

8-Stage Shift/Store Register with Three-State Outputs

MC14094B

The MC14094B combines an 8-stage shift register with a data latch for each stage and a 3-state output from each latch.

Data is shifted on the positive clock transition and is shifted from the seventh stage to two serial outputs. The Q_S output data is for use in high-speed cascaded systems. The Q_S output data is shifted on the following negative clock transition for use in low-speed cascaded systems.

Data from each stage of the shift register is latched on the negative transition of the strobe input. Data propagates through the latch while strobe is high.

Outputs of the eight data latches are controlled by 3-state buffers which are placed in the high-impedance state by a logic Low on Output Enable.

Features

- 3-State Outputs
- Capable of Driving Two Low-Power TTL Loads or One Low-Power Schottky TTL Load Over the Rated Temperature Range
- Input Diode Protection
- Data Latch
- Dual Outputs for Data Out on Both Positive and Negative Clock Transitions
- Useful for Serial-to-Parallel Data Conversion
- Pin-for-Pin Compatible with CD4094B
- 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 and are RoHS Compliant

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SOIC-16 D SUFFIX CASE 751B



MARKING DIAGRAMS





SOIC-16

A = Assembly Location

WL, L = Wafer Lot YY, Y = Year WW, W = Work Week G or ■ = Pb-Free Indicator

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

MAXIMUM RATINGS (Voltages Referenced to V_{SS})

Symbol	Parameter	Value	Unit
V _{DD}	DC Supply Voltage Range	-0.5 to +18.0	V
V _{in} , V _{out}	Input or Output Voltage Range (DC or Transient)	-0.5 to V _{DD} + 0.5	V
I _{in} , I _{out}	Input or Output Current (DC or Transient) per Pin	±10	mA
P _D	Power Dissipation, per Package (Note 1)	500	mW
T _A	Ambient Temperature Range	-55 to +125	°C
T _{stg}	Storage Temperature Range	-65 to +150	°C
TL	Lead Temperature (8–Second Soldering)	260	°C

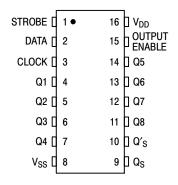
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high–impedance circuit. For proper operation, V_{in} and V_{out} should be constrained to the range $V_{SS} \le (V_{in} \text{ or } V_{out}) \le V_{DD}$.

Unused inputs must always be tied to an appropriate logic voltage level (e.g., either VSS or VDD). Unused outputs must be left open.

^{1.} Temperature Derating: "D/DW" Packages: -7.0 mW/°C From 65°C To 125°C

PIN ASSIGNMENT



TRUTH TABLE

	Output			Parallel Outputs		Serial C	Outputs
Clock	Enable	Strobe	Data	Q1	Q _N	Q _S *	Q′s
	0	Х	Х	Z	Z	Q7	No Chg.
~	0	Х	Х	Z	Z	No Chg.	Q7
	1	0	Х	No Chg.	No Chg.	Q7	No Chg.
	1	1	0	0	Q _N -1	Q7	No Chg.
	1	1	1	1	Q _N -1	Q7	No Chg.
~	1	1	1	No Chg.	No Chg.	No Chg.	Q7

Z = High Impedance X = Don't Care

ORDERING INFORMATION

Device	Package	Shipping [†]
MC14094BDG	SOIC-16 (Pb-Free)	48 Units / Rail
MC14094BDR2G	SOIC-16 (Pb-Free)	2500 Units / Tape & Reel
NLV14094BDR2G*	SOIC-16 (Pb-Free)	2500 Units / Tape & Reel
MC14094BDTR2G	TSSOP-16 (Pb-Free)	2500 Units / Tape & Reel
NLV14094BDTR2G*	TSSOP-16 (Pb-Free)	2500 Units / 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.

^{*} At the positive clock edge, information in the 7th shift register stage is transferred to Q8 and Q_S.

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

ELECTRICAL CHARACTERISTICS (Voltages Referenced to V_{SS})

				-55	5° C		25°C		125	5°C	
Characteristic		Symbol	V _{DD} Vdc	Min	Max	Min	Typ (Note 2)	Max	Min	Max	Unit
Output Voltage V _{in} = V _{DD} or 0	"0" Level	V _{OL}	5.0 10 15	- - -	0.05 0.05 0.05	- - -	0 0 0	0.05 0.05 0.05	- - -	0.05 0.05 0.05	Vdc
V _{in} = 0 or V _{DD}	"1" Level	V _{OH}	5.0 10 15	4.95 9.95 14.95	- - -	4.95 9.95 14.95	5.0 10 15	- - -	4.95 9.95 14.95	- - -	Vdc
Input Voltage (V _O = 4.5 or 0.5 Vdc) (V _O = 9.0 or 1.0 Vdc) (V _O = 13.5 or 1.5 Vdc)	"0" Level	V _{IL}	5.0 10 15	- - -	1.5 3.0 4.0	- - -	2.25 4.50 6.75	1.5 3.0 4.0	- - -	1.5 3.0 4.0	Vdc
$(V_O = 0.5 \text{ or } 4.5 \text{ Vdc})$ $(V_O = 1.0 \text{ or } 9.0 \text{ Vdc})$ $(V_O = 1.5 \text{ or } 13.5 \text{ Vdc})$	"1" Level	V _{IH}	5.0 10 15	3.5 7.0 11		3.5 7.0 11	2.75 5.50 8.25	- - -	3.5 7.0 11	- - -	Vdc
Output Drive Current $ (V_{OH} = 2.5 \text{ Vdc}) $ $ (V_{OH} = 4.6 \text{ Vdc}) $ $ (V_{OH} = 9.5 \text{ Vdc}) $ $ (V_{OH} = 13.5 \text{ Vdc}) $	Source	ІОН	5.0 5.0 10 15	-3.0 -0.64 -1.6 -4.2	- - -	-2.4 -0.51 -1.3 -3.4	-4.2 -0.88 -2.25 -8.8	- - -	-1.7 -0.36 -0.9 -2.4	- - -	mAdc
(V _{OL} = 0.4 Vdc) (V _{OL} = 0.5 Vdc) (V _{OL} = 1.5 Vdc)	Sink	I _{OL}	5.0 10 15	0.64 1.6 4.2	- - -	0.51 1.3 3.4	0.88 2.25 8.8	- - -	0.36 0.9 2.4	- - -	mAdc
Input Current		I _{in}	15	-	±0.1	-	±0.00001	±0.1	-	±1.0	μAdc
Input Capacitance (V _{in} = 0)		C _{in}	-	-	-	-	5.0	7.5	-	-	pF
Quiescent Current (Per Package)		I _{DD}	5.0 10 15	- - -	5.0 10 20	- - -	0.005 0.010 0.015	5.0 10 20	- - -	150 300 600	μAdc
Total Supply Current (Notes (Dynamic plus Quiescer Per Package) (C _L = 50 pF on all outpu buffers switching)	nt,	lτ	5.0 10 15			$I_T = ($	I.1 μΑ/kHz) f 14 μΑ/kHz) f 40 μΑ/kHz) f	+ I _{DD}			μAdc
3-State Output Leakage Co	urrent	I _{TL}	15	_	±0.1	_	±0.0001	±0.1	-	±3.0	μΑ

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.

2. Data labelled "Typ" is not to be used for design purposes but is intended as an indication of the IC's potential performance.

- The formulas given are for the typical characteristics only at 25°C.
 To calculate total supply current at loads other than 50 pF:

$$I_T(C_L) = I_T(50 \text{ pF}) + (C_L - 50) \text{ Vfk}$$

where: I_T is in μA (per package), C_L in pF, $V = (V_{DD} - V_{SS})$ in volts, f in kHz is input frequency, and k = 0.001.

SWITCHING CHARACTERISTICS (Note 5) ($C_L = 50 \text{ pF}, T_A = 25^{\circ}\text{C}$)

Characteristic	Symbol	V _{DD} Vdc	Min	Typ (Note 6)	Max	Unit
Output Rise and Fall Time $t_{TLH}, t_{THL} = (1.35 \text{ ns/pF}) \text{ C}_{L} + 33 \text{ ns}$ $t_{TLH}, t_{THL} = (0.6 \text{ ns/pF}) \text{ C}_{L} + 20 \text{ ns}$ $t_{TLH}, t_{THL} = (0.4 \text{ ns/pF}) \text{ C}_{L} + 20 \text{ ns}$	t _{TLH} , t _{THL}	5.0 10 15	- - -	100 50 40	200 100 80	ns
Propagation Delay Time (Figure 1) Clock to Serial out QS tpLH, tpHL = (0.90 ns/pF) C _L + 305 ns tpLH, tpHL = (0.36 ns/pF) C _L + 107 ns tpLH, tpHL = (0.26 ns/pF) C L + 82 ns	t _{PLH} , t _{PHL}	5.0 10 15	- - -	350 125 95	600 250 190	ns
Clock to Serial out Q'S t_{PLH} , t_{PHL} = (0.90 ns/pF) C_L + 350 ns t_{PLH} , t_{PHL} = (0.36 ns/pF) C_L + 149 ns t_{PLH} , t_{PHL} = (0.26 ns/pF) C_L + 62 ns		5.0 10 15	- - -	230 110 75	460 220 150	
Clock to Parallel out $t_{PLH},t_{PHL}=(0.90\;ns/pF)\;C_L+375\;ns$ $t_{PLH},t_{PHL}=(0.35\;ns/pF)\;C_L+177\;ns$ $t_{PLH},t_{PHL}=(0.26\;ns/pF)\;C_L+122\;ns$		5.0 10 15	- - -	420 195 135	840 390 270	
Strobe to Parallel out $t_{PLH},t_{PHL}=(0.90\;ns/pF)\;C_L+245\;ns$ $t_{PLH},t_{PHL}=(0.36\;ns/pF)\;C\;L+127\;ns$ $t_{PLH},t_{PHL}=(0.26\;ns/pF)\;C_L+87\;ns$		5.0 10 15	- - -	290 145 100	580 290 200	
Output Enable to Output $t_{PHZ}, t_{PZL} = (0.90 \text{ ns/pF}) \text{ C}_L + 95 \text{ ns}$ $t_{PHZ}, t_{PZL} = (0.36 \text{ ns/PF}) \text{ C}_L + 57 \text{ ns}$ $t_{PHZ}, t_{PZL} = (0.26 \text{ ns/pF}) \text{ C}_L + 42 \text{ ns}$	t _{PHZ} , t _{PZL}	5.0 10 15	- - -	140 75 55	280 150 110	
$t_{PLZ}, t_{PZH} = (0.90 \text{ ns/pF}) \text{ C}_L + 180 \text{ ns}$ $t_{PLZ}, t_{PZH} = (0.36 \text{ ns/pF}) \text{ C}_L + 77 \text{ ns}$ $t_{PLZ}, t_{PZH} = (0.26 \text{ ns/pF}) \text{ C}_L + 57 \text{ ns}$	t _{PLZ} , t _{PZH}	5.0 10 15	- - -	225 95 70	450 190 140	
Setup Time Data in to Clock	t _{su}	5.0 10 15	125 55 35	60 30 20	- - -	ns
Hold Time Clock to Data	t _h	5.0 10 15	0 20 20	- 40 - 10 0	- - -	ns
Clock Pulse Width, High	t _{WH}	5.0 10 15	200 100 83	100 50 40	- - -	ns
Clock Rise and Fall Time	$\begin{matrix}t_{r(\text{cl})}\\t_{f(\text{cl})}\end{matrix}$	5 10 15	- - -	- - -	15 5.0 4.0	μs
Clock Pulse Frequency	f _{cl}	5.0 10 15	- - -	2.5 5.0 6.0	1.25 2.5 3.0	MHz
Strobe Pulse Width	t _{WL}	5.0 10 15	200 80 70	100 40 35	- - -	ns

^{5.} The formulas given are for the typical characteristics only at 25°C.
6. Data labelled "Typ" is not to be used for design purposes but is intended as an indication of the IC's potential performance.

3-STATE TEST CIRCUIT

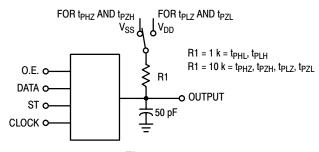
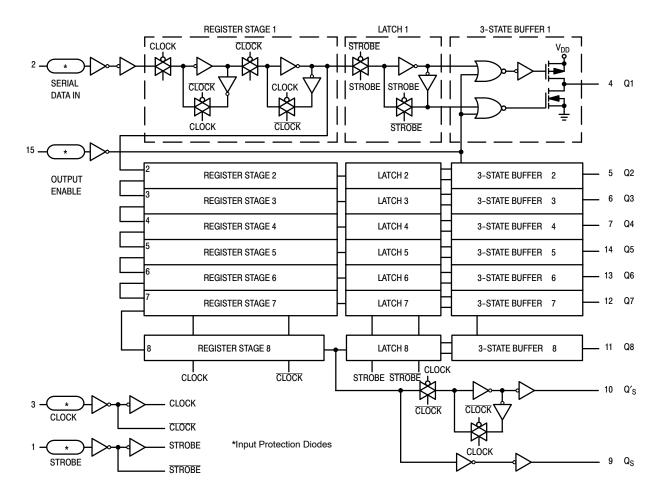
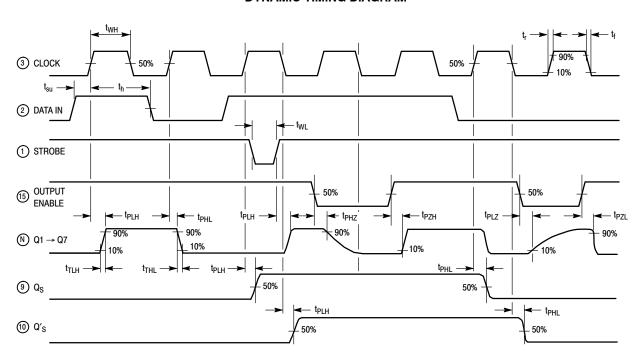


Figure 1.

BLOCK DIAGRAM



DYNAMIC TIMING DIAGRAM





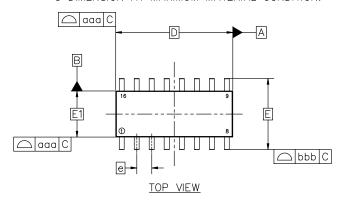


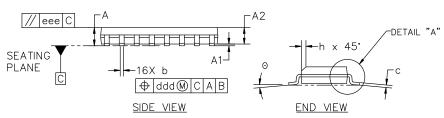
SOIC-16 9.90x3.90x1.37 1.27P CASE 751B ISSUE M

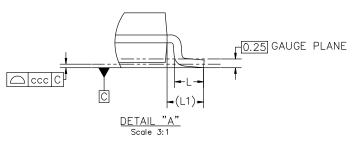
DATE 18 OCT 2024

NOTES:

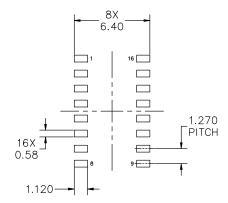
- 1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
- 2. DIMENSION IN MILLIMETERS. ANGLE IN DEGREES.
- 3. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD PROTRUSION.
- 4. MAXIMUM MOLD PROTRUSION 0.15mm PER SIDE.
- 5. DIMENSION 6 DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127mm TOTAL IN EXCESS OF THE 6 DIMENSION AT MAXIMUM MATERIAL CONDITION.







MILLIMETERS					
DIM	MIN	NOM	MAX		
А	1.35	1.55	1.75		
A1	0.10	0.18	0.25		
A2	1.25	1.37	1.50		
b	0.35	0.42	0.49		
С	0.19	0.22	0.25		
D		9.90 BSC			
E		6.00 BSC			
E1		3.90 BSC			
е		1.27 BSC			
h	0.25		0.50		
L	0.40	0.83	1.25		
L1		1.05 REF			
Θ	0.		7*		
TOLERAN	CE OF FC	RM AND	POSITION		
aaa		0.10			
bbb	0.20				
ссс	0.10				
ddd		0.25	·		
eee		0.10			



RECOMMENDED MOUNTING FOOTPRINT

*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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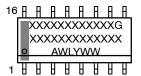
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SOIC-16 9.90x3.90x1.37 1.27P CASE 751B

ISSUE M

DATE 18 OCT 2024

GENERIC MARKING DIAGRAM*



XXXXX = Specific Device Code

A = Assembly Location
WL = Wafer Lot

Y = Year
WW = Work Week
G = Pb-Free Package

*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.

STYLE 1:		STYLE 2:		STYLE 3:	S	TYLE 4:	
	COLLECTOR	PIN 1.	CATHODE	PIN 1.	COLLECTOR, DYE #1	PIN 1.	COLLECTOR, DYE #1
	BASE	2.	ANODE	2.	BASE. #1	2.	
3.	EMITTER	3.	NO CONNECTION	3.	EMITTER. #1	3.	
4.	NO CONNECTION	4.	CATHODE	4.	COLLECTOR, #1	4.	COLLECTOR, #2
5.	EMITTER	5.	CATHODE	5.	COLLECTOR, #2	5.	COLLECTOR, #3
6.	BASE	6.	NO CONNECTION	6.	BASE, #2	6.	COLLECTOR, #3
7.	COLLECTOR	7.	ANODE	7.	EMITTER, #2	7.	COLLECTOR, #4
8.	COLLECTOR	8.	CATHODE	8.	COLLECTOR, #2	8.	COLLECTOR, #4
9.	BASE	9.	CATHODE	9.	COLLECTOR, #3	9.	BASE, #4
10.	EMITTER	10.	ANODE	10.	BASE, #3	10.	EMITTER, #4
11.	NO CONNECTION	11.	NO CONNECTION	11.	EMITTER, #3	11.	
	EMITTER	12.	CATHODE	12.	COLLECTOR, #3	12.	
13.	BASE	13.		13.	COLLECTOR, #4	13.	BASE, #2
14.	COLLECTOR	14.	NO CONNECTION	14.	BASE, #4	14.	
15.	EMITTER	15.	ANODE	15.	EMITTER, #4	15.	
16.	COLLECTOR	16.	CATHODE	16.	COLLECTOR, #4	16.	EMITTER, #1
STYLE 5:		STYLE 6:		STYLE 7:			
PIN 1.	DRAIN, DYE #1	PIN 1.	CATHODE	PIN 1.	SOURCE N-CH		
2.	DRAIN, #1	2.	CATHODE	2.	COMMON DRAIN (OUTPUT)		
3.	DRAIN, #2	3.	CATHODE	3.	COMMON DRAIN (OUTPUT)		
4.	DRAIN, #2	4.	CATHODE	4.	GATE P-CH		
5.	DRAIN, #3	5.		5.	COMMON DRAIN (OUTPUT)		
6.	DRAIN, #3	6.		6.	COMMON DRAIN (OUTPUT)		
7.	DRAIN, #4		CATHODE	7.	COMMON DRAIN (OUTPUT)		
8.	DRAIN, #4		CATHODE	8.	SOURCE P-CH		
9.	GATE, #4		ANODE	9.	SOURCE P-CH		
10.	SOURCE, #4	10	ANODE	10.	COMMON DRAIN (OUTPUT)		
11.	GATE, #3	11.	ANODE	11.	COMMON DRAIN (OUTPUT)		
12.	GATE, #3 SOURCE, #3	11. 12.	ANODE ANODE	11. 12.	COMMON DRAIN (OUTPUT) COMMON DRAIN (OUTPUT)		
12. 13.	GATE, #3 SOURCE, #3 GATE, #2	11. 12. 13.	ANODE ANODE ANODE	11. 12. 13.	COMMON DRAIN (OUTPUT) COMMON DRAIN (OUTPUT) GATE N-CH		
12. 13. 14.	GATE, #3 SOURCE, #3 GATE, #2 SOURCE, #2	11. 12. 13. 14.	ANODE ANODE ANODE ANODE	11. 12. 13. 14.	COMMON DRAIN (OUTPUT) COMMON DRAIN (OUTPUT) GATE N-CH COMMON DRAIN (OUTPUT)		
12. 13. 14. 15.	GATE, #3 SOURCE, #3 GATE, #2 SOURCE, #2 GATE, #1	11. 12. 13. 14. 15.	ANODE ANODE ANODE ANODE ANODE	11. 12. 13. 14. 15.	COMMON DRAIN (OUTPUT) COMMON DRAIN (OUTPUT) GATE N-CH COMMON DRAIN (OUTPUT) COMMON DRAIN (OUTPUT)		
12. 13. 14.	GATE, #3 SOURCE, #3 GATE, #2 SOURCE, #2	11. 12. 13. 14.	ANODE ANODE ANODE ANODE	11. 12. 13. 14.	COMMON DRAIN (OUTPUT) COMMON DRAIN (OUTPUT) GATE N-CH COMMON DRAIN (OUTPUT)		

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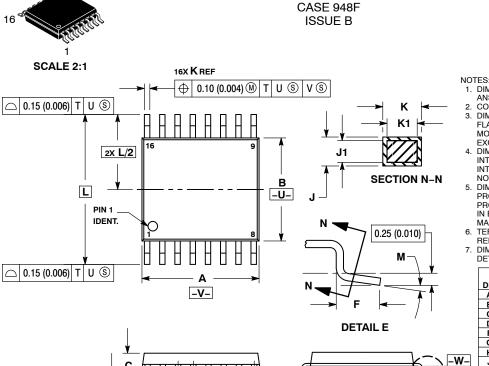
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☐ 0.10 (0.004)

SEATING PLANE

D

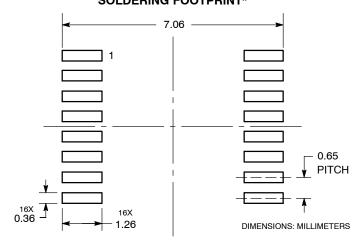


TSSOP-16 WB

- DIMENSIONING AND TOLERANCING PER
- ANSI Y14.5M, 1982. CONTROLLING DIMENSION: MILLIMETER.
- DIMENSION A DOES NOT INCLUDE MOLD FLASH. PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT
- EXCEED 0.15 (0.006) PER SIDE.
 DIMENSION B DOES NOT INCLUDE
 INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL
- IN TERLEAD FLASH OH PROTHOSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
- TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
- DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-.

	MILLIMETERS		INCHES		
DIM	MIN	MAX	MIN	MAX	
Α	4.90	5.10	0.193	0.200	
В	4.30	4.50	0.169	0.177	
С		1.20		0.047	
D	0.05	0.15	0.002	0.006	
F	0.50	0.75	0.020	0.030	
G	0.65	BSC	0.026	BSC	
Н	0.18	0.28	0.007	0.011	
J	0.09	0.20	0.004	0.008	
J1	0.09	0.16	0.004	0.006	
K	0.19	0.30	0.007	0.012	
K1	0.19	0.25	0.007	0.010	
L	6.40	6.40 BSC		BSC	
М	0 °	8°	0 °	8 °	

RECOMMENDED SOLDERING FOOTPRINT*



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

GENERIC MARKING DIAGRAM*



XXXX = Specific Device Code Α = Assembly Location

= Wafer Lot L = Year W = Work Week G or • = Pb-Free Package

*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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