

## +5V POWERED RS232 DRIVERS/RECEIVERS

### FEATURES/BENEFITS

- Operates from Single 5V Power Supply (+5V and +12V - SP231 and SP239)
- Meets All RS232C and V.28 Specifications
- Multiple Drivers and Receivers
- Onboard DC-DC Converters
- ±9V Output Swing with +5V Supply
- Low Power Shutdown ≤ 1 μA
- 3-State TTL/CMOS Receiver Outputs
- ±30V Receiver Input Levels
- Low Power CMOS: 5 mA Operation

### APPLICATIONS

- Computers
- Peripherals
- Modems
- Printers
- Instruments

### DESCRIPTION

The SP230 family of RS232 line drivers/receivers from Sipex Corporation provides a variety of configurations to fit most communication needs, especially those applications where ±12V is not available. The SP230 and SP236 feature a low power shutdown mode which reduces power dissipation to less than 5 μW. This is particularly beneficial in battery powered systems. The SP233 and SP235 use no external components and are particularly useful in applications where printed circuit board space is critical.

All of the SP230 family, except SP231 and SP239, include two charge pump voltage converters which allow them to operate from a single +5V supply. These converters convert the +5V input power to the ±10V needed to generate the RS232 output levels. The SP231 and SP239 are designed to operate from a +5V and +12V supplies with the use of an internal +12V to -12V charge pump voltage converter.

Both the drivers and receivers meet all EIA RS232C and CCITT V.28 specifications.

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### SELECTION TABLE

Part Number	Power Supply Voltage	No. of RS232 Drivers	No. of RS232 Receivers	External Components	Low Power Shutdown	TTL 3-State	No. of Pins
SP230	+5V	5	0	4 Capacitors	Yes	No	20
SP231	+5V & +7.5V to 13.2V	2	2	2 Capacitors	No	No	14
SP232	+5V	2	2	4 Capacitors	No	No	16
SP233	+5V	2	2	None	No	No	20
SP234	+5V	4	0	4 Capacitors	No	No	16
SP235	+5V	5	5	None	Yes	Yes	24
SP236	+5V	4	3	4 Capacitors	Yes	Yes	24
SP237	+5V	5	3	4 Capacitors	No	No	24
SP238	+5V	4	4	4 Capacitors	No	No	24
SP239	+5V & +12V	3	5	2 Capacitors	No	Yes	24
SP241	+5V	4	5	4 Capacitors	Yes	Yes	28

**+5V Powered RS232 Drivers/Receivers****ABSOLUTE MAXIMUM RATINGS\***

V <sub>CC</sub> .....	+6V	Short Circuit Duration	
V <sub>+</sub> .....	(V <sub>CC</sub> - 0.3V) to +13.2V	T <sub>out</sub> .....	Continuous
V <sub>-</sub> .....	-13.2V	Power Dissipation	
Input Voltages		CERDIP .....	.675 mW
T <sub>IN</sub> .....	-0.3 to (V <sub>CC</sub> + 0.3V)	(derate 9.5 mW/°C above +70° C)	
R <sub>IN</sub> .....	±30V	Plastic Dip .....	.375 mW
Output Voltages		(derate 7 mW/°C above +70° C)	
T <sub>out</sub> .....	(V <sub>+</sub> , +0.3V) to (V <sub>-</sub> , -0.3V)	Small Outline .....	.375 mW
R <sub>out</sub> .....	-0.3V to (V <sub>CC</sub> + 0.3V)	(derate 7 mW/°C above +70° C)	

\* This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operation sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods of time may affect reliability.

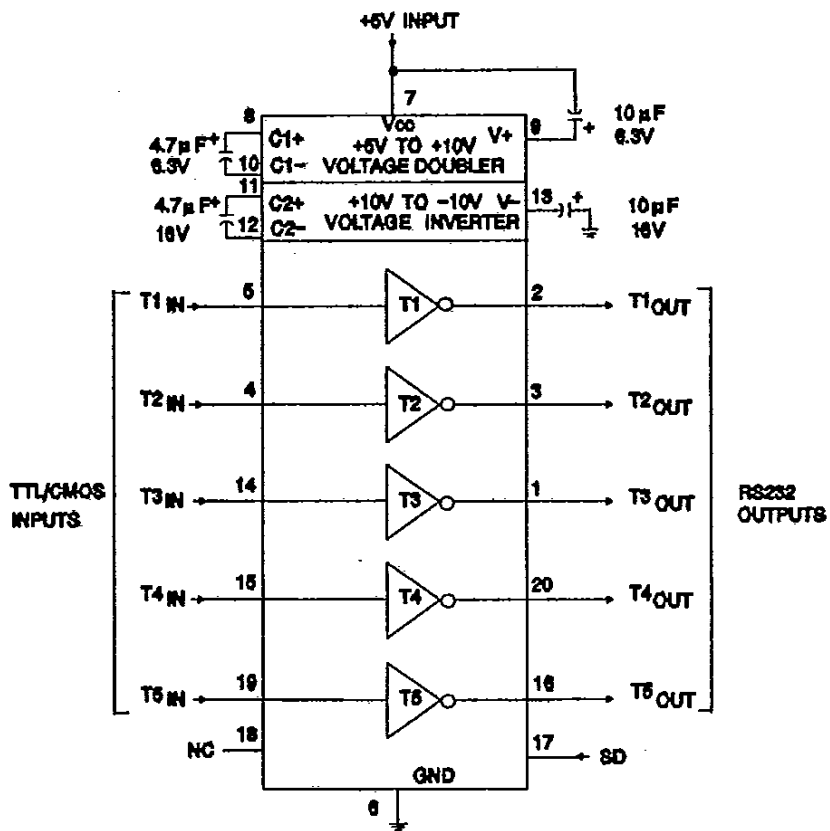
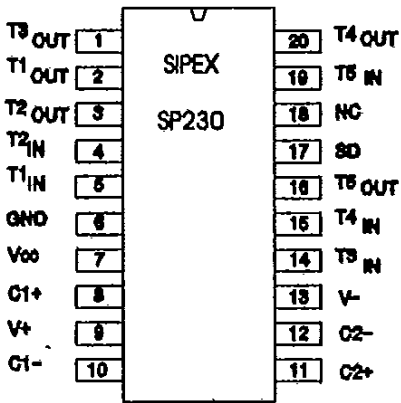
**ELECTRICAL CHARACTERISTICS**

V<sub>CC</sub> = 5V ±10%, V<sub>+</sub> = 7.5V to 13.2V (SP231 only) & V<sub>+</sub> = 12V ±10% (SP239 Only), T<sub>A</sub> = Operating Temp. Range, unless otherwise noted

PARAMETERS	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Output Voltage Swing	All transmitter outputs loaded with 3 KΩ to Ground	±5	±9		Volts
V <sub>CC</sub> Power Supply Current	No load, T <sub>A</sub> = +25° C		5	10	mA
V <sub>+</sub> Power Supply Current	No load, V <sub>+</sub> = 12V SP231 & SP239 only		5	10	mA
Shutdown Supply Current	T <sub>A</sub> = +25° C		1	10	μA
Input Logic Threshold Low	T <sub>IN</sub>			0.8	Volts
Input Logic Threshold High	T <sub>IN</sub>	2.0			Volts
Logic Pullup Current	T <sub>IN</sub> = 0V		15	200	μA
RS232 Input Voltage Range		-30		+30	Volts
RS232 Input Threshold Low	V <sub>CC</sub> = 5V, T <sub>A</sub> = +25° C	0.8	1.2		Volts
RS232 Input Threshold High	V <sub>CC</sub> = 5V, T <sub>A</sub> = +25° C		1.7	2.4	Volts
RS232 Input Hysteresis	V <sub>CC</sub> = 5V	0.2	0.5	1.0	Volts
RS232 Input Resistance	T <sub>A</sub> = +25° C	3	5	7	K ohms
TTL/CMOS Output Voltage Low	I <sub>out</sub> = 3.2mA			0.4	Volts
TTL/CMOS Output Voltage High	I <sub>out</sub> = -1.0mA	3.5			Volts
TTL/CMOS Output Leakage Current	EN = V <sub>CC</sub> , 0V ≤ R <sub>out</sub> ≤ V <sub>CC</sub>		0.05	±10	μA
Output Enable Time	SP235, SP236, SP239		400		nS
Output Disable Time	SP235, SP236, SP239		250		nS
Propagation Delay	RS232 to TTL		0.5		μS
Instantaneous Slew Rate	C <sub>L</sub> = 10 pF, R <sub>L</sub> = 3-7 KΩ T <sub>A</sub> = +25° C			30	V/μS
Transition Region Slew Rate	R <sub>L</sub> = 3KΩ, C <sub>L</sub> = 2500 pF Measured from +3V to -3V or -3V to +3V		3		V/μS
Output Resistance	V <sub>CC</sub> = V <sub>+</sub> = V <sub>-</sub> = 0V, V <sub>out</sub> = ±2V	300			Ohms
RS232 Output Short Circuit Current			±10		mA

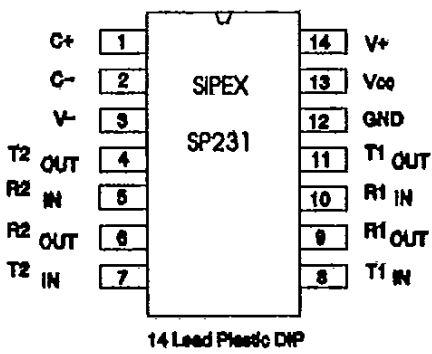
### SP230 Typical Operating Circuit

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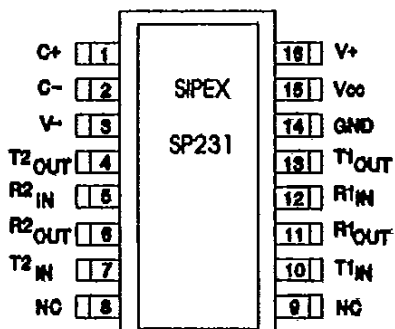


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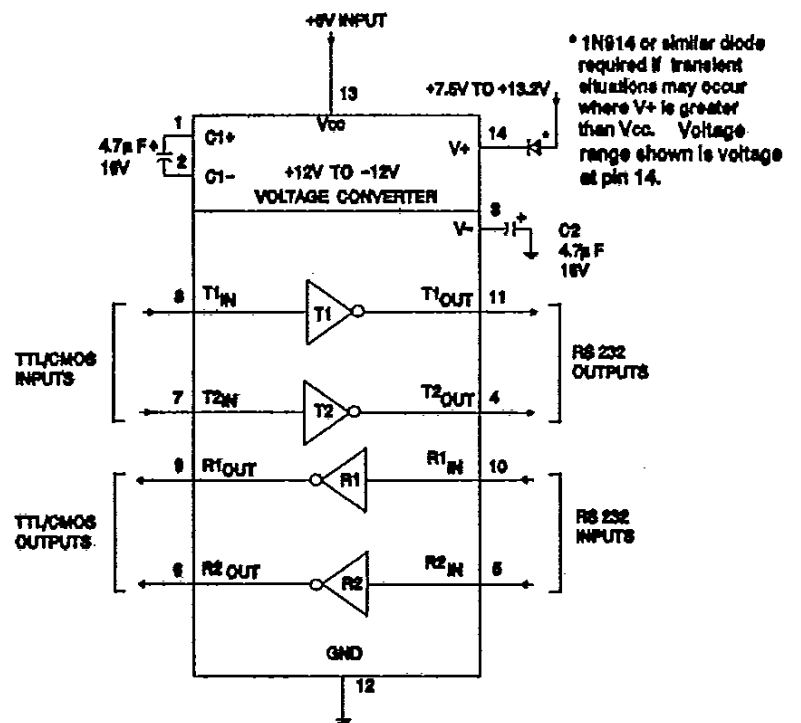
### SP231 Typical Operating Circuit



14 Lead Plastic DIP



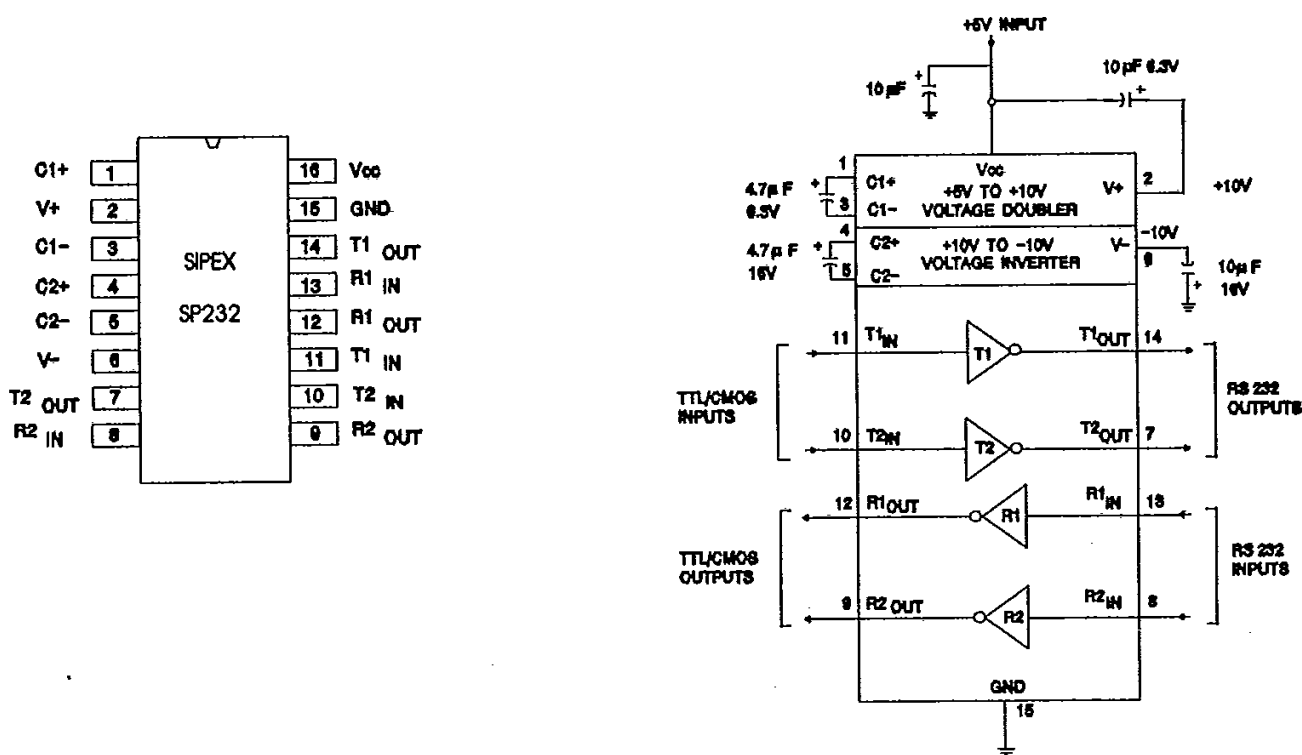
16 Lead Small Outline



# SP230-SP241

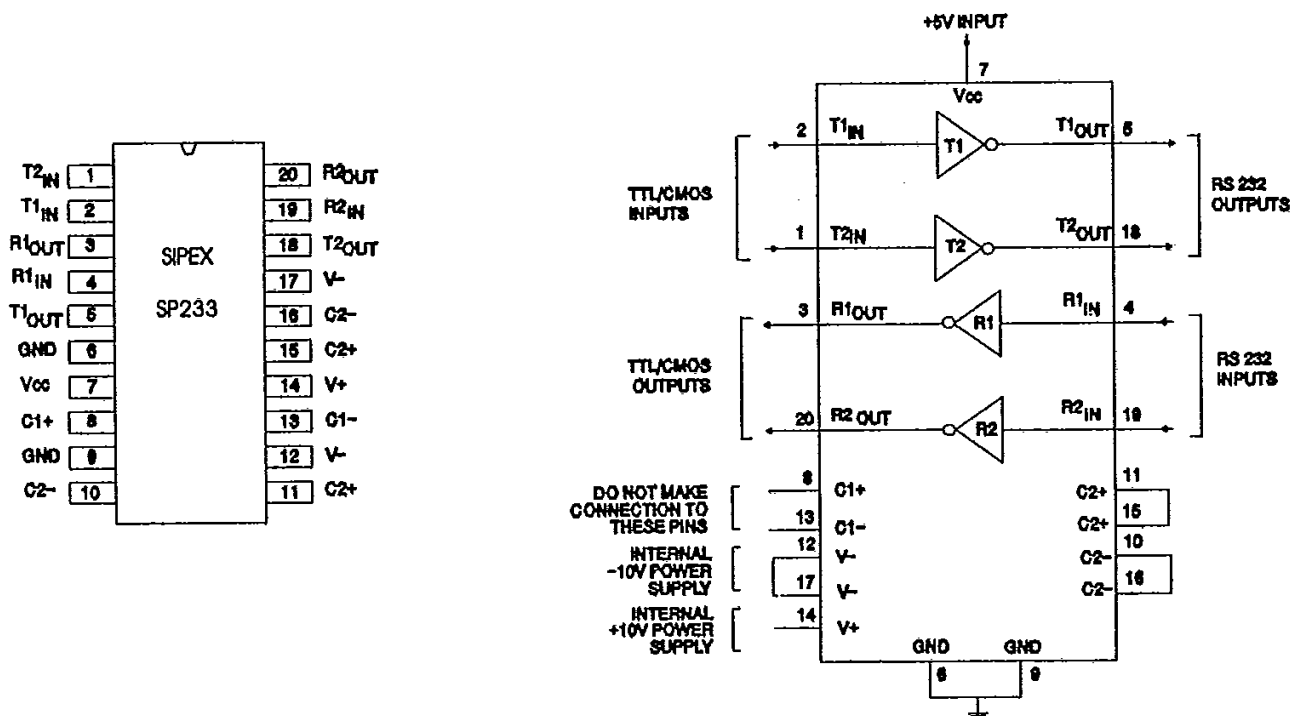
## +5V Powered RS232 Drivers/Receivers

SP232 Typical Operating Circuit



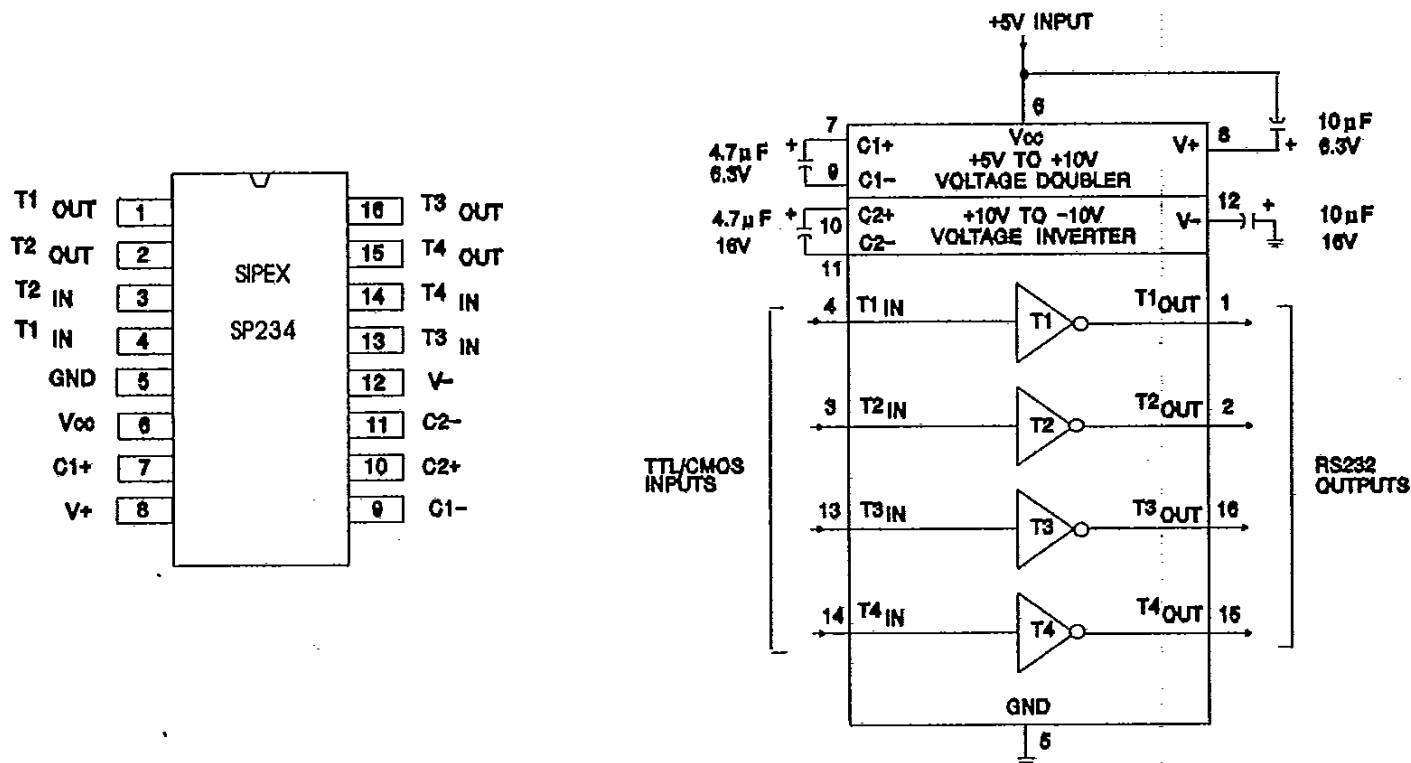
SP233 Typical Operating Circuit

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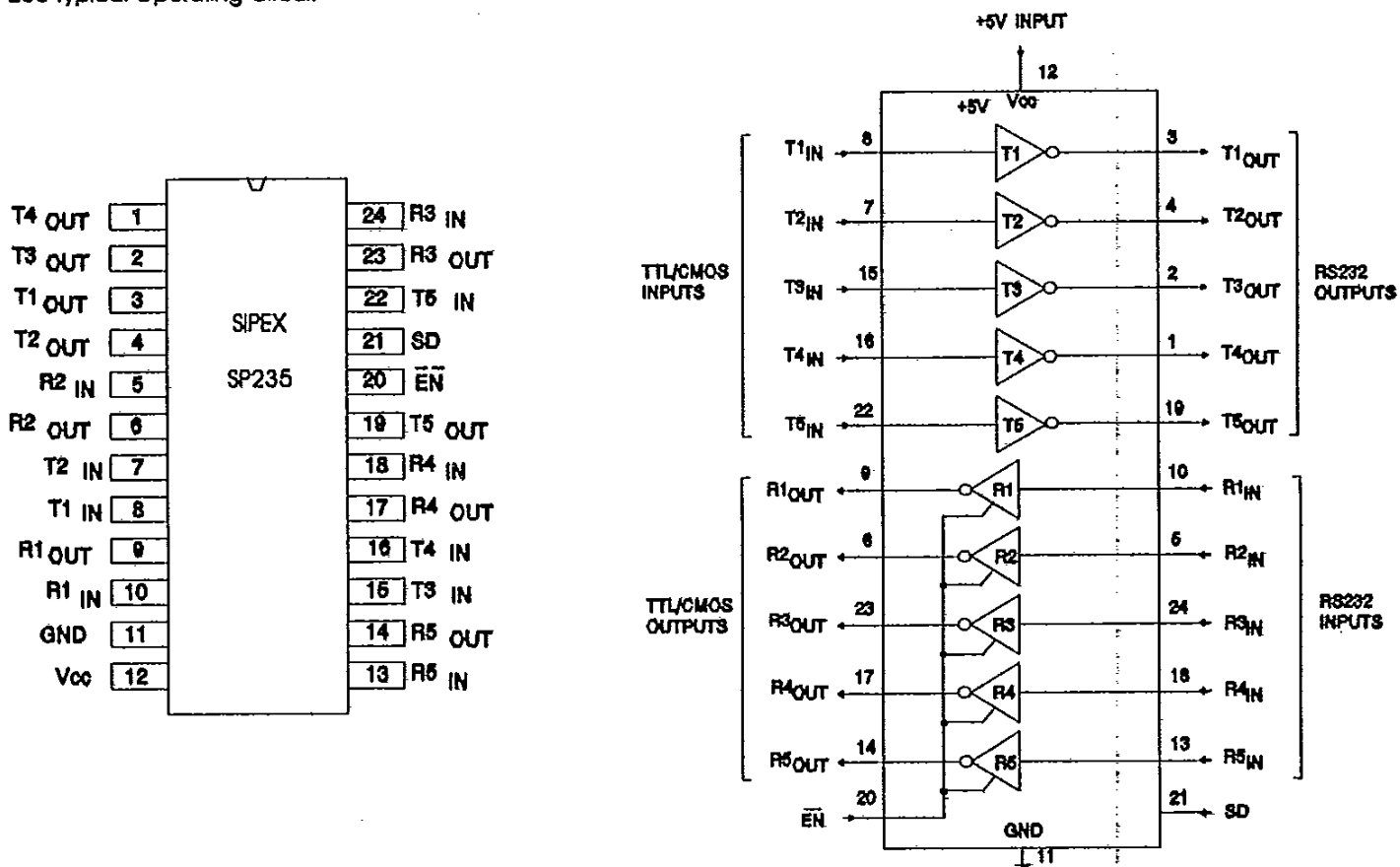
SP234 Typical Operating Circuit

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SP235 Typical Operating Circuit

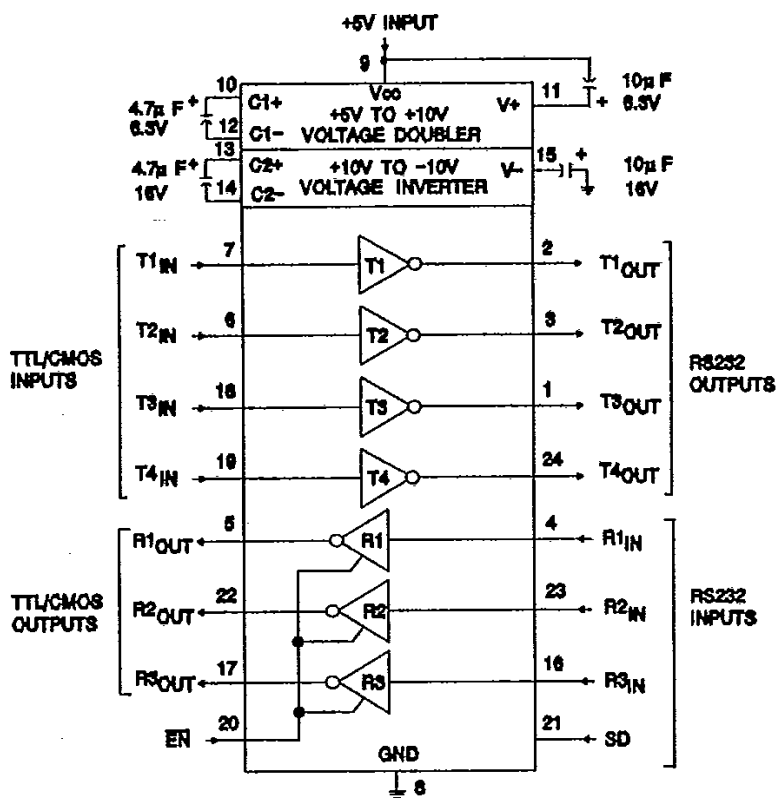
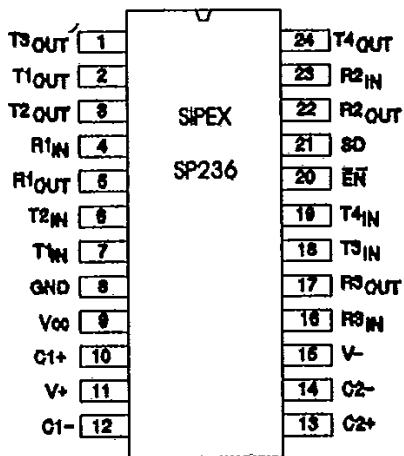


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# SP230-SP241

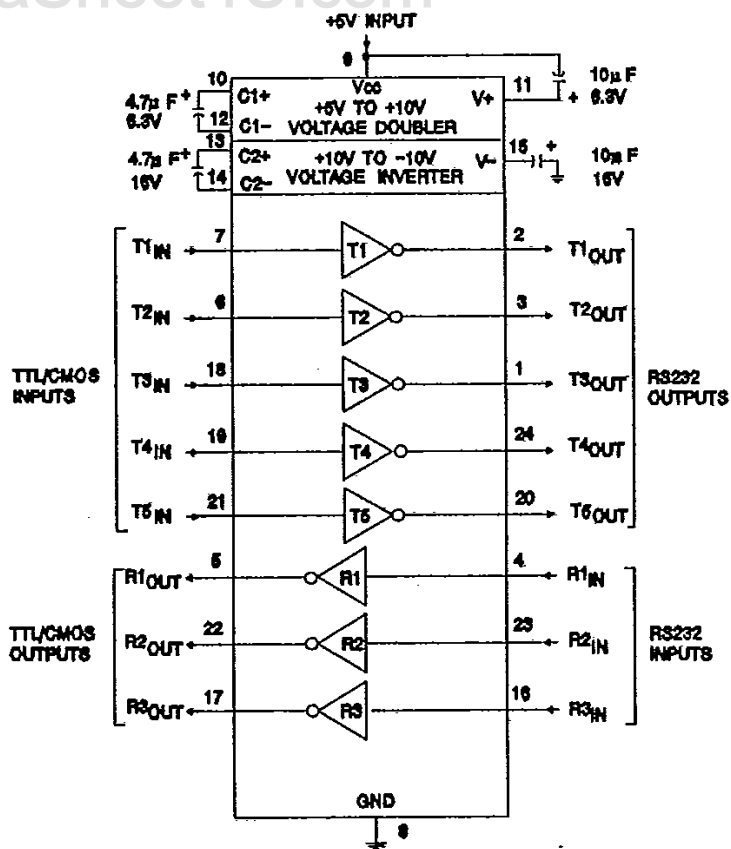
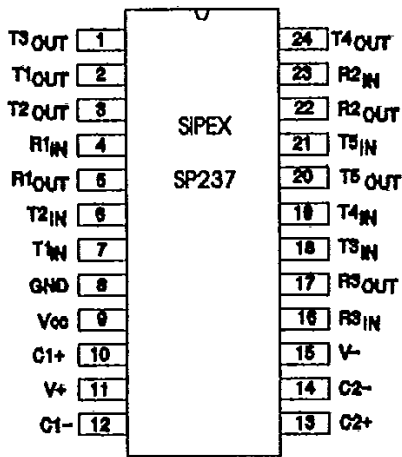
## +5V Powered RS232 Drivers/Receivers

SP236 Typical Operating Circuit

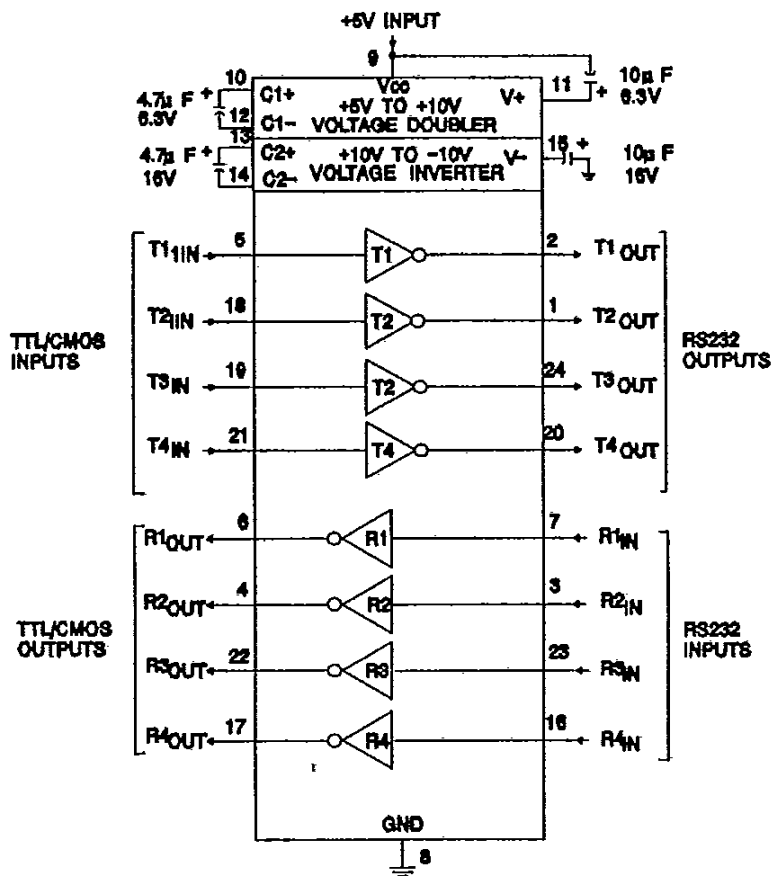
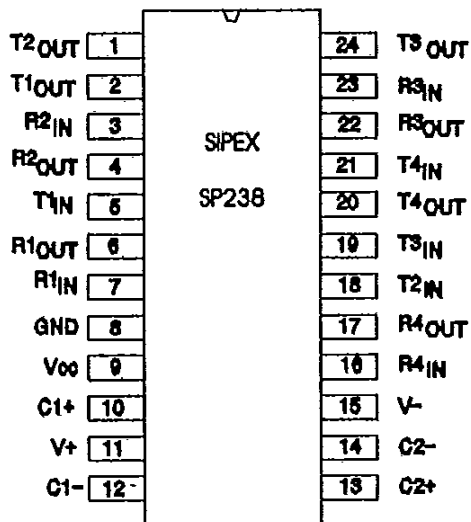


SP237 Typical Operating Circuit

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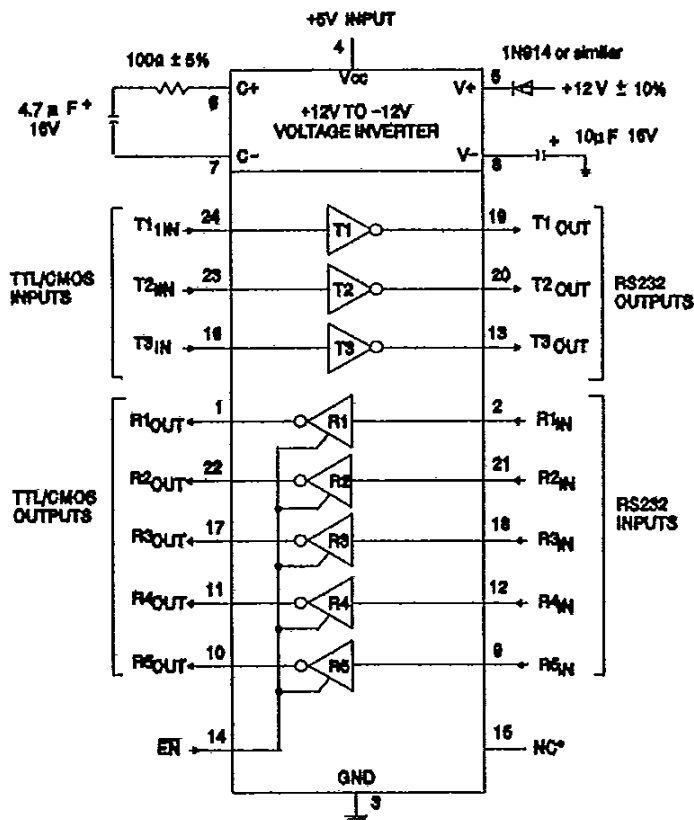
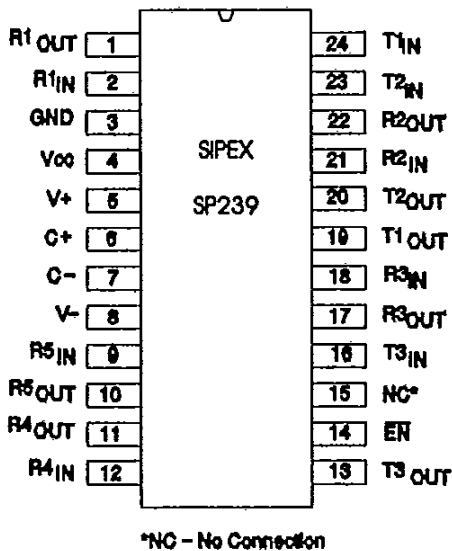


SP238 Typical Operating Circuit



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SP239 Typical Operating Circuit

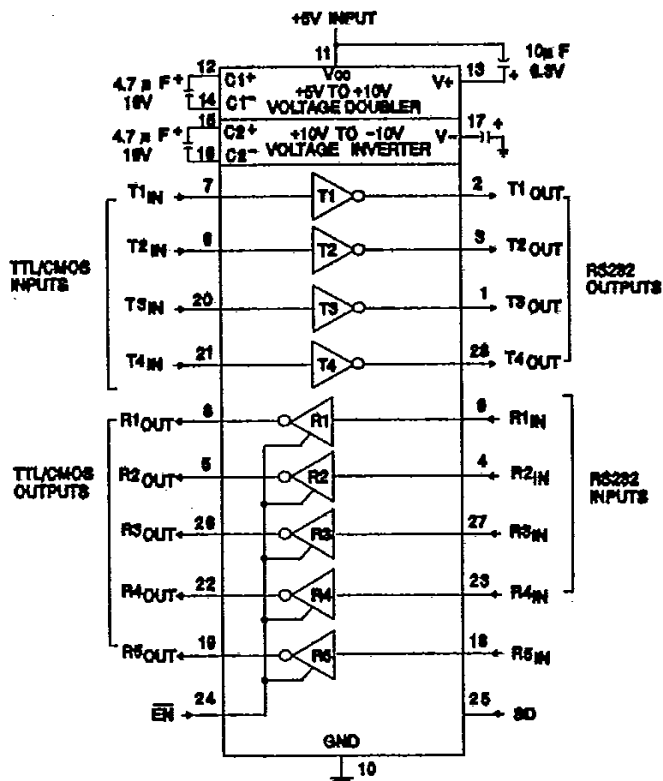
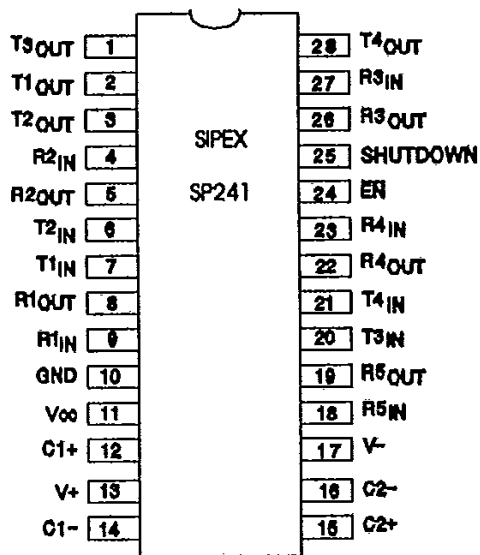


# SP230-SP241

+5V Powered RS232 Drivers/Receivers

SP241 Typical Operating Circuit

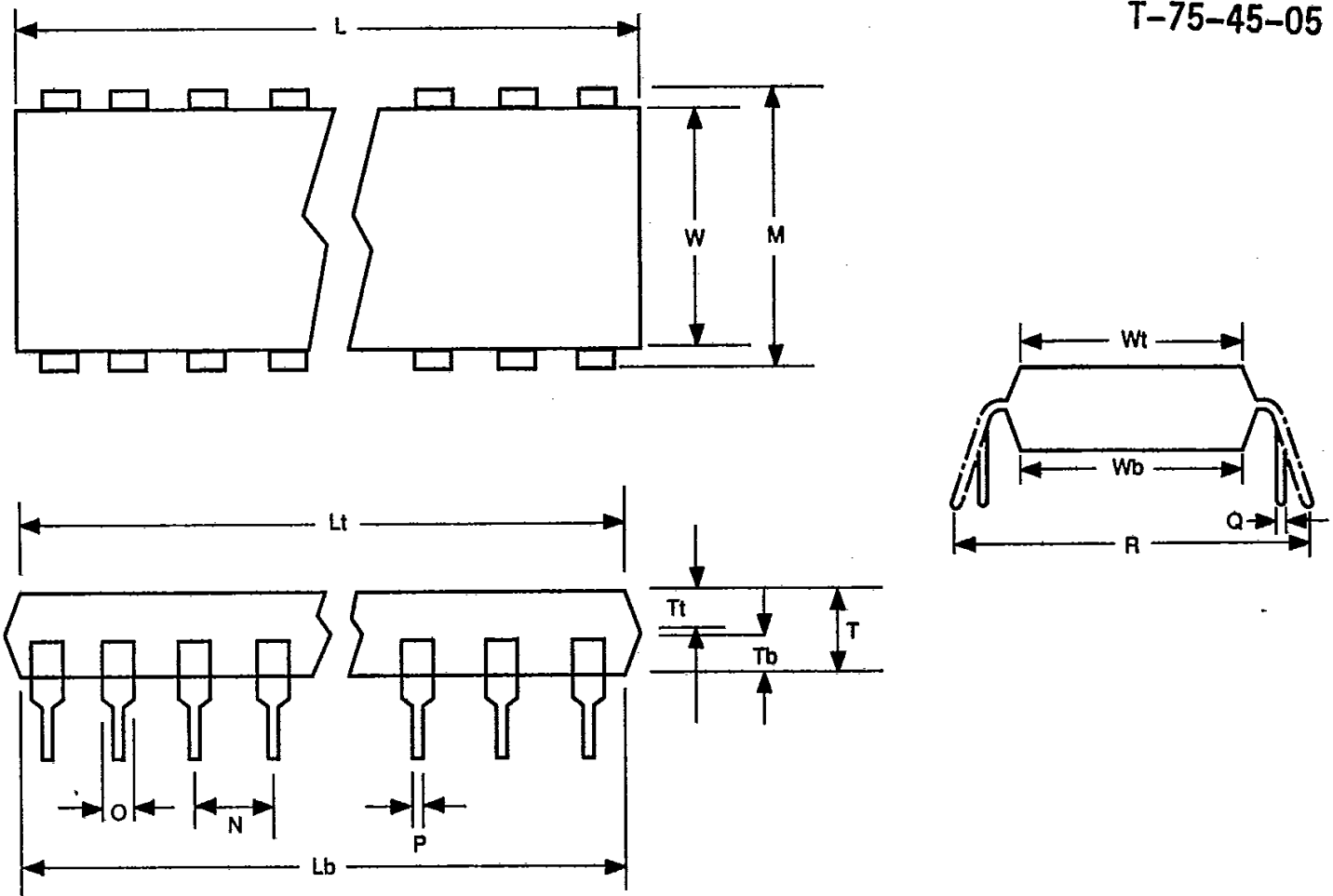
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PART	TEMP. RANGE	PACKAGE	PART	TEMP. RANGE	PACKAGE	PART	TEMP. RANGE	PACKAGE
<b>SP230</b>			<b>SP231</b>			<b>SP232</b>		
SP230CP	0°C to +70°C	20 Lead Plastic DIP	SP231CP	0°C to +70°C	14 Lead Plastic DIP	SP232CP	0°C to +70°C	16 Lead Plastic DIP
SP230CT	0°C to +70°C	20 Lead Small Outline	SP231CT	0°C to +70°C	16 Lead Small Outline	SP232CT	0°C to +70°C	16 Lead Small Outline
SP230CX	0°C to +70°C	Dice	SP231CX	0°C to +70°C	Dice	SP232CX	0°C to +70°C	Dice
SP230EP	-40°C to +85°C	20 Lead Plastic DIP	SP231EP	-40°C to +85°C	14 Lead Plastic DIP	SP232EP	-40°C to +85°C	16 Lead Plastic DIP
SP230ET	-40°C to +85°C	20 Lead Small Outline	SP231ET	-40°C to +85°C	16 Lead Small Outline	SP232ED	-40°C to +85°C	16 Lead CERDIP
SP230ED	-40°C to +85°C	20 Lead CERDIP	SP231ED	-40°C to +85°C	14 Lead CERDIP	SP232ET	-40°C to +85°C	16 Lead Small Outline
			SP231MD	-55°C to +125°C	14 Lead CERDIP	SP232MD	-55°C to +125°C	16 Lead CERDIP
<b>SP233</b>			<b>SP234</b>			<b>SP235</b>		
SP233CP	0°C to +70°C	20 Lead Plastic DIP	SP234CP	0°C to +70°C	16 Lead Plastic DIP	SP235CP	0°C to +70°C	24 Lead Plastic DIP*
SP233EP	-40°C to +85°C	20 Lead Plastic DIP	SP234CT	0°C to +70°C	16 Lead Small Outline	SP235EP	-40°C to +85°C	24 Lead Plastic DIP*
			SP234CX	0°C to +70°C	Dice	SP235EC	-40°C to +85°C	24 Lead Ceramic*
			SP234EP	-40°C to +85°C	16 Lead Plastic DIP			
			SP234ET	-40°C to +85°C	16 Lead Small Outline			
			SP234ED	-40°C to +85°C	16 Lead CERDIP			
			SP234MD	-55°C to +125°C	16 Lead CERDIP			
<b>SP236</b>			<b>SP237</b>			<b>SP238</b>		
SP236CS	0°C to +70°C	24 Lead Plastic DIP	SP237CS	0°C to +70°C	24 Lead Plastic DIP	SP238CS	0°C to +70°C	24 Lead Plastic DIP
SP236CT	0°C to +70°C	24 Lead Small Outline	SP237CT	0°C to +70°C	24 Lead Small Outline	SP238CT	0°C to +70°C	24 Lead Small Outline
SP236CX	0°C to +70°C	Dice	SP237CX	0°C to +70°C	Dice	SP238CX	0°C to +70°C	Dice
SP236ES	-40°C to +85°C	24 Lead Plastic DIP	SP237ES	-40°C to +85°C	24 Lead Plastic DIP	SP238ES	-40°C to +85°C	24 Lead Plastic DIP
SP236ET	-40°C to +85°C	24 Lead Small Outline	SP237ET	-40°C to +85°C	24 Lead Small Outline	SP238ET	-40°C to +85°C	24 Lead Small Outline
SP236ER	-40°C to +85°C	24 Lead CERDIP	SP237ER	-40°C to +85°C	24 Lead CERDIP	SP238ER	-40°C to +85°C	24 Lead CERDIP
SP236MR	-55°C to +125°C	24 Lead CERDIP				SP238MR	-55°C to +125°C	24 Lead CERDIP
<b>SP239</b>			<b>SP241</b>					
SP239CS	0°C to +70°C	24 Lead Plastic DIP	SP241CT	0°C to +70°C	24 Lead Small Outline			
SP239CT	0°C to +70°C	24 Lead Small Outline	SP241ET	-40°C to +85°C	24 Lead Small Outline			
SP239CX	0°C to +70°C	Dice						
SP239ES	-40°C to +85°C	24 Lead Plastic DIP						
SP239ET	-40°C to +85°C	24 Lead Small Outline						
SP239ER	-40°C to +85°C	24 Lead CERDIP						
SP239MR	-55°C to +125°C	24 Lead CERDIP						

\* = 0.600" package, all other packages are 0.300" wide.



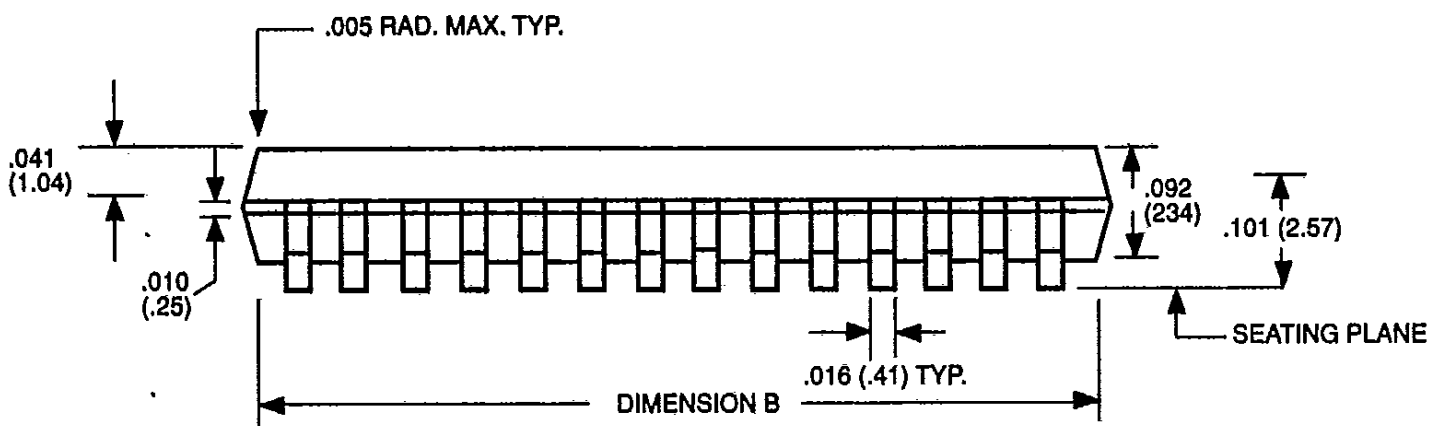
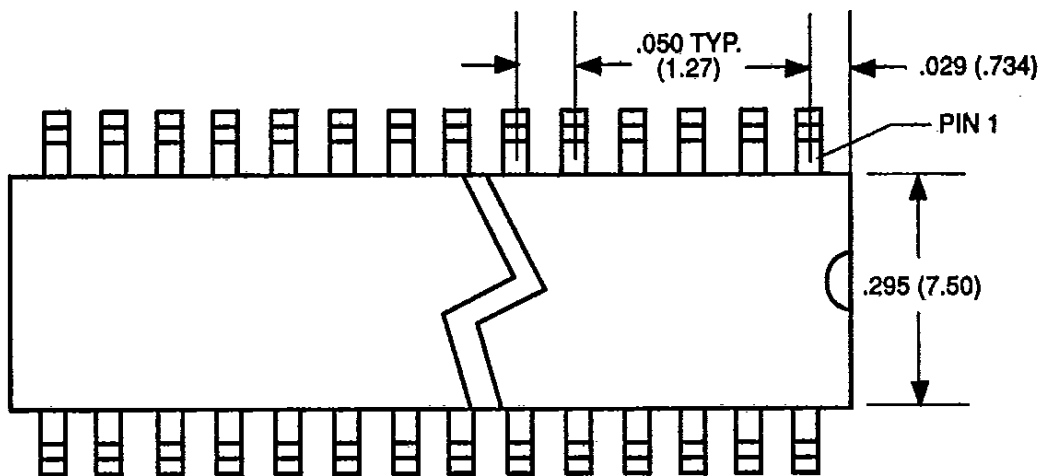
**PLASTIC DIP PACKAGE DIMENSIONS (300 MIL)**

LEAD TYPE	14	16	20	24 SKINNY DIP	24 DOUBLE DIP
W	250	250	260	260	540
Wt	235	235	245	243	525
Wb	235	235	245	243	525
L	750	750	1024	1240	1254
Lt	739	739	1009	1225	1244
Lb	739	739	1009	1225	1244
T	132	132	132	130	150
Tt	61	61	61	60	70
Tb	61	61	61	60	70
M	300-325	300-325	310-325	310-325	600-625
N	100±2	100±2	100±2	100±2	100±2
O	60±2	60±2	60±2	60±2	60±2
P	18±2	18±2	18±2	18±2	18±2
Q	10±.3	10±.3	10±.3	10±.3	10±.3
R	350±25	350±25	350±25	350±25	650±25

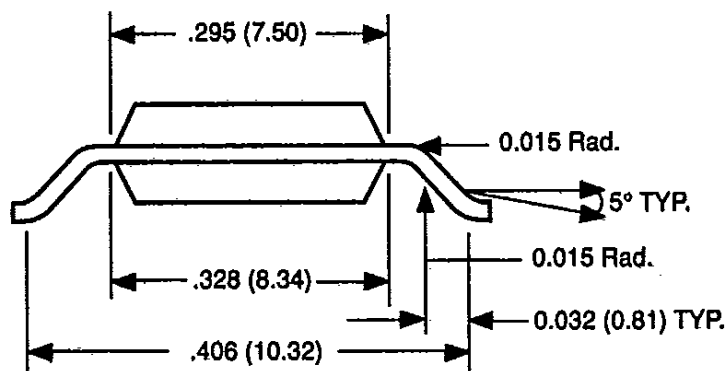
**NOTE**

Package Dimension Tolerance for:

1. Length (L) = ±4 mils
2. Width (W) = ±2 mils
3. Thickness (T) = ±2 mils



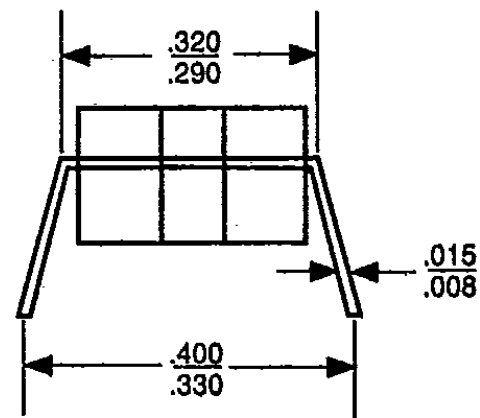
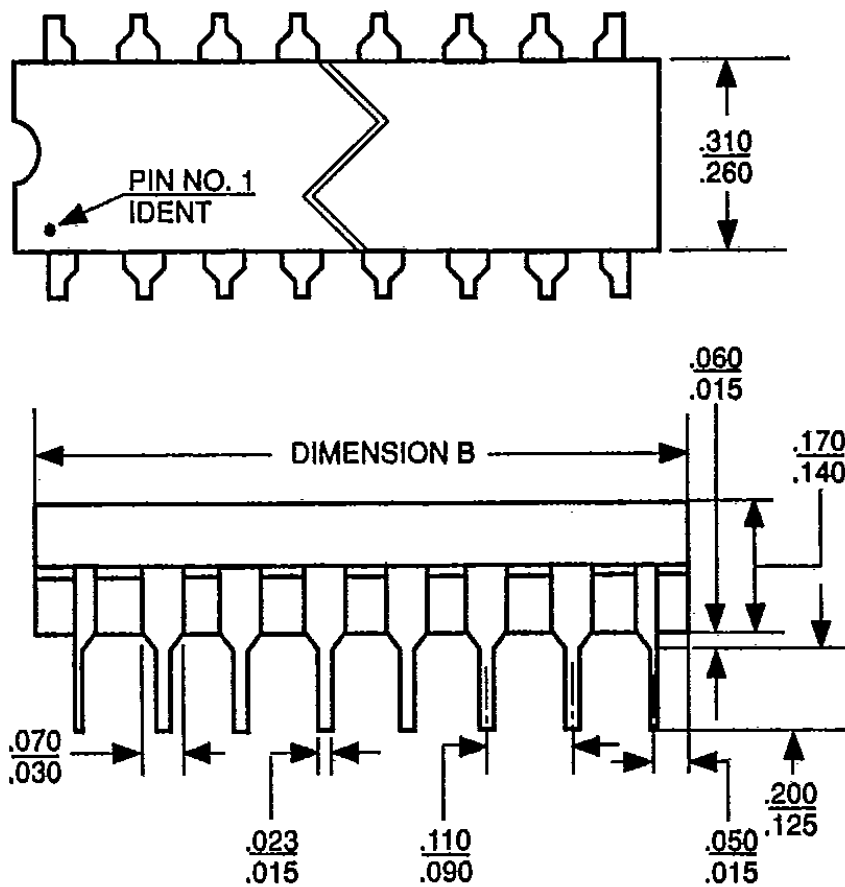
NOTE  
1. TOLERANCE UNLESS OTHERWISE SPECIFIED .xxx =  $\pm .002$ "



**SOIC PACKAGE DIMENSION**

PACKAGE TYPE	DIMENSION B
16 Lead	0.409
20 Lead	0.509
24 Lead	0.609
28 Lead	0.709

# CERDIP PACKAGE OUTLINE



## CERDIP PACKAGE DIMENSION

PACKAGE TYPE	DIMENSION B
16 Lead	0.785
18 Lead	0.960
20 Lead	1.06
24 Lead	1.28