

DALLAS

SEMICONDUCTOR

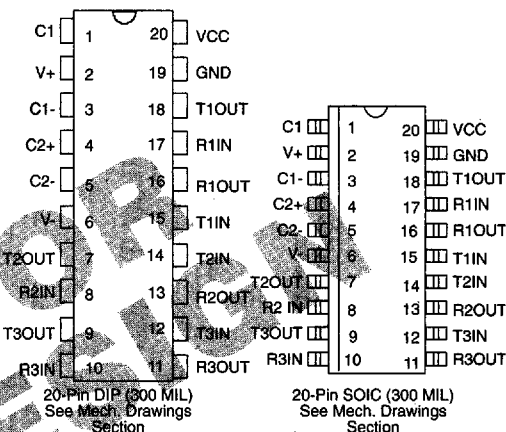
DS1229

+5V Powered Triple RS-232 Transmitter/Receiver

FEATURES

- Operates from a single 5V power supply
- Three drivers and three receivers
- Meets all EIA RS-232-C specifications
- Onboard voltage doubler
- Onboard voltage inverter
- $\pm 30\text{V}$ input levels
- $\pm 9\text{V}$ output levels with $\pm 5\text{V}$ supply
- Low-power CMOS
- Optional 20-Pin SOIC surface mount package

PIN ASSIGNMENT



PIN DESCRIPTION

C1+, C1-
C2+, C2-
V+, V-
T1IN, T2IN, T3IN
T1OUT, T2OUT, T3OUT
R1IN, R2IN, R3IN
R1OUT, R2OUT, R3OUT
VCC
GND

Capacitor 1 Connections
Capacitor 2 Connections
 ± 10 Volts
Transmitter In
Transmitter Out
Receiver In
Receiver Out
 ± 5 Volts
Ground

DESCRIPTION

The DS1229 is a triple RS-232-C receiver/transmitter that meets all EIA specifications while operating from a single +5V supply. The DS1229 has two internal charge pumps which are used to generate $\pm 10\text{V}$. The DS1229 also contains six level translators, three of which are RS-232 transmitters that convert TTL/CMOS inputs into +9V RS-232 outputs. The other three level translators are RS-232 receivers that convert RS-232 inputs

to 5V TTL/CMOS outputs. These receivers are capable of operating with up to $\pm 30\text{V}$ inputs. The DS1229 is suitable for all RS-232-C communications and is particularly valuable where higher voltage power supplies for RS-232 drivers are not available. The power supply section of the DS1229 supplies $\pm 10\text{V}$ from the VCC input.

OPERATION

The DS1229 consists of three major sections: a triple transmitter, a triple receiver and a dual charge pump which generates $\pm 10V$ from the 5V supply.

CHARGE PUMP SECTION

The dual charge pumps within the DS1229 are used to generate the voltages necessary for level conversion from TTL/CMOS to RS-232. One charge pump uses external capacitor C1 to double the V_{CC} input to +10V. The second charge pump uses external capacitor C2 to invert the +10V to -10V. Capacitors C3 and C4 are used to filter the +10V and -10V power supply. The recommended size of capacitors C1-C4 is 22 μF but the value is not critical. Increasing the value of C3 and C4 will lower the 16 KHz ripple on the +10V supplies and the RS-232 outputs. The value of C1 and C4 can be lowered to 1 μF where size is critical.

TRANSMITTER SECTION

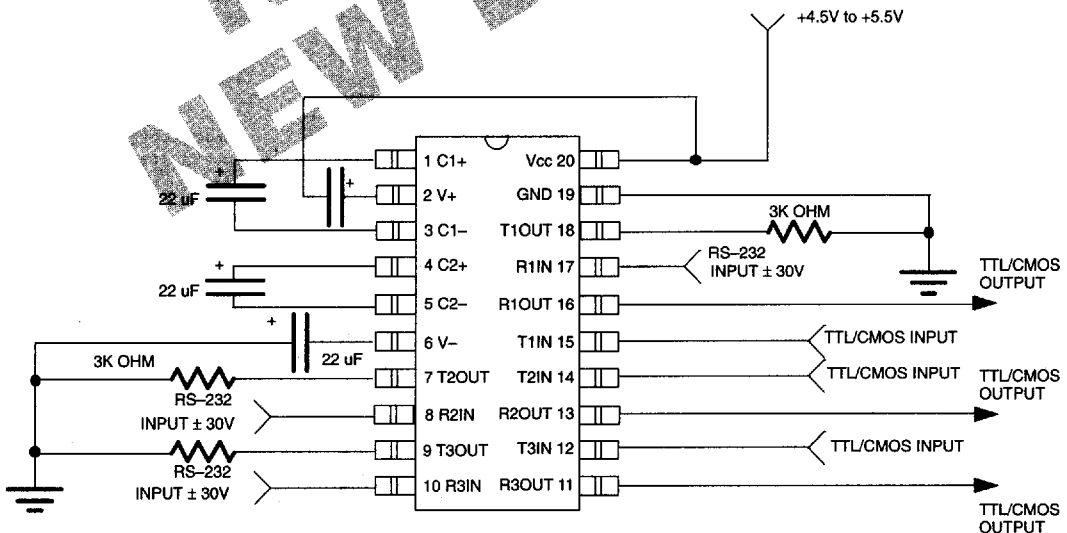
The three transmitters are CMOS inverters powered by the internal +10V supply. The input is TTL/CMOS-compatible. Each input has an internal 750K pull-up resistor so that unused transmitter inputs can be left unconnected.

Unused transmitter inputs will force the outputs low. The open circuit output voltage swing is from +10V to -10V. Worst-case conditions for RS-232-C of $\pm 5V$ driving a 3K load are met at maximum allowable ambient temperature and a V_{CC} level of 5.0V. Typical voltage swings of $\pm 9V$ occur with outputs of 5K and V_{CC} equal to 5V. The slew rate at the output is limited to less than 30V/ μs and the power-down output impedance will be a minimum of 300 ohms with $\pm 2V$ applied to the outputs and V_{CC} at zero volts. The outputs are also short-circuit-protected and can be short-circuited to ground indefinitely.

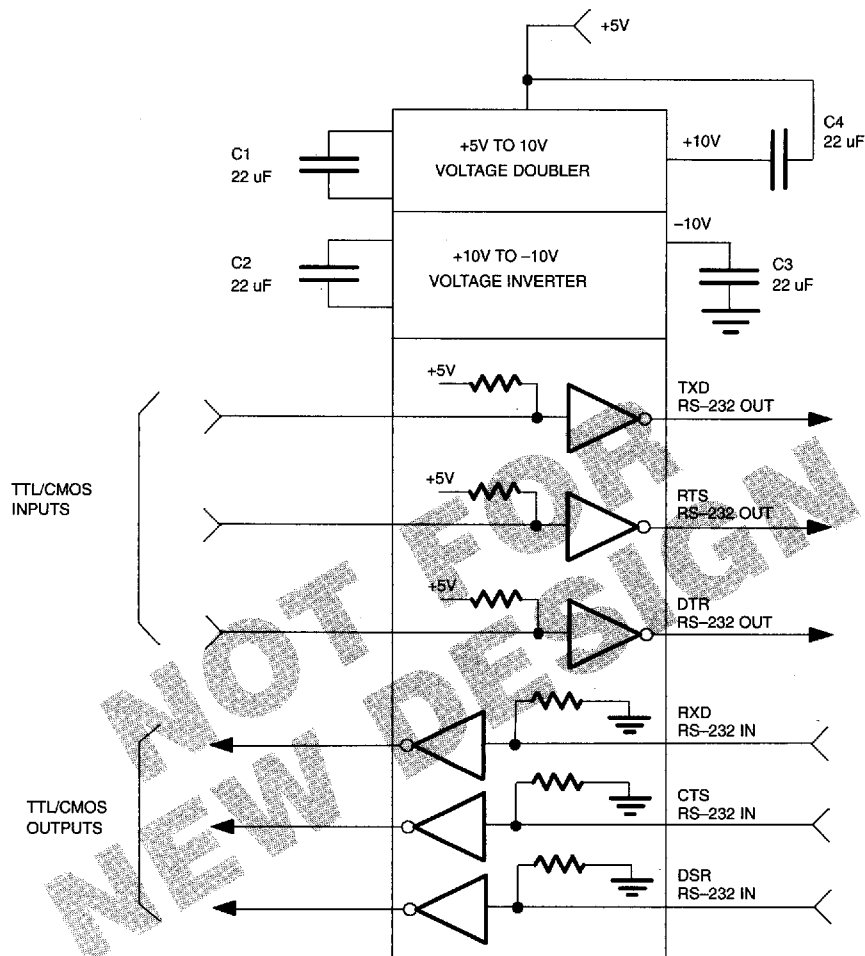
RECEIVER SECTION

The three receivers conform fully to the RS-232-C specifications. The input impedance is between 3K ohms and 7K ohms and can withstand up to $\pm 30V$ with or without V_{CC} applied. The input switching thresholds are within the $\pm 3V$ limit of RS-232-C specification with a V_{IL} of 0.7V and a V_{IH} of 2.4V. The receivers have 0.5 volts of hysteresis to improve noise rejection. The TTL/CMOS compatible output of the receiver will be low whenever the RS-232 input is greater than 2.4 volts. The receiver output will be high when the input is floating or driven between +0.6V and -30 V.

DS1229 RS-232 TRANSMITTER/RECEIVER Figure 1



TYPICAL APPLICATIONS Figure 2



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ABSOLUTE MAXIMUM RATINGS*

V_{CC}	7.0V
V_{+}	+12 volts
V_{-}	-12 volts
Transmitter Inputs	-0.3V to ($V_{CC} + 0.3V$)
Receiver Inputs	± 30 volts
Transmitter Outputs	($V_{+} + 0.3V$) to ($V_{-} - 0.3V$)
Receiver Outputs	-0.3V to ($V_{CC} + 0.3V$)
Storage Temperature	-55°C to +125°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.

RECOMMENDED DC OPERATING CONDITIONS

(0°C to 70°C)

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
Power Supply Voltage	V_{CC}	4.5	5.0	5.5	V	1
Logic 1 Input	V_{IH}	2.2		$V_{CC} + 0.3$	V	1
Logic 0 Input	V_{IL}	-0.3		+0.8	V	1
RS-232 Input Voltage	V_{RS}	-30		+30	V	1,2,11

DC ELECTRICAL CHARACTERISTICS(0°C to 70°C; $V_{CC} = 5V \pm 10\%$)

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
RS-232 Output Voltage	V_{ORS}	+4	± 9	± 10	V	3,12
Power Supply Current	I_{DD}		5	10	mA	4
Transmitter Pull-up Current	I_{TP}		5	200	μA	5
RS-232 Input Threshold Low	V_{TL}	0.7	1.2		V	6
RS-232 Input Threshold High	V_{TH}		1.7	2.4	V	6
RS-232 Input Hysteresis	V_{HY}	0.2	0.5	1.0	V	
Receiver Output Current @ 2.4V	I_{OH}	-1.0			mA	
Receiver Output Current @ 0.4V	I_{OL}			3.2	mA	
Output Resistance	R_{OUT}	300			ohms	7
RS-232 Output Current @ 0.4 V	I_{SC}			± 25	mA	
Propagation Delay	t_{PD}		3		μs	8
Transmitter Output Instantaneous Slew Rate	t_{SR}			30	V/ μs	9
Transmitter Output Transition Slew Rate	t_{TSR}		3		V/ μs	10

NOTES:

1. All voltages are referenced to ground.
2. Applies to Receiver Inputs only.
3. T1, T2, and T3 loaded with 3K ohms to ground.
4. All outputs are unloaded.
5. T1, T2, and T3 Inputs = 0 volts.
6. $V_{CC} = +5$ volts.
7. $V_{OUT} = \pm 2$ volts.
8. RS-232 to TTL or TTL to RS-232.
9. $C_L = 10$ pF, $R_L = 3K$, $t_A = 0^\circ C$. This parameter is sample tested only.
10. $R_L = 3K$, $C_L = 2500$ pF measured from +3 volts to -3 volts or -3 volts to +3 volts.
11. This parameter is sample tested only.
12. Negative output level of -5V is increased to -4.0 for the DS1229 only. Positive output level remains at +5V. Use of a +10%, -5% power supply will restore the negative level to -5V.

NOT FOR
NEW DESIGN