



THE DATASHEET OF 74LVC14AMTR





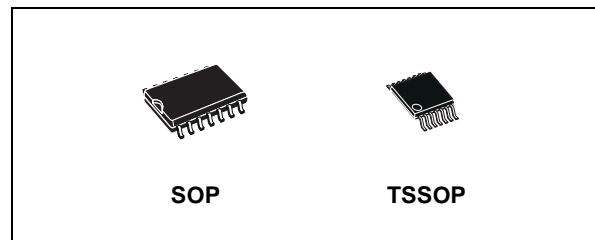
74LVC14A

LOW VOLTAGE CMOS HEX INVERTER HIGH PERFORMANCE

- 5V TOLERANT INPUTS
- HIGH SPEED: $t_{PD} = 5.0\text{ns}$ (MAX.) at $V_{CC} = 3\text{V}$
- POWER DOWN PROTECTION ON INPUTS AND OUTPUTS
- SYMMETRICAL OUTPUT IMPEDANCE:
 $|I_{OH}| = I_{OL} = 24\text{mA}$ (MIN) at $V_{CC} = 3\text{V}$
- PCI BUS LEVELS GUARANTEED AT 24 mA
- BALANCED PROPAGATION DELAYS:
 $t_{PLH} \approx t_{PHL}$
- OPERATING VOLTAGE RANGE:
 $V_{CC}(\text{OPR}) = 1.65\text{V}$ to 3.6V (1.2V Data Retention)
- PIN AND FUNCTION COMPATIBLE WITH 74 SERIES 00
- LATCH-UP PERFORMANCE EXCEEDS 500mA (JESD 17)
- ESD PERFORMANCE:
HBM > 2000V (MIL STD 883 method 3015);
MM > 200V

DESCRIPTION

The 74LVC14A is a low voltage CMOS HEX SCHMITT INVERTER fabricated with sub-micron silicon gate and double-layer metal wiring C²MOS technology. It is ideal for 1.65 to 3.6 V_{CC} operations and low power and low noise applications.



ORDER CODES

PACKAGE	TUBE	T & R
SOP	74LVC14AM	74LVC14AMTR
TSSOP		74LVC14ATTR

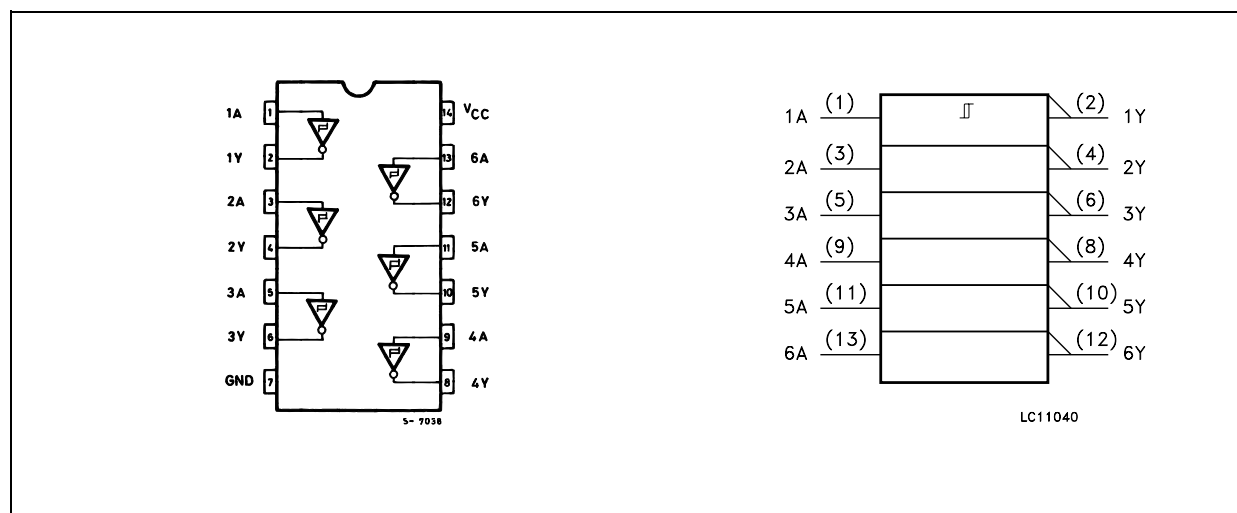
It can be interfaced to 5V signal environment for inputs in mixed 3.3/5V system.

It has more speed performance at 3.3V than 5V AC/ACT family, combined with a lower power consumption.

Pin configuration and function are the same as those of the 74LVC04A but the 74LVC14A has hysteresis between the positive and negative input threshold typically of 700mV.

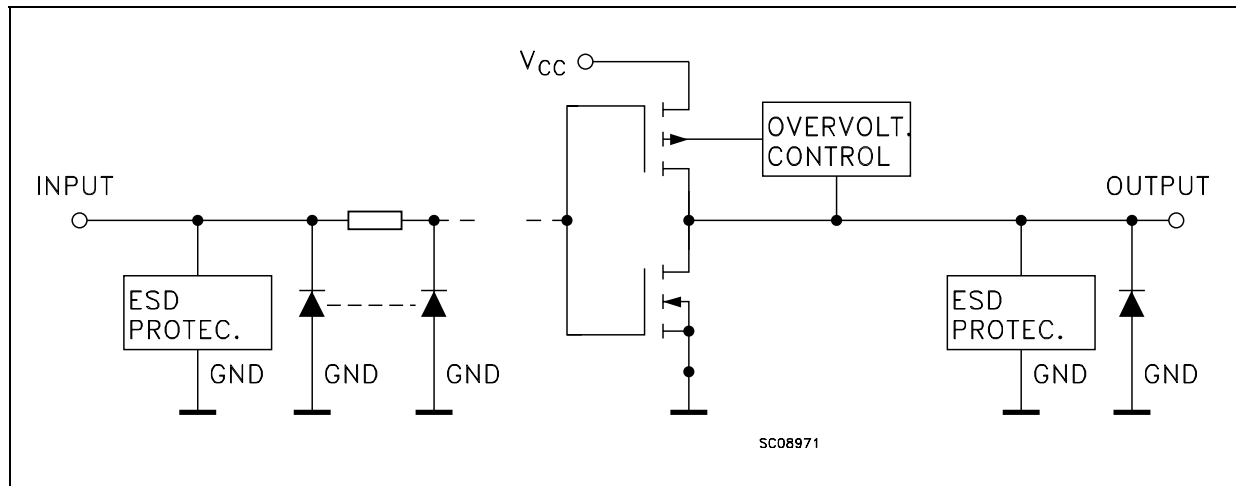
All inputs and outputs are equipped with protection circuits against static discharge, giving them 2KV ESD immunity and transient excess voltage.

PIN CONNECTION AND IEC LOGIC SYMBOLS



74LVC14A

INPUT AND OUTPUT EQUIVALENT CIRCUIT



PIN DESCRIPTION

PIN No	SYMBOL	NAME AND FUNCTION
1,3,5,9,11,13	1A to 6A	Data Inputs
2, 4, 6, 8, 10, 12	1Y to 6Y	Data Outputs
7	GND	Ground (0V)
14	V_{CC}	Positive Supply Voltage

TRUTH TABLE

A	Y
L	H
H	L

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	-0.5 to +7.0	V
V_I	DC Input Voltage	-0.5 to +7.0	V
V_O	DC Output Voltage ($V_{CC} = 0V$)	-0.5 to +7.0	V
V_O	DC Output Voltage (High or Low State) (note 1)	-0.5 to $V_{CC} + 0.5$	V
I_{IK}	DC Input Diode Current	- 50	mA
I_{OK}	DC Output Diode Current (note 2)	- 50	mA
I_O	DC Output Current	± 50	mA
I_{CC} or I_{GND}	DC V_{CC} or Ground Current per Supply Pin	± 100	mA
T_{stg}	Storage Temperature	-65 to +150	°C
T_L	Lead Temperature (10 sec)	300	°C

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied

1) I_O absolute maximum rating must be observed

2) $V_O < GND$

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage (note 1)	1.65 to 3.6	V
V_I	Input Voltage	0 to 5.5	V
V_O	Output Voltage ($V_{CC} = 0V$)	0 to 5.5	V
V_O	Output Voltage (High or Low State)	0 to V_{CC}	V
I_{OH}, I_{OL}	High or Low Level Output Current ($V_{CC} = 3.0$ to $3.6V$)	± 24	mA
I_{OH}, I_{OL}	High or Low Level Output Current ($V_{CC} = 2.7$ to $3.0V$)	± 12	mA
I_{OH}, I_{OL}	High or Low Level Output Current ($V_{CC} = 2.3$ to $2.7V$)	± 8	mA
I_{OH}, I_{OL}	High or Low Level Output Current ($V_{CC} = 1.65$ to $2.3V$)	± 4	mA
T_{op}	Operating Temperature	-55 to 125	°C

1) Truth Table guaranteed: 1.2V to 3.6V

DC SPECIFICATIONS

Symbol	Parameter	Test Condition		Value				Unit
		V _{CC} (V)		-40 to 85 °C		-55 to 125 °C		
				Min.	Max.	Min.	Max.	
V _{T+}	Positive Input threshold	1.65 to 1.95		0.6	1.4	0.6	1.4	V
		2.3 to 2.7		0.8	2.0	0.8	2.0	
		3.0		0.8	2.0	0.8	2.0	
		3.6		0.8	2.2	0.8	2.2	
V _{T-}	Negative Input threshold	1.65 to 1.95		0.3	1.0	0.3	1.0	V
		2.3 to 2.7		0.4	1.4	0.4	1.4	
		3.0		0.6	1.5	0.6	1.5	
		3.6		0.8	1.8	0.8	1.8	
V _H	Hysteresis Voltage	1.65 to 1.95		0.3	1.1	0.3	1.1	
		2.3 to 2.7		0.3	1.1	0.3	1.1	
		3.0		0.3	1.2	0.3	1.2	
		3.6		0.3	1.2	0.3	1.2	
V _{OH}	High Level Output Voltage	1.65 to 3.6	I _O =-100 μA	V _{CC} -0.2		V _{CC} -0.2		V
		1.65	I _O =-4 mA	1.2		1.2		
		2.3	I _O =-8 mA	1.7		1.7		
		2.7	I _O =-12 mA	2.2		2.2		
		3.0	I _O =-12 mA	2.4		2.4		
		3.0	I _O =-24 mA	2.2		2.2		
V _{OL}	Low Level Output Voltage	1.65 to 3.6	I _O =100 μA		0.2		0.2	V
		1.65	I _O =4 mA		0.45		0.45	
		2.3	I _O =8 mA		0.7		0.7	
		2.7	I _O =12 mA		0.4		0.4	
		3.0	I _O =24 mA		0.55		0.55	
I _I	Input Leakage Current	3.6	V _I = 0 to 5.5V		± 5		± 5	μA
I _{off}	Power Off Leakage Current	0	V _I or V _O = 5.5V		10		10	μA
I _{CC}	Quiescent Supply Current	3.6	V _I = V _{CC} or GND		10		10	μA
			V _I or V _O = 3.6 to 5.5V		± 10		± 10	
ΔI _{CC}	I _{CC} incr. per Input	2.7 to 3.6	V _{IH} = V _{CC} -0.6V		500		500	μA

DYNAMIC SWITCHING CHARACTERISTICS

Symbol	Parameter	Test Condition		Value			Unit
		V _{CC} (V)		T _A = 25 °C			
				Min.	Typ.	Max.	
V _{OLP}	Dynamic Low Level Quiet Output (note 1)	3.3	C _L = 50pF V _{IL} = 0V, V _{IH} = 3.3V		0.8		V
V _{OLV}					-0.8		

1) Number of output defined as "n". Measured with "n-1" outputs switching from HIGH to LOW or LOW to HIGH. The remaining output is measured in the LOW state.

AC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Test Condition				Value				Unit
		V _{CC} (V)	C _L (pF)	R _L (Ω)	t _s = t _r (ns)	-40 to 85 °C		-55 to 125 °C		
						Min.	Max.	Min.	Max.	
t _{PLH} t _{PHL}	Propagation Delay Time	1.65 to 1.95	30	1000	2.0		10.5		14	ns
		2.3 to 2.7	30	500	2.0		7.0		9.1	
		2.7	50	500	2.5		6.0		7.5	
		3.0 to 3.6	50	500	2.5	1	5.0	1	6.4	
t _{OSLH} t _{OSSL}	Output To Output Skew Time (note1, 2)	2.7 to 3.6					1		1	ns

1) Skew is defined as the absolute value of the difference between the actual propagation delay for any two outputs of the same device switching in the same direction, either HIGH or LOW (t_{OSLH} = |t_{PLHm} - t_{PLHn}|, t_{OSSL} = |t_{PHLm} - t_{PHLn}|)

2) Parameter guaranteed by design

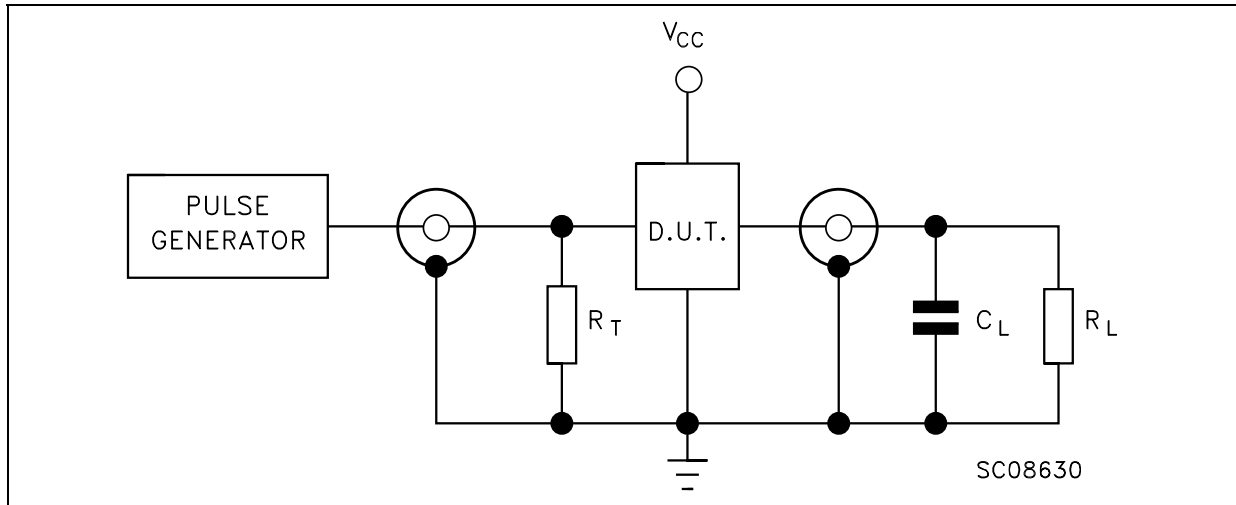
CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Test Condition		Value			Unit
		V _{CC} (V)		T _A = 25 °C			
				Min.	Typ.	Max.	
C _{IN}	Input Capacitance				4		pF
C _{PD}	Power Dissipation Capacitance (note 1)	1.8	f _{IN} = 10MHz		37		pF
		2.5			38		
		3.3			42		

1) C_{PD} is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit). Average operating current can be obtained by the following equation. I_{CC(opr)} = C_{PD} × V_{CC} × f_{IN} + I_{CC/n} (per circuit)

74LVC14A

TEST CIRCUIT

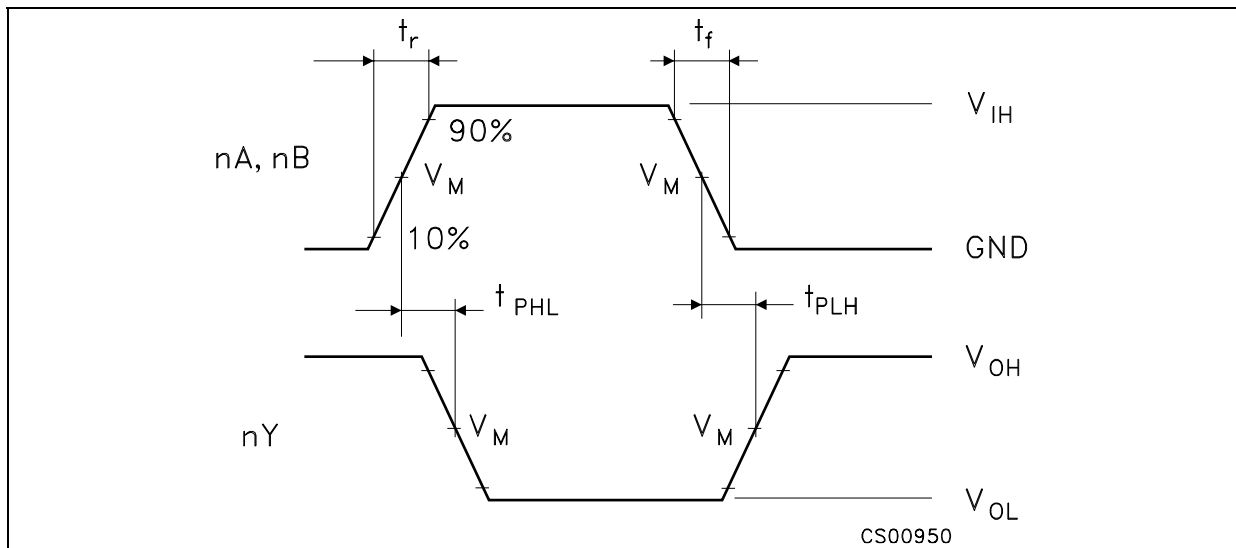


$R_T = Z_{OUT}$ of pulse generator (typically 50 Ω)

TEST CIRCUIT AND WAVEFORM SYMBOL VALUE

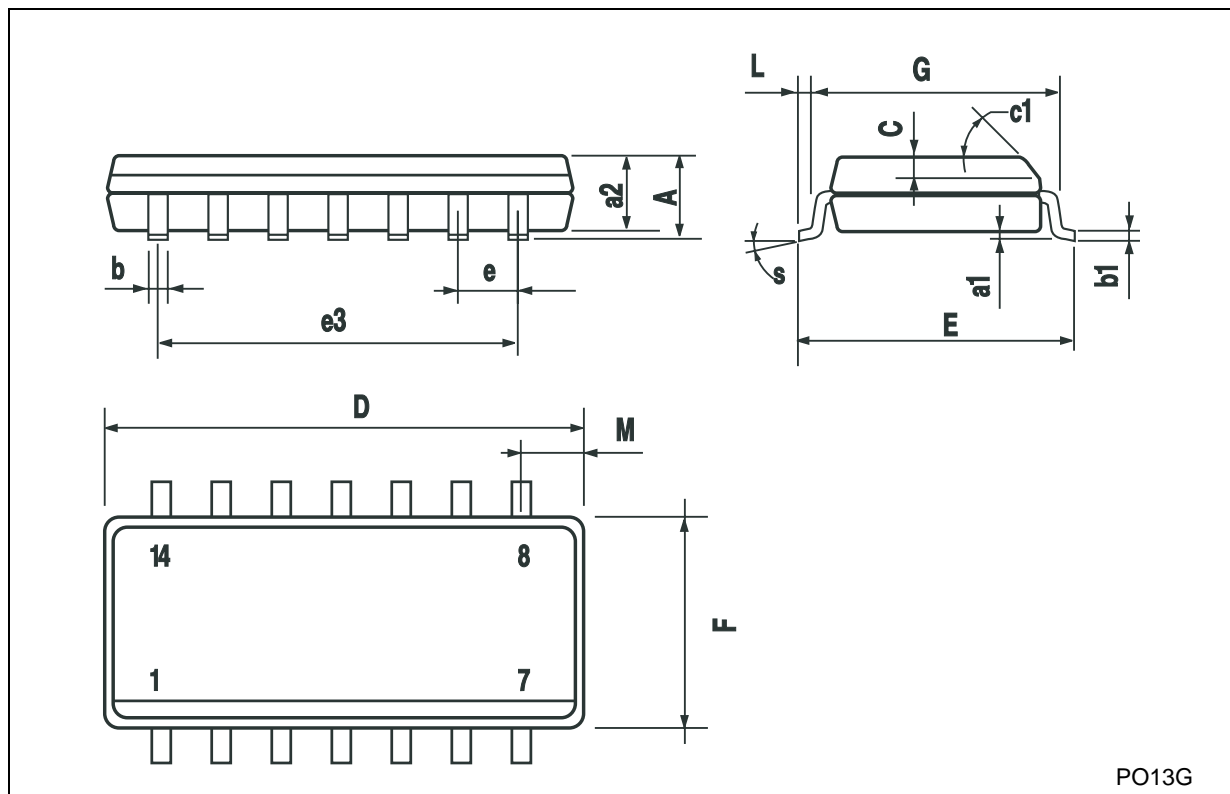
Symbol	V_{CC}			
	1.65 to 1.95V	2.3 to 2.7V	2.7V	3.0 to 3.6V
C_L	30pF	30pF	50pF	50pF
R_L	1000 Ω	500 Ω	500 Ω	500 Ω
V_{IH}	V_{CC}	V_{CC}	2.7V	2.7V
V_M	$V_{CC}/2$	$V_{CC}/2$	1.5V	1.5V
V_{OH}	V_{CC}	V_{CC}	3.0V	3.0V
$t_r = t_f$	<2.0ns	<2.0ns	<2.5ns	<2.5ns

WAVEFORM: PROPAGATION DELAY (f=1MHz; 50% duty cycle)



SO-14 MECHANICAL DATA

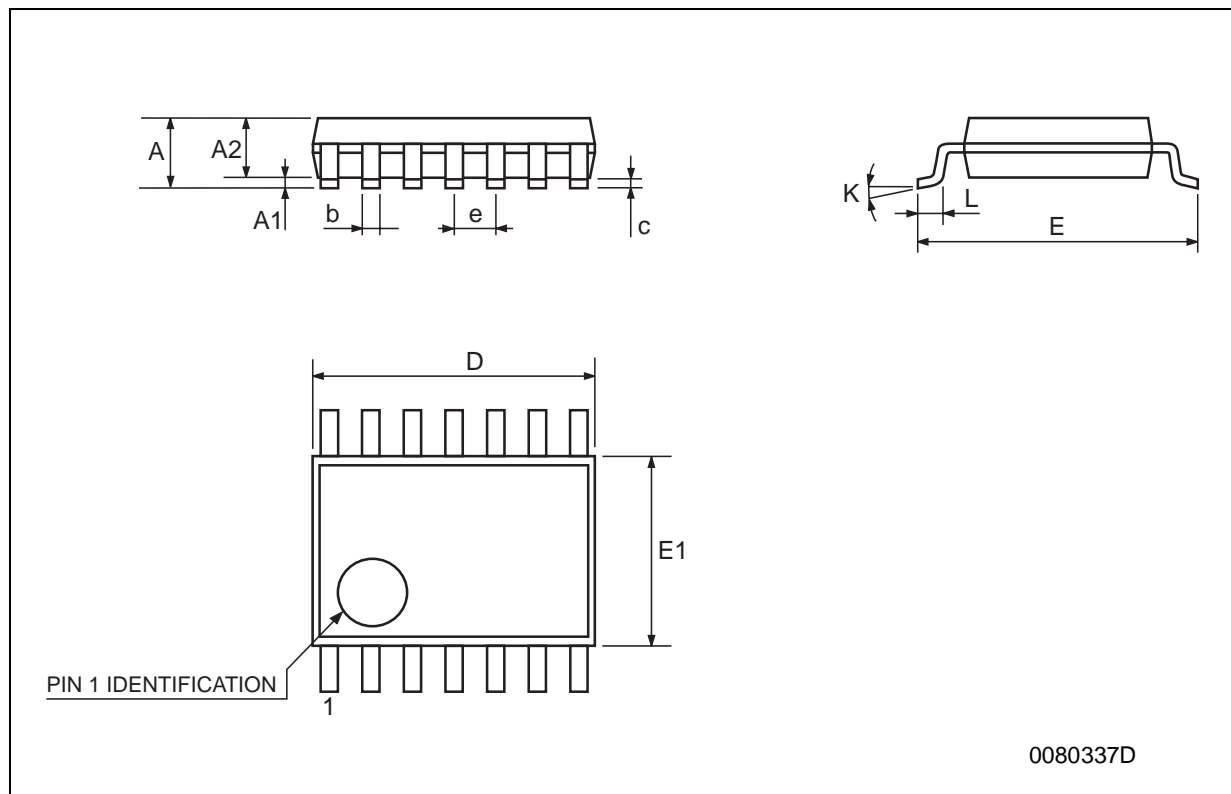
DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.2	0.003		0.007
a2			1.65			0.064
b	0.35		0.46	0.013		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.019	
c1	45° (typ.)					
D	8.55		8.75	0.336		0.344
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		7.62			0.300	
F	3.8		4.0	0.149		0.157
G	4.6		5.3	0.181		0.208
L	0.5		1.27	0.019		0.050
M			0.68			0.026
S	8° (max.)					



PO13G

TSSOP14 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			1.2			0.047
A1	0.05		0.15	0.002	0.004	0.006
A2	0.8	1	1.05	0.031	0.039	0.041
b	0.19		0.30	0.007		0.012
c	0.09		0.20	0.004		0.0089
D	4.9	5	5.1	0.193	0.197	0.201
E	6.2	6.4	6.6	0.244	0.252	0.260
E1	4.3	4.4	4.48	0.169	0.173	0.176
e		0.65 BSC			0.0256 BSC	
K	0°		8°	0°		8°
L	0.45	0.60	0.75	0.018	0.024	0.030



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