

NTHS4101P

MOSFET – Power, P-Channel, ChipFET -20 V, 6.7 A

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

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

| Rating | Symbol | Value | Unit |
|---|------------------------------------|--------------------------|--------------------|
| Drain-to-Source Voltage | V_{DS} | -20 | V_{dc} |
| Gate-to-Source Voltage – Continuous | V_{GS} | ± 8.0 | V_{dc} |
| Drain Current – Continuous – 5 seconds | I_D I_D | -4.8 -6.7 | A |
| Total Power Dissipation Continuous @ $T_A = 25^\circ\text{C}$ (5 sec) @ $T_A = 25^\circ\text{C}$ Continuous @ 85°C (5 sec) @ 85°C | P_D | 1.3 2.5 0.7 1.3 | W |
| Pulsed Drain Current – $t_p = 10 \mu\text{s}$ | I_{DM} | -190 | A |
| Operating Junction and Storage Temperature Range | T_J, T_{STG} | -55 to +150 | $^\circ\text{C}$ |
| Continuous Source Current | I_S | -4.8 | A |
| Thermal Resistance (Note 1) Junction-to-Ambient, 5 sec Junction-to-Ambient, Continuous | $R_{\theta JA}$ $R_{\theta JA}$ | 50 95 | $^\circ\text{C/W}$ |
| Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds | T_L | 260 | $^\circ\text{C}$ |

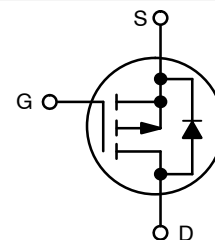
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.



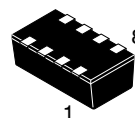
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| $V_{(BR)DS}$ | $R_{DS(on)}$ TYP | I_D MAX |
|--------------|------------------------|-----------|
| -20 V | 21 m Ω @ -4.5 V | -6.7 A |
| | 30 m Ω @ -2.5 V | |
| | 42 m Ω @ -1.8 V | |

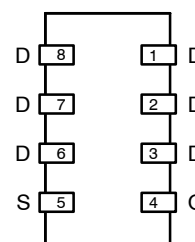


P-Channel MOSFET

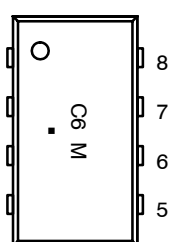


ChipFET
CASE 1206A
STYLE 1

PIN CONNECTIONS



MARKING DIAGRAM



C6 = Specific Device Code
M = Month Code
■ = Pb-Free Package

ORDERING INFORMATION

| Device | Package | Shipping† |
|--------------|-------------------|------------------|
| NTHS4101PT1 | ChipFET | 3000 Tape / Reel |
| NTHS4101PT1G | 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.

NTHS4101P

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

NTHS4101P

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} | -20 | | | 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} = -16 V _{dc} , V _{GS} = 0 V _{dc} V _{DS} = -16 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 = -4.8 A _{dc} V _{GS} = -2.5 V _{dc} , I _D = -4.2 A _{dc} V _{GS} = -1.8 V _{dc} , I _D = -1.0 A _{dc} | | 21 30 42 | 34 40 52 | mΩ |
| Forward Transconductance | g _{FS} | V _{DS} = -5.0 V _{dc} , I _D = -4.8 A _{dc} | | 15 | | S |
| Diode Forward Voltage | V _{SD} | I _S = -4.8 A _{dc} , V _{GS} = 0 V _{dc} | | -0.8 | -1.2 | V |

DYNAMIC CHARACTERISTICS

| | | | | | | |
|----------------------|------------------|---|--|------|--|----|
| Input Capacitance | C _{iss} | V _{DS} = -16 V _{dc} V _{GS} = 0 V f = 1.0 MHz | | 2100 | | pF |
| Output Capacitance | C _{oss} | | | 290 | | |
| Transfer Capacitance | C _{rss} | | | 200 | | |

SWITCHING CHARACTERISTICS (Note 3)

| | | | | | | |
|---------------------|---------------------|--|--|-----|----|----|
| Turn-On Delay Time | t _{d(on)} | V _{DD} = -16 V _{dc} V _{GS} = -4.5 V _{dc} I _D = -4.5 A _{dc} R _G = 2.5 Ω | | 8.0 | | ns |
| Rise Time | t _r | | | 28 | | |
| Turn-Off Delay Time | t _{d(off)} | | | 75 | | |
| Fall Time | t _f | | | 60 | | |
| Gate Charge | Q _g | V _{GS} = -4.5 V _{dc} I _D = -4.5 A _{dc} V _{DS} = -16 V _{dc} (Note 3) | | 25 | 35 | nC |
| | Q _{gs} | | | 4.0 | | |
| | Q _{gd} | | | 7.0 | | |

2. Pulse Test: Pulse Width = 250 μs, Duty Cycle = 2%.

3. Switching characteristics are independent of operating junction temperatures.

TYPICAL PERFORMANCE CURVES ($T_J = 25^\circ\text{C}$ unless otherwise noted)

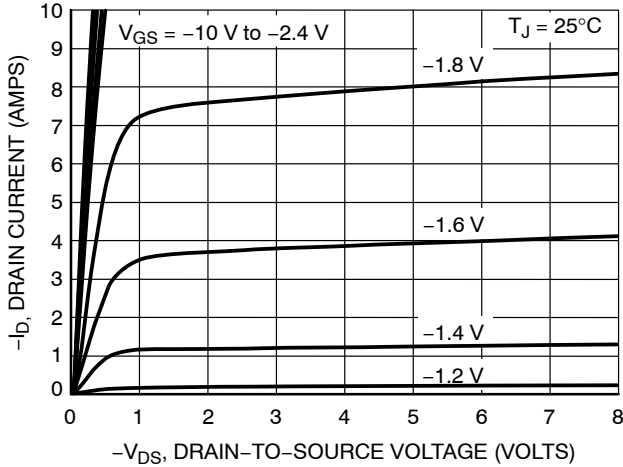


Figure 1. On-Region Characteristics

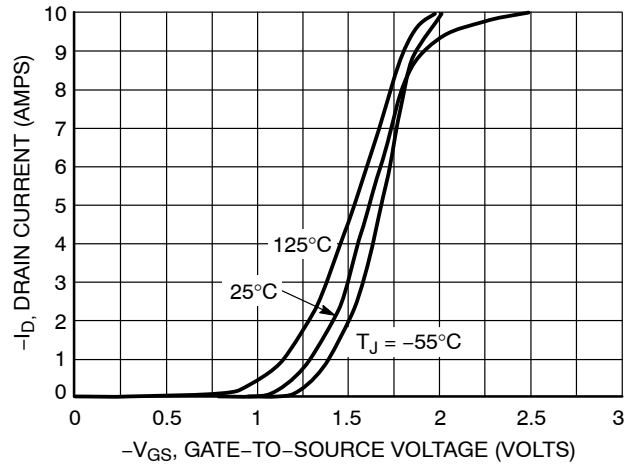


Figure 2. Transfer Characteristics

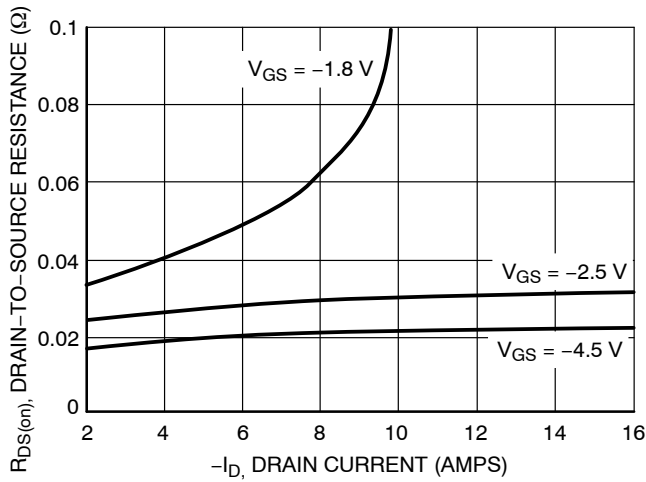


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

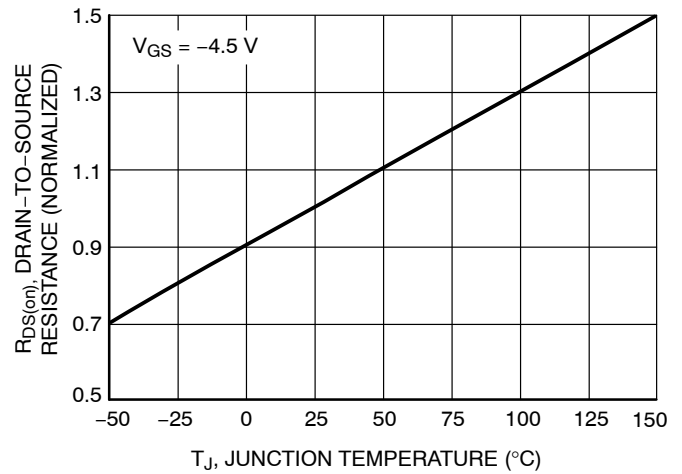


Figure 4. On-Resistance Variation with Temperature

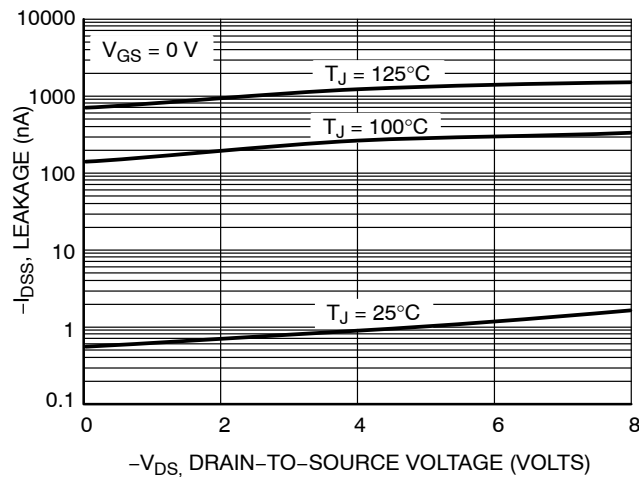


Figure 5. Drain-to-Source Leakage Current vs. Voltage

TYPICAL PERFORMANCE CURVES ($T_J = 25^\circ\text{C}$ unless otherwise noted)

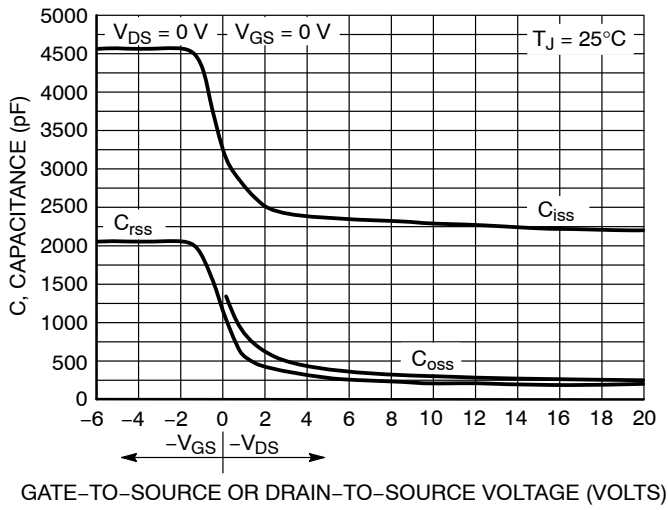


Figure 6. Capacitance Variation

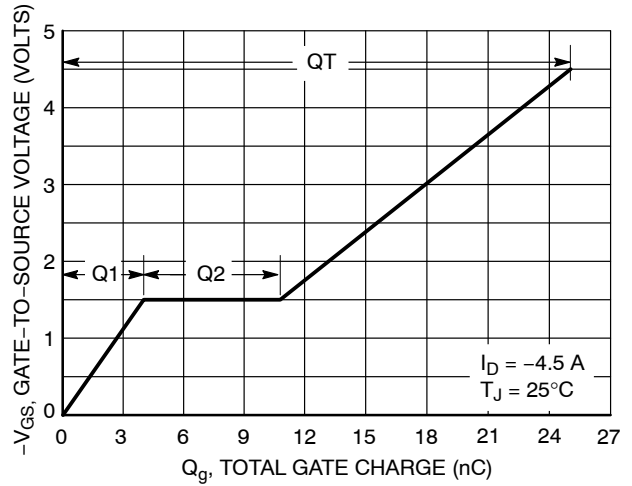


Figure 7. Gate-to-Source and Drain-to-Source Voltage vs. Total Gate Charge

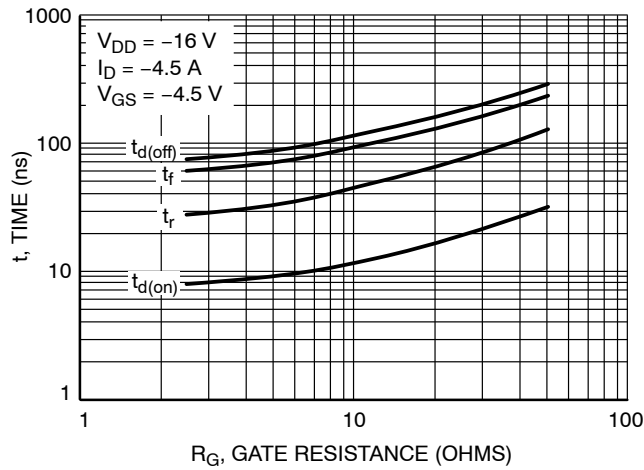


Figure 8. Resistive Switching Time Variation vs. Gate Resistance

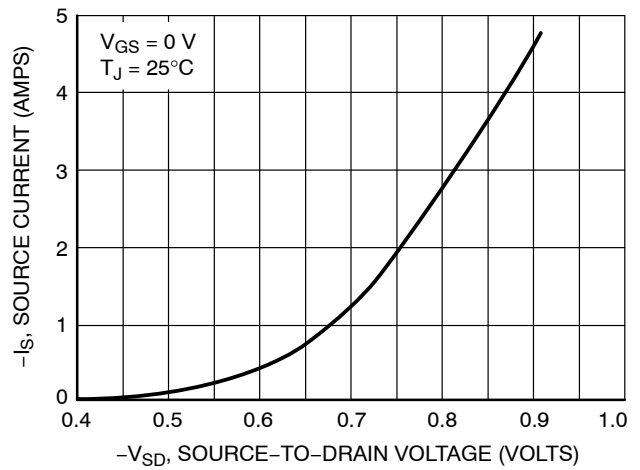


Figure 9. Diode Forward Voltage vs. Current

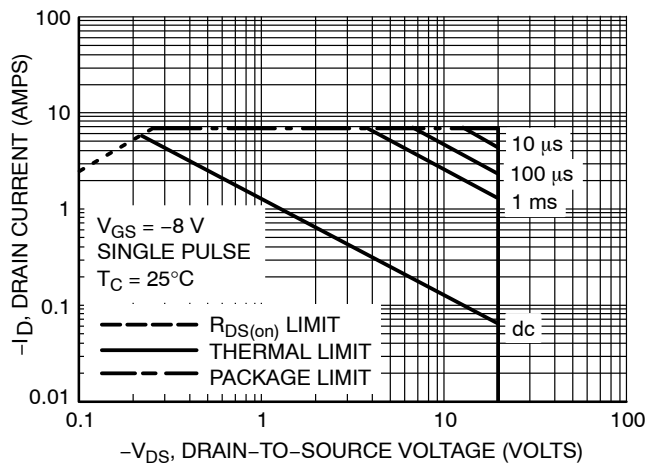
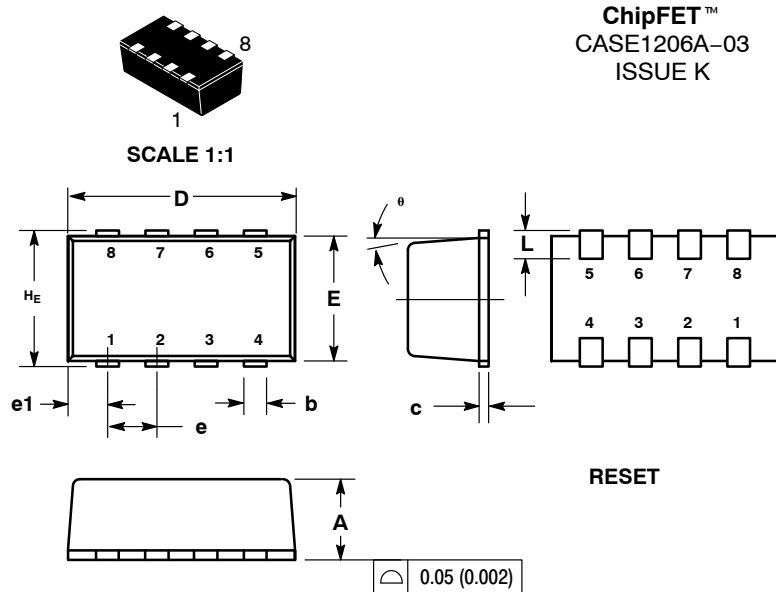


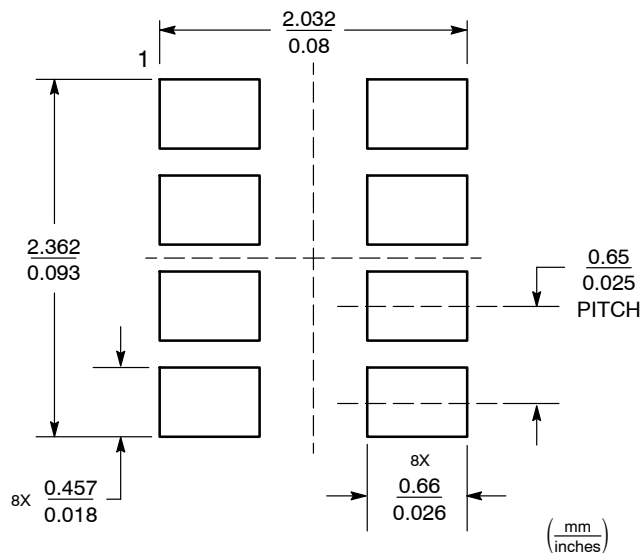
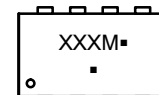
Figure 10. Maximum Rated Forward Biased Safe Operating Area


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

GENERIC MARKING DIAGRAM*


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

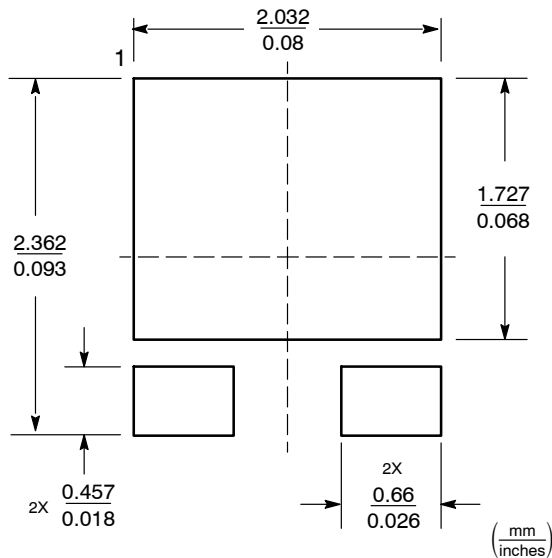
*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

OPTIONAL SOLDERING FOOTPRINTS ON PAGE 2

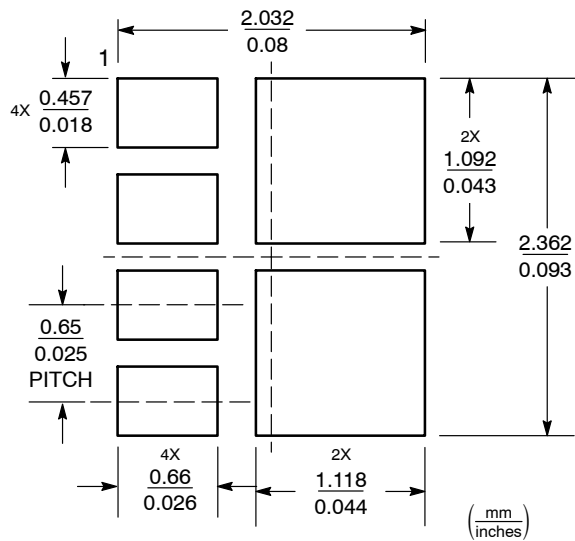
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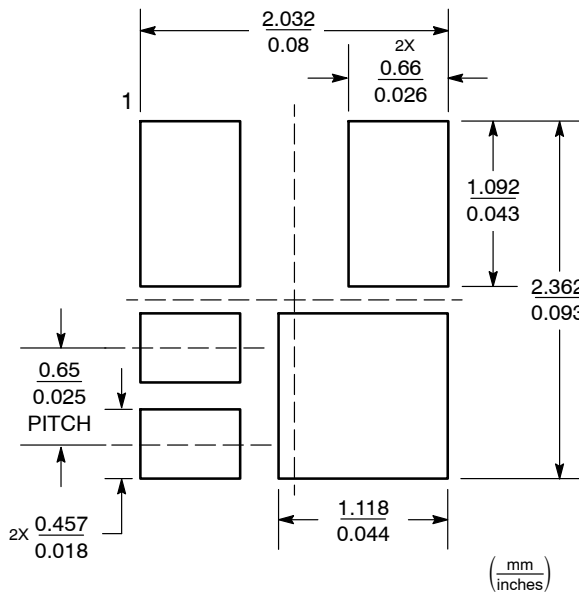
ADDITIONAL SOLDERING FOOTPRINTS*



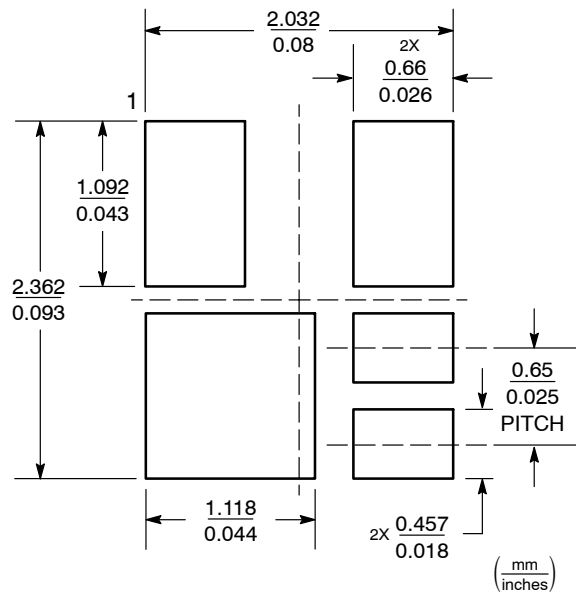
Styles 1 and 4



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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