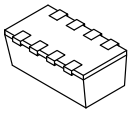
MOSFET – Dual, P-Channel, ChipFET

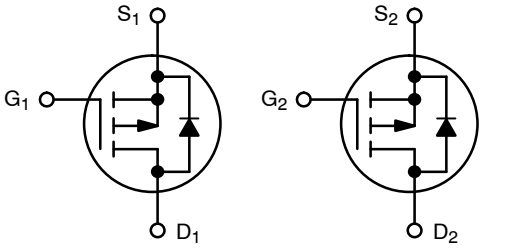
-20 V, -4.1 A

NTHD4102P



ChipFET
CASE 1206A
STYLE 2

$V_{(BR)DSS}$	$R_{DS(ON)}$ TYP	I_D MAX
−20 V	64 mΩ @ −4.5 V	−4.1 A
	85 mΩ @ −2.5 V	
	120 mΩ @ −1.8 V	



P−Channel MOSFET P−Channel MOSFET

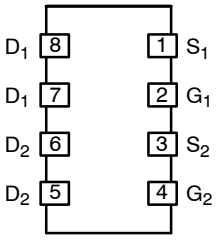
Features

- Offers an Ultra Low $R_{DS(ON)}$ Solution in the ChipFET Package
- Miniature ChipFET Package 40% Smaller Footprint than TSOP−6
- Low Profile (<1.1 mm) Allows it to Fit Easily into Extremely Thin Environments such as 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

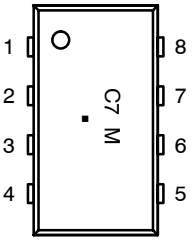
Applications

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

PIN CONNECTIONS



MARKING DIAGRAM



C7 = Specific Device Code
M = Month Code
▪ = Pb−Free Package

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

Symbol	Parameter			Value	Unit
V_{DSS}	Drain−to−Source Voltage			−20	V
V_{GS}	Gate−to−Source Voltage			±8.0	V
I_D	Continuous Drain Current (Note 1)	Steady State	T_A = 25°C	−2.9	A
			T_A = 85°C	−2.1	
		t ≤ 10 s	T_A = 25°C	−4.1	
P_D	Power Dissipation (Note 1)	Steady State	T_A = 25°C	1.1	W
		t ≤ 10 s		2.1	
I_{DM}	Pulsed Drain Current	t_p = 10 μs		−16	A
T_J, T_{STG}	Operating Junction and Storage Temperature			−55 to 150	°C
I_S	Source Current (Body Diode)			−1.1	A
T_L	Lead Temperature for Soldering Purposes (1/8" from case for 10 s)			260	°C

THERMAL RESISTANCE RATINGS

Symbol	Parameter	Max	Unit
$R_{\theta JA}$	Junction−to−Ambient, Steady State (Note 1)	113	°C/W
	Junction−to−Ambient, t ≤ 10s (Note 1)	60	

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. Surface mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces)

ORDERING INFORMATION

Device	Package	Shipping†
NTHD4102PT1	ChipFET	3,000 / Tape & Reel
NTHD4102PT1G	ChipFET (Pb−Free)	3,000 / 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.

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

Symbol	Characteristic	Test Condition		Min	Typ	Max	Unit
OFF CHARACTERISTICS							
$V_{(Br)DSS}$	Drain−to−Source Breakdown Voltage	V_{GS} = 0 V, I_D = −250 μA		−20			V
$V_{(Br)DSS}/T_J$	Drain−to−Source Breakdown Voltage Temperature Coefficient				−15		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{GS} = 0 V, V_{DS} = −16 V	T_J = 25°C			−1.0	μA
			T_J = 85°C			−5.0	
I_{GSS}	Gate−to−Source Leakage Current	V_{DS} = 0 V, V_{GS} = ±8.0 V				±100	nA
ON CHARACTERISTICS (Note 2)							
$V_{GS(TH)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = −250 μA		−0.45		−1.5	V
$V_{GS(TH)}/T_J$	Gate Threshold Temperature Coefficient				2.7		mV/°C
$R_{DS(ON)}$	Drain−to−Source On Resistance	V_{GS} = −4.5 V, I_D = −2.9 A			64	80	mΩ
		V_{GS} = −2.5 V, I_D = −2.2 A			85	110	
		V_{DS} = −1.8 V, I_D = −1.0 A			120	170	
g_{FS}	Forward Transconductance	V_{DS} = −10 V, I_D = −2.9 A			7.0		S
CHARGES, CAPACITANCES, AND GATE RESISTANCE							
C_{ISS}	Input Capacitance	V_{GS} = 0 V, f = 1.0 MHz, V_{DS} = −16 V			750		pF
C_{OSS}	Output Capacitance				100		
C_{RSS}	Reverse Transfer Capacitance				45		
$Q_{G(TOT)}$	Total Gate Charge	V_{GS} = −4.5 V, V_{DS} = −16 V, I_D = −2.6 A			7.6	8.6	nC
Q_{GS}	Gate−to−Source Charge				1.3		
Q_{GD}	Gate−to−Drain Charge				2.6		
SWITCHING CHARACTERISTICS (Note 3)							
$t_{d(ON)}$	Turn−On Delay Time	V_{GS} = −4.5 V, V_{DD} = −16 V, I_D = −2.6 A, R_G = 2.0 Ω			5.5	10	ns
t_r	Rise Time				12	25	
$t_{d(OFF)}$	Turn−Off Delay Time				32	40	
t_f	Fall Time				23	35	
DRAIN−SOURCE DIODE CHARACTERISTICS							
V_{SD}	Forward Diode Voltage	V_{GS} = 0 V, I_S = −1.1 A			−0.8	−1.2	V
t_{RR}	Reverse Recovery Time	V_{GS} = 0 V, dI_S/dt = 100 A/μs, I_S = 1.0 A			20	40	ns
ta	Charge Time				15		
tb	Discharge Time				5		
Q_{RR}	Reverse Recovery Charge				0.01		μC

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)

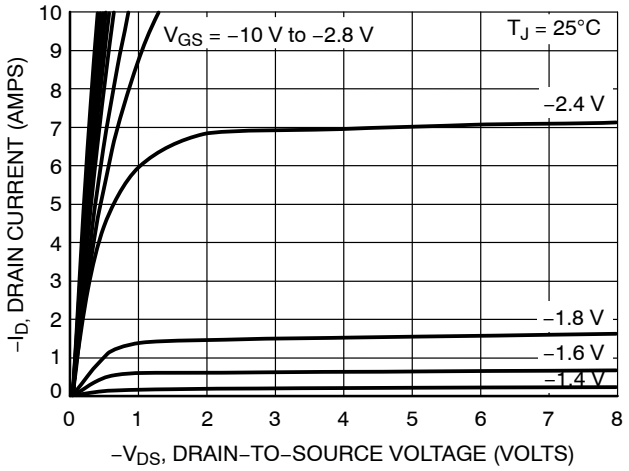


Figure 1. On−Region Characteristics

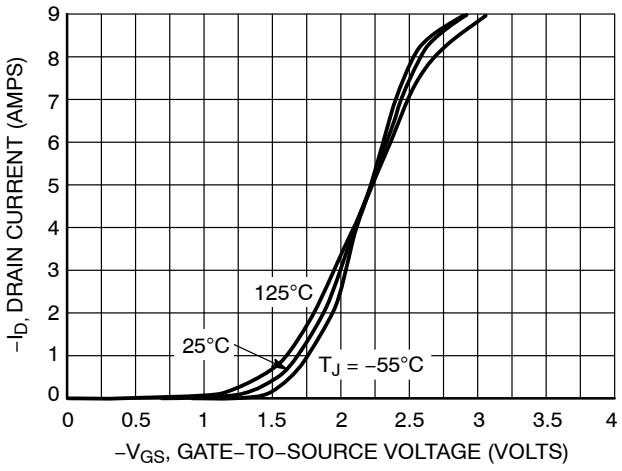


Figure 2. Transfer Characteristics

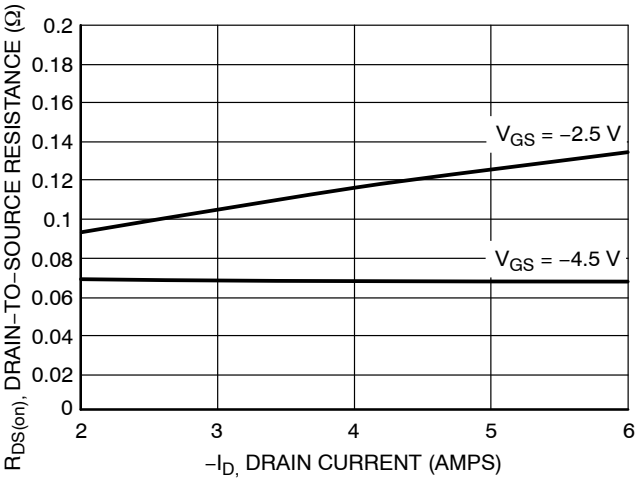


Figure 3. On−Resistance vs. Drain Current and Gate Voltage

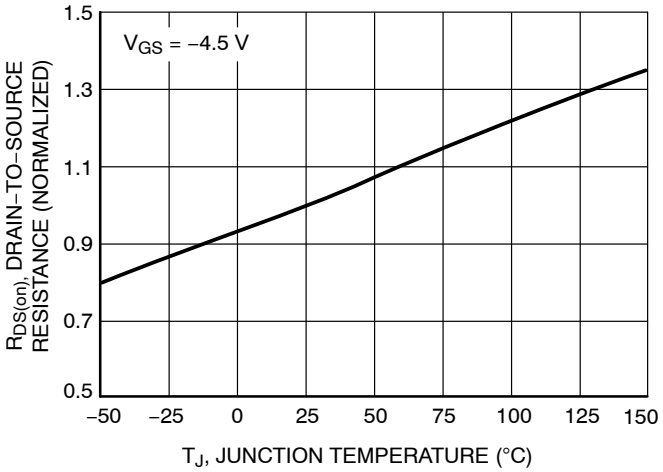


Figure 4. On−Resistance Variation with Temperature

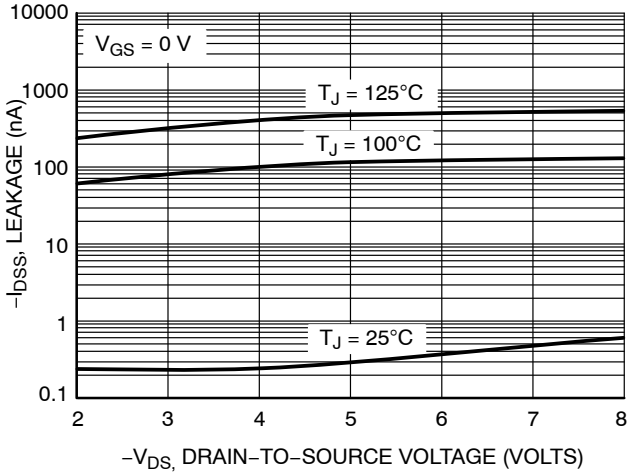


Figure 5. Drain−to−Source Leakage Current vs. Voltage

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

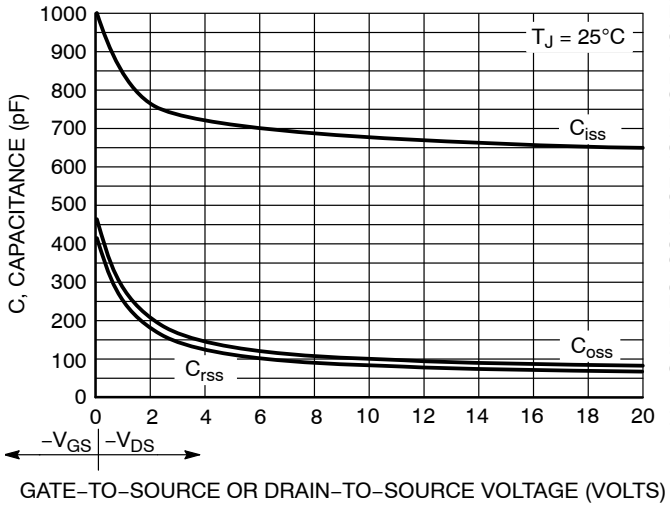


Figure 6. Capacitance Variation

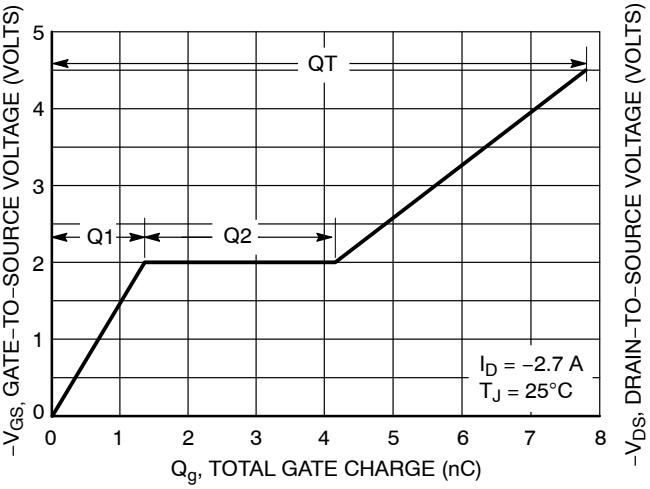


Figure 7. Gate−to−Source and Drain−to−Source Voltage vs. Total Gate Charge

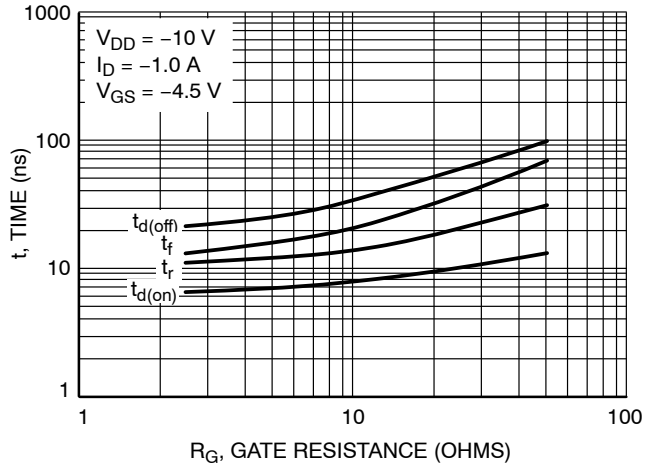


Figure 8. Resistive Switching Time Variation vs. Gate Resistance

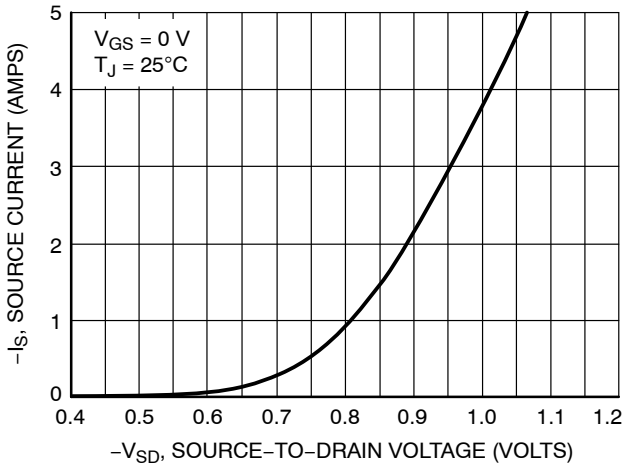


Figure 9. Diode Forward Voltage vs. Current

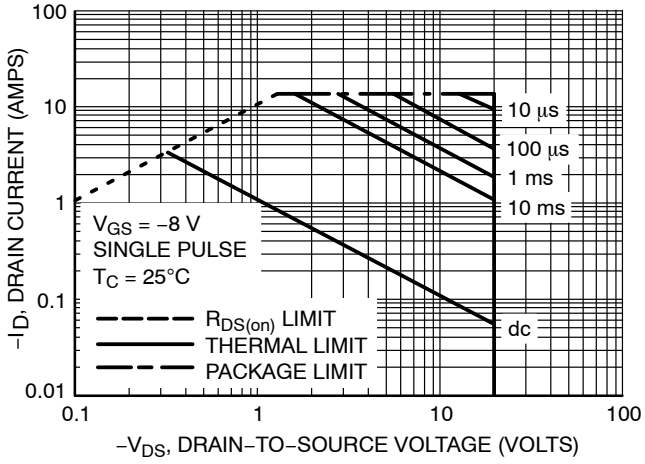
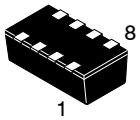


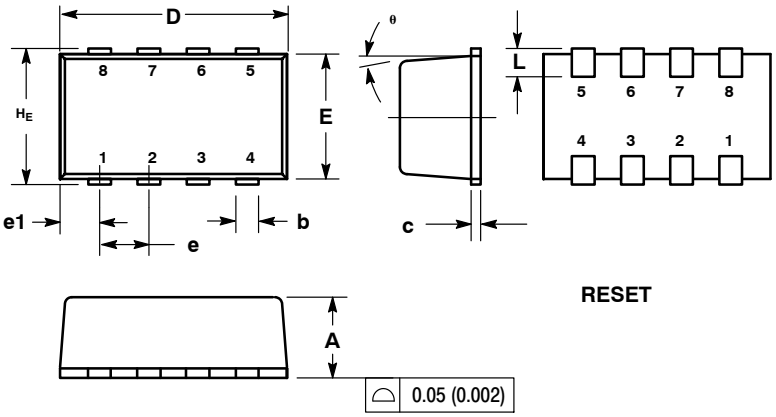
Figure 10. Maximum Rated Forward Biased Safe Operating Area

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

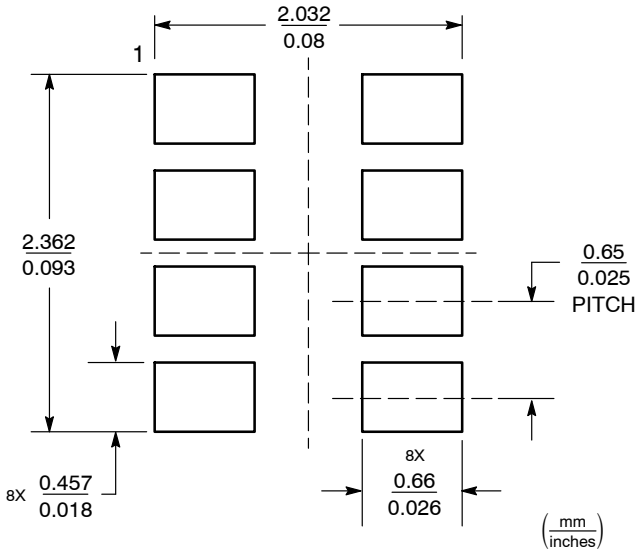
STYLE 3:
PIN 1. ANODE
2. ANODE
3. SOURCE
4. GATE
5. DRAIN
6. DRAIN
7. CATHODE
8. CATHODE

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. Some products may not follow the Generic Marking.

OPTIONAL SOLDERING FOOTPRINTS ON PAGE 2

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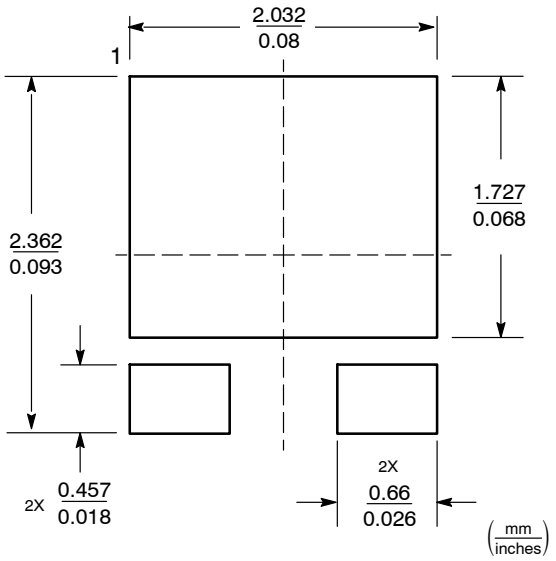
DESCRIPTION:	**ChipFET**		**PAGE 1 OF 2**

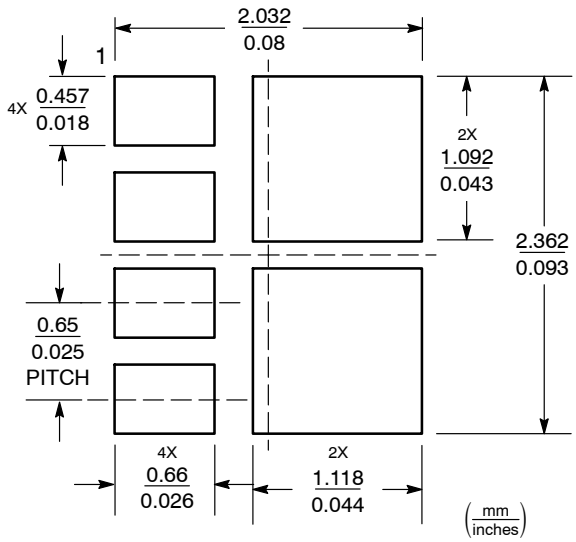
ChipFET™
CASE 1206A−03
ISSUE K

DATE 19 MAY 2009

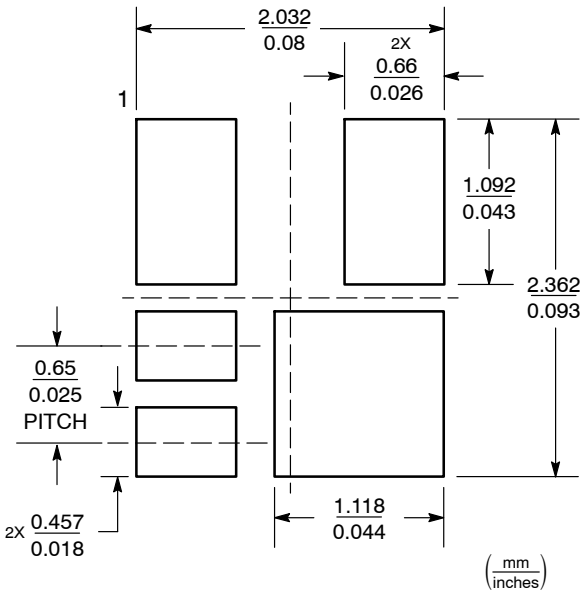
ADDITIONAL SOLDERING FOOTPRINTS*



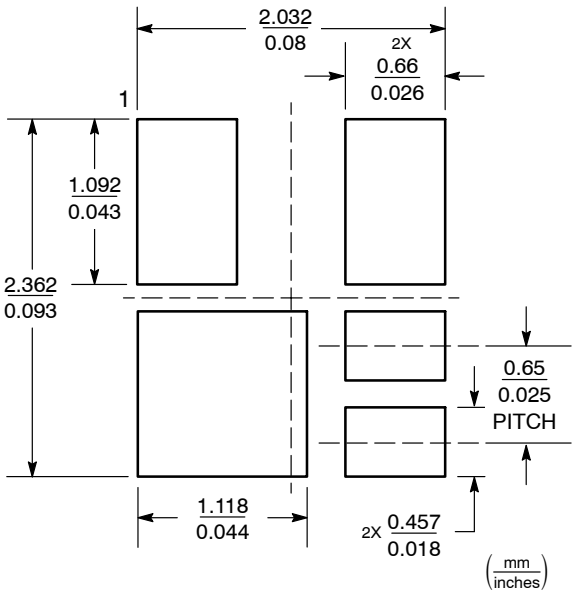
Styles 1 and 4



Style 2



Style 3



Style 5

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

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DESCRIPTION:	**ChipFET**	**PAGE 2 OF 2**

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