Single Unbuffered Inverter

MC74HC1GU04

The MC74HC1GU04 is a single unbuffered inverter in tiny footprint packages.

The MC74HC1G0U04 output drive current is 1/2 compared to MC74HC series.

Features

- High Speed: $t_{PD} = 7 \text{ ns (Typ)}$ at $V_{CC} = 5 \text{ V}$
- Low Power Dissipation: $I_{CC} = 1 \mu A$ (Max) at $T_A = 25^{\circ}C$
- High Noise Immunity
- Balanced Propagation Delays (t_{pLH} = t_{pHL})
- Symmetrical Output Impedance ($I_{OH} = I_{OL} = 2 \text{ mA}$)
- Chip Complexity: < 100 FETs
- NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

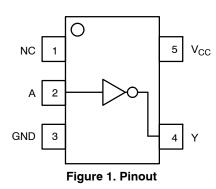




Figure 2. Logic Symbol

| PIN ASSIGNMENT | | | | |
|----------------|-----------------|--|--|--|
| 1 | NC | | | |
| 2 | А | | | |
| 3 | GND | | | |
| 4 | Υ | | | |
| 5 | V _{CC} | | | |



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SC-88A / SOT-353 / SC-70 **DF SUFFIX CASE 419A**



MARKING

DIAGRAMS



TSOP-5 / SOT-23 / SC-59 **DT SUFFIX CASE 483**



XX = Device Code = Date Code* = Pb-Free Package

(Note: Microdot may be in either location) *Date Code orientation and/or position may vary depending upon manufacturing location.





XXX = Specific Device Code

M = Date Code = Pb-Free Package

(Note: Microdot may be in either location)

FUNCTION TABLE

| Input A | Output Y |
|---------|----------|
| L | Н |
| Н | L |

ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section on page 6 of this data sheet.

MAXIMUM RATINGS

| Symbol | Parameter | | Value | Unit |
|-------------------------------------|-------------------------------------------------|------------------------------------------|------------------------------|------|
| V _{CC} | DC Supply Voltage | TSOP-5 SC-88A, SC-74A | -0.5 to +7.0 -0.5 to +6.5 | V |
| V _{IN} | DC Input Voltage | | -0.5 to $V_{CC}+0.5$ | V |
| V _{OUT} | DC Output Voltage | | -0.5 to $V_{CC}+0.5$ | V |
| I _{IK} | DC Input Diode Current | | ±20 | mA |
| lok | DC Output Diode Current | | ±20 | mA |
| I _{OUT} | DC Output Source/Sink Current | | ±12.5 | mA |
| I _{CC} or I _{GND} | DC Supply Current per Supply Pin or Ground Pin | | ±25 | mA |
| T _{STG} | Storage Temperature Range | | −65 to +150 | °C |
| TL | Lead Temperature, 1 mm from Case for 10 Seconds | | 260 | °C |
| TJ | Junction Temperature Under Bias | | +150 | °C |
| $\theta_{\sf JA}$ | Thermal Resistance (Note 1) | SC-88A SC-74A | 377 320 | °C/W |
| P _D | Power Dissipation in Still Air at 85°C | SC-88A SC-74A | 332 390 | mW |
| MSL | Moisture Sensitivity | | Level 1 | |
| F _R | Flammability Rating | Oxygen Index: 28 to 34 | UL 94 V-0 @ 0.125 in | |
| V _{ESD} | ESD Withstand Voltage (Note 2) | Human Body Model Charged Device Model | 2000 1000 | V |
| ILATCHUP | Latchup Performance (Note 3) | TSOP-5 SC-88A, SC-74A | ±500 ±100 | mA |

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.

Measured with minimum pad spacing on an FR4 board, using 10 mm-by-1 inch, 20 ounce copper trace with no air flow per JESD51-7.
 HBM tested to ANSI/ESDA/JEDEC JS-001-2017. CDM tested to JESD22-C101-F. JEDEC recommends that ESD qualification to EIA/JESD22-A115A (Machine Model) be discontinued per JEDEC/JEP172A.

^{3.} Tested to EIA/JESD78 Class II.

RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter | Min | Max | Unit |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|---------------------------|------|
| V _{CC} | DC Supply Voltage | 2.0 | 6.0 | V |
| V _{IN} | DC Input Voltage | 0.0 | V_{CC} | V |
| V _{OUT} | DC Output Voltage | 0.0 | V_{CC} | V |
| T _A | Operating Temperature Range | -55 | +125 | °C |
| t _r , t _f | Input Rise and Fall Time $ \begin{array}{c} \text{TSOP-} \\ \text{V}_{CC} = 2.0 \\ \text{V}_{CC} = 3.0 \\ \text{V}_{CC} = 4.5 \\ \text{V}_{CC} = 6.0 \\ \end{array} $ | V 0 V 0 V 0 | 1000 600 500 400 | ns |
| | Input Rise and Fall Time SC–88A, SC–74 $V_{CC}=2.0\ V\ to\ 2.7$ $V_{CC}=3.0\ V\ to\ 3.6$ $V_{CC}=4.5\ V\ to\ 6.0$ | V 0 V 0 | 20 10 5 | ns/V |

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

DC ELECTRICAL CHARACTERISTICS

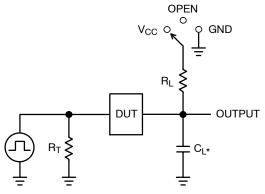
| | | | V _{CC} | Т | A = 25° | С | -40°C ≤ 1 | Γ _A ≤ 85°C | -55°C ≤ T | _A ≤ 125°C | |
|-----------------|------------------------------|---------------------------------------------------------------------------------------|--------------------------|---------------------------|--------------------------|--------------------------|---------------------------|--------------------------|---------------------------|--------------------------|------|
| Symbol | Parameter | Test Conditions | (V) | Min | Тур | Max | Min | Max | Min | Max | Unit |
| V _{IH} | High-Level Input Voltage | | 2.0 3.0 4.5 6.0 | 1.7 2.45 3.6 4.8 | - - - | | 1.7 2.45 3.6 4.8 | - - - - | 1.7 2.45 3.6 4.8 | - - - - | V |
| V _{IL} | Low-Level Input Voltage | | 2.0 3.0 4.5 6.0 | - - - | - - - - | 0.3 0.5 0.9 1.2 | - - - - | 0.3 0.5 0.9 1.2 | - - - - | 0.3 0.5 0.9 1.2 | V |
| V _{OH} | High-Level Output Voltage | $V_{IN} = V_{IH} \text{ or } V_{IL}$ $I_{OH} = -20 \mu A$ | 2.0 3.0 4.5 6.0 | 1.8 2.7 4.0 5.5 | 2.0 3.0 4.5 6.0 | | 1.8 2.7 4.0 5.5 | - - - - | 1.8 2.7 4.0 5.5 | - - - - | V |
| | | $V_{IN} = V_{IH}$ or V_{IL} $I_{OH} = -2$ mA $I_{OH} = -2.6$ mA | 4.5 6.0 | 4.18 5.68 | 4.33 5.76 | 1 1 1 | 4.13 5.63 | | 4.08 5.58 | | |
| V _{OL} | Low-Level Output Voltage | $V_{IN} = V_{IH} \text{ or } V_{IL}$ $I_{OL} = 20 \mu\text{A}$ | 2.0 3.0 4.5 6.0 | - - - | 0.0 0.0 0.0 0.0 | 0.1 0.1 0.1 0.1 | - - - - | 0.1 0.1 0.1 0.1 | - - - - | 0.1 0.1 0.1 0.1 | V |
| | | $V_{IN} = V_{IH}$ or V_{IL} $I_{OL} = 2 \text{ mA}$ $I_{OL} = 2.6 \text{ mA}$ | 4.5 6.0 | - - - | 0.17 0.18 | 0.26 0.26 | - - - | 0.33 0.33 | - - - | 0.40 0.40 | |
| I _{IN} | Input Leakage Current | V _{IN} = 6.0 V or GND | 6.0 | _ | _ | ±0.1 | l | ±1.0 | - | ±1.0 | μА |
| I _{CC} | Quiescent Supply Current | V _{IN} = V _{CC} or GND | 6.0 | - | _ | 1.0 | - | 10 | - | 40 | μА |

AC ELECTRICAL CHARACTERISTICS

| | | | Т | A = 25° | С | -40°C ≤ 7 | Γ _A ≤ 85°C | -55°C ≤ T | ' _A ≤ 125°C | |
|--------------------|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----------------------|-----------------------|------------------|-----------------------|-------------|------------------------|------|
| Symbol | Parameter | Test Conditions | Min | Тур | Max | Min | Max | Min | Max | Unit |
| t _{PLH} , | Propagation Delay, A to Y | $V_{CC} = 5.0 \text{ V}$ $C_L = 15 \text{ pF}$ | - | 3 | 15 | - | 20 | - | 25 | ns |
| ^t PHL | A 10 1 | $\begin{tabular}{lllllllllllllllllllllllllllllllllll$ | | 17 9 7 6.5 | 100 27 20 17 | - - - | 125 35 25 21 | - - - | 155 90 35 26 | |
| t _{TLH} , | Output Transition Time | $V_{CC} = 5.0 \text{ V}$ $C_L = 15 \text{ pF}$ | - | 4 | 10 | - | 15 | - | 20 | ns |
| ^t ⊤HL | Tille | $\begin{tabular}{c} $V_{CC} = 2.0 \ V $ & $C_L = 50 \ pF \\ $V_{CC} = 3.0 \ V $ & $V_{CC} = 4.5 \ V $ \\ $V_{CC} = 6.0 \ V $ & V_{CC | | 25 16 12 10 | 125 35 25 21 | - - - - | 155 45 31 26 | - - - | 200 60 38 32 | |
| C _{IN} | Input Capacitance | | _ | 5 | 10 | _ | 10 | _ | 10 | pF |

| | | Typical @ 25°C, V _{CC} = 5.0 V | |
|----------|----------------------------------------|-----------------------------------------|----|
| C_{PD} | Power Dissipation Capacitance (Note 4) | 10 | pF |

^{4.} C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation: I_{CC(OPR)} = C_{PD} • V_{CC} • f_{in} + I_{CC}. C_{PD} is used to determine the no–load dynamic power consumption; P_D = C_{PD} • V_{CC}² • f_{in} + I_{CC} • V_{CC}.



| Test | Switch Position | C _L , pF | R_L, Ω |
|----------------------------------------------|--------------------|---------------------------------|---------------|
| t _{PLH} / t _{PHL} | Open | See AC Characteristics Table | X |
| t _{TLH} / t _{THL} (Note 5) | Open | Table | Х |
| t _{PLZ} / t _{PZL} | V _{CC} | | 1 k |
| t _{PHZ} / t _{PZH} | GND | | 1 k |

X - Don't Care

* C_L includes probe and jig capacitance R_T is Z_{OUT} of pulse generator (typically 50 W) f = 1 MHz

Figure 3. Test Circuit

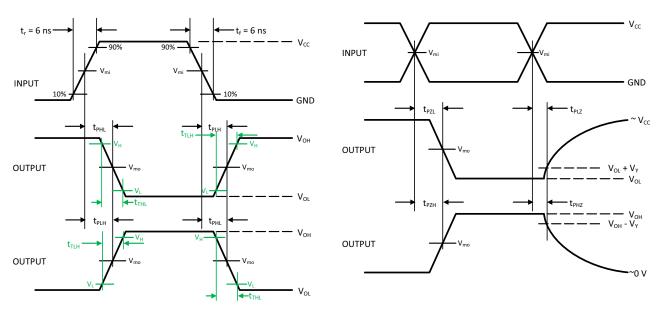


Figure 4. Switching Waveforms

| | | V _{mo} , V | | | | |
|---------------------|--------------------|-------------------------------------|--------------------------------------|------------------------------------------------------------|------------------------------------------------------------|--------------------|
| V _{CC} , V | V_{mi} , V | t _{PLH} , t _{PHL} | $t_{PZL}, t_{PLZ}, t_{PZH}, t_{PHZ}$ | V_L, V | V _H , V | V _Y , V |
| 3.0 to 3.6 | V _{CC} /2 | V _{CC} /2 | V _{CC} /2 | V _{OL} + 0.1 (V _{OH} – V _{OL}) | V _{OL} + 0.9 (V _{OH} – V _{OL}) | 0.3 |
| 4.5 to 5.5 | V _{CC} /2 | V _{CC} /2 | V _{CC} /2 | V _{OL} + 0.1 (V _{OH} – V _{OL}) | V _{OL} + 0.9 (V _{OH} – V _{OL}) | 0.3 |

^{5.} t_{TLH} and t_{THL} are measured from 10% to 90% of ($V_{OH} - V_{OL}$), and 90% to 10% of ($V_{OH} - V_{OL}$), respectively.

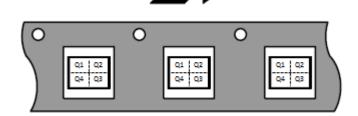
ORDERING INFORMATION

| Device | Packages | Marking | Pin 1 Orientation (See below) | Shipping [†] |
|-------------------|----------|---------|----------------------------------|-----------------------|
| MC74HC1GU04DFT1G | SC-88A | H6 | Q2 | 3000 / Tape & Reel |
| MC74HC1GU04DFT2G | SC-88A | H6 | Q4 | 3000 / Tape & Reel |
| MC74HC1GU04DTT1G | TSOP-5 | H6 | Q4 | 3000 / Tape & Reel |
| MC74HC1GU04DBVT1G | SC-74A | H6 | Q4 | 3000 / Tape & Reel |

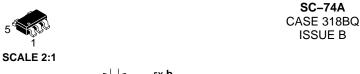
[†]For complete information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

Pin 1 Orientation in Tape and Reel

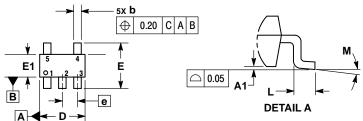
Direction of Feed

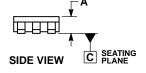


^{*}NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable.

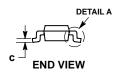


DATE 18 JAN 2018

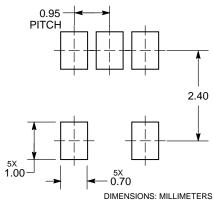




TOP VIEW



RECOMMENDED SOLDERING FOOTPRINT*



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

- NOTES:

 1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.

 2. CONTROLLING DIMENSION: MILLIMETERS.

 3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.

 4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.15 PER SIDE.

| | MILLIMETERS | | | | |
|-----|-------------|------|--|--|--|
| | MILLIMETERS | | | | |
| DIM | MIN | MAX | | | |
| Α | 0.90 | 1.10 | | | |
| A1 | 0.01 | 0.10 | | | |
| b | 0.25 | 0.50 | | | |
| С | 0.10 | 0.26 | | | |
| D | 2.85 | 3.15 | | | |
| E | 2.50 | 3.00 | | | |
| E1 | 1.35 | 1.65 | | | |
| е | 0.95 BSC | | | | |
| L | 0.20 | 0.60 | | | |
| М | 0 ° | 10° | | | |

GENERIC MARKING DIAGRAM*



XXX = Specific Device Code

= Date Code M

= 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.

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| 98AON66279 | G |

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| DEVICION DETERMINENT | | | | | |
|----------------------|-------------------------------------------------------------------------------|-------------|--|--|--|
| ISSUE | REVISION | DATE | | | |
| 0 | RELEASED FOR PRODUCTION. REQ BY I. HYLAND. | 27 JUN 2017 | | | |
| А | CORRECTED MARKING DIAGRAM FROM 6 TO 5-LEAD. REQ BY I. HYLAND. | 20 SEP 2017 | | | |
| В | CORRECTED SOLDERING FOOTPRINT PITCH FROM 3.40MM TO 2.40MM. REQ. BY I. HYLAND. | 18 JAN 2018 | | | |
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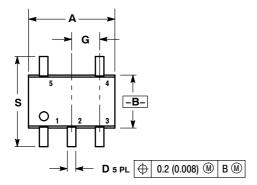


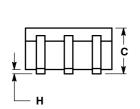


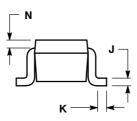
SC-88A (SC-70-5/SOT-353) CASE 419A-02 ISSUE L

DATE 17 JAN 2013

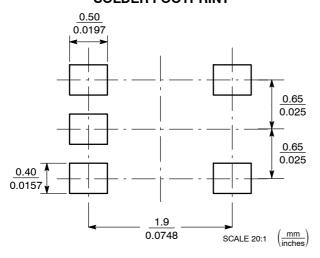
SCALE 2:1







SOLDER FOOTPRINT



- NOTES:
 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
- 419A-01 OBSOLETE. NEW STANDARD 419A-02.
- DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE

| | INCHES | | MILLIN | IETERS |
|-----|-----------|-------|----------|--------|
| DIM | MIN | MAX | MIN | MAX |
| Α | 0.071 | 0.087 | 1.80 | 2.20 |
| В | 0.045 | 0.053 | 1.15 | 1.35 |
| С | 0.031 | 0.043 | 0.80 | 1.10 |
| D | 0.004 | 0.012 | 0.10 | 0.30 |
| G | 0.026 BSC | | 0.65 BSC | |
| Н | | 0.004 | | 0.10 |
| J | 0.004 | 0.010 | 0.10 | 0.25 |
| K | 0.004 | 0.012 | 0.10 | 0.30 |
| N | 0.008 REF | | 0.20 REF | |
| S | 0.079 | 0.087 | 2.00 | 2.20 |

GENERIC MARKING DIAGRAM*



XXX = Specific Device Code

= Date Code

= Pb-Free Package

(Note: Microdot may be in either location)

*This infomration is generic. Please refer to device data sheet for actual part marking.

STYLE 5: PIN 1. CATHODE 2. COMMON ANODE 3. CATHODE 2 4. CATHODE 3

5. CATHODE 4

| STYLE 1: | STYLE 2: | STYLE 3: | STYLE 4: |
|-----------------------|--------------|----------------------------------------------------------------|-----------------|
| PIN 1. BASE | PIN 1. ANODE | PIN 1. ANODE 1 | PIN 1. SOURCE 1 |
| 2. EMITTER | 2. EMITTER | 2. N/C | 2. DRAIN 1/2 |
| 3. BASE | 3. BASE | 3. ANODE 2 | 3. SOURCE 1 |
| 4. COLLECTOR | 4. COLLECTOR | 4. CATHODE 2 | 4. GATE 1 |
| 5. COLLECTOR | 5. CATHODE | 5. CATHODE 1 | 5. GATE 2 |
| STYLE 6: | STYLE 7: | STYLE 8: PIN 1. CATHODE 2. COLLECTOR 3. N/C 4. BASE 5. EMITTER | STYLE 9: |
| PIN 1. EMITTER 2 | PIN 1. BASE | | PIN 1. ANODE |
| 2. BASE 2 | 2. EMITTER | | 2. CATHODE |
| 3. EMITTER 1 | 3. BASE | | 3. ANODE |
| 4. COLLECTOR | 4. COLLECTOR | | 4. ANODE |
| 5. COLLECTOR 2/BASE 1 | 5. COLLECTOR | | 5. ANODE |

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| 08ASB42084 | R |

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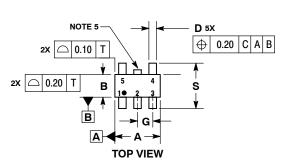
| ISSUE | REVISION | DATE |
|-------|--------------------------------------------------------------------------------------------------------------|-------------|
| С | CONVERTED FROM PAPER DOCUMENT TO ELECTRONIC. REQ. BY N LAFEB-RE. | 20 JUN 1998 |
| D | CONVERTED FROM MOTOROLA TO ON SEMICONDUCTOR. ADDED STYLE 5. REQ. BY E. KIM. | 24 JUL 2000 |
| Е | ADDED STYLES 6 & 7. REQ. BY S. BACHMAN. | 03 AUG 2000 |
| F | DELETED DIMENSION V, WAS 0.3-0.44MM/0.012-0.016IN. REQ. BY G. KWONG. | 14 JUN 2001 |
| G | ADDED STYLE 8, REQ. BY S. CHANG; ADDED STYLE 9, REQ. BY S. BACHMAN; ADDED NOTE 4, REQ. BY S. RIGGS | 25 JUN 2003 |
| Н | CHANGED STYLE 6. REQ. BY C. LIM | 28 APR 2005 |
| J | CHANGED TITLE DESCRIPTION. REQ. BY B. LOFTS. | 31 AUG 2005 |
| K | CORRECTED TITLE AND DESCRIPTION TO SC-88A (SC-70-5/SOT-353). CORRECTED MARKING DIAGRAM. REQ. BY D. TRUHITTE. | 13 JUL 2010 |
| L | ADDED SOLDER FOOTPRINT. REQ. BY I. MARIANO. | 17 JAN 2013 |
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TSOP-5 **CASE 483 ISSUE N**

DATE 12 AUG 2020









NOTES:

- DIMENSIONING AND TOLERANCING PER ASME
- CONTROLLING DIMENSION: MILLIMETERS.
 MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH
 THICKNESS. MINIMUM LEAD THICKNESS IS THE
 MINIMUM THICKNESS OF BASE MATERIAL.
- DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.15 PER SIDE. DIMENSION A. OPTIONAL CONSTRUCTION: AN ADDITIONAL
- TRIMMED LEAD IS ALLOWED IN THIS LOCATION. TRIMMED LEAD NOT TO EXTEND MORE THAN 0.2 FROM BODY.

| | MILLIMETERS | | |
|-----|-------------|------|--|
| DIM | MIN | MAX | |
| Α | 2.85 | 3.15 | |
| В | 1.35 1.65 | | |
| C | 0.90 | 1.10 | |
| D | 0.25 | 0.50 | |
| G | 0.95 BSC | | |
| Н | 0.01 | 0.10 | |
| J | 0.10 | 0.26 | |
| K | 0.20 | 0.60 | |
| М | 0 ° | 10 ° | |
| S | 2.50 | 3.00 | |

SOLDERING FOOTPRINT*



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

GENERIC MARKING DIAGRAM*





XXX = Specific Device Code XXX = Specific Device Code

= Assembly Location = Date Code

= Year = Pb-Free Package

= Work Week W

= 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.

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