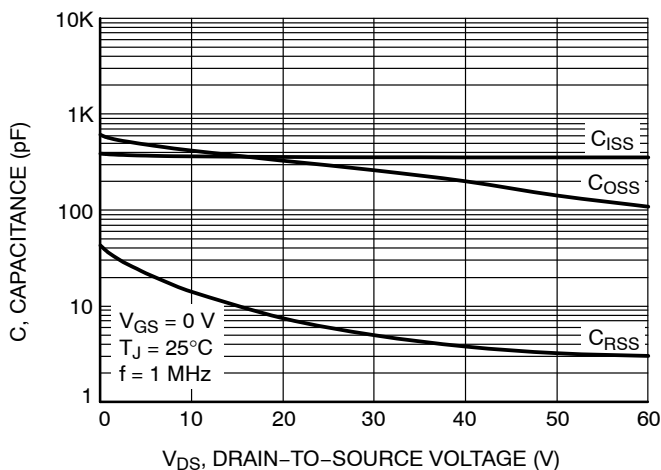
TYPICAL CHARACTERISTICS
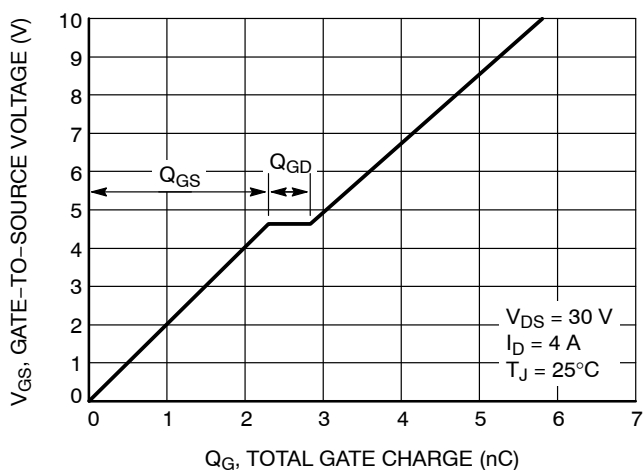

Figure 7. Capacitance Variation
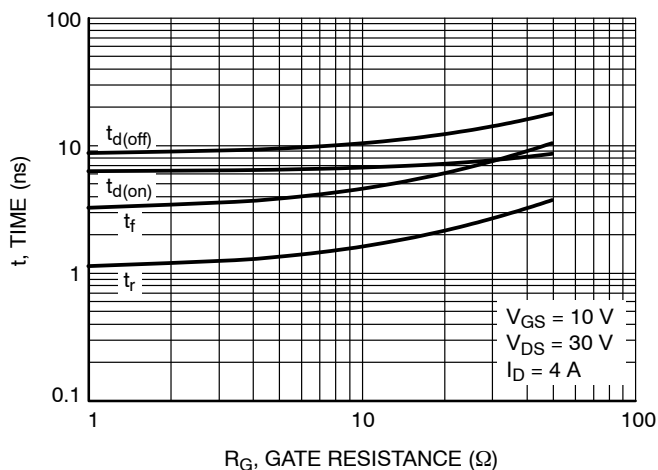

Figure 8. Gate−to−Source and
Drain−to−Source Voltage vs. Total Charge

Figure 9. Resistive Switching Time Variation
vs. Gate Resistance
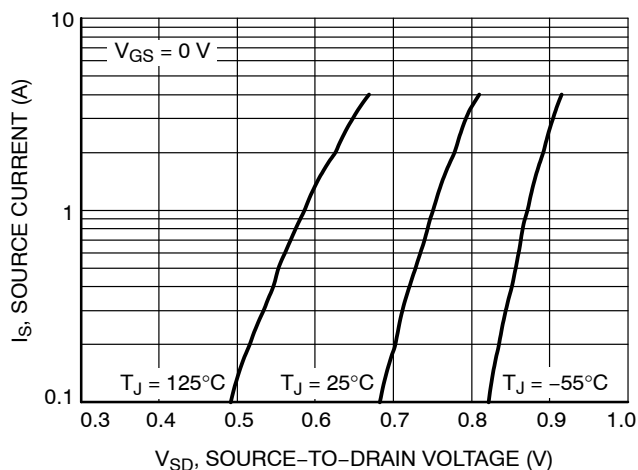
Figure 10. Diode Forward Voltage vs. Current
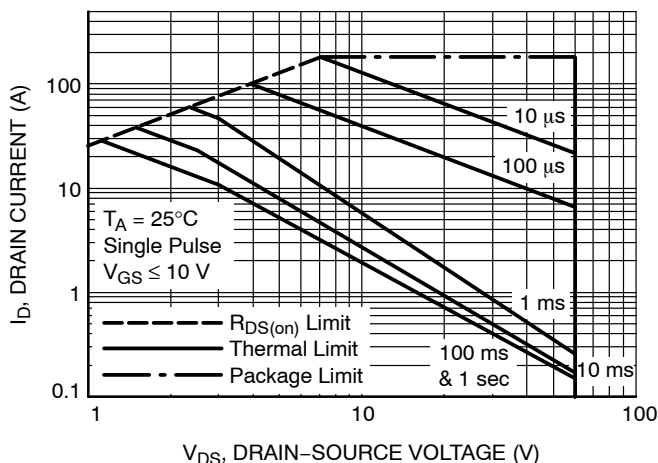
Figure 11. Safe Operating Area
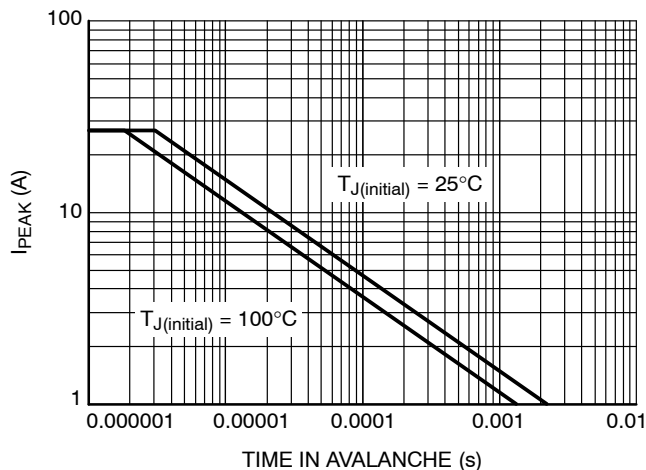
Figure 12. Maximum Drain Current vs. Time in
Avalanche

TYPICAL CHARACTERISTICS
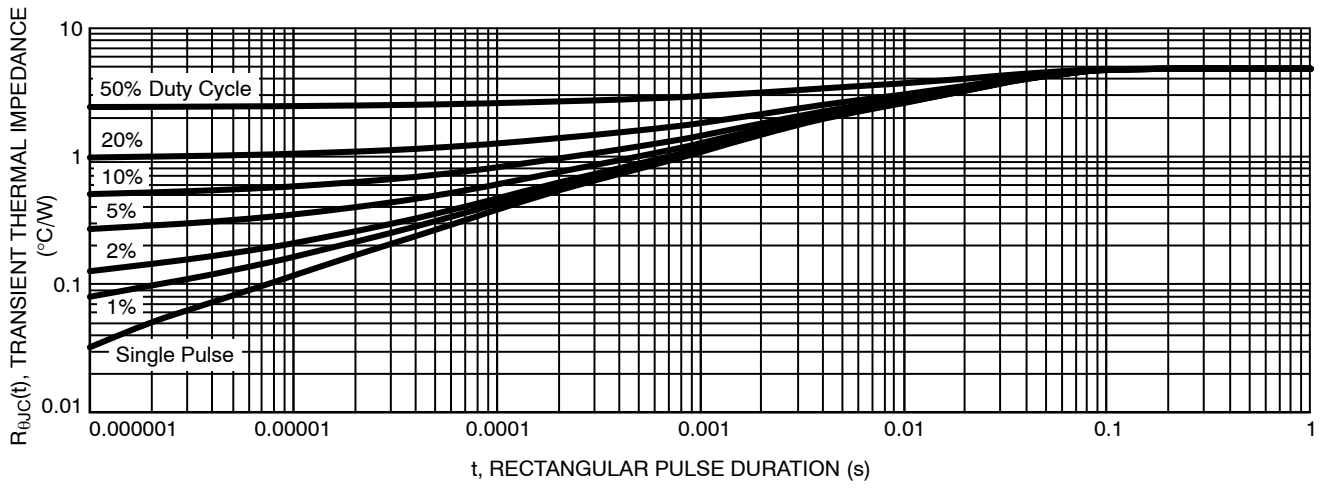
Figure 13. Thermal Response

DFN5 5x6, 1.27P
(SO−8FL)
CASE 488AA
ISSUE N

SCALE 2:1
1

DATE 25 JUN 2018

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.

2 X
| ⌒ | 0.20 | C |

D
▶ | A |

D1

△2

B
2 X
| ⌒ | 0.20 | C |

E1

△2

E

4 X
θ

c

A1

DETAIL A

SEATING PLANE
| C |

TOP VIEW

1 2 3 4

MILLIMETERS			
DIM	**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 °

| ⁄⁄ | 0.10 | C |
| ⌒ | 0.10 | C |

A

SIDE VIEW

DETAIL A

GENERIC MARKING DIAGRAM*

1
XXXXXX
AYWZZ

XXXXXX = Specific Device Code
A = Assembly Location
Y = Year
W = Work Week
ZZ = Lot Traceability

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, "G" or microdot " ▪", may or may not be present. Some products may not follow the Generic Marking.

8X b
| ⊕ | 0.10 | C | A | B |
| | 0.05 | c | | |

e/2
e

L
1   4
K

PIN 5
(EXPOSED PAD)
E2

L1
M

G
D2

BOTTOM VIEW

RECOMMENDED SOLDERING FOOTPRINT*

2X
0.495

4.560

2X
1.530

2X
0.475

3.200
4.530

1.330

2X
0.905

1

0.965

4X
1.000

4X 0.750

1.270
PITCH

DIMENSIONS: MILLIMETERS
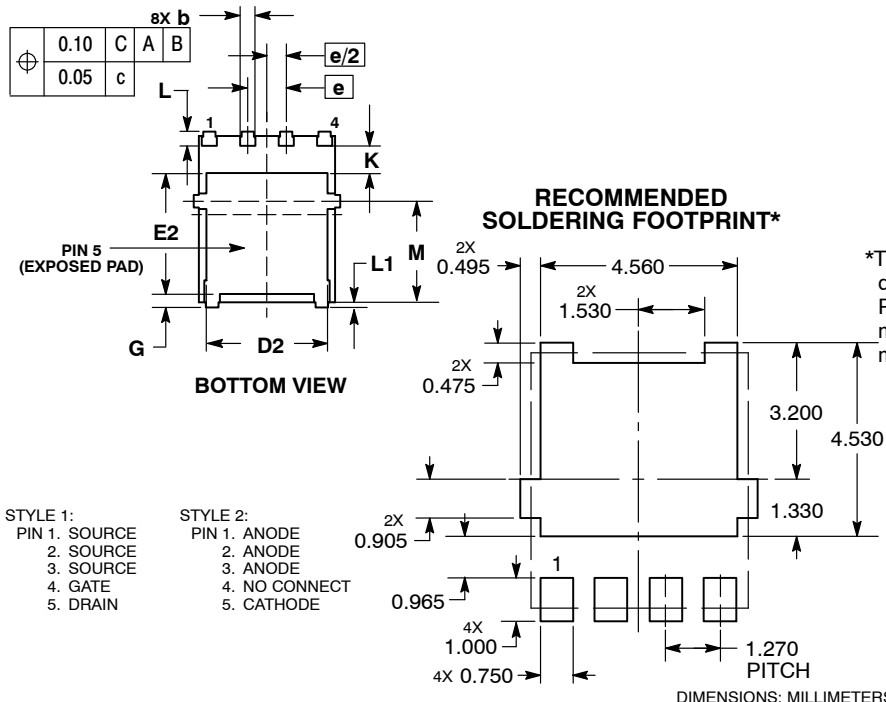
STYLE 1:
PIN 1. SOURCE
2. SOURCE
3. SOURCE
4. GATE
5. DRAIN

STYLE 2:
PIN 1. ANODE
2. ANODE
3. ANODE
4. NO CONNECT
5. CATHODE

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

ADDITIONAL INFORMATION

◊