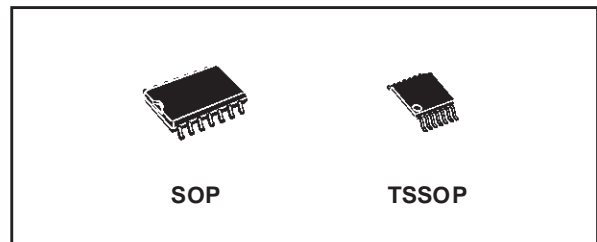




# 74LVQ4066

## QUAD BILATERAL SWITCH

- HIGH SPEED:  
 $t_{PD} = 0.4 \text{ ns (TYP.) at } V_{CC} = 3.3 \text{ V}$   
 $t_{PD} = 0.1 \text{ ns (TYP.) at } V_{CC} = 5 \text{ V}$
- LOW POWER DISSIPATION:  
 $I_{CC} = 2\mu\text{A (MAX.) at } T_A = 25^\circ\text{C}$
- LOW "ON" LOW RESISTANCE  
 $R_{ON} = 14\Omega \text{ at } V_{CC} = 3.3 \text{ V, } I_{I/O} \leq 1 \text{ mA}$   
 $R_{ON} = 12\Omega \text{ at } V_{CC} = 5.0 \text{ V, } I_{I/O} \leq 1 \text{ mA}$
- SINE WAVE DISTORTION :  
 $0.04\% \text{ at } V_{CC} = 3.3 \text{ V, } f = 1 \text{ KHz}$
- OPERATING VOLTAGE RANGE:  
 $V_{CC(OPR)} = 2 \text{ V to } 5.5 \text{ V}$
- PIN AND FUNCTION COMPATIBLE WITH  
 74 SERIES 4066
- IMPROVED LATCH-UP IMMUNITY



### ORDER CODES

PACKAGE	TUBE	T & R
SOP	74LVQ4066M	74LVQ4066MTR
TSSOP		74LVQ4066TTR

### DESCRIPTION

The 74LVQ4066 is a low voltage CMOS QUAD BILATERAL SWITCH fabricated with sub-micron silicon gate and double-layer metal wiring C<sup>2</sup>MOS technology.

It is ideal for low power and low noise 3.3V applications and each switch is designed to handle both analog and digital signals.

The switches permit signals with amplitudes up to V<sub>cc</sub> (peak) to be transmitted in either direction

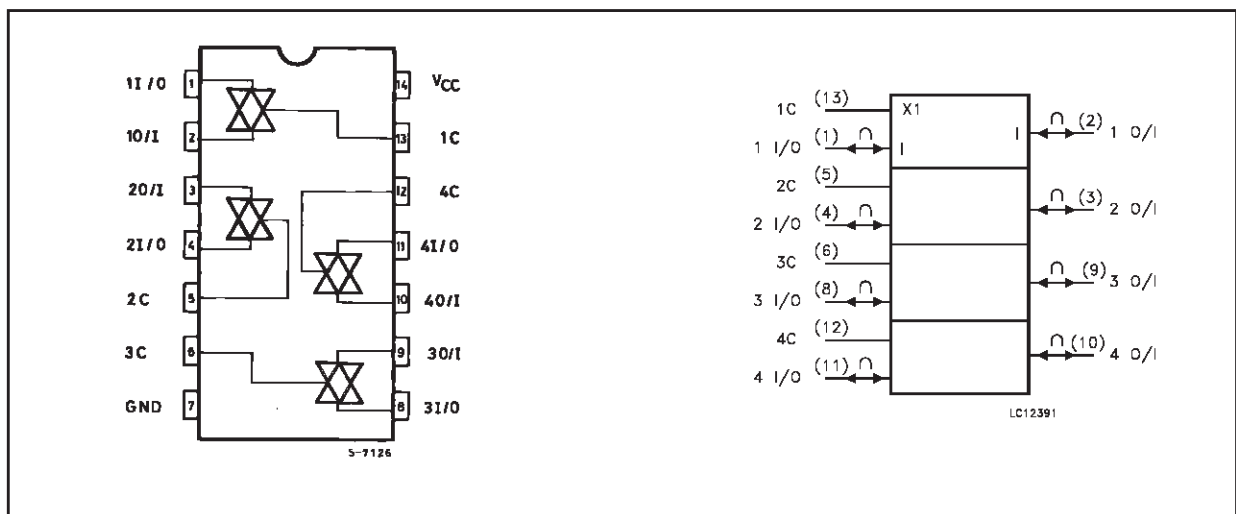
without relevant propagation delay and without generating additional ground bounce noise.

It has an ON-Resistance which is greatly reduced in comparison with 74HC4066.

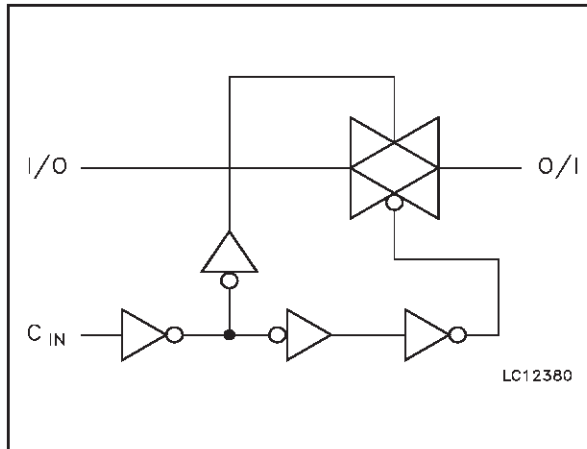
It is provided of four individual enable inputs to control the switches; the switch is ON when the C input is held high and OFF (High Impedance) when C is held low.

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

### PIN CONNECTION AND IEC LOGIC SYMBOLS



## LOGIC DIAGRAM



## PIN DESCRIPTION

PIN No	SYMBOL	NAME AND FUNCTION
1, 4, 8, 11	1 to 4 I/O	Independent Input/Output
2, 3, 9, 10	1 to 4 O/I	Independent Output/Input
13, 5, 6, 12	1C to 4C	Enable Input (Active HIGH)
7	GND	Ground (0V)
14	V <sub>CC</sub>	Positive Supply Voltage

## TRUTH TABLE

A	B
H	ON
L	OFF*

(\*) High Impedance

## ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V <sub>CC</sub>	Supply Voltage	-0.5 to +7	V
V <sub>I</sub>	DC Input Voltage	-0.5 to V <sub>CC</sub> + 0.5	V
V <sub>O</sub>	DC Output Voltage	-0.5 to V <sub>CC</sub> + 0.5	V
I <sub>IK</sub>	DC Input Diode Current	± 20	mA
I <sub>OK</sub>	DC Output Diode Current	± 20	mA
I <sub>O</sub>	DC Output Current	± 50	mA
I <sub>CC</sub> or I <sub>GND</sub>	DC V <sub>CC</sub> or Ground Current	± 200	mA
T <sub>stg</sub>	Storage Temperature	-65 to +150	°C
T <sub>L</sub>	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.

## RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V <sub>CC</sub>	Supply Voltage (note 1)	2 to 5.5	V
V <sub>I</sub>	Input Voltage	0 to V <sub>CC</sub>	V
V <sub>O</sub>	Output Voltage	0 to V <sub>CC</sub>	V
T <sub>op</sub>	Operating Temperature	-55 to 125	°C
dt/dv	Input Rise and Fall Time on control pin V <sub>CC</sub> = 3.0V (note 2)	0 to 10	ns/V

1) Truth Table guaranteed: 1.2V to 5.5V

2) V<sub>IN</sub> from 30% to 70%V<sub>CC</sub>

## DC SPECIFICATIONS

Symbol	Parameter	Test Condition		Value						Unit	
		V <sub>CC</sub> (V)		T <sub>A</sub> = 25°C			-40 to 85°C		-55 to 125°C		
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.
V <sub>IH</sub>	High Level Input Voltage	2.7 to		0.7 V <sub>CC</sub>			0.7 V <sub>CC</sub>		0.7 V <sub>CC</sub>		V
V <sub>IL</sub>	Low Level Input Voltage	5.5				0.3 V <sub>CC</sub>		0.3 V <sub>CC</sub>		0.3 V <sub>CC</sub>	V
R <sub>ON</sub>	ON Resistance	3.3 (**)	V <sub>I</sub> =V <sub>IH</sub> V <sub>I/O</sub> =V <sub>CC</sub> to GND I <sub>I/O</sub> ≤ 1mA		14	20		28		36	Ω
		5.0(*)			12	17		22		26	
		3.3 (**)	V <sub>I</sub> =V <sub>IH</sub> V <sub>I/O</sub> =V <sub>CC</sub> or GND I <sub>I/O</sub> ≤ 1mA		10.5	14		20		26	
		5.0(*)			9.5	13		17		20	
R <sub>ON</sub>	Difference of ON Resistance Between Switches	3.0 to 5.5	V <sub>I</sub> =V <sub>IH</sub> V <sub>I/O</sub> =V <sub>CC</sub> to GND I <sub>I/O</sub> ≤ 1mA		2						Ω
I <sub>OFF</sub>	Input/Output Leakage Current (SWITCH OFF)	5.5	V <sub>OS</sub> = V <sub>CC</sub> to GND V <sub>IS</sub> = V <sub>CC</sub> to GND V <sub>I</sub> = V <sub>IL</sub>			± 0.1		± 1.0		± 1.0	μA
I <sub>Iz</sub>	Switch Input Leakage Current (SWITCH ON , OUTPUT OFF)	5.5	V <sub>OS</sub> = V <sub>CC</sub> to GND V <sub>I</sub> = V <sub>IH</sub>			± 0.1		± 1.0		± 1.0	μA
I <sub>IN</sub>	Control Input Leakage Current	5.5	V <sub>I</sub> = V <sub>CC</sub> or GND			± 0.1		± 1.0		± 1.0	μA
I <sub>CC</sub>	Quiescent Supply Current	5.5	V <sub>I</sub> = V <sub>CC</sub> or GND			2		20		20	μA

(\*)Voltage range is 5V ±0.5V

(\*\*)Voltage range is 3.3V ±0.3V

AC ELECTRICAL CHARACTERISTICS ( $C_L = 50 \text{ pF}$ , Input  $t_r = t_f = 3\text{ns}$ )

Symbol	Parameter	Test Condition		Value						Unit	
		$V_{CC}$ (V)		$T_A = 25^\circ\text{C}$			$-40 \text{ to } 85^\circ\text{C}$		$-55 \text{ to } 125^\circ\text{C}$		
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.
$t_{PD}$	Delay Time	3.3(*)			0.4	0.8		1.2		2.0	ns
		5.0(**)			0.1	0.2		1.0		1.8	
$t_{PZL}$ $t_{PZH}$	Output Enable Time	3.3(*)	$R_L = 1 \text{ k}\Omega$		2.5	4.0		5.0		7.0	ns
		5.0(**)			2.0	4.0		5.0		7.0	
$t_{PLZ}$ $t_{PHZ}$	Output Disable Time	3.3(*)	$R_L = 1 \text{ k}\Omega$		5.0	7.5		9.0		11.0	ns
		5.0(**)			5.0	7.5		9.0		11.0	
$C_{IN}$	Input Capacitance				5						pF
$C_{I/O}$	Switch Terminal Capacitance				10						pF
$C_{PD}$	Power Dissipation Capacitance (note 1)	3.3			2.5						pF
		5.0			3						

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.  $I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}/4$  (Switch).

(\*) Voltage range is  $3.3\text{V} \pm 0.3\text{V}$

(\*) Voltage range is  $5\text{V} \pm 0.5\text{V}$

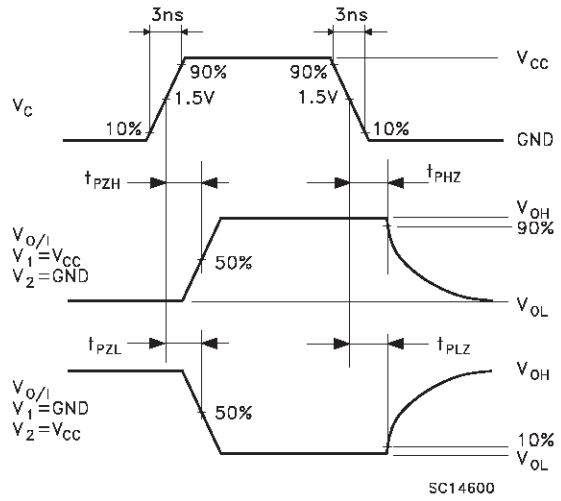
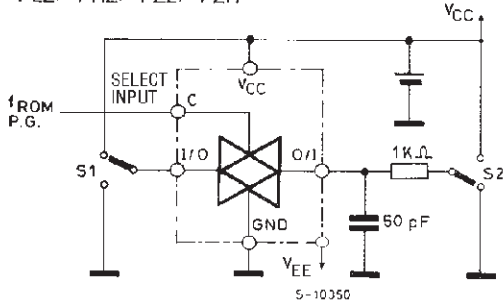
ANALOG SWITCH CHARACTERISTICS (GND = 0 V ,  $T_A = 25^\circ\text{C}$ )

Symbol	Parameter	Test Condition			Value	Unit
		$V_{CC}$ (V)	$V_{IN}$ ( $V_{p-p}$ )			
	Sine Wave Distortion (THD)	3.3	2.75	$f_{IN} = 1 \text{ KHz}$ $R_L = 10\text{K}\Omega$ $C_L = 50 \text{ pF}$	0.04	%
		5.0(*)	4		0.04	
$f_{MAX}$	Frequency Response (Switch ON)	3.3	Adjust $f_{IN}$ voltage to Obtain 0dBm at $V_{OS}$ .		150	MHz
		5.0(*)	Increase $f_{IN}$ Frequency until dB Meter reads -3dB $R_L = 50\Omega$ , $C_L = 10\text{pF}$		180	
	Feed through Attenuation (Switch OFF)	3.3	$V_{IN}$ is centered at $V_{CC}/2$ . Adjust input for 0dBm		-60	dB
		5.0(*)	$R_L = 600\Omega$ , $C_L = 50\text{pF}$ , $F_{IN} = 1 \text{ MHz}$ sine wave		-60	
	Crosstalk (Control Input to Signal Output)	3.3	$R_L = 600\Omega$ , $C_L = 50\text{pF}$ , $f_{IN} = 1\text{MHz}$ square wave		60	mV
		5.0(*)			60	
	Crosstalk (Between Any Switches)	3.3	$R_L = 600\Omega$ , $C_L = 50\text{pF}$ , $f_{IN} = 1\text{MHz}$ sine wave		-60	dB
		5.0(*)			-60	

(\*) Voltage range is  $5\text{V} \pm 0.5\text{V}$

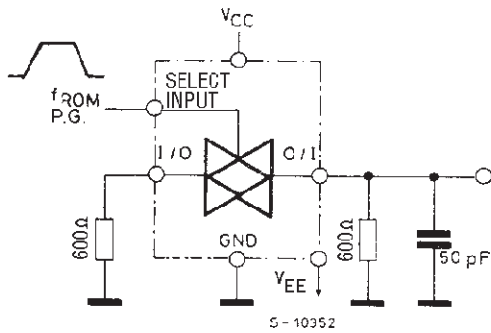
SWITCHING CHARACTERISTICS TEST CIRCUIT

$t_{PLZ}$ ,  $t_{PHZ}$ ,  $t_{PZL}$ ,  $t_{PZH}$



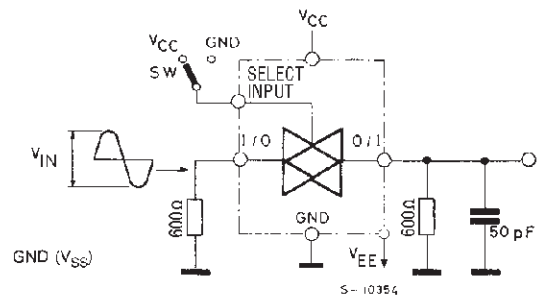
SC14600

CROSSTALK (control to output)



S-10352

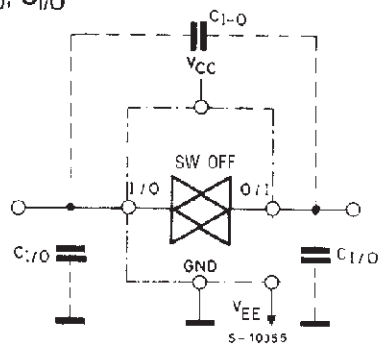
BANDWIDTH AND FEEDTHROUGH ATTENUATION



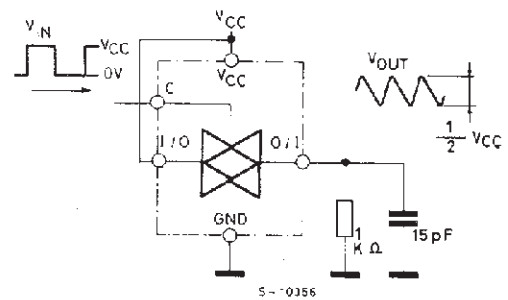
S-10354

MAXIMUM CONTROL FREQUENCY

$C_{I-O}$ ,  $C_{I/O}$

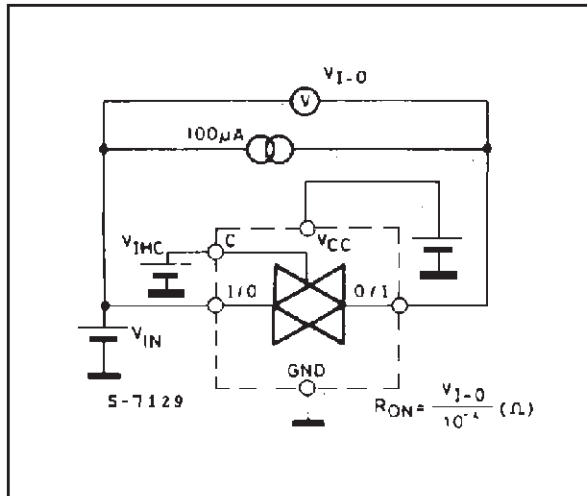


S-10355

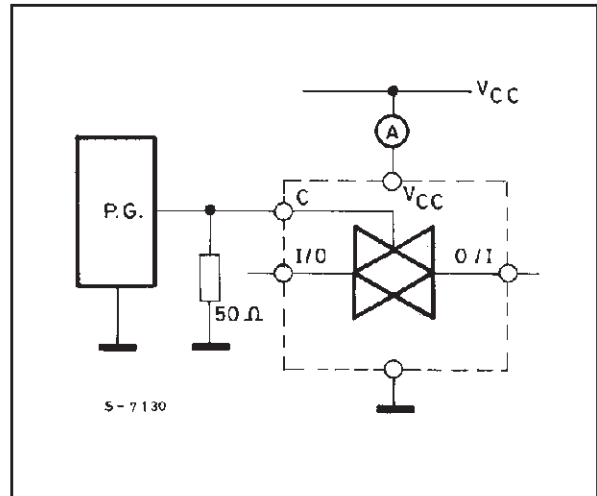


S-10356

CHANNEL RESISTANCE ( $R_{ON}$ )

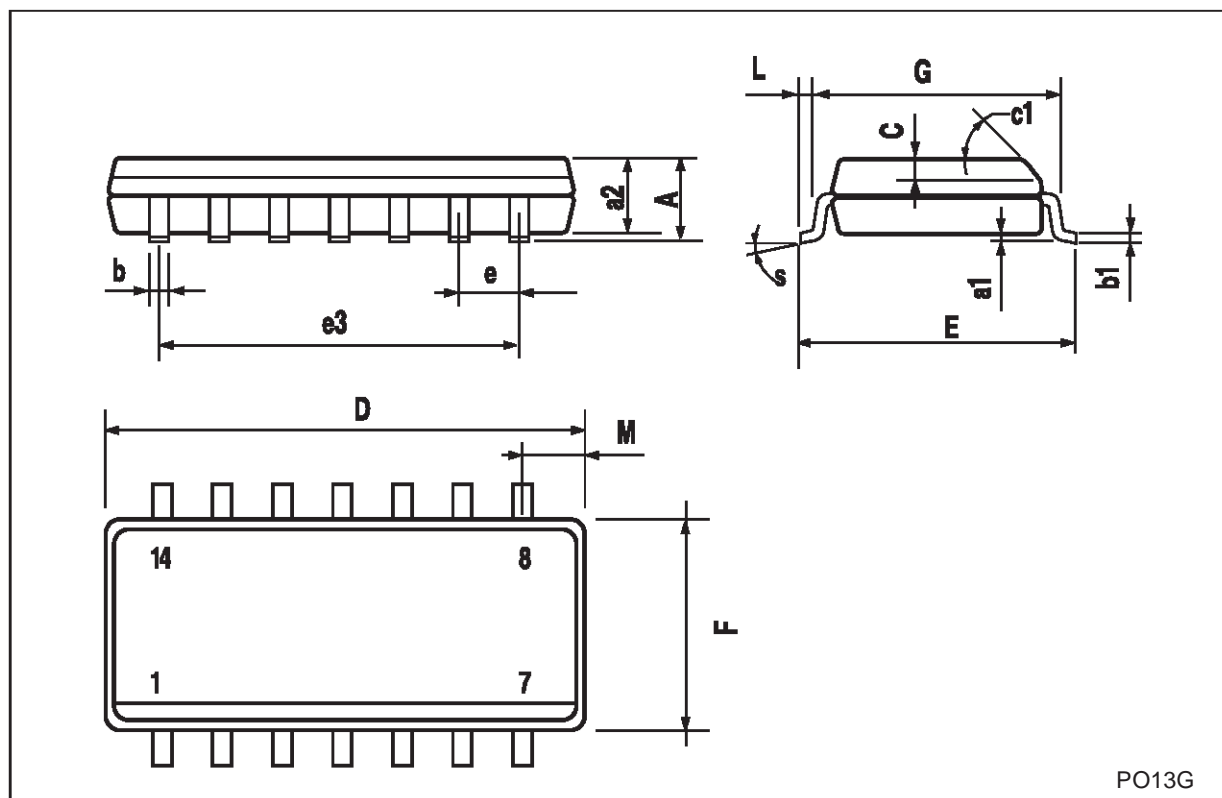


$I_{CC}$  (Opr.)



## SO-14 MECHANICAL DATA

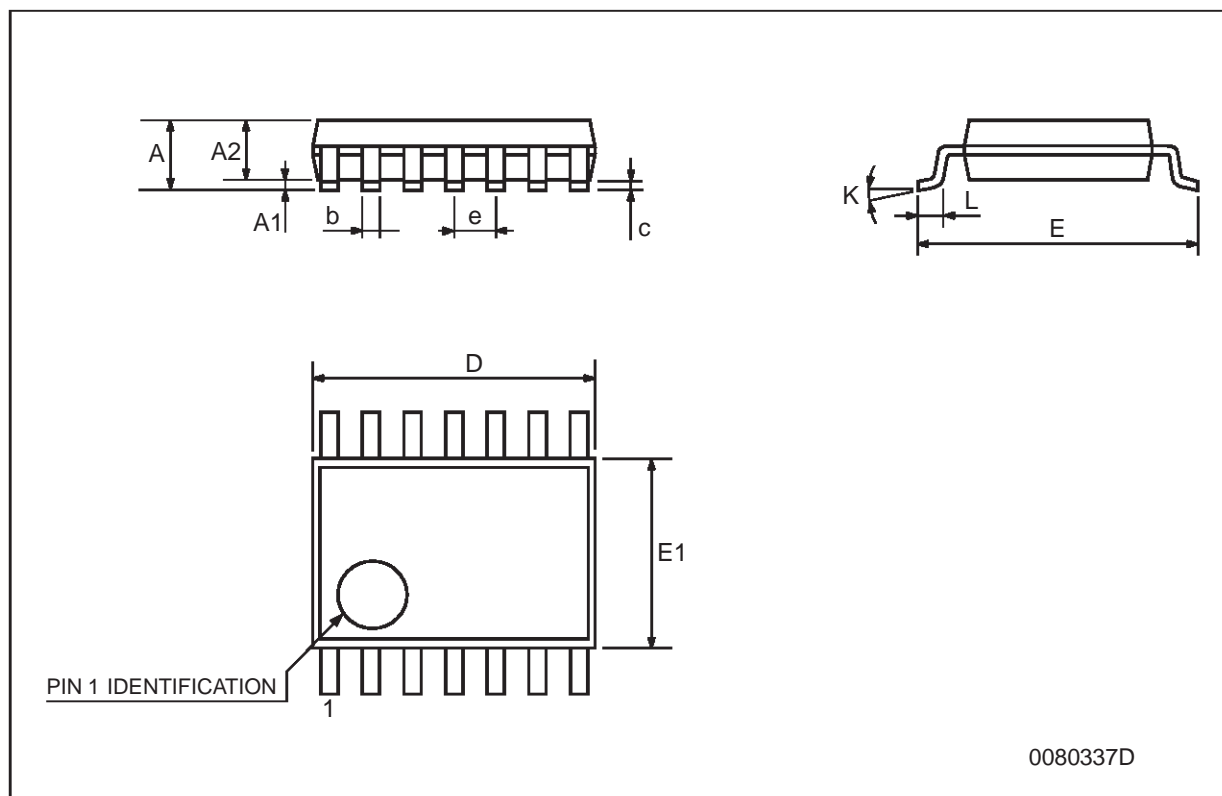
DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.2	0.003		0.007
a2			1.65			0.064
b	0.35		0.46	0.013		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.019	
c1	45° (typ.)					
D	8.55		8.75	0.336		0.344
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		7.62			0.300	
F	3.8		4.0	0.149		0.157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