

# MC74HC1G04

## Single Inverter

The MC74HC1G04 is a high speed CMOS inverter fabricated with silicon gate CMOS technology.

The internal circuit is composed of multiple stages, including a buffer output which provides high noise immunity and stable output.

The MC74HC1G04 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:  $I_{CC} = 1 \mu\text{A}$  (Max) at  $T_A = 25^\circ\text{C}$
- 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

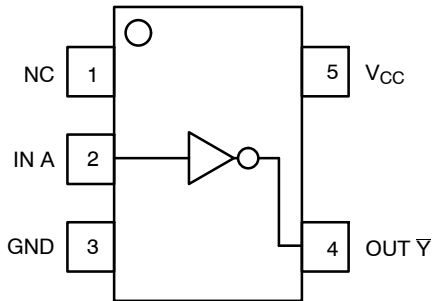


Figure 1. Pinout

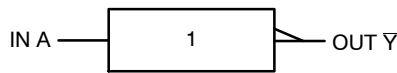


Figure 2. Logic Symbol

PIN ASSIGNMENT	
1	NC
2	IN A
3	GND
4	OUT $\bar{Y}$
5	$V_{CC}$

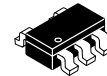


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SC-88A  
DF SUFFIX  
CASE 419A



TSOP-5  
DT SUFFIX  
CASE 483

XX = Device Code  
M = Date Code\*  
▪ = Pb-Free Package

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

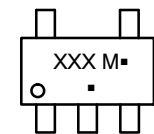
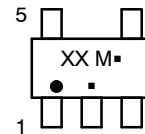
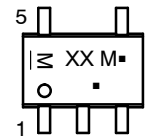


SC-74A  
DBV SUFFIX  
CASE 318BQ

XXX = Specific Device Code  
M = Date Code  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

### MARKING DIAGRAMS



### FUNCTION TABLE

Input A	Output $\bar{Y}$
L	H
H	L

### ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section on page 5 of this data sheet.

# MC74HC1G04

## MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
$V_{CC}$	DC Supply Voltage SC-88A (NLV), 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	$\pm 20$	mA
$I_{OK}$	DC Output Diode Current	$\pm 20$	mA
$I_{OUT}$	DC Output Source/Sink Current	$\pm 12.5$	mA
$I_{CC}$ or $I_{GND}$	DC Supply Current per Supply Pin or Ground Pin	$\pm 25$	mA
$T_{STG}$	Storage Temperature Range	-65 to +150	°C
$T_L$	Lead Temperature, 1 mm from Case for 10 Seconds	260	°C
$T_J$	Junction Temperature Under Bias	+150	°C
$\theta_{JA}$	Thermal Resistance (Note 1) SC70-5/SC-88A/SOT-353 SOT23-5/TSOP-5/SC59-5 SC-74A	659 555 555	°C/W
$P_D$	Power Dissipation in Still Air at 85°C SC70-5/SC-88A/SOT-353 SOT23-5/TSOP-5/SC59-5 SC-74A	190 225 225	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
$I_{LATCHUP}$	Latchup Performance (Note 3) SC-88A (NLV), SOT-23 SC-88A, SC-74A	$\pm 500$ $\pm 100$	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.

1. Measured with minimum pad spacing on an FR4 board, using 10 mm-by-1 inch, 20 ounce copper trace with no air flow.
2. 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 SC-88A (NLV), TSOP-5 $V_{CC} = 2.0$ V $V_{CC} = 3.0$ V $V_{CC} = 4.5$ V $V_{CC} = 6.0$ V	0 0 0 0	1000 600 500 400	ns/V
	Input Rise and Fall Time SC-88A, SC-74A $V_{CC} = 1.65$ V to 1.95 V $V_{CC} = 2.3$ V to 2.7 V $V_{CC} = 3.0$ V to 3.6 V $V_{CC} = 4.5$ V to 6.0 V	0 0 0 0	20 20 10 5	

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.

# MC74HC1G04

## DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	V <sub>CC</sub> (V)	T <sub>A</sub> = 25°C			-40°C ≤ T <sub>A</sub> ≤ 85°C		-55°C ≤ T <sub>A</sub> ≤ 125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
V <sub>IH</sub>	High-Level Input Voltage		2.0	1.5	-	-	1.5	-	1.5	-	V
			3.0	2.1	-	-	2.1	-	2.1	-	
			4.5	3.15	-	-	3.15	-	3.15	-	
			6.0	4.20	-	-	4.20	-	4.20	-	
V <sub>IL</sub>	Low-Level Input Voltage		2.0	-	-	0.5	-	0.5	-	0.5	V
			3.0	-	-	0.9	-	0.9	-	0.9	
			4.5	-	-	1.35	-	1.35	-	1.35	
			6.0	-	-	1.80	-	1.80	-	1.80	
V <sub>OH</sub>	High-Level Output Voltage	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> I <sub>OH</sub> = -20 μA	2.0	1.9	2.0	-	1.9	-	1.9	-	V
			3.0	2.9	3.0	-	2.9	-	2.9	-	
			4.5	4.4	4.5	-	4.4	-	4.4	-	
			6.0	5.9	6.0	-	5.9	-	5.9	-	
		V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> I <sub>OH</sub> = -2 mA I <sub>OH</sub> = -2.6 mA	4.5	4.18	4.31	-	4.13	-	4.08	-	
			6.0	5.68	5.80	-	5.63	-	5.58	-	
V <sub>OL</sub>	Low-Level Output Voltage	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> I <sub>OL</sub> = 20 μA	2.0	-	0.0	0.1	-	0.1	-	0.1	V
			3.0	-	0.0	0.1	-	0.1	-	0.1	
			4.5	-	0.0	0.1	-	0.1	-	0.1	
			6.0	-	0.0	0.1	-	0.1	-	0.1	
		V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> I <sub>OL</sub> = 2 mA I <sub>OL</sub> = 2.6 mA	4.5	-	0.17	0.26	-	0.33	-	0.40	
			6.0	-	0.18	0.26	-	0.33	-	0.40	
I <sub>IN</sub>	Input Leakage Current	V <sub>IN</sub> = 6.0 V or GND	6.0	-	-	±0.1*	-	±1.0	-	±1.0	μA
I <sub>CC</sub>	Quiescent Supply Current	V <sub>IN</sub> = V <sub>CC</sub> or GND	6.0	-	-	1.0	-	10	-	40	μA

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

\*Guaranteed by design.

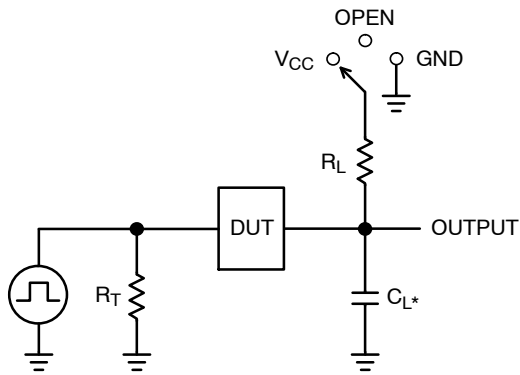
## AC ELECTRICAL CHARACTERISTICS (Input t<sub>r</sub> = t<sub>f</sub> = 6.0 ns)

Symbol	Parameter	Test Conditions	T <sub>A</sub> = 25°C			-40°C ≤ T <sub>A</sub> ≤ 85°C		-55°C ≤ T <sub>A</sub> ≤ 125°C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
t <sub>PLH</sub> , t <sub>PHL</sub>	Propagation Delay, Input A or B to Y	V <sub>CC</sub> = 5.0 V C <sub>L</sub> = 15 pF	-	3.5	15	-	20	-	25	ns
		V <sub>CC</sub> = 2.0 V C <sub>L</sub> = 50 pF	-	20	100	-	125	-	155	
		V <sub>CC</sub> = 3.0 V	-	11	27	-	35	-	90	
		V <sub>CC</sub> = 4.5 V	-	8	20	-	25	-	35	
		V <sub>CC</sub> = 6.0 V	-	7	17	-	21	-	26	
t <sub>TLH</sub> , t <sub>THL</sub>	Output Transition Time	V <sub>CC</sub> = 5.0 V C <sub>L</sub> = 15 pF	-	3	10	-	15	-	20	ns
		V <sub>CC</sub> = 2.0 V C <sub>L</sub> = 50 pF	-	25	125	-	155	-	200	
		V <sub>CC</sub> = 3.0 V	-	16	35	-	45	-	60	
		V <sub>CC</sub> = 4.5 V	-	11	25	-	31	-	38	
		V <sub>CC</sub> = 6.0 V	-	9	21	-	26	-	32	
C <sub>IN</sub>	Input Capacitance		-	5	10	-	10	-	10	pF

C <sub>PD</sub>	Power Dissipation Capacitance (Note 4)	Typical @ 25°C, V <sub>CC</sub> = 5.0 V		pF
		10		

4. C<sub>PD</sub> 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<sub>CC(OPR)</sub> = C<sub>PD</sub> • V<sub>CC</sub> • f<sub>in</sub> + I<sub>CC</sub>. C<sub>PD</sub> is used to determine the no-load dynamic power consumption; P<sub>D</sub> = C<sub>PD</sub> • V<sub>CC</sub><sup>2</sup> • f<sub>in</sub> + I<sub>CC</sub> • V<sub>CC</sub>.

# MC74HC1G04

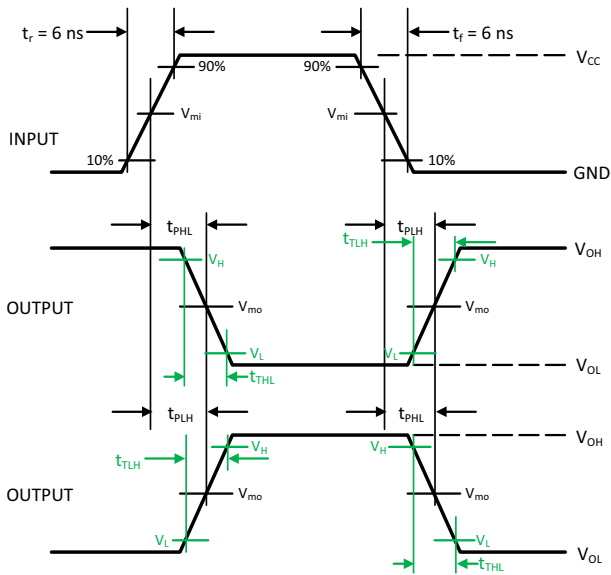


\* $C_L$  includes probe and jig capacitance  
 $R_T$  is  $Z_{OUT}$  of pulse generator (typically 50  $\Omega$ )  
 $f = 1$  MHz

**Figure 3. Test Circuit**

Test	Switch Position	$C_L$ , pF	$R_L$ , $\Omega$
$t_{PLH} / t_{PHL}$	Open	See AC Characteristics Table	X
$t_{TLH} / t_{THL}$ (Note 5)	Open		X
$t_{PLZ} / t_{PZL}$	$V_{CC}$		1 k
$t_{PHZ} / t_{PZH}$	GND		1 k

X - Don't Care



**Figure 4. Switching Waveforms**

$V_{CC}$ , V	$V_{mi}$ , V	$V_{mo}$ , V		$V_L$ , V	$V_H$ , V	$V_Y$ , V
		$t_{PLH}$ , $t_{PHL}$	$t_{PZL}$ , $t_{PLZ}$ , $t_{PZH}$ , $t_{PHZ}$			
3.0 to 3.6	$V_{CC}/2$	$(V_{OH} - V_{OL})/2$	$V_{CC}/2$	$V_{OL} + 0.1 (V_{OH} - V_{OL})$	$V_{OL} + 0.9 (V_{OH} - V_{OL})$	0.3
4.5 to 5.5	$V_{CC}/2$	$(V_{OH} - V_{OL})/2$	$V_{CC}/2$	$V_{OL} + 0.1 (V_{OH} - V_{OL})$	$V_{OL} + 0.9 (V_{OH} - V_{OL})$	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.

# MC74HC1G04

## ORDERING INFORMATION

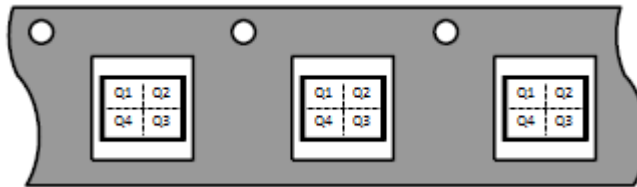
Device	Packages	Specific Device Code	Pin 1 Orientation (See below)	Shipping <sup>†</sup>
MC74HC1G04DFT1G	SC-88A	H5	Q2	3000 / Tape & Reel
NLVHC1G04DFT1G*	SC-88A	H5	Q2	3000 / Tape & Reel
MC74HC1G04DFT2G	SC-88A	H5	Q4	3000 / Tape & Reel
NLVHC1G04DFT2G*	SC-88A	H5	Q4	3000 / Tape & Reel
MC74HC1G04DTT1G	TSOP-5	H5	Q4	3000 / Tape & Reel
MC74HC1G04DBVT1G (In Development)	SC-74A	TBD	Q4	3000 / Tape & Reel

<sup>†</sup>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.

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

### Pin 1 Orientation in Tape and Reel

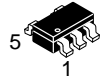
Direction of Feed



# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

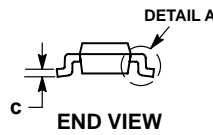
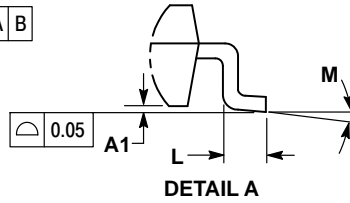
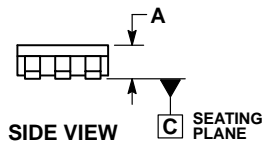
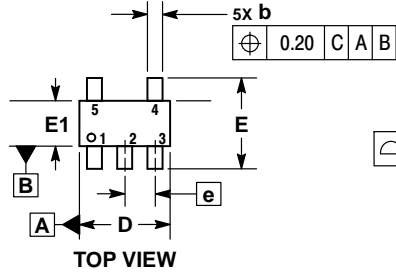
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SCALE 2:1

### SC-74A CASE 318BQ ISSUE B

DATE 18 JAN 2018

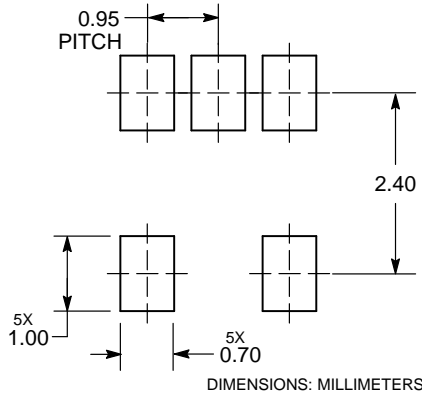


NOTES:

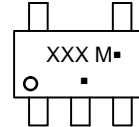
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.15 PER SIDE.

DIM	MILLIMETERS	
	MIN	MAX
A	0.90	1.10
A1	0.01	0.10
b	0.25	0.50
c	0.10	0.26
D	2.85	3.15
E	2.50	3.00
E1	1.35	1.65
e	0.95 BSC	
L	0.20	0.60
M	0°	10°

#### RECOMMENDED SOLDERING FOOTPRINT\*



#### GENERIC MARKING DIAGRAM\*



- XXX = Specific Device Code
- M = Date 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.

\*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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STATUS:	ON SEMICONDUCTOR STANDARD	
NEW STANDARD:		
DESCRIPTION:	SC-74A	PAGE 1 OF 2



ISSUE	REVISION	DATE
O	RELEASED FOR PRODUCTION. REQ BY I. HYLAND.	27 JUN 2017
A	CORRECTED MARKING DIAGRAM FROM 6 TO 5-LEAD. REQ BY I. HYLAND.	20 SEP 2017
B	CORRECTED SOLDERING FOOTPRINT PITCH FROM 3.40MM TO 2.40MM. REQ. BY I. HYLAND.	18 JAN 2018

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# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

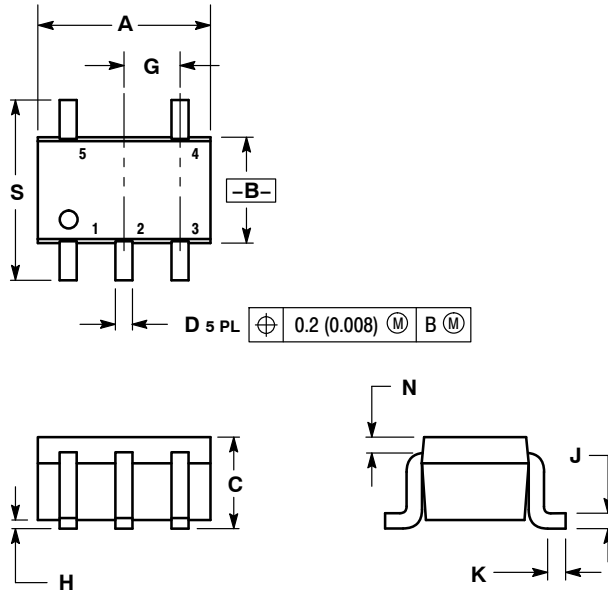
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### SC-88A (SC-70-5/SOT-353) CASE 419A-02 ISSUE L

SCALE 2:1

DATE 17 JAN 2013

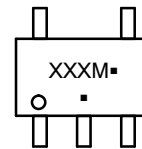


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419A-01 OBSOLETE. NEW STANDARD 419A-02.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.071	0.087	1.80	2.20
B	0.045	0.053	1.15	1.35
C	0.031	0.043	0.80	1.10
D	0.004	0.012	0.10	0.30
G	0.026 BSC		0.65 BSC	
H	---	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\*

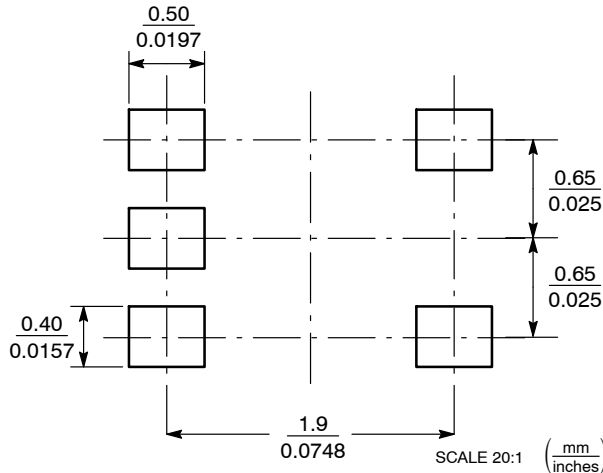


- XXX = Specific Device Code
- M = Date Code
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(Note: Microdot may be in either location)

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

#### SOLDER FOOTPRINT



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

STYLE 2:  
PIN 1. ANODE  
2. EMITTER  
3. BASE  
4. COLLECTOR  
5. CATHODE

STYLE 3:  
PIN 1. ANODE 1  
2. N/C  
3. ANODE 2  
4. CATHODE 2  
5. CATHODE 1

STYLE 4:  
PIN 1. SOURCE 1  
2. DRAIN 1/2  
3. SOURCE 1  
4. GATE 1  
5. GATE 2

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

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

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

STYLE 8:  
PIN 1. CATHODE  
2. COLLECTOR  
3. N/C  
4. BASE  
5. EMITTER

STYLE 9:  
PIN 1. ANODE  
2. CATHODE  
3. ANODE  
4. ANODE  
5. ANODE

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<b>STATUS:</b>	<b>ON SEMICONDUCTOR STANDARD</b>	
<b>NEW STANDARD:</b>		
<b>DESCRIPTION:</b>	<b>SC-88A (SC-70-5/SOT-353)</b>	<b>PAGE 1 OF 2</b>





ISSUE	REVISION	DATE
C	CONVERTED FROM PAPER DOCUMENT TO ELECTRONIC. REQ. BY N LAFEBRE.	20 JUN 1998
D	CONVERTED FROM MOTOROLA TO ON SEMICONDUCTOR. ADDED STYLE 5. REQ. BY E. KIM.	24 JUL 2000
E	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
H	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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# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

ON Semiconductor®



SCALE 2:1

## TSOP-5 CASE 483 ISSUE N

DATE 12 AUG 2020



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. DIMENSION A.
5. OPTIONAL CONSTRUCTION: AN ADDITIONAL TRIMMED LEAD IS ALLOWED IN THIS LOCATION. TRIMMED LEAD NOT TO EXTEND MORE THAN 0.2 FROM BODY.

DIM	MILLIMETERS	
	MIN	MAX
A	2.85	3.15
B	1.35	1.65
C	0.90	1.10
D	0.25	0.50
G	0.95 BSC	
H	0.01	0.10
J	0.10	0.26
K	0.20	0.60
M	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  
 A = Assembly Location        M = Date Code  
 Y = Year                            ▪ = Pb-Free Package  
 W = Work Week  
 ▪ = 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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