3.3V Dual LVTTL/LVCMOS to Differential LVPECL Translator

MC100LVELT22



SOIC−8
D SUFFIX
CASE 751



TSSOP−8
DT SUFFIX
CASE 948R

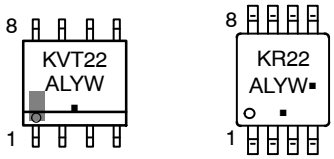
Description

The MC100LVELT22 is a dual LVTTL/LVCMOS to differential LVPECL translator. Due to LVPECL (Low Voltage Positive ECL) levels, only +3.3V and ground is required. The small 8−lead package outline with low skew dual gate design makes the MC100LVELT22 ideal for applications which require translation of a clock and/or data signal.

Features

- 350 ps Typical Propagation Delay
- <100 ps Output−to−Output Skew
- Flow Through Pinouts
- The 100 Series Contains Temperature Compensation
- LVPECL Operating Range: V_{CC} = 3.15 V to 3.45 V with GND = 0 V
- When Unused TTL Input is left Open, Q Output will Default High
- These are Pb−Free Devices

MARKING DIAGRAM



A = Assembly Location
L = Wafer Lot
Y = Year
W = Work Week
M = Date Code
▪ = Pb−Free Package

(Note: Microdot may be in either location)

*For additional marking information, refer to Application Note AND8002/D.

ORDERING INFORMATION

Device	Package	Shipping†
MC100LVELT22DG	SOIC−8 (Pb-Free)	98 Units / Tube
MC100LVELT22DR2G	SOIC−8 (Pb-Free)	2500Tape & Reel
MC100LVELT22DTG	TSSOP−8 (Pb-Free)	100 Units / Tube
MC100LVELT22DTRG	TSSOP−8 (Pb-Free)	2500 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.

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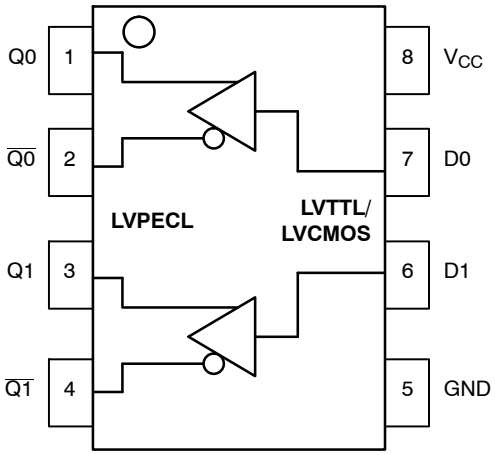


Figure 1. 8−Lead Pinout (Top View) **and Logic Diagram**

Table 1. PIN DESCRIPTION

PIN	FUNCTION
Qn, $\overline{Qn}$	LVPECL Differential Outputs
D0, D1	LVTTL/LVCMOS Inputs
V_{CC}	Positive Supply
GND	Ground

Table 2. ATTRIBUTES

Characteristics		Value
Internal Input Pulldown Resistor		N/A
Internal Input Pullup Resistor		N/A
ESD Protection	Human Body Model Machine Model	> 4 kV > 200 V
Moisture Sensitivity, Indefinite Time Out of Drypack (Note 1) SOIC−8 TSSOP−8		 Level 1 Level 3
Flammability Rating	Oxygen Index: 28 to 34	UL 94 V−0 @ 0.125 in
Transistor Count		164
Meets or exceeds JEDEC Spec EIA/JESD78 IC Latchup Test		

1. For additional information, see Application Note AND8003/D.

Table 3. MAXIMUM RATINGS

Symbol	Parameter	Condition 1	Condition 2	Rating	Unit
V_{CC}	Positive Power Supply	GND = 0 V		7	V
V_I	Input Voltage	GND = 0 V	$V_I \leq V_{CC}$	7	V
I_{out}	Output Current	Continuous Surge		50 100	mA mA
T_A	Operating Temperature Range			−40 to +85	°C
T_{stg}	Storage Temperature Range			−65 to +150	°C
θ_{JA}	Thermal Resistance (Junction−to−Ambient)	0 lfpm 500 lfpm	SO−8 SO−8	190 130	°C/W °C/W
θ_{JC}	Thermal Resistance (Junction−to−Case)	std bd	SO−8	41 to 44 ± 5%	°C/W
θ_{JA}	Thermal Resistance (Junction−to−Ambient)	0 lfpm 500 lfpm	TSSOP−8 TSSOP−8	185 140	°C/W °C/W
θ_{JC}	Thermal Resistance (Junction−to−Case)	std bd	TSSOP−8	41 to 44 ± 5%	°C/W
T_{sol}	Wave Solder Pb−Free	<2 to 3 sec @ 260°C		265	°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.
2. JEDEC standard multilayer board − 2S2P (2 signal, 2 power)

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Table 4. LVPECL DC CHARACTERISTICS V_{CC} = 3.3 V; GND = 0.0 V (Note 3)

Symbol	Characteristic	−40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
I_{CC}	Power Supply Current			28			28			29	mA
V_{OH}	Output HIGH Voltage (Note 4)	2275		2420	2275		2420	2275		2420	mV
V_{OL}	Output LOW Voltage (Note 4)	1490		1680	1490		1680	1490		1680	mV

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 lfpm.

3. Output parameters vary 1:1 with V_{CC}. V_{CC} can vary ±0.15 V.
4. Outputs are terminated through a 50 ohm resistor to V_{CC}−2 V.

Table 5. LVTTL/LVCMOS INPUT DC CHARACTERISTICS V_{CC} = 3.3 V; T_A = −40°C to 85°C (Note 5)

Symbol	Characteristic	Min	Typ	Max	Unit	Condition
I_{IH}	Input HIGH Current			20	μA	V_{IN} = 2.7 V
I_{IHH}	Input HIGH Current			100	μA	V_{IN} = V_{CC}
I_{IL}	Input LOW Current			−0.2	mA	V_{IN} = 0.5 V
V_{IK}	Input Clamp Diode Voltage			−1.2	V	I_{IN} = −18 mA
V_{IH}	Input HIGH Voltage	2.0		3.3	V	
V_{IL}	Input LOW Voltage	0		0.8	V	

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 lfpm.

5. V_{CC} can vary ±0.15 V.

Table 6. AC CHARACTERISTICS V_{CC} = 3.3 V; GND = 0.0 V (Note 6)

Symbol	Characteristic	−40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
f_{max}	Maximum Toggle Frequency					350					MHz
t_{PLH}	Propagation Delay (Note 7)	200	350	600	200	350	600	200	350	600	ps
t_{skew}	Skew Output−to−Output Part−to−Part		30	100 400		30	100 400		30	100 400	ps
t_{JITTER}	Random Clock Jitter (RMS)			2.1		1.1	1.9			1.6	ps
$t_{jit(\phi)}$	Additive RMS Phase Jitter f_c = 50 MHz, Integration Range: 12 kHz to 20 MHz (See Figure 2)					219					fs
t_r/t_f	Output Rise/Fall Time (20−80%)	200		550	200		500	200		500	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 lfpm.

6. V_{CC} can vary ±0.15 V. Outputs are terminated through a 50 Ω resistor to V_{CC} − 2 V.
7. Specifications for standard TTL input signal.

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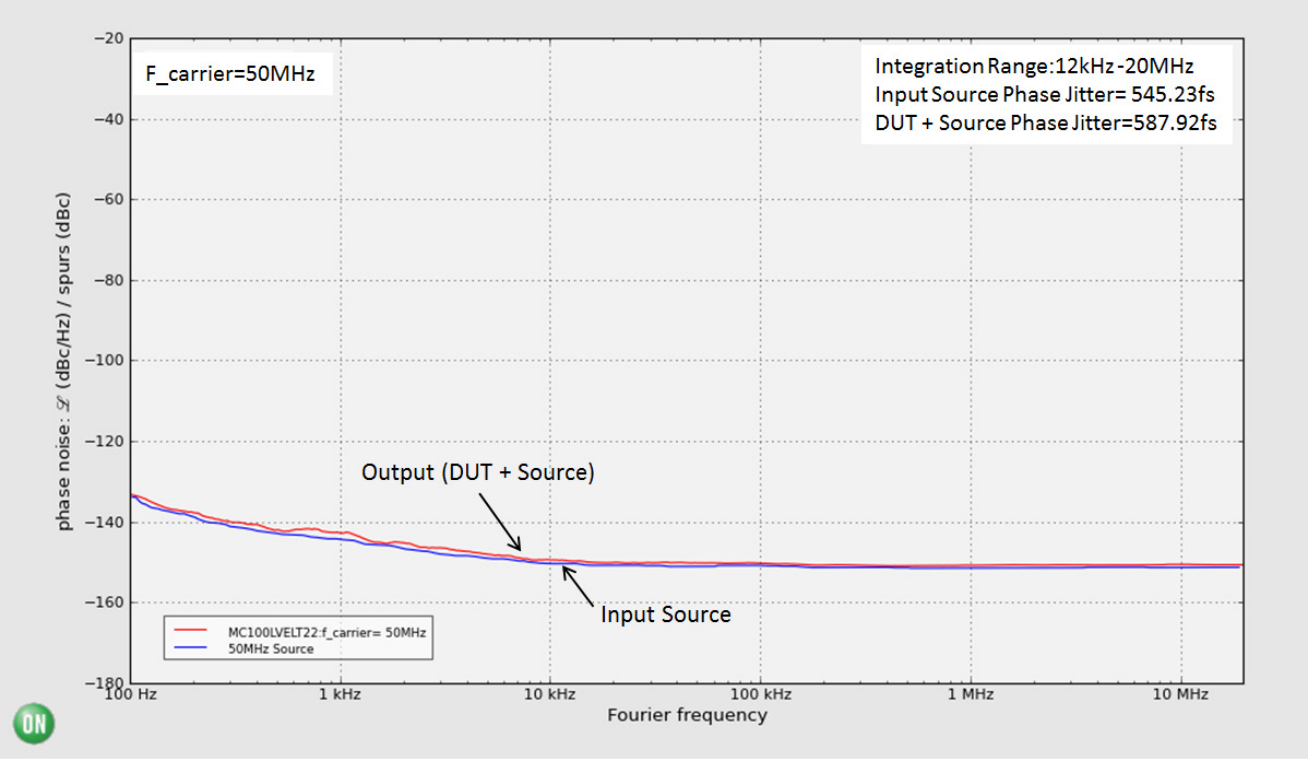


Figure 2. Typical MC100LVELT22 Phase Noise Plot at $f_{Carrier}$ = 50 MHz, V_{CC} = 3.3 V, 25°C

The above phase noise data was captured using Agilent E5052A/B. The data displays the input phase noise and output phase noise used to calculate the additive phase jitter at a specified integration range. The additive RMS phase jitter contributed by the device (integrated between 12 kHz and 20 MHz) is 219 fs. The additive RMS phase jitter performance of the translator is highly dependent on the phase noise of the input source.

To obtain the most precise additive phase noise measurement, it is vital that the source phase noise be notably lower than that of the DUT. If the phase noise of the source is greater than the noise floor of the device under test, the source noise will dominate the additive phase jitter calculation and lead to an incorrect negative result for the additive phase noise within the integration range. The Figure above is a good example of the MC100LVELT22 source generator phase noise having a significantly lower floor than the DUT and results in an additive phase jitter of 219 fs.

$$\text{Additive RMS phase jitter} = \sqrt{\text{RMS phase jitter of output}^2 - \text{RMS phase jitter of input}^2}$$

$$219\ \text{fs} = \sqrt{587.92\ \text{fs}^2 - 545.23\ \text{fs}^2}$$

Figure 2 was created with measured data from Agilent−E5052B Signal Source Analyzer using ON Semiconductor Phase Noise Explorer web tool. This free application enables an interactive environment for advanced phase noise and jitter analysis of timing devices and clock tree designs. To see the performance of MC100LVELT22 beyond conditions outlined in this datasheet, please visit the ON Semiconductor Green Point Design Tools homepage.

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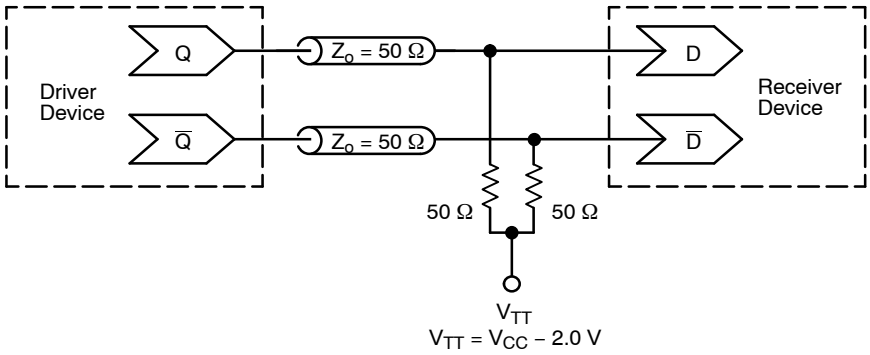


Figure 3. Typical Termination for Output Driver and Device Evaluation (See Application Note AND8020/D – Termination of ECL Logic Devices.)

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

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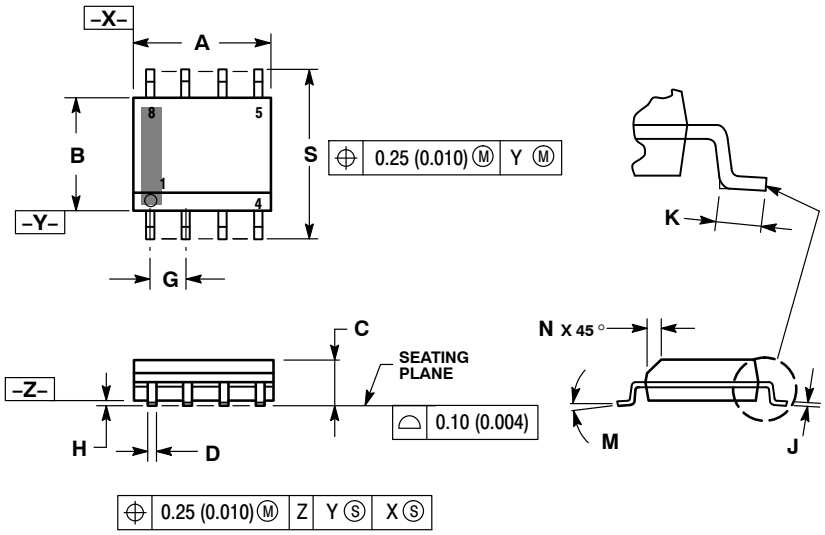
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SCALE 1:1

SOIC−8 NB
CASE 751−07
ISSUE AK

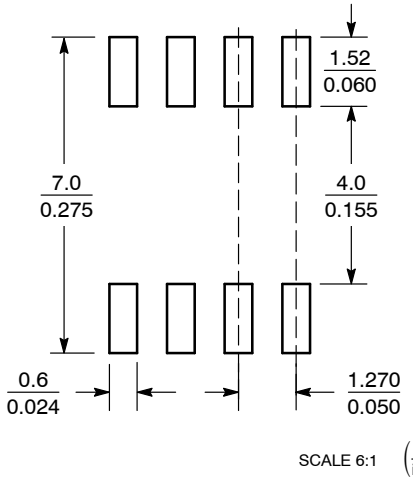
DATE 16 FEB 2011



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.

	MILLIMETERS		INCHES	
DIM	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

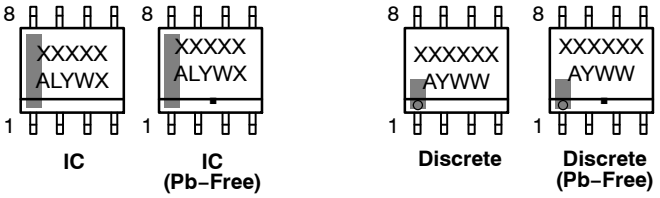
SOLDERING FOOTPRINT*



SCALE 6:1 (mm / inches)

*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*



XXXXX = Specific Device Code
A = Assembly Location
L = Wafer Lot
Y = Year
W = Work Week
▪ = Pb−Free Package

XXXXXX = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
▪ = 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.

STYLES ON PAGE 2

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CASE 751−07
ISSUE AK

DATE 16 FEB 2011

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

STYLE 2:
PIN 1. COLLECTOR, DIE, #1
2. COLLECTOR, #1
3. COLLECTOR, #2
4. COLLECTOR, #2
5. BASE, #2
6. EMITTER, #2
7. BASE, #1
8. EMITTER, #1

STYLE 3:
PIN 1. DRAIN, DIE #1
2. DRAIN, #1
3. DRAIN, #2
4. DRAIN, #2
5. GATE, #2
6. SOURCE, #2
7. GATE, #1
8. SOURCE, #1

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

STYLE 5:
PIN 1. DRAIN
2. DRAIN
3. DRAIN
4. DRAIN
5. GATE
6. GATE
7. SOURCE
8. SOURCE

STYLE 6:
PIN 1. SOURCE
2. DRAIN
3. DRAIN
4. SOURCE
5. SOURCE
6. GATE
7. GATE
8. SOURCE

STYLE 7:
PIN 1. INPUT
2. EXTERNAL BYPASS
3. THIRD STAGE SOURCE
4. GROUND
5. DRAIN
6. GATE 3
7. SECOND STAGE Vd
8. FIRST STAGE Vd

STYLE 8:
PIN 1. COLLECTOR, DIE #1
2. BASE, #1
3. BASE, #2
4. COLLECTOR, #2
5. COLLECTOR, #2
6. EMITTER, #2
7. EMITTER, #1
8. COLLECTOR, #1

STYLE 9:
PIN 1. EMITTER, COMMON
2. COLLECTOR, DIE #1
3. COLLECTOR, DIE #2
4. EMITTER, COMMON
5. EMITTER, COMMON
6. BASE, DIE #2
7. BASE, DIE #1
8. EMITTER, COMMON

STYLE 10:
PIN 1. GROUND
2. BIAS 1
3. OUTPUT
4. GROUND
5. GROUND
6. BIAS 2
7. INPUT
8. GROUND

STYLE 11:
PIN 1. SOURCE 1
2. GATE 1
3. SOURCE 2
4. GATE 2
5. DRAIN 2
6. DRAIN 2
7. DRAIN 1
8. DRAIN 1

STYLE 12:
PIN 1. SOURCE
2. SOURCE
3. SOURCE
4. GATE
5. DRAIN
6. DRAIN
7. DRAIN
8. DRAIN

STYLE 13:
PIN 1. N.C.
2. SOURCE
3. SOURCE
4. GATE
5. DRAIN
6. DRAIN
7. DRAIN
8. DRAIN

STYLE 14:
PIN 1. N−SOURCE
2. N−GATE
3. P−SOURCE
4. P−GATE
5. P−DRAIN
6. P−DRAIN
7. N−DRAIN
8. N−DRAIN

STYLE 15:
PIN 1. ANODE 1
2. ANODE 1
3. ANODE 1
4. ANODE 1
5. CATHODE, COMMON
6. CATHODE, COMMON
7. CATHODE, COMMON
8. CATHODE, COMMON

STYLE 16:
PIN 1. EMITTER, DIE #1
2. BASE, DIE #1
3. EMITTER, DIE #2
4. BASE, DIE #2
5. COLLECTOR, DIE #2
6. COLLECTOR, DIE #2
7. COLLECTOR, DIE #1
8. COLLECTOR, DIE #1

STYLE 17:
PIN 1. VCC
2. V2OUT
3. V1OUT
4. TXE
5. RXE
6. VEE
7. GND
8. ACC

STYLE 18:
PIN 1. ANODE
2. ANODE
3. SOURCE
4. GATE
5. DRAIN
6. DRAIN
7. CATHODE
8. CATHODE

STYLE 19:
PIN 1. SOURCE 1
2. GATE 1
3. SOURCE 2
4. GATE 2
5. DRAIN 2
6. MIRROR 2
7. DRAIN 1
8. MIRROR 1

STYLE 20:
PIN 1. SOURCE (N)
2. GATE (N)
3. SOURCE (P)
4. GATE (P)
5. DRAIN
6. DRAIN
7. DRAIN
8. DRAIN

STYLE 21:
PIN 1. CATHODE 1
2. CATHODE 2
3. CATHODE 3
4. CATHODE 4
5. CATHODE 5
6. COMMON ANODE
7. COMMON ANODE
8. CATHODE 6

STYLE 22:
PIN 1. I/O LINE 1
2. COMMON CATHODE/VCC
3. COMMON CATHODE/VCC
4. I/O LINE 3
5. COMMON ANODE/GND
6. I/O LINE 4
7. I/O LINE 5
8. COMMON ANODE/GND

STYLE 23:
PIN 1. LINE 1 IN
2. COMMON ANODE/GND
3. COMMON ANODE/GND
4. LINE 2 IN
5. LINE 2 OUT
6. COMMON ANODE/GND
7. COMMON ANODE/GND
8. LINE 1 OUT

STYLE 24:
PIN 1. BASE
2. EMITTER
3. COLLECTOR/ANODE
4. COLLECTOR/ANODE
5. CATHODE
6. CATHODE
7. COLLECTOR/ANODE
8. COLLECTOR/ANODE

STYLE 25:
PIN 1. VIN
2. N/C
3. REXT
4. GND
5. IOUT
6. IOUT
7. IOUT
8. IOUT

STYLE 26:
PIN 1. GND
2. dv/dt
3. ENABLE
4. ILIMIT
5. SOURCE
6. SOURCE
7. SOURCE
8. VCC

STYLE 27:
PIN 1. ILIMIT
2. OVLO
3. UVLO
4. INPUT+
5. SOURCE
6. SOURCE
7. SOURCE
8. DRAIN

STYLE 28:
PIN 1. SW_TO_GND
2. DASIC_OFF
3. DASIC_SW_DET
4. GND
5. V_MON
6. VBULK
7. VBULK
8. VIN

STYLE 29:
PIN 1. BASE, DIE #1
2. EMITTER, #1
3. BASE, #2
4. EMITTER, #2
5. COLLECTOR, #2
6. COLLECTOR, #2
7. COLLECTOR, #1
8. COLLECTOR, #1

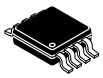
STYLE 30:
PIN 1. DRAIN 1
2. DRAIN 1
3. GATE 2
4. SOURCE 2
5. SOURCE 1/DRAIN 2
6. SOURCE 1/DRAIN 2
7. SOURCE 1/DRAIN 2
8. GATE 1

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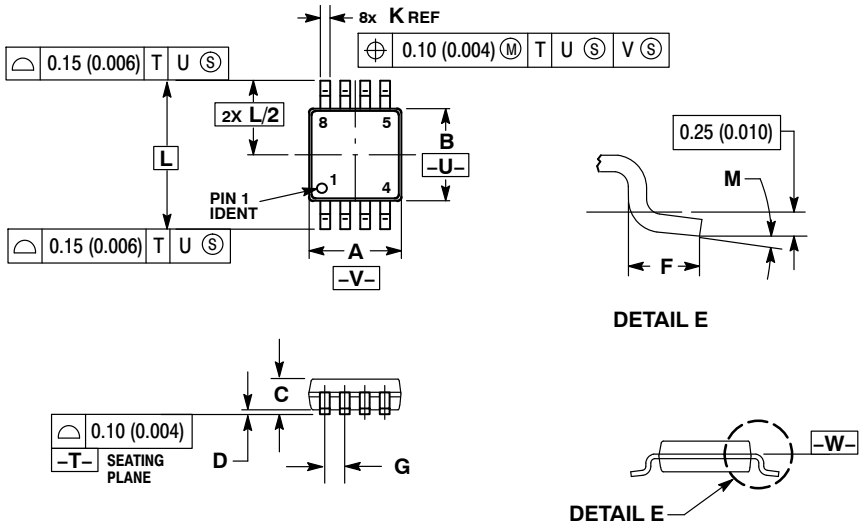
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SCALE 2:1

TSSOP−8 3.00x3.00x0.95
CASE 948R−02
ISSUE A

DATE 07 APR 2000



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−.

	MILLIMETERS		INCHES	
DIM	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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