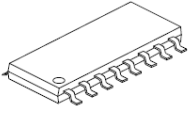
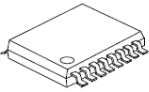
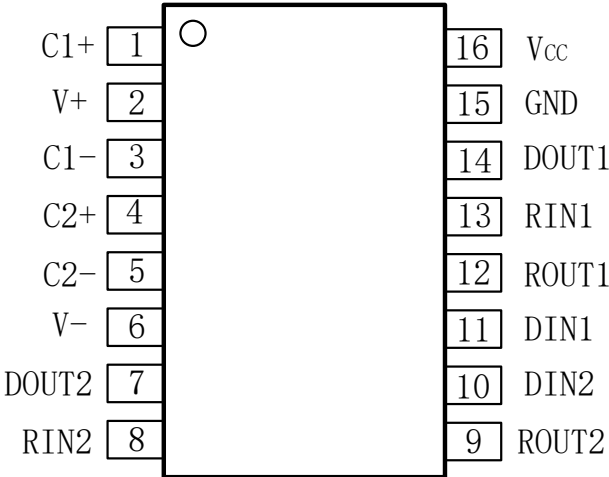


3.0V To 5.5V Low Power Multichannel Rs-232 Line Transceivers Using For 0.1µf External Capacitors

 <p>SOP-16</p>  <p>TSSOP-16</p>	<p>Features</p> <ul style="list-style-type: none"> ● Exceeds ±8KV ESD Protection(HBM) for RS-232 I/O Pins ● Meets the Requirements of TIA/EIA-232-F and ITU V.28 Standards ● Operates With 3.0V to 5.5V V_{CC} Supply ● Operates Up To 250kbit/s Data Rate ● Two Drivers and Two Receivers ● External Capacitors 4×0.1µF ● Accepts 5.0V Logic Input With 3.3V Supply
<p>Description</p> <p>The TC3232 have two receivers and two drivers, and a dual charge-pump circuit. The device meets the requirements of TIA/EIA-232-F and provides the electrical interface between an asynchronous communication controller and the serial-port connector. The charge pump and four small external capacitors allow operation from a single 3.0V to 5.5V supply. The device operates at data signaling rates up to 250kbit/s and a maximum of 35V/µs driver output slew rate.</p>	<p>Applications</p> <ul style="list-style-type: none"> ● Notebook, Subnotebook, and Palmtop Computers ● High-Speed Modems ● Battery-Powered Equipment ● Hand-Held Equipment ● Peripherals ● Printers
<p>PIN Configuration</p> 	

PIN FUNCTION DESCRIPTION

Pin Number	Name	Function
1	C1+	Positive Terminal of Voltage-Doubler Charge-Pump Capacitor
2	V+	+5.5V Generated by the Charge Pump
3	C1-	Negative Terminal of Voltage-Doubler Charge-Pump Capacitor
4	C2+	Positive Terminal of Inverting Charge-Pump Capacitor
5	C2-	Negative Terminal of Inverting Charge-Pump Capacitor
6	V-	-5.5V Generated by the Charge Pump
7	DOUT2	RS-232 Driver Outputs
8	RIN2	RS-232 Receiver Inputs
9	ROUT2	TTL/CMOS Receiver Outputs
10	DIN2	TTL/CMOS Driver Inputs
11	DIN1	TTL/CMOS Driver Inputs
12	ROUT1	TTL/CMOS Receiver Outputs
13	RIN1	RS-232 Receiver Inputs
14	DOUT1	RS-232 Driver Outputs
15	GND	Ground
16	Vcc	+3.0V to +5.5V Supply Voltage

ABSOLUTE MAXIMUM RATING

Parameter		Symbol	Rating	Units
Power Supply		V _{CC}	-0.3 to +6.0	V
Positive Output Supply Voltage (Note 2)		V ₊	-0.3 to +7.0	V
Negative Output Supply Voltage (Note 2)		V ₋	+0.3 to -7.0	V
Supply Voltage Difference (Note 2)		V ₊ - V ₋	+13	V
Input Voltage	Drivers	V _{IN}	-0.3 to +6.0	V
	Receivers		-25 to +25	
Output Voltage	Drivers	V _{OUT}	-13.2 to +13.2	V
	Receivers		-0.3 to V _{CC} +0.3	
Operating Junction Temperature		T _J	-40 to +85	°C
Storage Temperature		T _{STG}	-65 to +150	°C

Notes:

- Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.
- All voltages are with respect to network GND.

THERMAL DATA

Parameter		Symbol	Rating	Units
Junction to Ambient	SOP-16	θ _{JA}	105	°C/W
	TSSOP-16		118	

RECOMMENDED OPERATING CONDITIONS (See Note & Table 1)

Parameter	Symbol	Conditions	MIN	TYP	MAX	UNITS	
Supply Voltage	V _{CC}	V _{CC} = 3.3 V	3.0	3.3	3.6	V	
		V _{CC} = 5.0 V	4.5	5.0	5.5		
Driver and Control High-level Input Voltage	V _{IH}	DIN	V _{CC} = 3.3 V	2.0	-	-	V
			V _{CC} = 5.0 V	2.4	-	-	
Driver and Control Low-level Input Voltage	V _{IL}	DIN	-	-	0.8	V	
Driver and Control Input Voltage	V _{IN}	DIN	-	-	5.5	V	
Receiver Input Voltage	V _{RIN}	-	-25	-	+25	V	
Operating Free-Air Temperature	T _A	-	0	-	70	°C	

Notes: Test conditions are C1~C4=0.1μF at V_{CC}=3.3V±0.3V; C1=0.047μF, C2~C4=0.33μF at V_{CC}=5.0V±0.5V.

ELECTRICAL CHARACTERISTICS

 ($V_{CC}=+5V\pm 5\%$, $T_A=-40^{\circ}C \sim +85^{\circ}C$, Typical Values are $V_{CC}=+5V$ and $T_A=25^{\circ}C$) (Note 3)

Parameter	Symbol	Conditions	MIN	TYP (Note 1)	MAX	UNITS
Input leakage current	I_{IN}	DIN	-	± 0.01	± 1	μA
Supply current	I_{CC}	No Load	-	0.3	1.0	mA
Driver						
High-Level Output Voltage	V_{OH}	DOUT at $R_L = 3\text{ k}\Omega$ to GND, DIN = GND	+5.0	+5.4	-	V
Low-Level Output Voltage	V_{OL}	DOUT at $R_L = 3\text{ k}\Omega$ to GND, DIN = V_{CC}	-5.0	-5.4	-	V
High-Level Input Current	I_{OH}	$V_I = V_{CC}$	-	± 0.01	± 1	μA
Low-Level Input Current	I_{OL}	V_I at GND	-	± 0.01	± 1	μA
Short-Circuit Output Current (Note 2)	I_{OS}	$V_{CC} = 3.6\text{ V}$, $V_{OUT} = 0\text{ V}$	-	± 35	± 60	mA
		$V_{CC} = 5.5\text{ V}$, $V_{OUT} = 0\text{ V}$	-	± 35	± 60	
Output Resistance	r_O	V_{CC} , V+ and V- = 5.5 V, $V_{OUT} = \pm 2.0\text{ V}$	300	10M	-	Ω
Output Leakage Current	I_{OFF}	$V_{CC} = 3.0\text{ V to } 5.5\text{ V}$, $V_{OUT} = \pm 12.0\text{ V}$	-	-	± 25	μA
Receiver						
High-Level Output Voltage	V_{OH}	$I_{OH} = -1.0\text{ mA}$	$V_{CC} - 0.6V$	$V_{CC} - 0.1V$	-	V
Low-Level Output Voltage	V_{OL}	$I_{OL} = 1.6\text{ mA}$	-	-	0.4	mV
Positive-Going Input Threshold Voltage	V_{IT+}	$V_{CC} = 3.3\text{ V}$	-	1.5	2.4	V
		$V_{CC} = 5.0\text{ V}$	-	1.8	2.4	
Negative-Going Input Threshold Voltage	V_{IT-}	$V_{CC} = 3.3\text{ V}$	0.6	1.2	-	V
		$V_{CC} = 5.0\text{ V}$	0.8	1.5	-	
Input Hysteresis	V_{HYS}	V_{IT+} to V_{IT-}	-	0.3	-	V
Output Leakage Current	I_{OFF}	-	-	± 0.05	± 10	μA
Input Resistance	R_I	$V_I = \pm 3.0\text{ V to } \pm 25V$	3	5	7	k Ω

Notes:

1. All typical values are at $V_{CC}=3.3V$ or $V_{CC}=5.0V$, and $T_A=25^{\circ}C$.
2. Short-circuit durations should be controlled to prevent exceeding the device absolute power-dissipation ratings, and not more than one output should be shorted at a time.
3. Test conditions are C1~C4=0.1 μF at $V_{CC}=3.3V\pm 0.3V$; C1=0.047 μF , C2~C4=0.33 μF at $V_{CC}=5.0V\pm 0.5V$.
4. Pulse skew is defined as $|t_{PLH} - t_{PHL}|$ of each channel of the same device.

SWITCHING CHARACTERISTICS

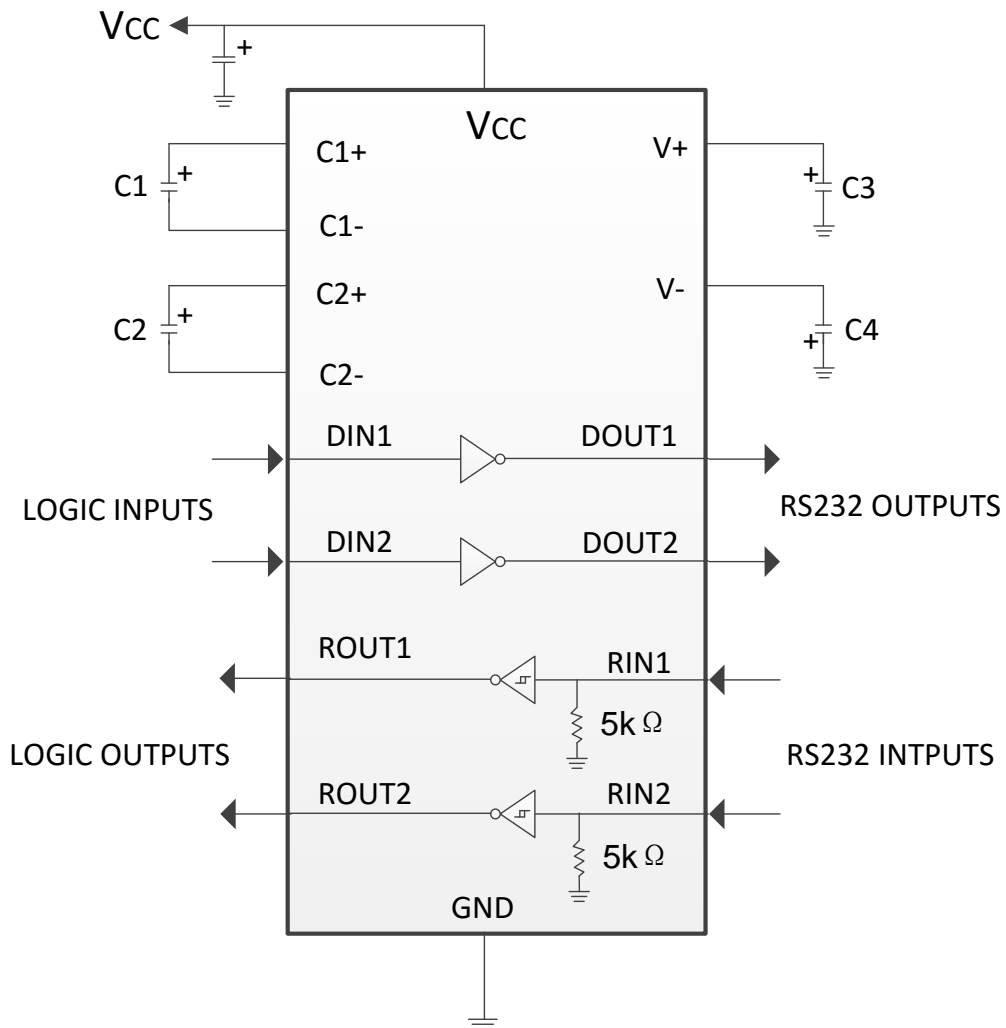
($V_{CC}=+5V\pm 5\%$, $T_A=-40^{\circ}C\sim +85^{\circ}C$, Typical Values are $V_{CC}=+5V$ and $T_A=25^{\circ}C$)

Parameter	Symbol	Conditions	MIN	TYP (Note 1)	MAX	UNITS	
Driver							
Maximum Data Rate	-	$C_L = 1000\text{ pF}$, $R_L = 3\text{ k}\Omega$, One Driver Switching	150	250	-	Kbit/s	
Pulse Skew (Note 4)	$t_{SK(P)}$	$C_L = 220\text{ pF}$ to 2500 pF , $R_L = 3\text{ k}\Omega$ to $7\text{ k}\Omega$	-	300	-	ns	
Slew Rate, Transition Region	SR(tr)	$R_L = 3\text{ k}\Omega$ to $7\text{ k}\Omega$, $V_{CC} = 3.3\text{ V}$	$C_L = 220\text{ pF}$ to 1000 pF	5	-	35	V/ μ s
			$C_L = 220\text{ pF}$ to 2500 pF	3	-	35	
Receiver							
Propagation Delay Time, Low to High-Level Output	t_{PLH}	$C_L = 150\text{ pF}$	-	300	-	ns	
Propagation Delay Time, High to Low-Level Output	t_{PHL}	$C_L = 150\text{ pF}$	-	300	-	ns	
Output Enable Time	t_{EN}	$C_L = 150\text{ pF}$, $R_L = 3\text{ k}\Omega$	-	200	-	ns	
Output Disable Time	t_{DIS}	$C_L = 150\text{ pF}$, $R_L = 3\text{ k}\Omega$	-	200	-	ns	
Pulse Skew (Note 4)	$t_{SK(P)}$	$ t_{PLH} - t_{PHL} $	-	300	-	ns	

Notes:

- All typical values are at $V_{CC}=3.3V$ or $V_{CC}=5.0V$, and $T_A=25^{\circ}C$.
- Short-circuit durations should be controlled to prevent exceeding the device absolute power-dissipation ratings, and not more than one output should be shorted at a time.
- Test conditions are $C1\sim C4=0.1\mu F$ at $V_{CC}=3.3V\pm 0.3V$; $C1=0.047\mu F$, $C2\sim C4=0.33\mu F$ at $V_{CC}=5.0V\pm 0.5V$.
- Pulse skew is defined as $|t_{PLH} - t_{PHL}|$ of each channel of the same device.

TYPICAL APPLICATION CIRCUIT



Notes:

1. C3 can be connected to V_{CC} or GND.
2. Resistor values are nominal.
3. NC: No internal connection.
4. Nonpolarized ceramic capacitors are acceptable. If polarized tantalum or electrolytic capacitors are used, they should be connected as above circuit.

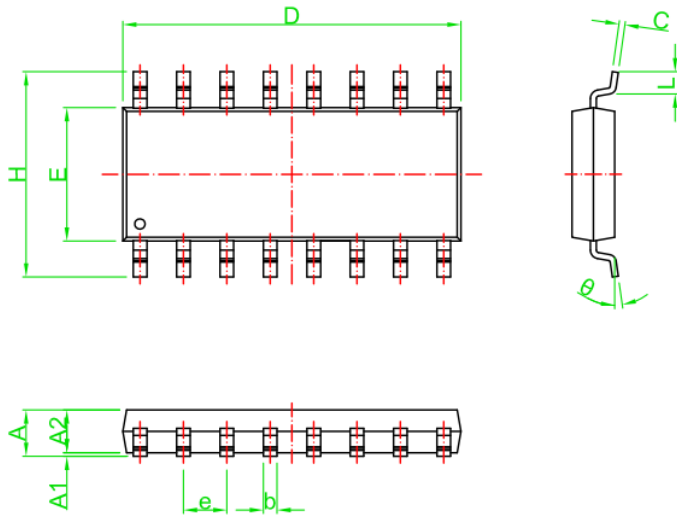
Table1. Typical Operating Circuit and Capacitor Values

V _{CC} (V)	C1 (μF)	C2, C3, C4 (μF)	C _{BYPASS} (μF)
3.0~3.6	0.22	0.22	0.22
3.15~3.6	0.1	0.1	0.1
4.5~5.5	0.047	0.33	0.047
3.0~5.5	0.22	1.0	0.22

OUTLINE DRAWING

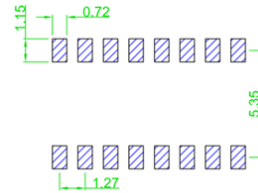
PACKAGE OUTLINE

SOP-16

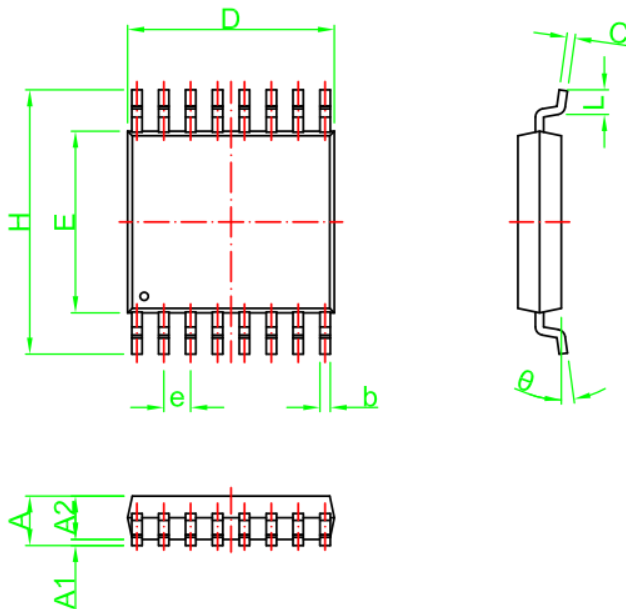


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.35	1.75	0.053	0.069
A1	0.10	0.25	0.004	0.010
A2	1.25	1.65	0.049	0.065
b	0.30	0.50	0.012	0.020
C	0.15	0.25	0.006	0.010
D	9.70	10.20	0.382	0.402
E	3.70	4.10	0.146	0.161
e	1.27 TYP		0.050 TYP	
H	5.80	6.20	0.228	0.244
L	0.45	0.85	0.018	0.033
θ	0°	8°	0°	8°

Recommended Land Pattern

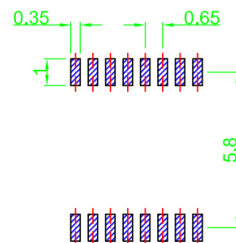


TSSOP-16



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	---	1.20	---	0.047
A1	0.05	0.15	0.002	0.006
A2	0.80	1.05	0.031	0.041
b	0.19	0.30	0.007	0.012
C	0.09	0.20	0.004	0.008
D	4.90	5.10	0.193	0.201
E	4.30	4.50	0.169	0.177
e	0.65 TYP		0.026 TYP	
H	6.20	6.60	0.244	0.260
L	0.45	0.75	0.018	0.030
θ	0°	8°	0°	8°

Recommended Land Pattern



ORDERING INFORMATION

Order code	Package	Marking	Base qty	Delivery mode
TC3232-SP	SOP-16	TC3232S	2500	Tape and Reel
TC3232-TP	TSSOP-16	TC3232T	3000	Tape and Reel