

# MC100LVEL32

## 3.3V ECL ÷2 Divider

The MC100LVEL32 is an integrated ÷2 divider. The LVEL32 is functionally identical to the EL32, but operates from a 3.3 V supply.

The reset pin is asynchronous and is asserted on the rising edge. Upon power-up, the internal flip-flop will attain a random state; the reset allows for the synchronization of multiple LVEL32's in a system.

The  $V_{BB}$  pin, an internally generated voltage supply, is available to this device only. For single-ended input conditions, the unused differential input is connected to  $V_{BB}$  as a switching reference voltage.  $V_{BB}$  may also rebias AC coupled inputs. When used, decouple  $V_{BB}$  and  $V_{CC}$  via a 0.01  $\mu$ F capacitor and limit current sourcing or sinking to 0.5 mA. When not used,  $V_{BB}$  should be left open.

- 510 ps Propagation Delay
- 2.6 GHz Typical Maximum Frequency
- ESD Protection: >4 KV HBM, >200 V MM
- The 100 Series Contains Temperature Compensation
- PECL Mode Operating Range:  $V_{CC}$ = 3.0 V to 3.8 V with  $V_{EE}$ = 0 V
- NECL Mode Operating Range:  $V_{CC}$ = 0 V with  $V_{EE}$  = -3.0 V to -3.8 V
- Internal Input Pulldown Resistors
- Meets or Exceeds JEDEC Spec EIA/JESD78 IC Latchup Test
- Moisture Sensitivity Level 1  
For Additional Information, see Application Note AND8003/D
- Flammability Rating: UL-94 code V-0 @ 1/8", Oxygen Index 28 to 34
- Transistor Count = 111 devices



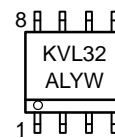
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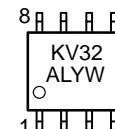
### MARKING DIAGRAMS\*



SO-8  
D SUFFIX  
CASE 751



TSSOP-8  
DT SUFFIX  
CASE 948R



A = Assembly Location  
L = Wafer Lot  
Y = Year  
W = Work Week

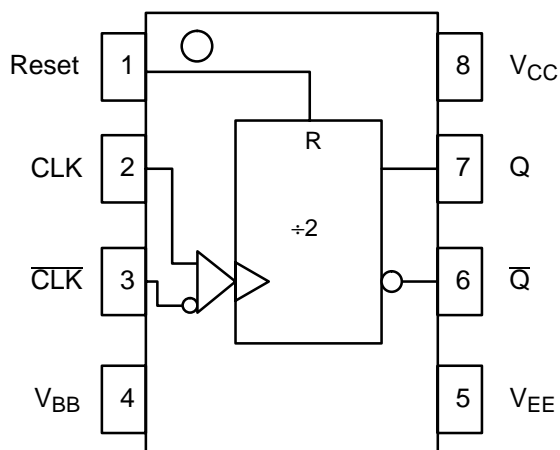
\*For additional information, see Application Note AND8002/D

### ORDERING INFORMATION

Device	Package	Shipping
MC100LVEL32D	SO-8	98 Units / Rail
MC100LVEL32DR2	SO-8	2500 / Reel
MC100LVEL32DT	TSSOP-8	98 Units / Rail
MC100LVEL32DTR2	TSSOP-8	2500 / Reel

# MC100LEVEL32

## LOGIC DIAGRAM AND PINOUT ASSIGNMENT



## PIN DESCRIPTION

PIN	FUNCTION
CLK, $\overline{\text{CLK}}$	ECL Differential Clock Inputs
Q, $\overline{\text{Q}}$	ECL Differential Data +2 Outputs
Reset	ECL Asynch Reset
$V_{\text{BB}}$	Reference Voltage Output
$V_{\text{CC}}$	Positive Supply
$V_{\text{EE}}$	Negative Supply

## MAXIMUM RATINGS (Note 1.)

Symbol	Parameter	Condition 1	Condition 2	Rating	Units
$V_{\text{CC}}$	PECL Mode Power Supply	$V_{\text{EE}} = 0 \text{ V}$		8 to 0	V
$V_{\text{EE}}$	NECL Mode Power Supply	$V_{\text{CC}} = 0 \text{ V}$		-8 to 0	V
$V_{\text{I}}$	PECL Mode Input Voltage NECL Mode Input Voltage	$V_{\text{EE}} = 0 \text{ V}$ $V_{\text{CC}} = 0 \text{ V}$	$V_{\text{I}} \leq V_{\text{CC}}$ $V_{\text{I}} \geq V_{\text{EE}}$	6 to 0 -6 to 0	V V
$I_{\text{out}}$	Output Current	Continuous Surge		50 100	mA mA
$I_{\text{BB}}$	$V_{\text{BB}}$ Sink/Source			$\pm 0.5$	mA
$T_{\text{A}}$	Operating Temperature Range			-40 to +85	$^{\circ}\text{C}$
$T_{\text{stg}}$	Storage Temperature Range			-65 to +150	$^{\circ}\text{C}$
$\theta_{\text{JA}}$	Thermal Resistance (Junction to Ambient)	0 LFPM 500 LFPM	8 SOIC 8 SOIC	190 130	$^{\circ}\text{C}/\text{W}$ $^{\circ}\text{C}/\text{W}$
$\theta_{\text{JC}}$	Thermal Resistance (Junction to Case)	std bd	8 SOIC	41 to 44 $\pm 5\%$	$^{\circ}\text{C}/\text{W}$
$\theta_{\text{JA}}$	Thermal Resistance (Junction to Ambient)	0 LFPM 500 LFPM	8 TSSOP 8 TSSOP	185 140	$^{\circ}\text{C}/\text{W}$ $^{\circ}\text{C}/\text{W}$
$\theta_{\text{JC}}$	Thermal Resistance (Junction to Case)	std bd	8 TSSOP	41 to 44 $\pm 5\%$	$^{\circ}\text{C}/\text{W}$
$T_{\text{sol}}$	Wave Solder	<2 to 3 sec @ 248 $^{\circ}\text{C}$		265	$^{\circ}\text{C}$

1. Maximum Ratings are those values beyond which device damage may occur.

# MC100LEVEL32

## LVPECL DC CHARACTERISTICS $V_{CC}=3.3\text{ V}$ ; $V_{EE}=0.0\text{ V}$ (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		29	35		29	35		31	36	mA
$V_{OH}$	Output HIGH Voltage (Note 2.)	2215	2295	2420	2275	2345	2420	2275	2345	2420	mV
$V_{OL}$	Output LOW Voltage (Note 2.)	1470	1605	1745	1490	1595	1680	1490	1595	1680	mV
$V_{IH}$	Input HIGH Voltage (Single Ended)	2135		2420	2135		2420	2135		2420	mV
$V_{IL}$	Input LOW Voltage (Single Ended)	1490		1825	1490		1825	1490		1825	mV
$V_{BB}$	Output Voltage Reference	1.92		2.04	1.92		2.04	1.92		2.04	V
$V_{IHCMR}$	Input HIGH Voltage Common Mode Range (Differential) (Note 3.)										
	$V_{pp} < 500\text{ mV}$	1.2		3.1	1.1		3.1	1.1		3.1	V
	$V_{pp} \geq 500\text{ mV}$	1.4		3.1	1.3		3.1	1.3		3.1	V
$I_{IH}$	Input HIGH Current			150			150			150	$\mu\text{A}$
$I_{IL}$	Input LOW Current	CLK CLK	0.5 -600		0.5 -600			0.5 -600			$\mu\text{A}$ $\mu\text{A}$

NOTE: Devices are designed to meet the DC specifications shown in the above table, after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse air flow greater than 500 lfm is maintained.

1. Input and output parameters vary 1:1 with  $V_{CC}$ .  $V_{EE}$  can vary  $\pm 0.3\text{ V}$ .
2. Outputs are terminated through a 50 ohm resistor to  $V_{CC}-2$  volts.
3.  $V_{IHCMR}$  min varies 1:1 with  $V_{EE}$ , 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  $V_{ppmin}$  and 1 V.

## LVNECL DC CHARACTERISTICS $V_{CC}=0.0\text{ V}$ ; $V_{EE}=-3.3\text{ V}$ (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		29	35		29	35		31	36	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
$V_{BB}$	Output Voltage Reference	-1.38		-1.26	-1.38		-1.26	-1.38		-1.26	V
$V_{IHCMR}$	Input HIGH Voltage Common Mode Range (Differential) (Note 3.)										
	$V_{pp} < 500\text{ mV}$	2.1		-0.2	2.2		-0.2	2.2		-0.2	V
	$V_{pp} \geq 500\text{ mV}$	1.9		-0.2	2.0		-0.2	2.0		-0.2	V
$I_{IH}$	Input HIGH Current			150			150			150	$\mu\text{A}$
$I_{IL}$	Input LOW Current	CLK CLK	0.5 -600		0.5 -600			0.5 -600			$\mu\text{A}$ $\mu\text{A}$

NOTE: Devices are designed to meet the DC specifications shown in the above table, after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse air flow greater than 500 lfm is maintained.

1. Input and output parameters vary 1:1 with  $V_{CC}$ .  $V_{EE}$  can vary  $\pm 0.3\text{ V}$ .
2. Outputs are terminated through a 50 ohm resistor to  $V_{CC}-2$  volts.
3.  $V_{IHCMR}$  min varies 1:1 with  $V_{EE}$ , 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  $V_{ppmin}$  and 1 V.

# MC100LEVEL32

**AC CHARACTERISTICS**  $V_{CC}= 3.3\text{ V}$ ;  $V_{EE}= 0.0\text{ V}$  or  $V_{CC}= 0.0\text{ V}$ ;  $V_{EE}= -3.3\text{ V}$  (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	2.2	2.5		2.4	2.6		2.6	2.8		GHz
$t_{PLH}$ $t_{PHL}$	Propagation Delay CLK to Q (Diff) CLK to Q (S.E.) Reset to Q	350 300 340	500 500 540	530 580 540	370 320 350	510 510 540	550 600 550	410 360 380	540 540 550	590 640 580	ps
$t_{RR}$	Reset Recovery	175	50		175	50		175	50		ps
$t_{PW}$	Minimum Pulse Width Reset	500	300		500	300		500	300		ps
$t_{JITTER}$	Cycle-to-Cycle Jitter		TBD			TBD			TBD		ps
$V_{PP}$	Input Swing (Note 2.)	150		1000	150		1000	150		1000	mV
$t_r$ $t_f$	Output Rise/Fall Times Q (20% – 80%)	120	225	320	120	225	320	120	225	320	ps

- $V_{EE}$  can vary  $\pm 0.3\text{ V}$ .
- $V_{PP}(\text{min})$  is minimum input swing for which AC parameters are guaranteed.

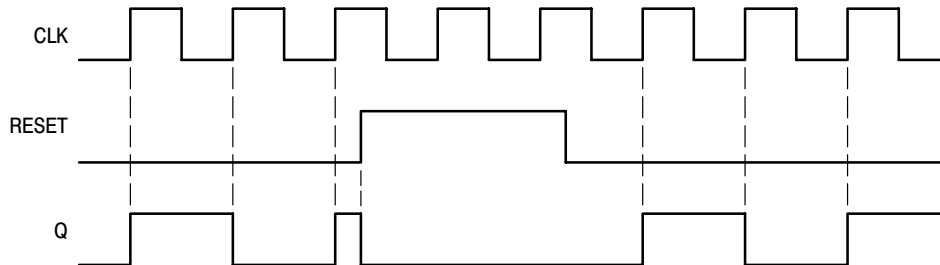


Figure 1. Timing Diagram

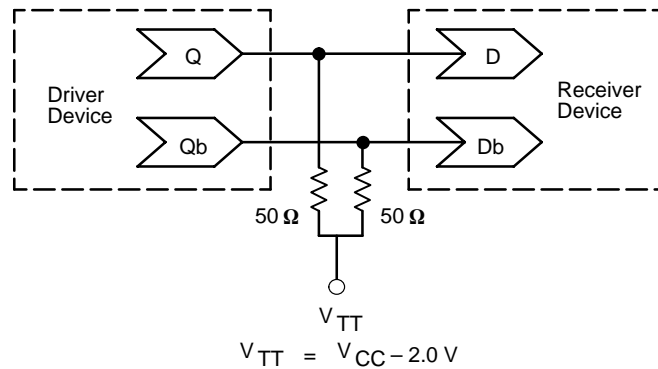


Figure 2. Typical Termination for Output Driver and Device Evaluation  
(See Application Note AND8020 – Termination of ECL Logic Devices.)

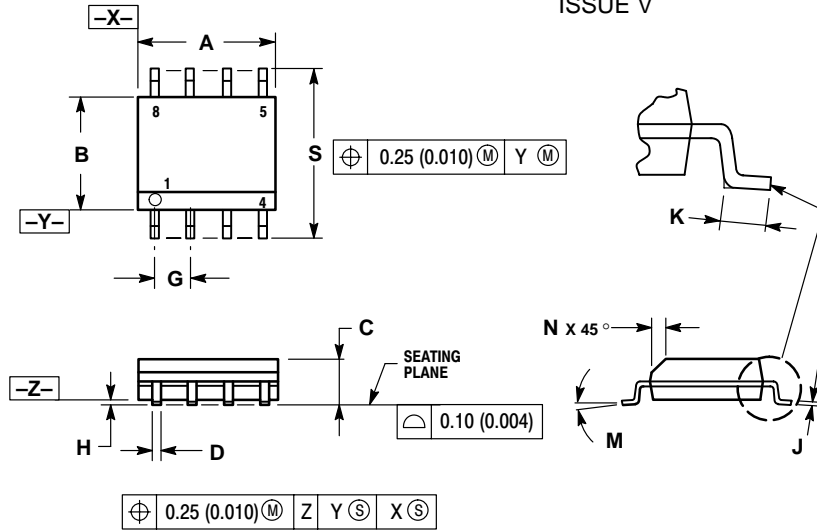
## Resource Reference of Application Notes

- AN1404** – ECLinPS Circuit Performance at Non–Standard  $V_{IH}$  Levels
- AN1405** – ECL Clock Distribution Techniques
- AN1406** – Designing with PECL (ECL at +5.0 V)
- AN1503** – ECLinPS I/O SPICE Modeling Kit
- AN1504** – Metastability and the ECLinPS Family
- AN1560** – Low Voltage ECLinPS SPICE Modeling Kit
- AN1568** – Interfacing Between LVDS and ECL
- AN1596** – ECLinPS Lite Translator ELT Family SPICE I/O Model Kit
- AN1650** – Using Wire–OR Ties in ECLinPS Designs
- AN1672** – The ECL Translator Guide
- AND8001** – Odd Number Counters Design
- AND8002** – Marking and Date Codes
- AND8020** – Termination of ECL Logic Devices

# MC100LEVEL32

## PACKAGE DIMENSIONS

SO-8  
D SUFFIX  
PLASTIC SOIC PACKAGE  
CASE 751-07  
ISSUE V



**NOTES:**

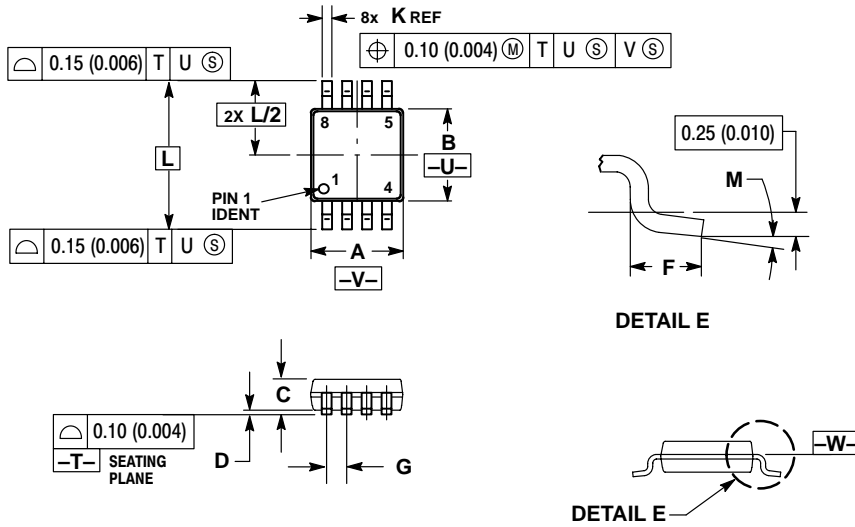
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

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

# MC100LVEL32

## PACKAGE DIMENSIONS


TSSOP-8  
DT SUFFIX  
PLASTIC TSSOP PACKAGE  
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-.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.90	3.10	0.114	0.122
B	2.90	3.10	0.114	0.122
C	0.80	1.10	0.031	0.043
D	0.05	0.15	0.002	0.006
F	0.40	0.70	0.016	0.028
G	0.65 BSC		0.026 BSC	
K	0.25	0.40	0.010	0.016
L	4.90 BSC		0.193 BSC	
M	0°	6°	0°	6°

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