



**THE DATASHEET OF  
MC100EL05DG**



# MC10EL05, MC100EL05

## 5 V ECL 2-Input Differential AND/NAND

### Description

The MC10EL/100EL05 is a 2-input differential AND/NAND gate. The device is functionally equivalent to the E404 device with higher performance capabilities. With propagation delays and output transition times significantly faster than the E404, the EL05 is ideally suited for those applications which require the ultimate in AC performance.

Because a negative 2-input NAND is equivalent to a 2-input OR function, the differential inputs and outputs of the device allows the EL05 to also be used as a 2-input differential OR/NOR gate.

The differential inputs employ clamp circuitry so that under open input conditions (pulled down to  $V_{EE}$ ) the input to the AND gate will be HIGH. In this way, if one set of inputs is open, the gate will remain active to the other input.

The 100 Series contains temperature compensation.

### Features

- 275 ps Propagation Delay
- ESD Protection:
  - ◆ > 1 kV Human Body Model,
  - ◆ > 100 V Machine Model
- PECL Mode Operating Range:
  - ◆  $V_{CC} = 4.2\text{ V to }5.7\text{ V}$  with  $V_{EE} = 0\text{ V}$
- NECL Mode Operating Range:
  - ◆  $V_{CC} = 0\text{ V}$  with  $V_{EE} = -4.2\text{ V to }-5.7\text{ V}$
- Internal Input Pulldown Resistors
- Meets or Exceeds JEDEC Spec EIA/JESD78 IC Latchup Test
- Moisture Sensitivity
  - ◆ Level 1 for SOIC-8
  - ◆ Level 3 for TSSOP-8
  - ◆ For Additional Information, see Application Note [AND8003/D](#)
- Flammability Rating:
  - ◆ UL 94 V-0 @ 0.125 in, Oxygen Index: 28 to 34
- Transistor Count = 44 devices
- These Devices are Pb-Free, Halogen Free and are RoHS Compliant

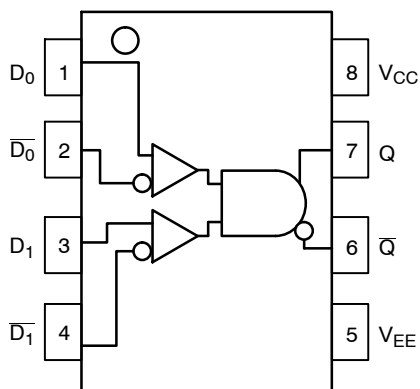


Figure 1. Logic Diagram and Pinout Assignment



ON Semiconductor®

[www.onsemi.com](http://www.onsemi.com)

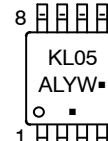
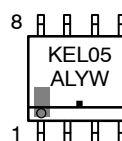
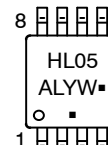
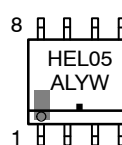


SOIC-8  
D SUFFIX  
CASE 751-07



TSSOP-8  
DT SUFFIX  
CASE 948R-02

### MARKING DIAGRAMS\*



H = MC10	L = Wafer Lot
K = MC100	Y = Year
4O = MC10	W = Work Week
2C = MC100	D = Date Code
A = Assembly Location	▪ = Pb-Free Package

(Note: Microdot may be in either location)

\*For additional marking information, refer to Application Note [AND8002/D](#).

### ORDERING INFORMATION

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

# MC10EL05, MC100EL05

**Table 1. TRUTH TABLE**

D0	D1	D0̄	D1̄	Q	Q̄
L	L	H	H	L	H
L	H	H	L	L	H
H	L	L	H	L	H
H	H	L	L	H	L

**Table 2. PIN DESCRIPTION**

PIN	Function
D0, D0̄; D1, D1̄	ECL Data Inputs
Q, Q̄	ECL Data Outputs
V <sub>CC</sub>	Positive Supply
V <sub>EE</sub>	Negative Supply

**Table 3. MAXIMUM RATINGS**

Symbol	Parameter	Condition 1	Condition 2	Rating	Unit
V <sub>CC</sub>	PECL Mode Power Supply	V <sub>EE</sub> = 0 V		8	V
V <sub>EE</sub>	NECL Mode Power Supply	V <sub>CC</sub> = 0 V		-8	V
V <sub>I</sub>	PECL Mode Input Voltage NECL Mode Input Voltage	V <sub>EE</sub> = 0 V V <sub>CC</sub> = 0 V	V <sub>I</sub> ≤ V <sub>CC</sub> V <sub>I</sub> ≥ V <sub>EE</sub>	6 -6	V
I <sub>out</sub>	Output Current	Continuous Surge		50 100	mA
T <sub>A</sub>	Operating Temperature Range			-40 to +85	°C
T <sub>stg</sub>	Storage Temperature Range			-65 to +150	°C
θ <sub>JA</sub>	Thermal Resistance (Junction-to-Ambient)	0 lfpm 500 lfpm	SOIC-8	190 130	°C/W
θ <sub>JC</sub>	Thermal Resistance (Junction-to-Case)	Standard Board	SOIC-8	41 to 44	°C/W
θ <sub>JA</sub>	Thermal Resistance (Junction-to-Ambient)	0 lfpm 500 lfpm	TSSOP-8	185 140	°C/W
θ <sub>JC</sub>	Thermal Resistance (Junction-to-Case)	Standard Board	TSSOP-8	41 to 44 ± 5%	°C/W
T <sub>sol</sub>	Wave Solder (Pb-Free)	<2 to 3 sec @ 260°C		265	°C

# MC10EL05, MC100EL05

**Table 4. 10EL SERIES PECL DC CHARACTERISTICS** ( $V_{CC}= 5.0\text{ V}$ ;  $V_{EE}= 0.0\text{ V}$  (Note 1))

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
$I_{EE}$	Power Supply Current		18	22		18	22		18	22	mA
$V_{OH}$	Output HIGH Voltage (Note 2)	3920	4010	4110	4020	4105	4190	4090	4185	4280	mV
$V_{OL}$	Output LOW Voltage (Note 2)	3050	3200	3350	3050	3210	3370	3050	3227	3405	mV
$V_{IH}$	Input HIGH Voltage (Single-Ended)	3770		4110	3870		4190	3940		4280	mV
$V_{IL}$	Input LOW Voltage (Single-Ended)	3050		3500	3050		3520	3050		3555	mV
$V_{IHCMR}$	Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 3)	3.0		4.6	3.0		4.6	3.0		4.6	V
$I_{IH}$	Input HIGH Current			150			150			150	$\mu\text{A}$
$I_{IL}$	Input LOW Current	0.5			0.5			0.3			$\mu\text{A}$

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lpm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

1. Input and output parameters vary 1:1 with  $V_{CC}$ .  $V_{EE}$  can vary +0.25 V / -0.5 V.
2. Outputs are terminated through a 50  $\Omega$  resistor to  $V_{CC} - 2.0\text{ V}$ .
3.  $V_{IHCMR}$  min varies 1:1 with  $V_{EE}$ .  $V_{IHCMR}$  max varies 1:1 with  $V_{CC}$ . The  $V_{IHCMR}$  range is referenced to the most positive side of the differential input signal. Normal operation is obtained if the HIGH level falls within the specified range and the peak-to-peak voltage lies between  $V_{PP(\text{min})}$  and 1.0 V.

**Table 5. 10EL SERIES NECL DC CHARACTERISTICS** ( $V_{CC}= 0\text{ V}$ ;  $V_{EE}= -5.0\text{ V}$  (Note 1))

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
$I_{EE}$	Power Supply Current		18	22		18	22		18	22	mA
$V_{OH}$	Output HIGH Voltage (Note 2)	-1080	-990	-890	-980	-895	-810	-910	-815	-720	mV
$V_{OL}$	Output LOW Voltage (Note 2)	-1950	-1800	-1650	-1950	-1790	-1630	-1950	-1773	-1595	mV
$V_{IH}$	Input HIGH Voltage (Single-Ended)	-1230		-890	-1130		-810	-1060		-720	mV
$V_{IL}$	Input LOW Voltage (Single-Ended)	-1950		-1500	-1950		-1480	-1950		-1445	mV
$V_{IHCMR}$	Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 3)	-2.0		-0.4	-2.0		-0.4	-2.0		-0.4	V
$I_{IH}$	Input HIGH Current			150			150			150	$\mu\text{A}$
$I_{IL}$	Input LOW Current	0.5			0.5			0.3			$\mu\text{A}$

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lpm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

1. Input and output parameters vary 1:1 with  $V_{CC}$ .  $V_{EE}$  can vary +0.25 V / -0.5 V.
2. Outputs are terminated through a 50  $\Omega$  resistor to  $V_{CC} - 2.0\text{ V}$ .
3.  $V_{IHCMR}$  min varies 1:1 with  $V_{EE}$ .  $V_{IHCMR}$  max varies 1:1 with  $V_{CC}$ . The  $V_{IHCMR}$  range is referenced to the most positive side of the differential input signal. Normal operation is obtained if the HIGH level falls within the specified range and the peak-to-peak voltage lies between  $V_{PP(\text{min})}$  and 1.0 V.

## MC10EL05, MC100EL05

**Table 6. 100EL SERIES PECL DC CHARACTERISTICS** ( $V_{CC}= 5.0\text{ V}$ ;  $V_{EE}= 0.0\text{ V}$  (Note 1))

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
$I_{EE}$	Power Supply Current		18	22		18	22		21	25	mA
$V_{OH}$	Output HIGH Voltage (Note 2)	3915	3995	4120	3975	4045	4120	3975	4050	4120	mV
$V_{OL}$	Output LOW Voltage (Note 2)	3170	3305	3445	3190	3295	3380	3190	3295	3380	mV
$V_{IH}$	Input HIGH Voltage (Single-Ended)	3835		4120	3835		4120	3835		4120	mV
$V_{IL}$	Input LOW Voltage (Single-Ended)	3190		3525	3190		3525	3190		3525	mV
$V_{IHCMR}$	Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 3)	3.0		4.6	3.0		4.6	3.0		4.6	V
$I_{IH}$	Input HIGH Current			150			150			150	$\mu\text{A}$
$I_{IL}$	Input LOW Current	0.5			0.5			0.5			$\mu\text{A}$

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lpm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

1. Input and output parameters vary 1:1 with  $V_{CC}$ .  $V_{EE}$  can vary +0.8 V / -0.5 V.
2. Outputs are terminated through a 50  $\Omega$  resistor to  $V_{CC} - 2.0\text{ V}$ .
3.  $V_{IHCMR}$  min varies 1:1 with  $V_{EE}$ .  $V_{IHCMR}$  max varies 1:1 with  $V_{CC}$ . The  $V_{IHCMR}$  range is referenced to the most positive side of the differential input signal. Normal operation is obtained if the HIGH level falls within the specified range and the peak-to-peak voltage lies between  $V_{PP(\text{min})}$  and 1.0 V.

**Table 7. 100EL SERIES NECL DC CHARACTERISTICS** ( $V_{CC}= 0.0\text{ V}$ ;  $V_{EE}= -5.0\text{ V}$  (Note 1))

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
$I_{EE}$	Power Supply Current		18	22		18	22		21	25	mA
$V_{OH}$	Output HIGH Voltage (Note 2)	-1085	-1005	-880	-1025	-955	-880	-1025	-955	-880	mV
$V_{OL}$	Output LOW Voltage (Note 2)	-1830	-1695	-1555	-1810	-1705	-1620	-1810	-1705	-1620	mV
$V_{IH}$	Input HIGH Voltage (Single-Ended)	-1165		-880	-1165		-880	-1165		-880	mV
$V_{IL}$	Input LOW Voltage (Single-Ended)	-1810		-1475	-1810		-1475	-1810		-1475	mV
$V_{IHCMR}$	Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 3)	-2.0		-0.4	-2.0		-0.4	-2.0		-0.4	V
$I_{IH}$	Input HIGH Current			150			150			150	$\mu\text{A}$
$I_{IL}$	Input LOW Current	0.5			0.5			0.5			$\mu\text{A}$

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lpm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

1. Input and output parameters vary 1:1 with  $V_{CC}$ .  $V_{EE}$  can vary +0.8 V / -0.5 V.
2. Outputs are terminated through a 50  $\Omega$  resistor to  $V_{CC} - 2.0\text{ V}$ .
3.  $V_{IHCMR}$  min varies 1:1 with  $V_{EE}$ .  $V_{IHCMR}$  max varies 1:1 with  $V_{CC}$ . The  $V_{IHCMR}$  range is referenced to the most positive side of the differential input signal. Normal operation is obtained if the HIGH level falls within the specified range and the peak-to-peak voltage lies between  $V_{PP(\text{min})}$  and 1.0 V.

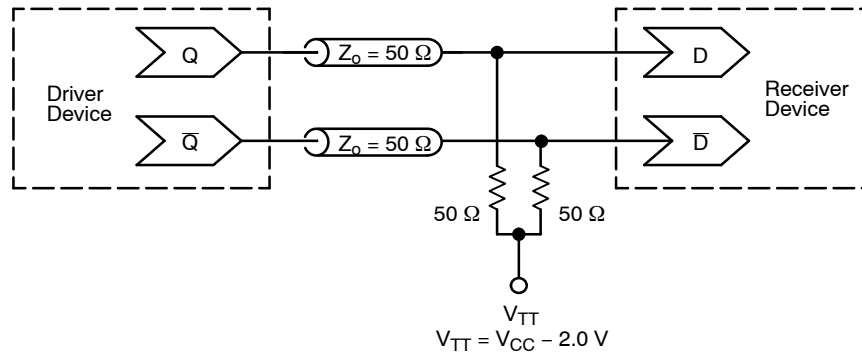
# MC10EL05, MC100EL05

**Table 8. AC CHARACTERISTICS** ( $V_{CC} = 5.0\text{ V}$ ;  $V_{EE} = 0\text{ V}$  or  $V_{CC} = 0\text{ V}$ ;  $V_{EE} = -5.0\text{ V}$  (Note 1))

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
$f_{\max}$	Maximum Toggle Frequency		TBD			TBD			TBD		GHz
$t_{PLH}$ $t_{PHL}$	Propagation Delay to Output	135	260	440	185	275	390	215	305	420	ps
$V_{PP}$	Input Swing (Note 2)	150		1000	150		1000	150		1000	mV
$t_{JITTER}$	Cycle-to-Cycle Jitter		TBD			TBD			TBD		ps
$t_r$ $t_f$	Output Rise/Fall Times Q (20% – 80%)	100	225	350	100	225	350	100	225	350	ps

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

- 10 Series:  $V_{EE}$  can vary  $+0.25\text{ V} / -0.5\text{ V}$ .  
100 Series:  $V_{EE}$  can vary  $+0.8\text{ V} / -0.5\text{ V}$ .
- $V_{PP(\min)}$  is minimum input swing for which AC parameters guaranteed. The device has a DC gain of  $\approx 40$ .



**Figure 2. Typical Termination for Output Driver and Device Evaluation**  
(See Application Note [AND8020/D](#) – Termination of ECL Logic Devices.)

## MC10EL05, MC100EL05

### ORDERING INFORMATION

Device	Package	Shipping†
MC10EL05DG	SOIC-8 (Pb-Free)	98 Units / Rail
MC10EL05DR2G	SOIC-8 (Pb-Free)	2500 / Tape & Reel
MC10EL05DTG	TSSOP-8 (Pb-Free)	100 Units / Rail
MC100EL05DG	SOIC-8 (Pb-Free)	98 Units / Rail
MC100EL05DTG	TSSOP-8 (Pb-Free)	100 Units / Rail

†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](#).

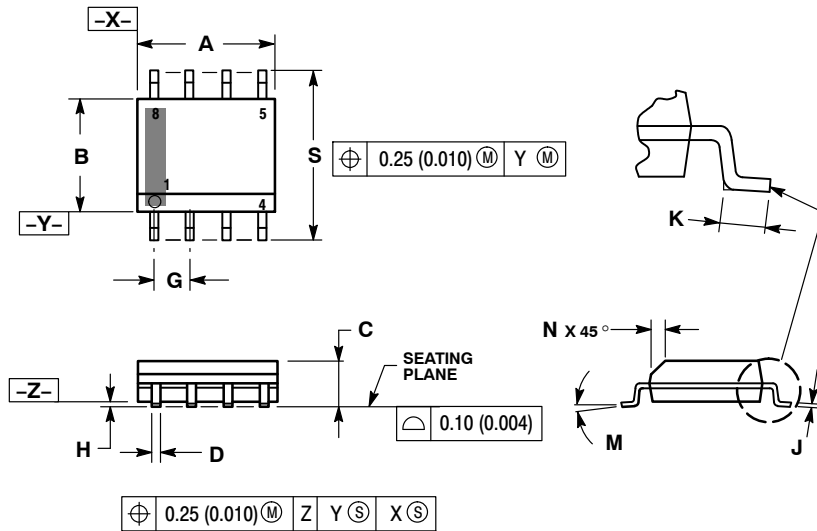
#### Resource Reference of Application Notes

- AN1405/D** – ECL Clock Distribution Techniques
- AN1406/D** – Designing with PECL (ECL at +5.0 V)
- AN1503/D** – ECLinPS™ I/O SPiCE Modeling Kit
- AN1504/D** – Metastability and the ECLinPS Family
- AN1568/D** – Interfacing Between LVDS and ECL
- AN1672/D** – The ECL Translator Guide
- AND8001/D** – Odd Number Counters Design
- AND8002/D** – Marking and Date Codes
- AND8020/D** – Termination of ECL Logic Devices
- AND8066/D** – Interfacing with ECLinPS
- AND8090/D** – AC Characteristics of ECL Devices

# MC10EL05, MC100EL05

## PACKAGE DIMENSIONS

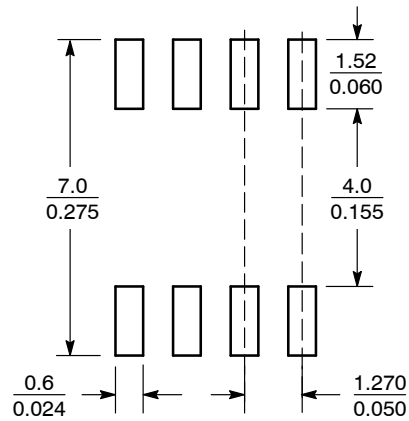
SOIC-8 NB  
CASE 751-07  
ISSUE AK



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: MILLIMETER.
  3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
  4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
  5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.
  6. 751-01 THRU 751-06 ARE OBSOLETE. NEW STANDARD IS 751-07.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.80	5.00	0.189	0.197
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.053	0.069
D	0.33	0.51	0.013	0.020
G	1.27 BSC		0.050 BSC	
H	0.10	0.25	0.004	0.010
J	0.19	0.25	0.007	0.010
K	0.40	1.27	0.016	0.050
M	0°	8°	0°	8°
N	0.25	0.50	0.010	0.020
S	5.80	6.20	0.228	0.244

### SOLDERING FOOTPRINT\*



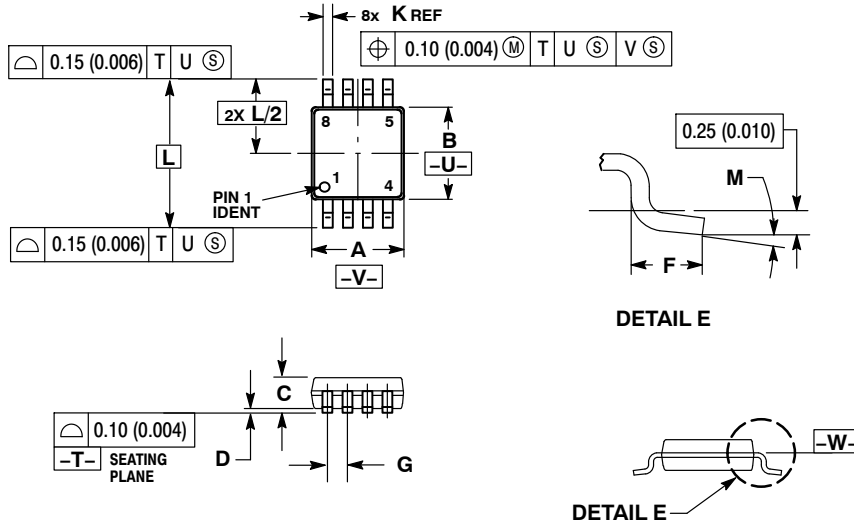
SCALE 6:1  $\left(\frac{\text{mm}}{\text{inches}}\right)$

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

# MC10EL05, MC100EL05

## PACKAGE DIMENSIONS

TSSOP-8  
CASE 948R-02  
ISSUE A



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: MILLIMETER.
  3. 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.
  4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
  5. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
  6. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-.

ECLinPS is a registered trademark of Semiconductor Components Industries, LLC (SCILLC) or its subsidiaries in the United States and/or other countries.

ON Semiconductor and are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

### PUBLICATION ORDERING INFORMATION

**LITERATURE FULFILLMENT:**  
Literature Distribution Center for ON Semiconductor  
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA  
**Phone:** 303-675-2175 or 800-344-3860 Toll Free USA/Canada  
**Fax:** 303-675-2176 or 800-344-3867 Toll Free USA/Canada  
**Email:** [orderlit@onsemi.com](mailto:orderlit@onsemi.com)

**N. American Technical Support:** 800-282-9855 Toll Free  
USA/Canada  
**Europe, Middle East and Africa Technical Support:**  
Phone: 421 33 790 2910  
**Japan Customer Focus Center**  
Phone: 81-3-5817-1050

**ON Semiconductor Website:** [www.onsemi.com](http://www.onsemi.com)  
**Order Literature:** <http://www.onsemi.com/orderlit>  
For additional information, please contact your local Sales Representative

## Looking for pricing, stock, or lifecycle information?

Click below to explore more details on WIN SOURCE:

 [View MC100EL05DG](#) on WIN SOURCE

 [ON Semiconductor](#) Information

## Optimize Your Supply Chain with WIN SOURCE Solutions

-  Global Sourcing Solution
-  Obsolete Management
-  Cost Control Management
-  Shortage Management
-  Alternative Solution
-  Excess Inventory Management