NTHS2101P

Power MOSFET

–8.0 V, –7.5 A P–Channel ChipFET™

Features
- Offers an Ultra Low $R_{DS(on)}$ Solution in the ChipFET Package
- Miniature ChipFET Package 40% Smaller Footprint than TSOP–6 making it an Ideal Device for Applications where Board Space is at a Premium
- Low Profile (<1.1 mm) Allows it to Fit Easily into Extremely Thin Environments such as Portable Electronics
- Designed to Provide Low $R_{DS(on)}$ at Gate Voltage as Low as 1.8 V, the Operating Voltage used in many Logic ICs in Portable Electronics
- Simplifies Circuit Design since Additional Boost Circuits for Gate Voltages are not Required
- Operated at Standard Logic Level Gate Drive, Facilitating Future Migration to Lower Levels using the same Basic Topology
- Pb–Free Package is Available

Applications
- Optimized for Battery and Load Management Applications in Portable Equipment such as MP3 Players, Cell Phones, Digital Cameras, Personal Digital Assistant and other Portable Applications
- Charge Control in Battery Chargers
- Buck and Boost Converters

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$V_{(BR)DSS}$	Ultra Low $R_{DS(on)}$ TYP	I_D MAX
–8.0 V	19 mΩ @ –4.5 V_{GS}	–7.5 A
	25 mΩ @ –2.5 V_{GS}	
	34 mΩ @ –1.8 V_{GS}	

P–Channel MOSFET

**ChipFET
CASE 1206A
STYLE 1**

PIN CONNECTIONS

MARKING DIAGRAM

D4 = Specific Device Code
M = Month Code

ORDERING INFORMATION

Device	Package	Shipping†
NTHS2101PT1	ChipFET	3000/Tape & Reel
NTHS2101PT1G	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 Specifications Brochure, BRD8011/D.

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

Rating	Symbol	Value	Unit
Drain–to–Source Voltage	V_{DSS}	–8.0	V_{dc}
Gate–to–Source Voltage – Continuous	V_{GS}	±8.0	V_{dc}
Drain Current – Continuous – 5 seconds	I_D	–5.4 –7.5	A

Total Power Dissipation
    Continuous @ T_A = 25°C
    (5 sec) @ T_A = 25°C
    Continuous @ 85°C
    (5 sec) @ 85°C
	P_D	
		1.3
		2.5
		0.7
		1.3
			W

Continuous Source Current	Is	–1.1	A

Thermal Resistance (Note 1)
    Junction–to–Ambient, 5 sec
    Junction–to–Ambient, Continuous
	$R_{\theta JA}$	
		50
		95
			°C/W

Maximum Lead Temperature for Soldering Purposes, 1/8″ from case for 10 seconds	T_L	260	°C

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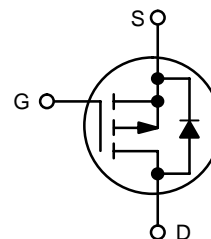
1. Surface Mounted on FR4 Board using 1 in sq pad size (Cu area = 1.27 in sq [1 oz] including traces).
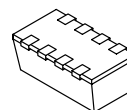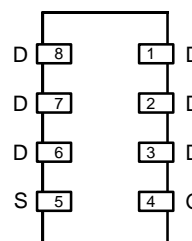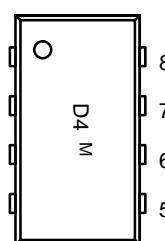
1

NTHS2101P

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

Characteristic	Symbol	Test Condition	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain–to–Source Breakdown Voltage (Note 2) Temperature Coefficient (Positive)	$V_{(Br)DSS}$	V_{GS} = 0 V_{dc}, I_D = –250 μA_{dc}	–8.0			V_{dc}
Gate–Body Leakage Current Zero	I_{GSS}	V_{DS} = 0 V_{dc}, V_{GS} = ±8.0 V_{dc}			±100	nA_{dc}
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = –6.4 V_{dc}, V_{GS} = 0 V_{dc} V_{DS} = –6.4 V_{dc}, V_{GS} = 0 V_{dc}, T_J = 85°C			–1.0 –5.0	μA_{dc}
ON CHARACTERISTICS (Note 2)						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = –250 μA_{dc}	–0.45		–1.5	V_{dc}
Static Drain–to–Source On–Resistance	$R_{DS(on)}$	V_{GS} = –4.5 V_{dc}, I_D = –5.4 A_{dc} V_{GS} = –2.5 V_{dc}, I_D = –4.5 A_{dc} V_{GS} = –1.8 V_{dc}, I_D = –2.0 A_{dc}		19 25 34	25 36 48	$m\Omega$
Forward Transconductance	g_{FS}	V_{DS} = –5.0 V_{dc}, I_D = –5.2 A_{dc}		20		S
Diode Forward Voltage	V_{SD}	I_S = –1.1 A_{dc}, V_{GS} = 0 V_{dc}		–0.62	–1.2	V
DYNAMIC CHARACTERISTIC						
Input Capacitance	C_{iss}	V_{DS} = –6.4 V_{dc} V_{GS} = 0 V f = 1.0 MHz		2400		pF
Output Capacitance	C_{oss}			550		
Transfer Capacitance	C_{rss}			420		
SWITCHING CHARACTERISTICS (Note 3)						
Turn–On Delay Time	$t_{d(on)}$	V_{DD} = –6.4 V_{dc} V_{GS} = –4.5 V_{dc} I_D = –5.4 A_{dc} R_G = 2.0 Ω (Note 2)		7.0		ns
Rise Time	t_r			28		
Turn–Off Delay Time	$t_{d(off)}$			73		
Fall Time	t_f			60		
Gate Charge	Q_G	V_{GS} = –4.5 V_{dc} I_D = –5.4 A_{dc} V_{DS} = –6.4 V_{dc}		15	30	nC
	Q_{GS}			4.0		
	Q_{GD}			8.0		
Source–Drain Reverse Recovery Time	T_{rr}	I_F = –1.1 A, di/dt = 100 A/μs		90		ns

2. Pulse Test: Pulse Width = 250 μs, Duty Cycle = 2%.
3. Switching characteristics are independent of operating junction temperatures.

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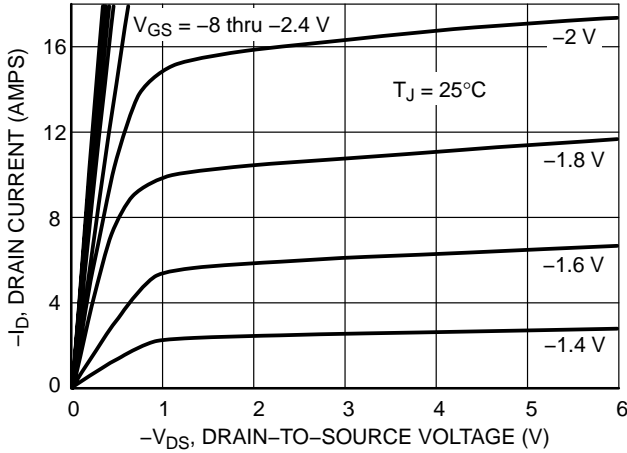## TYPICAL ELECTRICAL CHARACTERISTICS

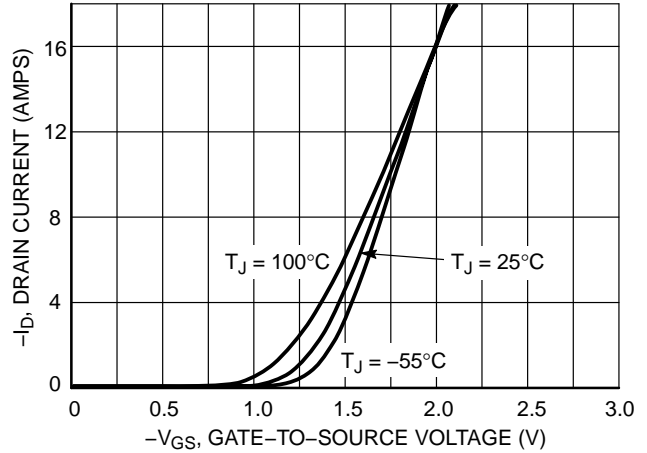**Figure 1. On−Region Characteristics**
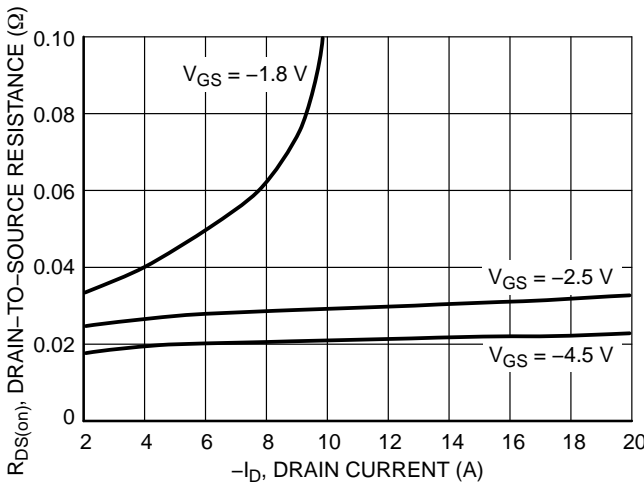

Figure 2. Transfer Characteristics

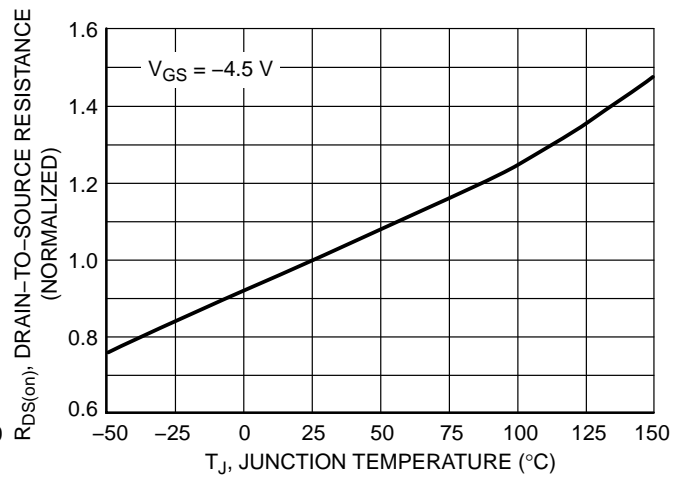**Figure 3. On−Resistance versus Drain Current and Gate Voltage**

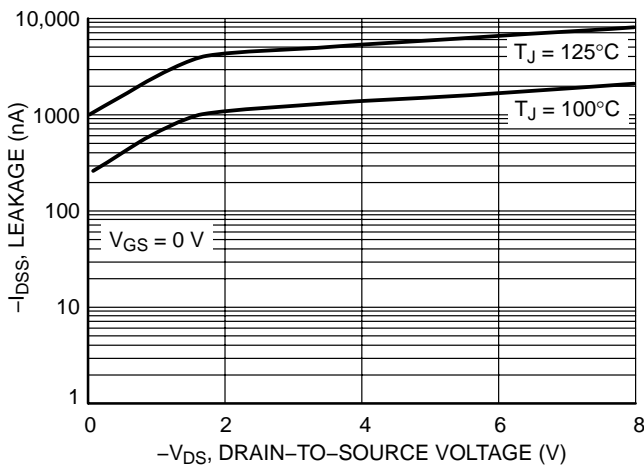**Figure 4. On−Resistance Variation with Temperature**

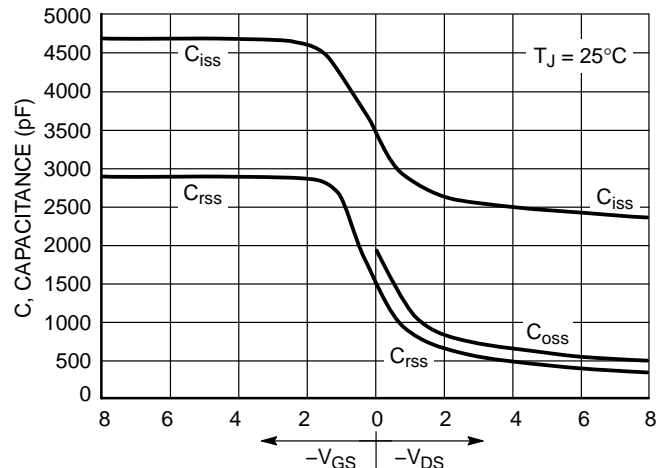**Figure 5. Drain−to−Source Leakage Current vs. Voltage**

Figure 6. Capacitance Variation

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TYPICAL ELECTRICAL CHARACTERISTICS
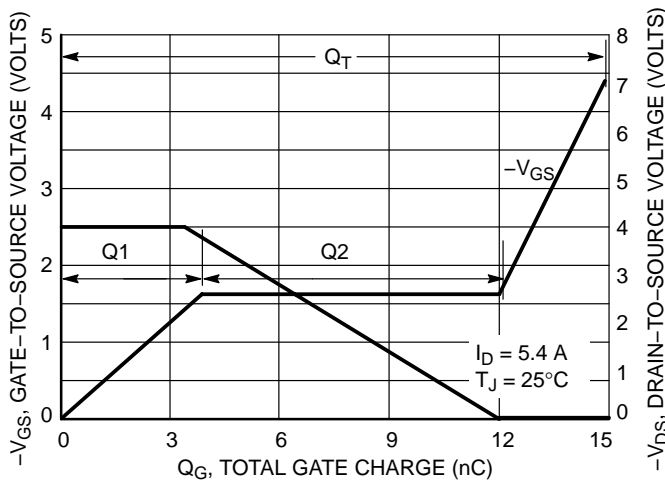
Figure 7. Gate−to−Source and
Drain−to−Source Voltage vs. Total Charge
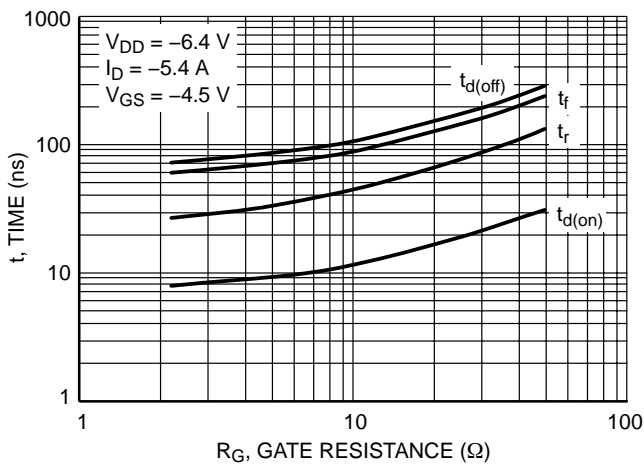
Figure 8. Resistive Switching Time Variation
vs. Gate Resistance
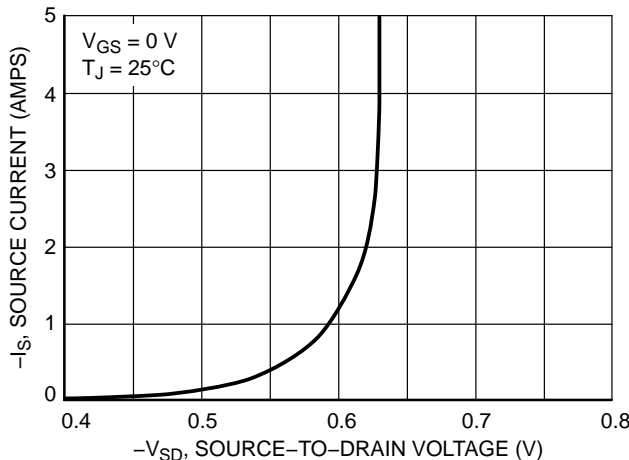
Figure 9. Diode Forward Voltage vs. Current
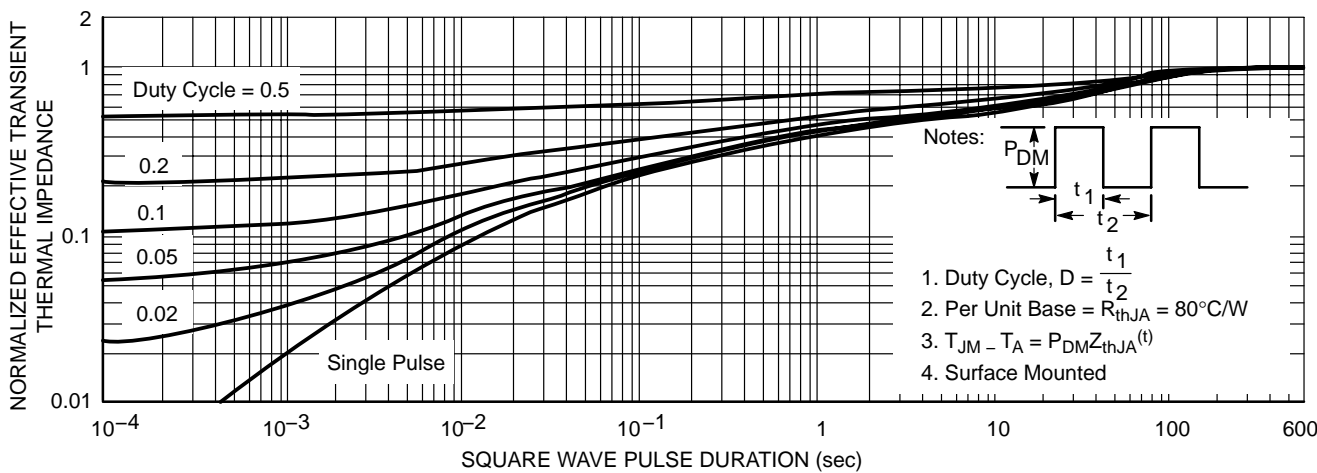
Figure 10. Normalized Thermal Transient Impedance, Junction−to−Ambient

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MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

ON Semiconductor®

ChipFET™
CASE1206A−03
ISSUE K

DATE 19 MAY 2009

SCALE 1:1

RESET

⬜ 0.05 (0.002)
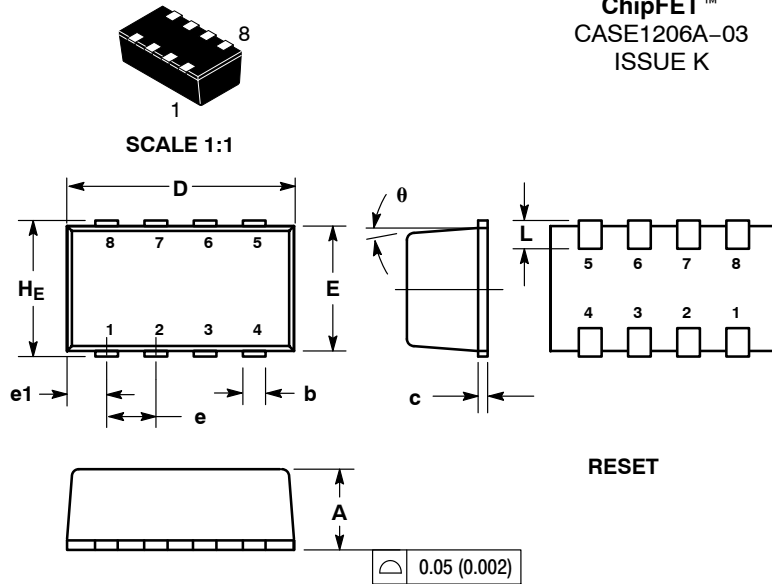
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. MOLD GATE BURRS SHALL NOT EXCEED 0.13 MM PER SIDE.
4. LEADFRAME TO MOLDED BODY OFFSET IN HORIZONTAL AND VERTICAL SHALL NOT EXCEED 0.08 MM.
5. DIMENSIONS A AND B EXCLUSIVE OF MOLD GATE BURRS.
6. NO MOLD FLASH ALLOWED ON THE TOP AND BOTTOM LEAD SURFACE.

DIM	MILLIMETERS			INCHES		
	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

2.032 / 0.08

2.362 / 0.093

0.65 / 0.025 PITCH

8X 0.457 / 0.018

8X 0.66 / 0.026

$\left(\frac{mm}{inches}\right)$

Basic Style

GENERIC MARKING DIAGRAM*

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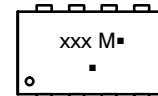
xxx = Specific Device Code
M = Month Code
■ = Pb−Free Package
(Note: Microdot may be in either location)

*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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DESCRIPTION:	ChipFET		PAGE 1 OF 2

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ChipFET™
CASE 1206A−03
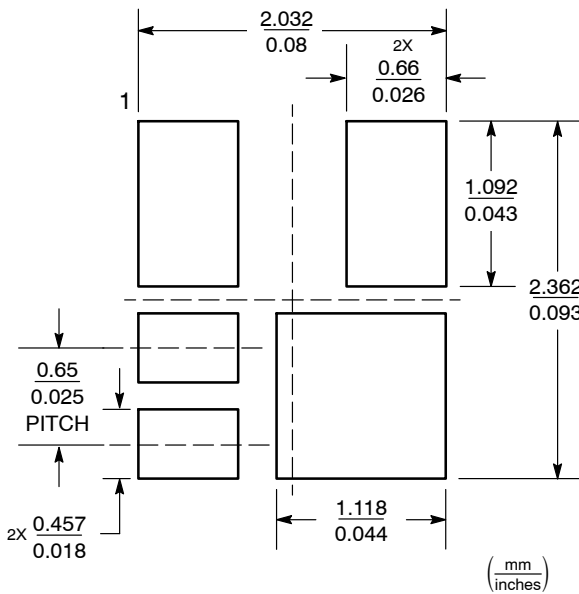ISSUE K

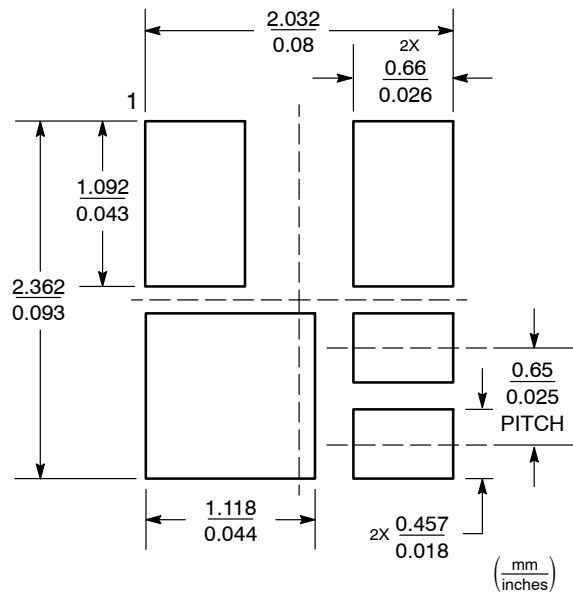## ADDITIONAL SOLDERING FOOTPRINTS*

Styles 1 and 4
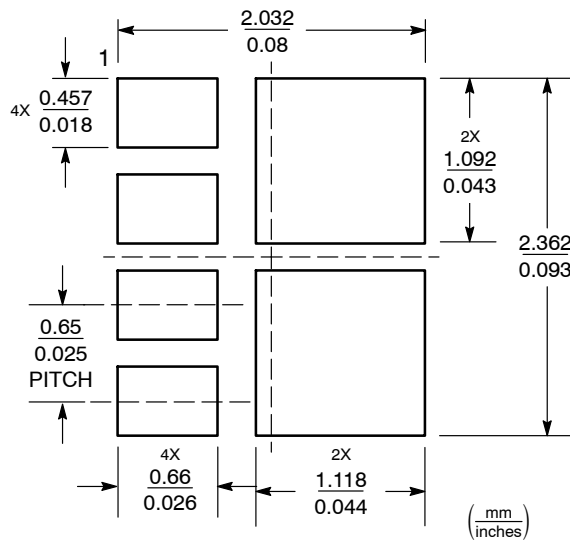
Style 2

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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DESCRIPTION:	ChipFET		PAGE 2 OF 2

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PUBLICATION ORDERING INFORMATION

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