



## ST232A

### VERY HIGH SPEED, ULTRA LOW POWER CONSUMPTION 5V POWERED RS-232 DRIVERS AND RECEIVERS

- SUPPLY VOLTAGE RANGE: 4.5 TO 5.5V
- SUPPLY CURRENT NO LOAD (TYP): 1.5mA
- TRANSMITTER OUTPUT VOLTAGE SWING (TYP):  $\pm 9V$
- TRANSITION SLEW RATE (TYP.):  $12V/\mu s$
- RECEIVER PROPAGATION DELAY (TYP.):  $0.1\mu s$
- RECEIVER INPUT VOLTAGE RANGE:  $\pm 30V$
- DATA RATE (TYP): 400Kbp/s
- OPERATING TEMPERATURE RANGE:  
-40 TO 85 °C, 0 TO 70 °C

#### DESCRIPTION

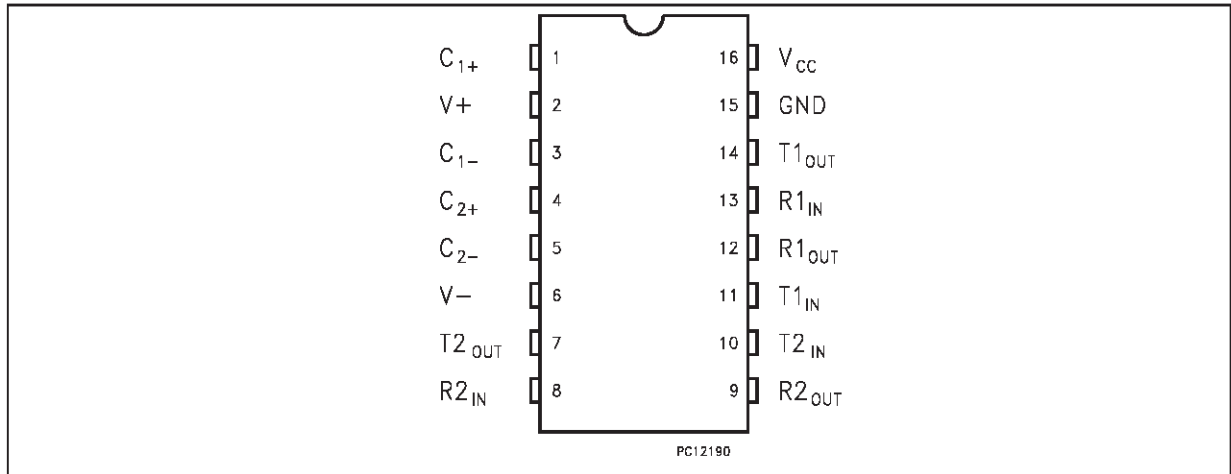
The ST232A is a 2 driver, 2 receiver device following EIA/TIA-232 and V.28 communication standard. It is particularly suitable for applications where  $\pm 12V$  is not available. The ST232 uses a single 5V power supply and only four external capacitors ( $0.1\mu F$ ). Typical applications are in: Portable Computers, Low Power Modems, Interfaces Translation, Battery Powered RS-232 System, Multi-Drop RS-232 Networks.



#### ORDER CODES

Type	Temperature Range	Package	Comments
ST232ACN	0 to 70 °C	DIP-16	25 parts per tube / 40 tube per box
ST232ABN	-40 to 85 °C	DIP-16	25 parts per tube / 40 tube per box
ST232ACD	0 to 70 °C	SO-16 (Tube)	50 parts per tube / 20 tube per box
ST232ABD	-40 to 85 °C	SO-16 (Tube)	50 parts per tube / 20 tube per box
ST232ACDR	0 to 70 °C	SO-16 (Tape & Reel)	2500 parts per reel
ST232ABDR	-40 to 85 °C	SO-16 (Tape & Reel)	2500 parts per reel
ST232ACW	0 to 70 °C	SO-16 Large (Tube)	50 parts per tube / 20 tube per box
ST232ABW	-40 to 85 °C	SO-16 Large (Tube)	50 parts per tube / 20 tube per box
ST232ACWR	0 to 70 °C	SO-16 Large (Tape & Reel)	1000 parts per reel
ST232ABWR	-40 to 85 °C	SO-16 Large (Tape & Reel)	1000 parts per reel
ST232ACTR	0 to 70 °C	TSSOP16 (Tape & Reel)	2500 parts per reel
ST232ABTR	-40 to 85 °C	TSSOP16 (Tape & Reel)	2500 parts per reel

**PIN CONFIGURATION**



**PIN DESCRIPTION**

PIN No	SYMBOL	NAME AND FUNCTION
1	C <sub>1+</sub>	Positive Terminal for the first Charge Pump Capacitor
2	V+	Doubled Voltage Terminal
3	C <sub>1-</sub>	Negative Terminal for the first Charge Pump Capacitor
4	C <sub>2+</sub>	Positive Terminal for the second Charge Pump Capacitor
5	C <sub>2-</sub>	Negative Terminal for the second Charge Pump Capacitor
6	V-	Inverted Voltage Terminal
7	T <sub>2</sub> OUT	Second Transmitter Output Voltage
8	R <sub>2</sub> IN	Second Receiver Input Voltage
9	R <sub>2</sub> OUT	Second Receiver Output Voltage
10	T <sub>2</sub> IN	Second Transmitter Input Voltage
11	T <sub>1</sub> IN	First Transmitter Input Voltage
12	R <sub>1</sub> OUT	First Receiver Output Voltage
13	R <sub>1</sub> IN	First Receiver Input Voltage
14	T <sub>1</sub> OUT	First Transmitter Output Voltage
15	GND	Ground
16	V <sub>CC</sub>	Supply Voltage

**ABSOLUTE MAXIMUM RATINGS**

Symbol	Parameter	Value	Unit
V <sub>CC</sub>	Supply Voltage	-0.3 to 6	V
V+	Extra Positive Voltage	(V <sub>CC</sub> -0.3) to 13.2	V
V-	Extra Negative Voltage	0.3 to -13.2	V
T <sub>IN</sub>	Transmitter Input Voltage Range	-0.3 to (V <sub>CC</sub> + 0.3)	V
R <sub>IN</sub>	Receiver Input Voltage Range	±30	V
T <sub>OUT</sub>	Transmitter Output Voltage Range	±15	V
R <sub>OUT</sub>	Receiver Output Voltage Range	-0.3 to (V <sub>CC</sub> + 0.3)	V
T <sub>SCTOUT</sub>	Short Circuit Duration on T <sub>OUT</sub>	infinite	

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

**ELECTRICAL CHARACTERISTICS**(C<sub>1</sub> -C<sub>4</sub> = 0.1μF, V<sub>CC</sub> = 5V ± 10%, T<sub>A</sub> = -40 to 85 °C, unless otherwise specified.Typical Values are referred to T<sub>A</sub> = 25 °C)

Symbol	Parameter	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
I <sub>SUPPLY</sub>	V <sub>CC</sub> Power Supply Current	No Load		1.5	4	mA

**TRANSMITTER ELECTRICAL CHARACTERISTICS**(C<sub>1</sub> -C<sub>4</sub> = 0.1μF, V<sub>CC</sub> = 5V ± 10%, T<sub>A</sub> = -40 to 85 °C, unless otherwise specified.Typical Values are referred to T<sub>A</sub> = 25 °C)

Symbol	Parameter	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
V <sub>TOUT</sub>	Output Voltage Swing	All Transmitter outputs are loaded with 3KΩ to GND	±5	±9		V
I <sub>TIL</sub>	Logic Pull-Up Current	T <sub>IN</sub> = 0 V		5	40	μA
V <sub>TIL</sub>	Input Logic Threshold Low		0.8	1.4		V
V <sub>TIH</sub>	Input Logic Threshold High			1.4	2	V
SR <sub>T</sub>	Transition Slew Rate	T <sub>A</sub> = 25 °C, V <sub>CC</sub> = 5 V, R <sub>L</sub> = 3 to 7 KΩ, C <sub>L</sub> = 50 to 2500 pF (Note 1)	6	12	30	V/μs
D <sub>R</sub>	Data Rate	(Note 2)	200	400		Kbits/s
R <sub>TOUT</sub>	Transmitter Output Resistance	V <sub>CC</sub> = V <sub>+</sub> = V <sub>-</sub> = 0V V <sub>OUT</sub> = ± 2 V	300	10M		Ω
I <sub>SC</sub>	Transmitter Output Short Circuit Current	one TX <sub>OUT</sub> to GND	±7	±22		mA
t <sub>dT</sub>	Propagation Delay Time	TTL-CMOS IN to RS-232 OUT C <sub>L</sub> = 150 pF (50% to 50%)		1.3	3.5	μs

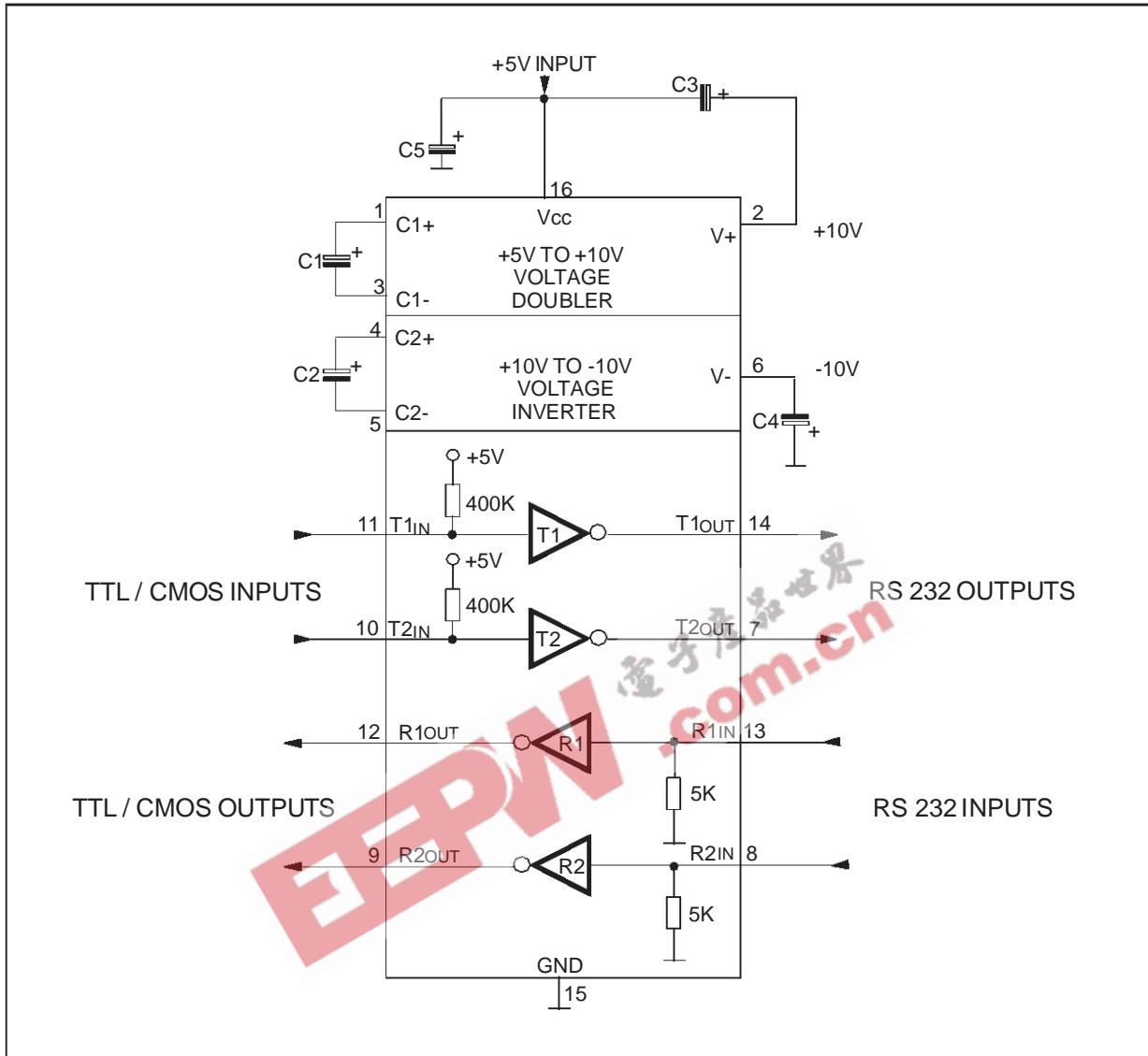
Note 1: Measured from 3V to -3V or from -3V to 3V.

Note 2: One transmitter output is loaded with R<sub>L</sub> = 3KΩ to 7KΩ, C<sub>L</sub> = 50 to 1000pF**RECEIVER ELECTRICAL CHARACTERISTICS**(C<sub>1</sub> -C<sub>4</sub> = 0.1μF, V<sub>CC</sub> = 5V ± 10%, T<sub>A</sub> = -40 to 85 °C, unless otherwise specified.Typical Values are referred to T<sub>A</sub> = 25 °C)

Symbol	Parameter	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
V <sub>RIN</sub>	Receiver Input Voltage Operating Range		-30		30	V
R <sub>RIN</sub>	RS-232 Input Resistance	T <sub>A</sub> = 25 °C,	3	5	7	KΩ
V <sub>RIL</sub>	RS-232 Input Logic Threshold Low		0.8	1.3		V
V <sub>RIH</sub>	RS-232 Input Logic Threshold High			1.8	2.4	V
V <sub>RIHYS</sub>	RS-232 Input Hysteresis	V <sub>CC</sub> = 5 V	0.2	0.5	1	V
V <sub>ROL</sub>	TTL/CMOS Output Voltage Low	I <sub>OUT</sub> = 3.2mA (to V <sub>CC</sub> )		0.2	0.4	V
V <sub>ROH</sub>	TTL/CMOS Output Voltage High	I <sub>OUT</sub> = 1mA (to GND)	3.5	V <sub>CC</sub> -0.2		V
I <sub>SCR</sub>	Receiver Output Short Circuit Current	to GND to V <sub>CC</sub>	2 10	10 30		mA mA
t <sub>dR</sub>	Propagation Delay Time	C <sub>L</sub> = 150pF (Note 1)		0.1	0.5	μs

Note 1: RS-232 IN to TTL-CMOS OUT (from 50% to 50%)

APPLICATION CIRCUITS (note 1, note 2)

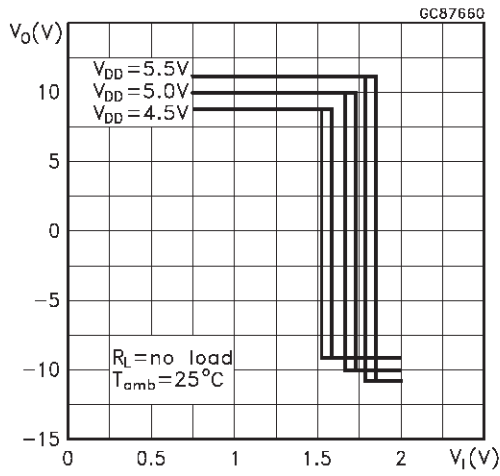


Note 1: C<sub>1-4</sub> capacitors can even be 1 μF ones.  
 Note 2: C<sub>1-4</sub> can be common or biased capacitors.

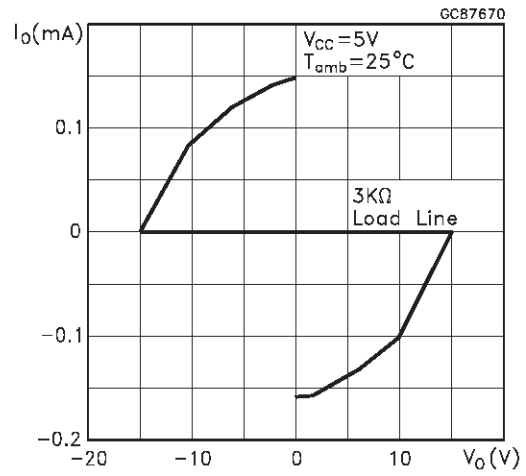
Capacitance Value (μF)

C1	C2	C3	C4	C5
0.1	0.1	0.1	0.1	0.1

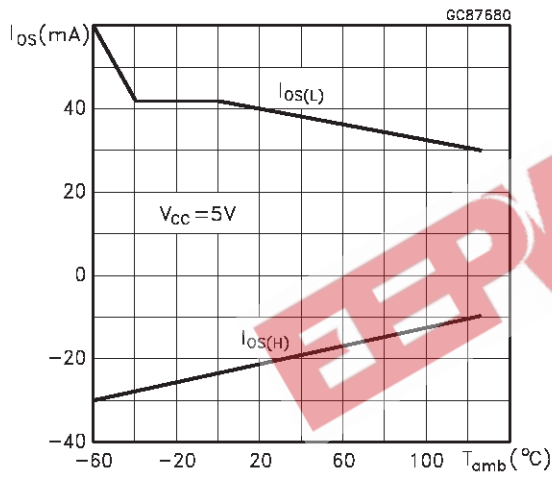
Driver Voltage Transfer Characteristics



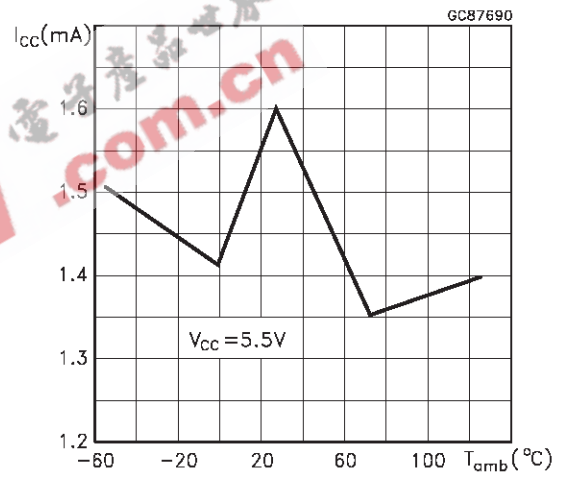
Driver Output Current vs Output Voltage



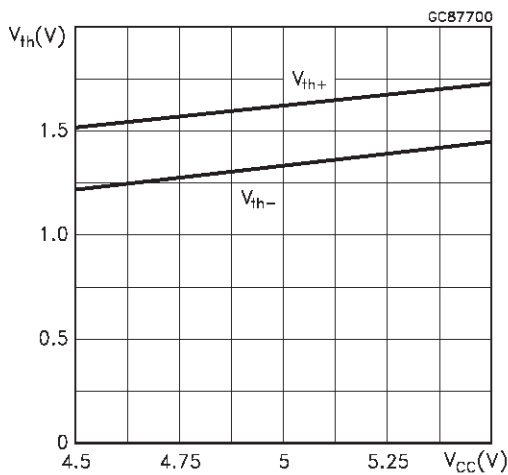
Driver Short Circuit Output Current vs Temperature



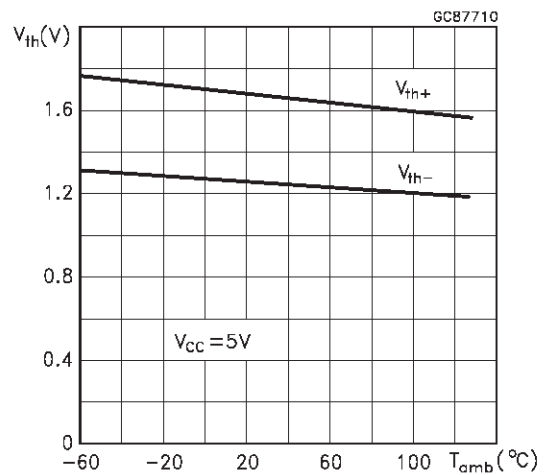
Driver Short Circuit Supply Current vs Temperature



Receiver Threshold vs Supply Voltage

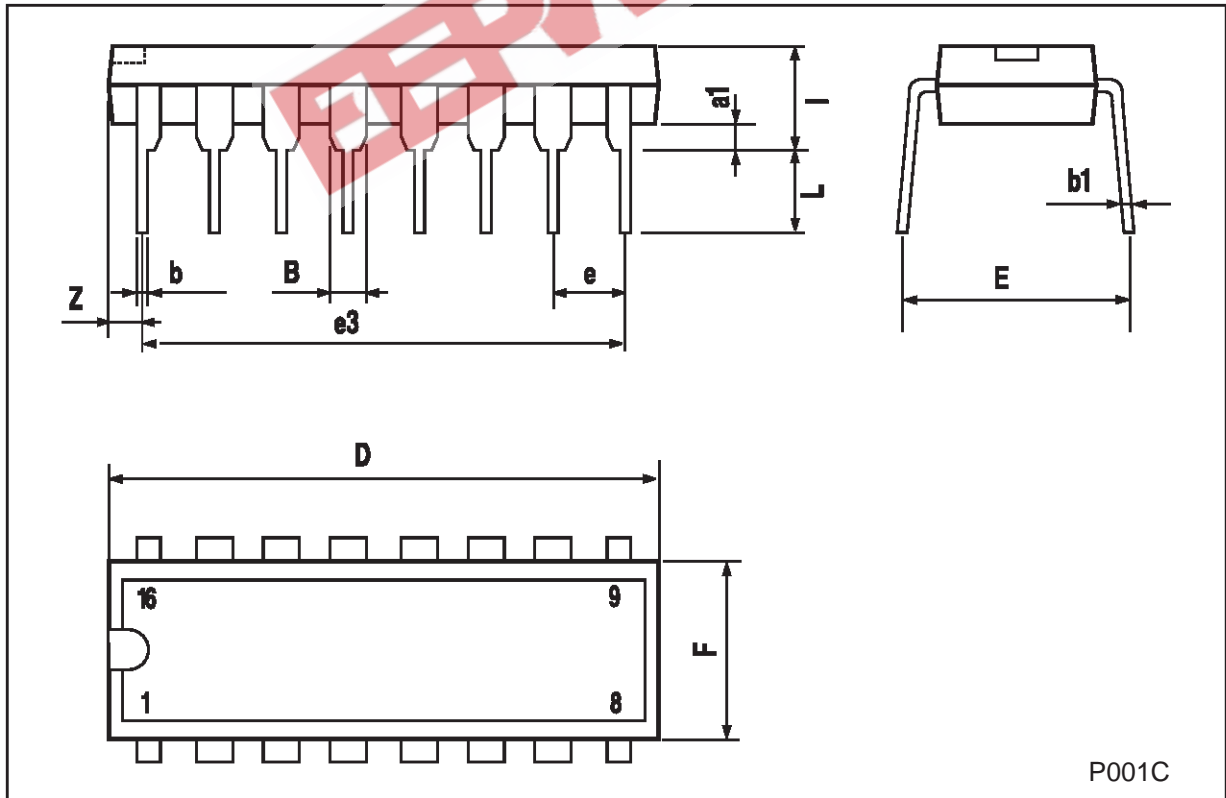


Receiver Threshold vs Temperature



Plastic DIP-16 (0.25) MECHANICAL DATA

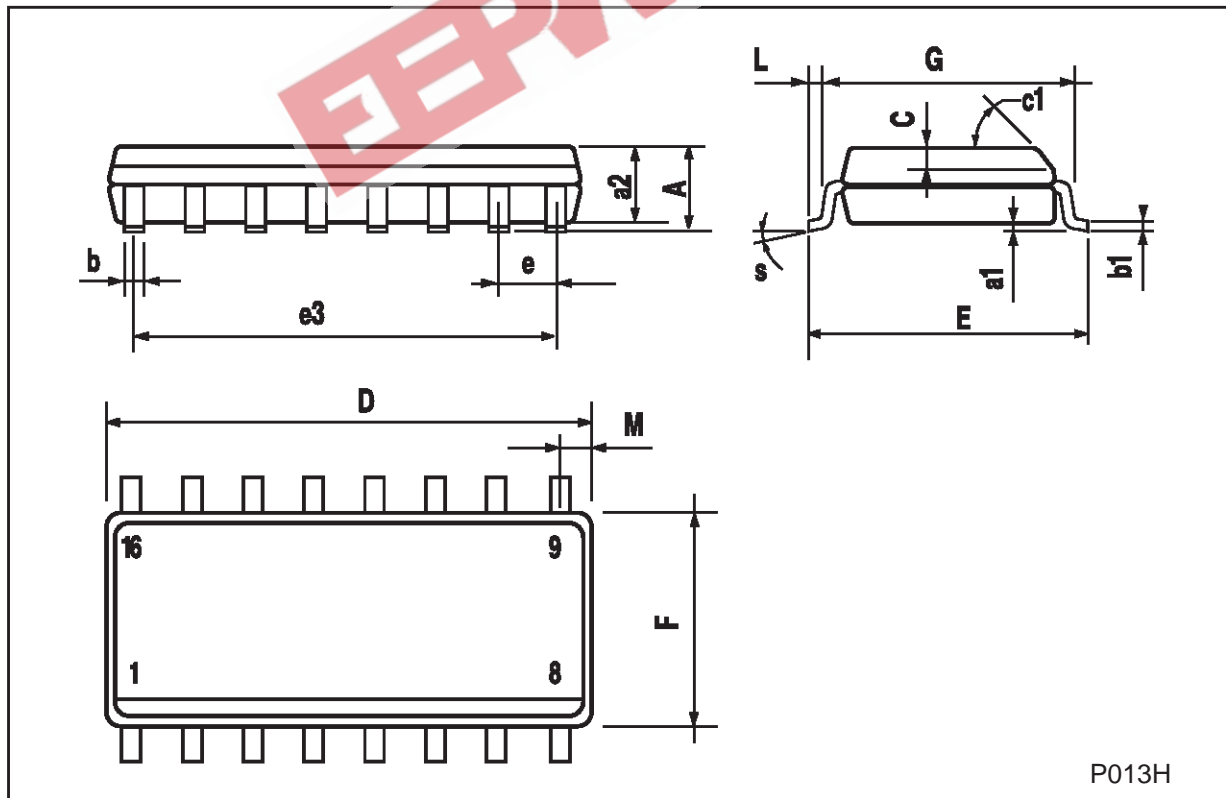
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	0.77		1.65	0.030		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		17.78			0.700	
F			7.1			0.280
l			5.1			0.201
L		3.3			0.130	
Z			1.27			0.050



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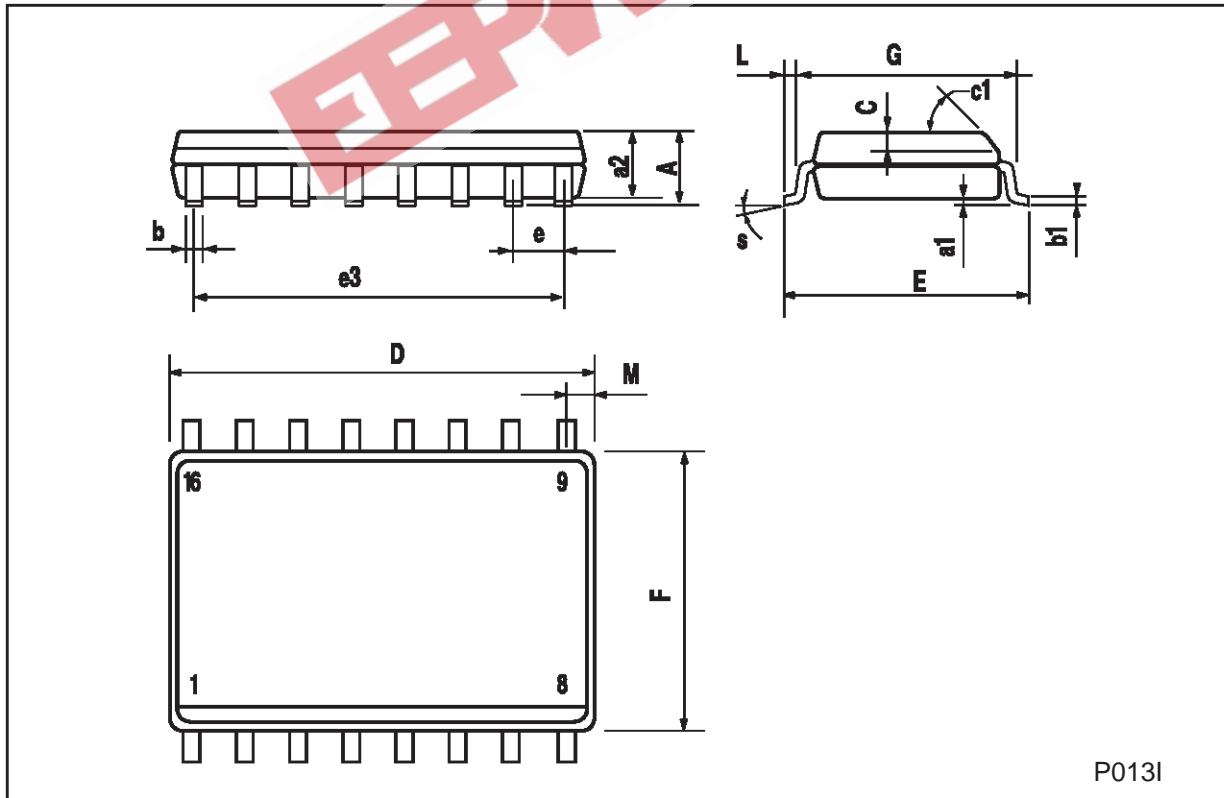
## SO-16 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.2	0.004		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	9.8		10	0.385		0.393
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		8.89			0.350	
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			0.62			0.024
S	8 (max.)					



SO16L MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			2.65			0.104
a1	0.1		0.2	0.004		0.008
a2			2.45			0.096
b	0.35		0.49	0.014		0.019
b1	0.23		0.32	0.009		0.012
C		0.5			0.020	
c1	45 (typ.)					
D	10.1		10.5	0.397		0.413
E	10.0		10.65	0.3.93		0.419
e		1.27			0.050	
e3		8.89			0.350	
F	7.4		7.6	0.291		0.300
L	0.5		1.27	0.020		0.050
M			0.75			0.029
S	8 (max.)					

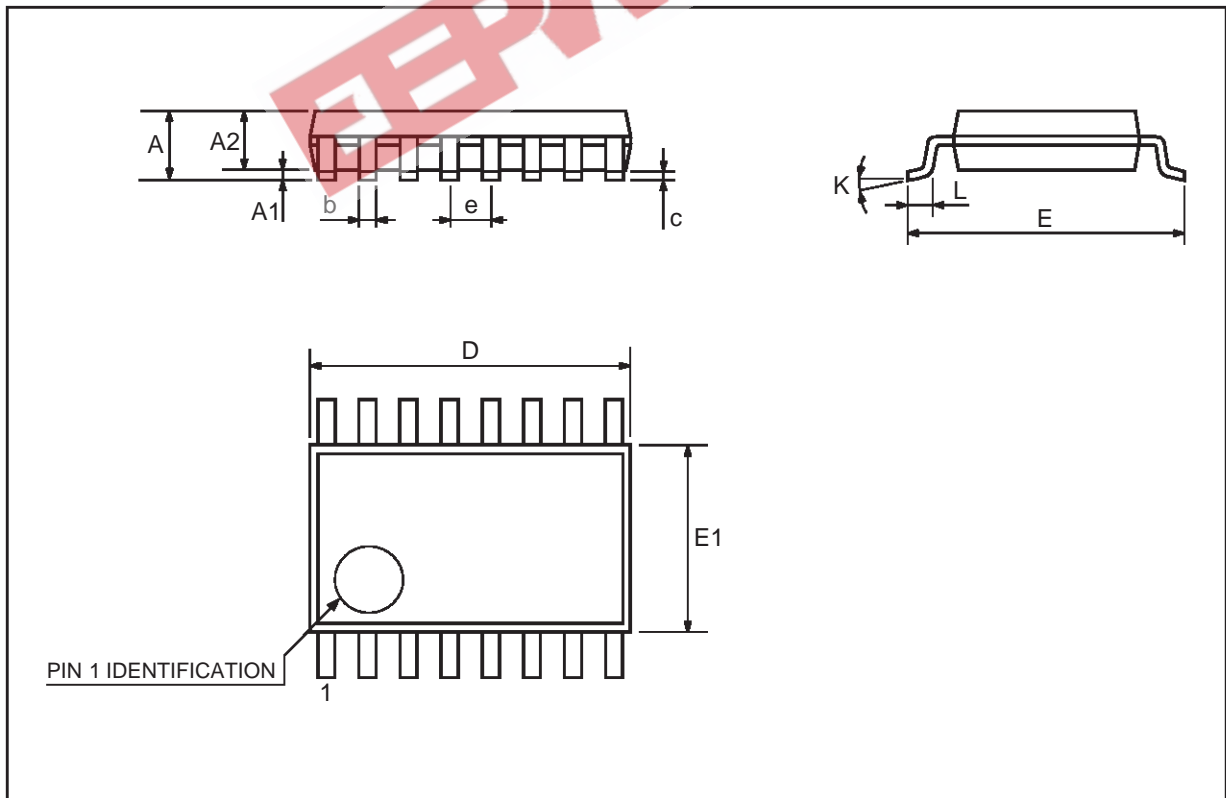


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## TSSOP16 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.1			0.433
A1	0.05	0.10	0.15	0.002	0.004	0.006
A2	0.85	0.9	0.95	0.335	0.354	0.374
b	0.19		0.30	0.0075		0.0118
c	0.09		0.20	0.0035		0.0079
D	4.9	5	5.1	0.193	0.197	0.201
E	6.25	6.4	6.5	0.246	0.252	0.256
E1	4.3	4.4	4.48	0.169	0.173	0.176
e		0.65 BSC			0.0256 BSC	
K	0°	4°	8°	0°	4°	8°
L	0.50	0.60	0.70	0.020	0.024	0.028





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