NTHD4508N

MOSFET – Power, Dual, N-Channel, ChipFET

20 V, 4.1 A

Features

- Low $R_{DS(on)}$ and Fast Switching Speed
- Leadless ChipFET Package has 40% Smaller Footprint than TSOP−6
- Excellent Thermal Capabilities Where Heat Transfer is Required
- Pb−Free Package is Available

Applications

- DC−DC Buck/Boost Converters
- Battery and Low Side Switching in Portable Equipment Such as MP3 Players, Cell Phones, DSCs and PDAs
- Level Shifting

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

Parameter			Symbol	Value	Unit
Drain−to−Source Voltage			V_{DSS}	20	V
Gate−to−Source Voltage			V_{GS}	±12	V
Continuous Drain Current	Steady State	T_J = 25 °C	I_D	3.0	A
		T_J = 85 °C		2.2	
	t ≤ 5 s	T_J = 25 °C		4.1	
Power Dissipation	Steady State	T_J = 25 °C	P_D	1.13	W
		T_J = 85 °C		0.59	
	t ≤ 5 s	T_J = 25 °C		2.1	
Pulsed Drain Current	t_p = 10 μs		I_{DM}	12	A
Operating Junction and Storage Temperature			T_J, T_{STG}	−55 to 150	°C
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)			T_L	260	°C

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction−to−Ambient − Steady State (Note 1)	$R_{\theta JA}$	110	°C/W

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

1. Surface Mounted on FR4 Board using 1 in sq pad size (Cu area = 1.27 in sq [1 oz] including traces).

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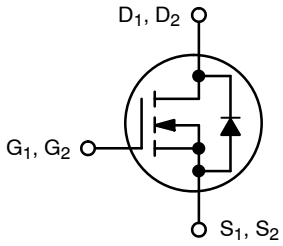
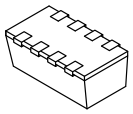
$V_{(BR)DSS}$	$R_{DS(on)}$ TYP	I_D MAX
20 V	60 mΩ @ 4.5 V	4.1 A
	80 mΩ @ 2.5 V	

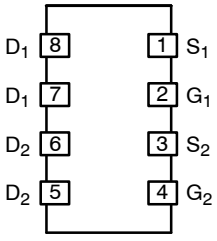


N−Channel MOSFET

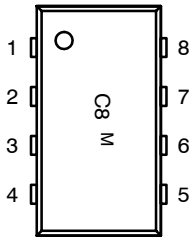


ChipFET
CASE 1206A
STYLE 2

PIN CONNECTIONS



MARKING DIAGRAM



C8 = Specific Device Code
M = Month Code

ORDERING INFORMATION

Device	Package	Shipping†
NTHD4508NT1	ChipFET	3000/Tape & Reel
NTHD4508NT1G	ChipFET (Pb−Free)	3000/Tape & Reel

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

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ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
OFF CHARACTERISTICS						
Drain−to−Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V	20			V
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V, V_{DS} = 16 V			1.0	μA
		V_{GS} = 0 V, V_{DS} = 16 V, T_J = 125°C			10	
Gate−to−Source Leakage Current	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±12 V			±100	nA
ON CHARACTERISTICS (Note 2)						
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = 250 μA	0.6		1.2	V
Drain−to−Source On−Resistance	$R_{DS(on)}$	V_{GS} = 4.5, I_D = 3.1 A		60	75	mΩ
		V_{GS} = 2.5, I_D = 2.3 A		80	115	
Forward Transconductance	g_{FS}	V_{DS} = 10 V, I_D = 3.1 A		6.0		S
CHARGES AND CAPACITANCES						
Input Capacitance	C_{ISS}	V_{GS} = 0 V, f = 1.0 MHz, V_{DS} = 10 V		180		pF
Output Capacitance	C_{OSS}			80		
Reverse Transfer Capacitance	C_{RSS}			25		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 4.5 V, V_{DS} = 10 V, I_D = 3.1 A		2.6	4.0	nC
Threshold Gate Charge	$Q_{G(TH)}$			0.5		
Gate−to−Source Charge	Q_{GS}			0.6		
Gate−to−Drain Charge	Q_{GD}			0.7		
SWITCHING CHARACTERISTICS (Note 3)						
Turn−On Delay Time	$t_{d(ON)}$	V_{GS} = 4.5 V, V_{DS} = 16 V, I_D = 3.1 A, R_G = 2.5 Ω		5.0	10	ns
Rise Time	t_r			15	30	
Turn−Off Delay Time	$t_{d(OFF)}$			10	20	
Fall Time	t_f			3.0	6.0	
DRAIN−SOURCE DIODE CHARACTERISTICS						
Forward Diode Voltage	V_{SD}	V_{GS} = 0 V, I_S = 3.1 A		0.75	1.15	V
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, I_S = 1.5 A, dI_S/dt = 100 A/μs		12.5		ns
Charge Time	ta			9.0		
Discharge Time	tb			3.5		
Reverse Recovery Charge	Q_{RR}			6.0		nC

2. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
3. Switching characteristics are independent of operating junction temperatures.

TYPICAL PERFORMANCE CURVES (T_J = 25°C unless otherwise noted)

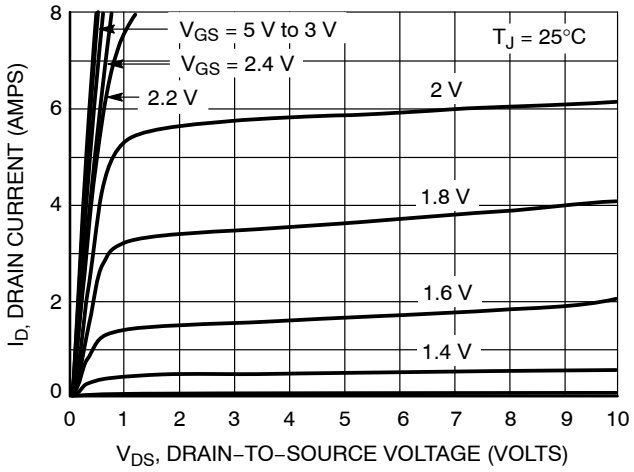

Figure 1. On−Region Characteristics

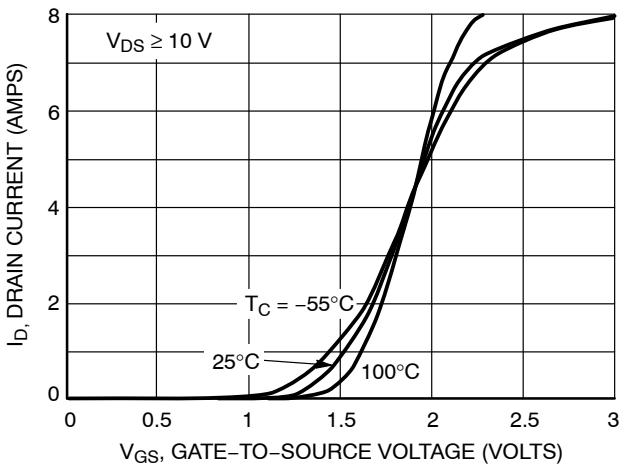

Figure 2. Transfer Characteristics

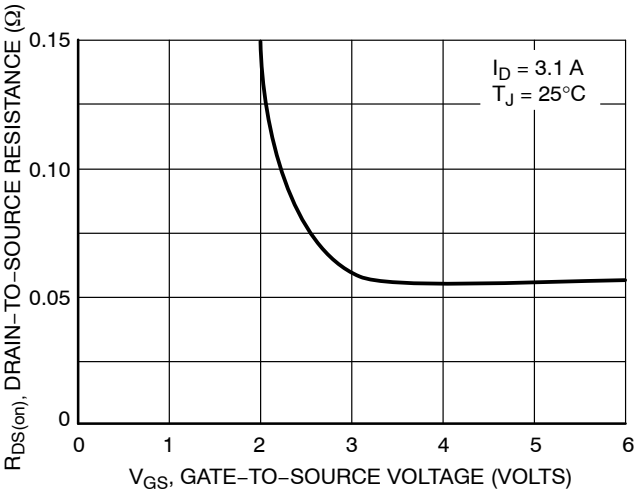

Figure 3. On−Resistance vs. Gate−to−Source Voltage

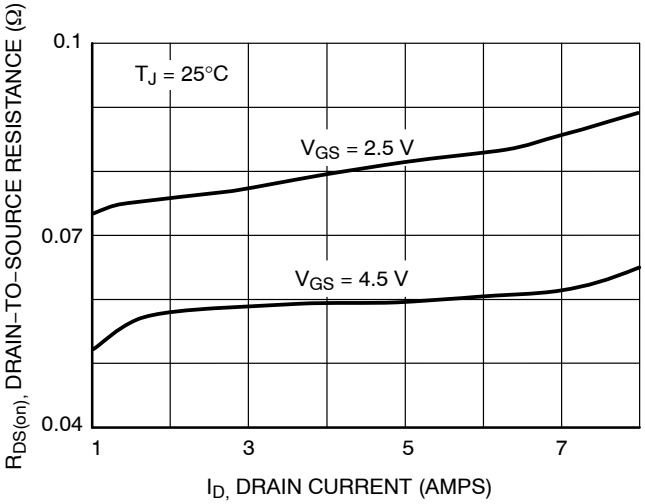

Figure 4. On−Resistance vs. Drain Current and Gate Voltage

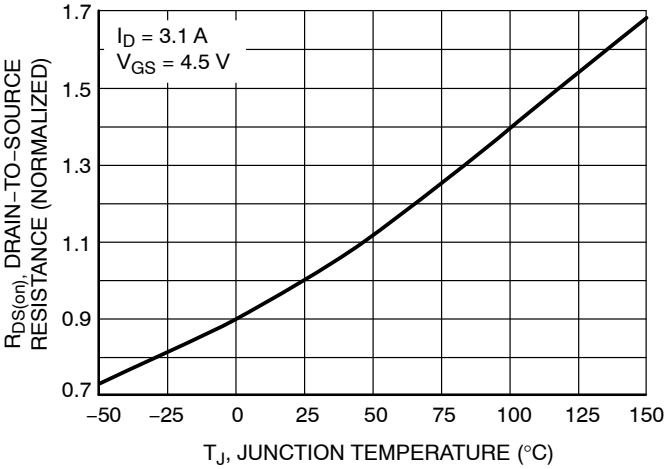

Figure 5. On−Resistance Variation with Temperature

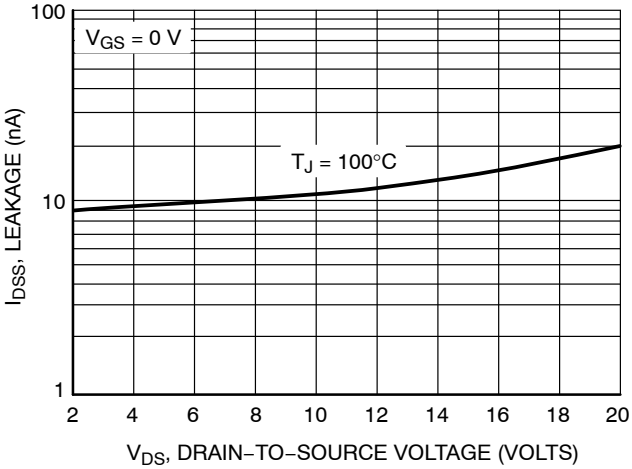

Figure 6. Drain−to−Source Leakage Current vs. Voltage

TYPICAL PERFORMANCE CURVES (T_J = 25°C unless otherwise noted)

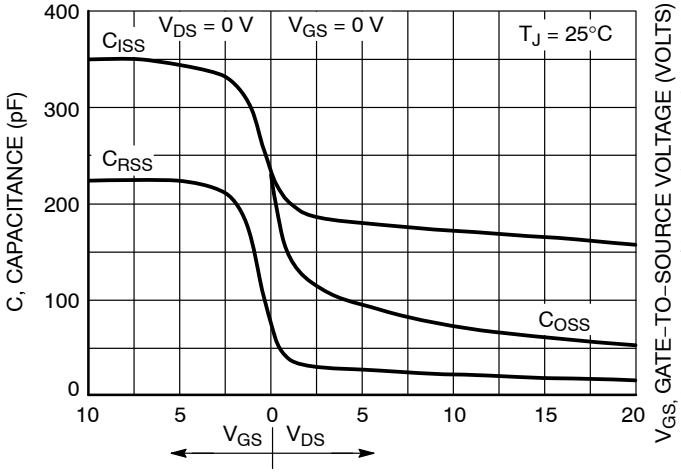

Figure 7. Capacitance Variation

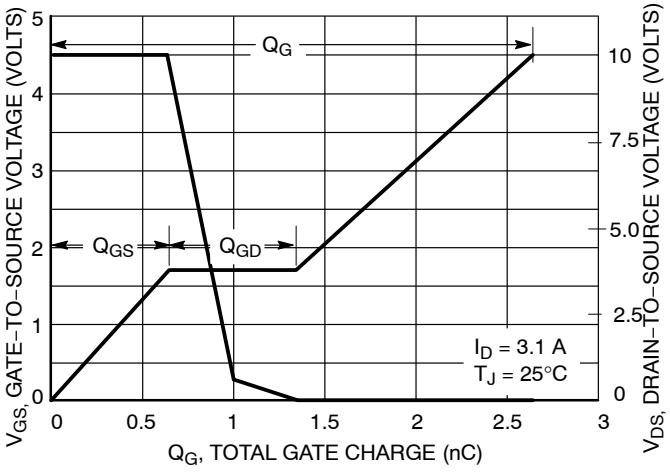

Figure 8. Gate−to−Source and Drain−to−Source Voltage vs. Total Charge

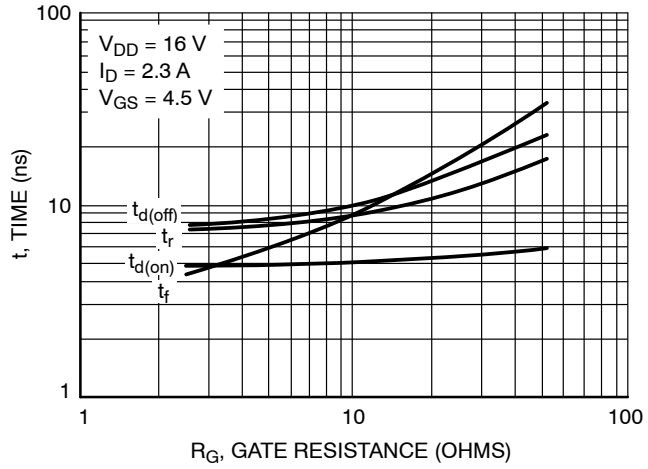

Figure 9. Resistive Switching Time Variation vs. Gate Resistance

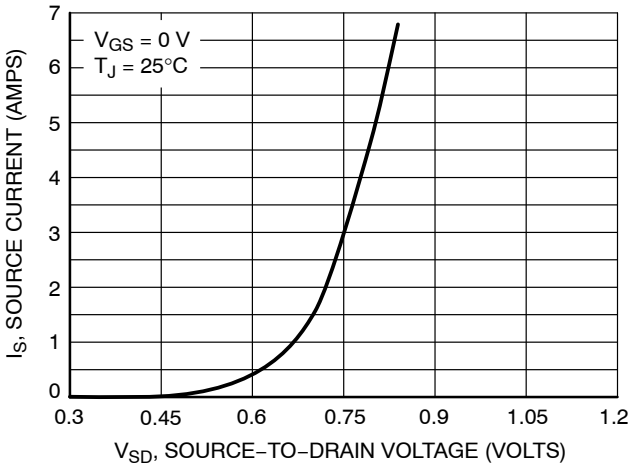

Figure 10. Diode Forward Voltage vs. Current

SOLDERING FOOTPRINTS*

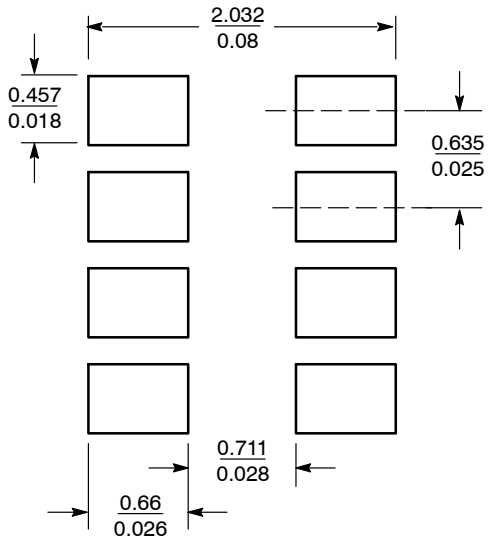

Figure 11. Basic

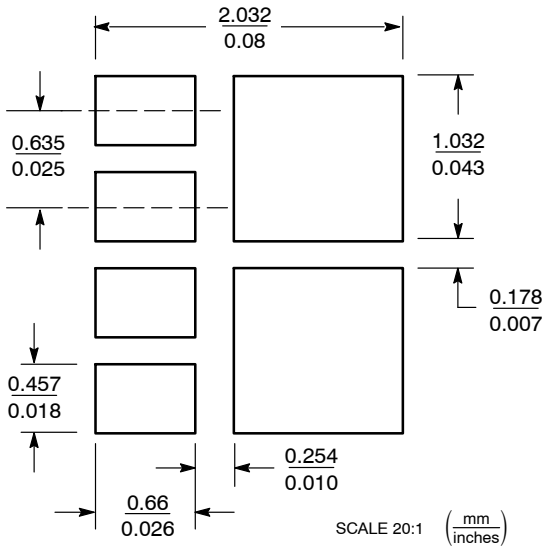

Figure 12. Style 2

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

BASIC PAD PATTERNS

The basic pad layout with dimensions is shown in Figure 11. This is sufficient for low power dissipation MOSFET applications, but power semiconductor performance requires a greater copper pad area, particularly for the drain leads.

The minimum recommended pad pattern shown in Figure 12 improves the thermal area of the drain connections (pins 5, 6, 7, 8) while remaining within the confines of the basic footprint. The drain copper area is 0.0019 sq. in. (or 1.22 sq. mm). This will assist the power dissipation path away from the device (through the copper lead−frame) and into the board and exterior chassis (if applicable) for the single device. The addition of a further copper area and/or the addition of vias to other board layers will enhance the performance still further.

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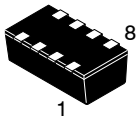
MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

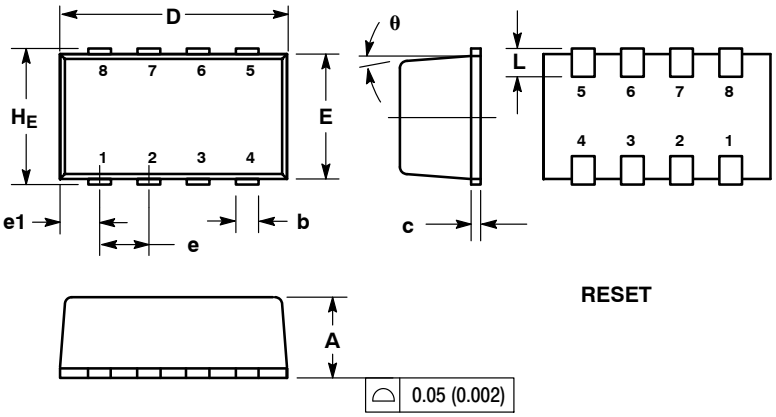
ON Semiconductor®

ChipFET™
CASE1206A−03
ISSUE K

DATE 19 MAY 2009



SCALE 1:1



RESET

NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. MOLD GATE BURRS SHALL NOT EXCEED 0.13 MM PER SIDE.
4. LEADFRAME TO MOLDED BODY OFFSET IN HORIZONTAL AND VERTICAL SHALL NOT EXCEED 0.08 MM.
5. DIMENSIONS A AND B EXCLUSIVE OF MOLD GATE BURRS.
6. NO MOLD FLASH ALLOWED ON THE TOP AND BOTTOM LEAD SURFACE.

	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
A	1.00	1.05	1.10	0.039	0.041	0.043
b	0.25	0.30	0.35	0.010	0.012	0.014
c	0.10	0.15	0.20	0.004	0.006	0.008
D	2.95	3.05	3.10	0.116	0.120	0.122
E	1.55	1.65	1.70	0.061	0.065	0.067
e	0.65 BSC			0.025 BSC		
e1	0.55 BSC			0.022 BSC		
L	0.28	0.35	0.42	0.011	0.014	0.017
H_E	1.80	1.90	2.00	0.071	0.075	0.079
θ	5° NOM			5° NOM		

STYLE 1:
PIN 1. DRAIN
2. DRAIN
3. DRAIN
4. GATE
5. SOURCE
6. DRAIN
7. DRAIN
8. DRAIN

STYLE 2:
PIN 1. SOURCE 1
2. GATE 1
3. SOURCE 2
4. GATE 2
5. DRAIN 2
6. DRAIN 2
7. DRAIN 1
8. DRAIN 1

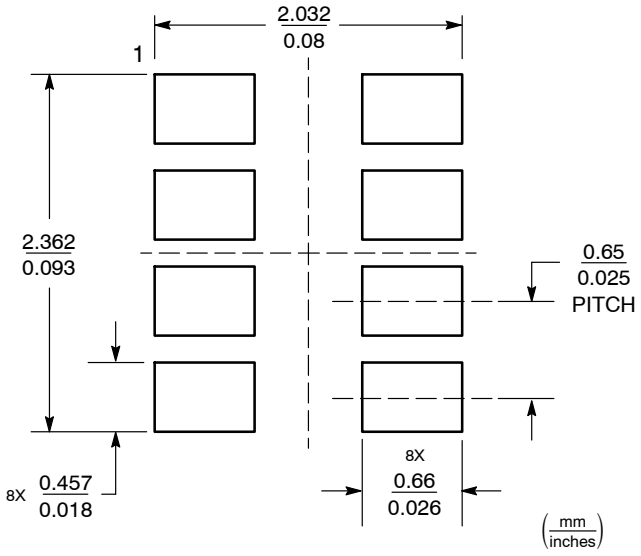
STYLE 3:
PIN 1. ANODE
2. ANODE
3. SOURCE
4. GATE
5. DRAIN
6. DRAIN
7. CATHODE
8. CATHODE

STYLE 4:
PIN 1. COLLECTOR
2. COLLECTOR
3. COLLECTOR
4. BASE
5. EMITTER
6. COLLECTOR
7. COLLECTOR
8. COLLECTOR

STYLE 5:
PIN 1. ANODE
2. ANODE
3. DRAIN
4. DRAIN
5. SOURCE
6. GATE
7. CATHODE
8. CATHODE

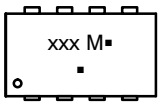
STYLE 6:
PIN 1. ANODE
2. DRAIN
3. DRAIN
4. GATE
5. SOURCE
6. DRAIN
7. DRAIN
8. CATHODE / DRAIN

SOLDERING FOOTPRINT



Basic Style

GENERIC MARKING DIAGRAM*



xxx = Specific Device Code
M = Month Code
▪ = Pb−Free Package
(Note: Microdot may be in either location)

*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.

OPTIONAL SOLDERING FOOTPRINTS ON PAGE 2

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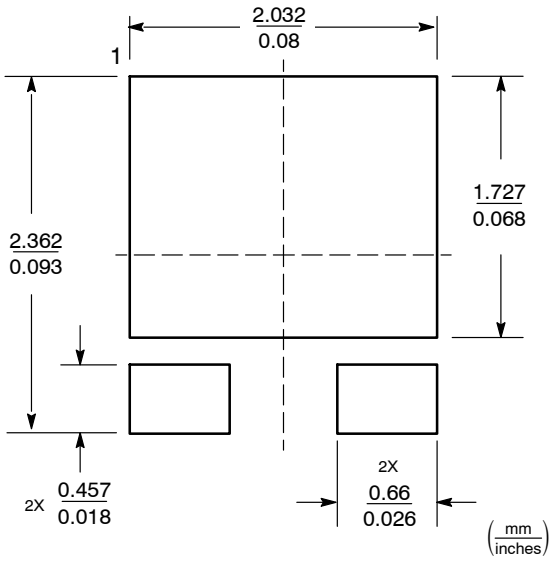
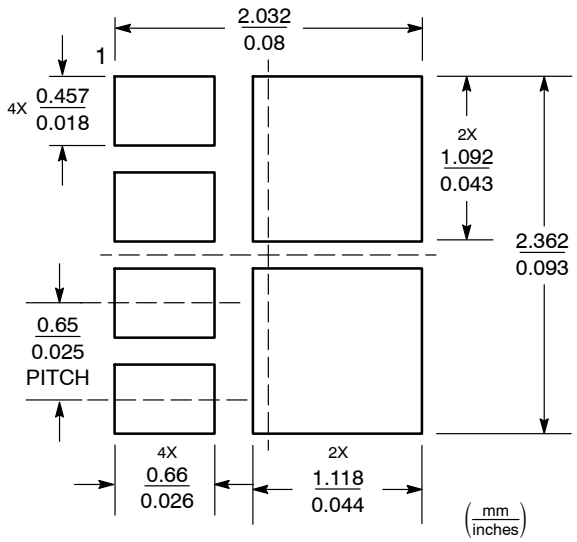
ChipFET™
CASE 1206A−03
ISSUE K

DATE 19 MAY 2009

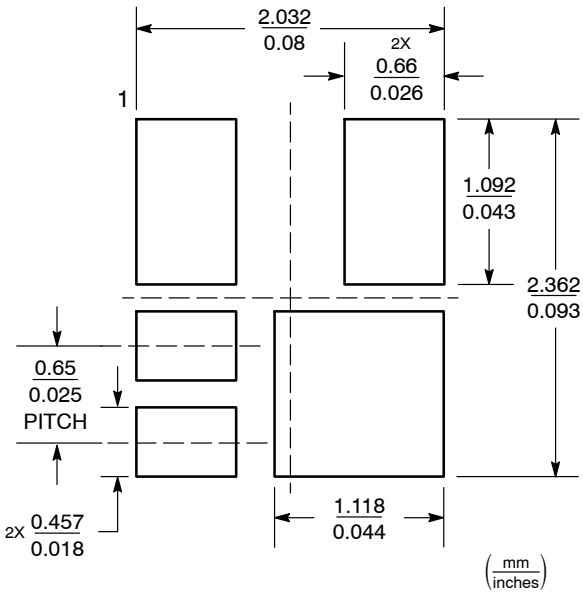
ADDITIONAL SOLDERING FOOTPRINTS*



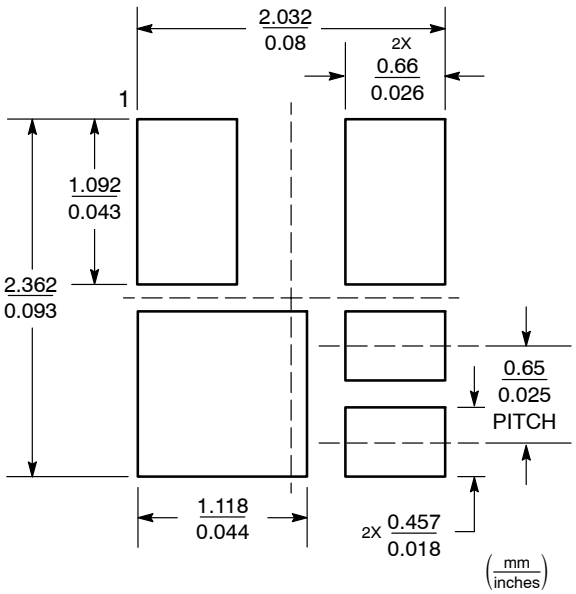
Styles 1 and 4



Style 2



Style 3



Style 5

*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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