

LMS202 5V Single Supply TIA/EIA-232 Dual Transceivers

Check for Samples: [LMS202](#)

FEATURES

- Single +5V Power Supply
- 230 kbps Data Rate
- On-Board DC-to-DC Converter
- 0.1 μ F Charge Pump Capacitors
- Drop-In Replacement to Maxim's MAX202

APPLICATIONS

- POS Equipment (Bar Code Reader)
- Hand-Held Equipment
- General Purpose RS-232 Communication

DESCRIPTION

The LMS202 features two transmitters and two receivers for RS-232 communication. It has a DC-to-DC converter that permits the device to operate with only a single +5V power supply. The on-chip DC-to-DC converter which utilizes four external 0.1 μ F capacitors to generate dual internal power supplies for RS-232 compatible output levels.

The device meet EIA/TIA-232E and CCITT V.28 specifications up to 230kbits/sec. The LMS202 is available in 16-pin narrow and wide SOIC packages.

Connection Diagram and Typical Circuit

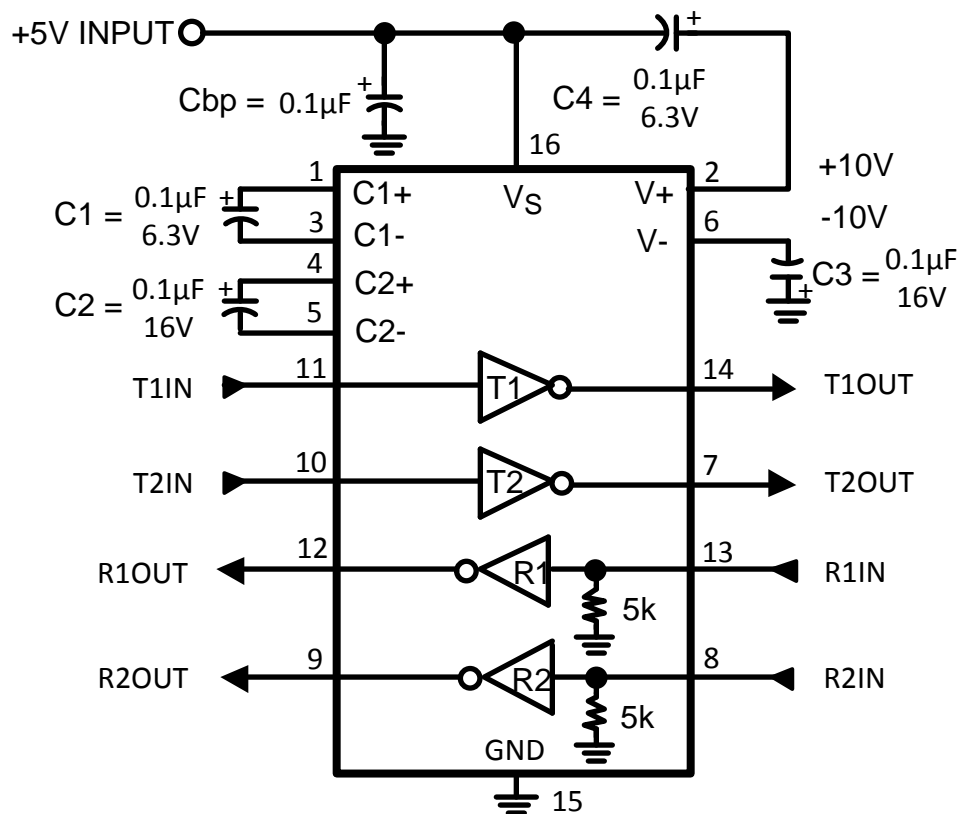


Figure 1. 16-Pin SOIC
See D or DW Package



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PIN DESCRIPTIONS

Pin Number	Pin Name	Pin Function
1, 3	C1+, C1-	External capacitor connection pins. Recommended external capacitor C1 = 0.1 μ F (6.3V)
2	V+	Positive supply for TIA/EIA-232E drivers. Recommended external capacitor C4 = 0.1 μ F (6.3V)
4, 5	C2+, C2-	External capacitor connection pins. Recommended external capacitor C2 = 0.1 μ F (16V)
6	V-	Negative supply for TIA/EIA-232E drivers. Recommended external capacitor C3 = 0.1 μ F (16V)
7, 14	T1out, T2out	Transmitter output pins conform to TIA/EIA-232E levels. The typical transmitter output swing is $\pm 8V$ when loaded 3k Ω load to ground. The open-circuit output voltage swings from (V+ - 0.6V) to V-
8, 13	R1in, R2in	Receiver inputs accept TIA/EIA-232
9, 12	R1out and R2out	Receiver output pins are TTL/CMOS compatible
10, 11	Tin1, Tin2	Transmitter input pins are TTL/CMOS compatible. Inputs of transmitter do not have pull-up resistors. Connect all unused transmitter inputs to ground
15	GND	Ground pin
16	V _S	Power supply pin for the device, +5V ($\pm 10\%$)



These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

Absolute Maximum Ratings⁽¹⁾⁽²⁾

V _S	-0.3V to 6V
V+	(V _S - 0.3V) to +14V
V-	+0.3V to -14V
Driver Input Voltage, T _{IN}	-0.3V to (V+ +0.3V)
Receiver Input Voltage, R _{IN}	$\pm 30V$
Driver Output Voltage T _O	(V- -0.3V) to (V+ +0.3V)
Receiver Output Voltage R _O	-0.3 to (V _S +0.3)
Short Circuit Duration, T _O	Continuous
ESD Rating	Human Body Model ⁽³⁾ 2kV
	Machine Model ⁽⁴⁾ 200V
Soldering Information	Infrared or Convection (20sec.) 235°C
Junction Temperature	150°C
Storage Temperature Range	-65°C to +150°C

- (1) Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is intended to be functional, but specific performance is not ensured. For ensured specifications and the test conditions, see the Electrical Characteristics.
- (2) If Military/Aerospace specified devices are required, please contact the Texas Instruments Sales Office/Distributors for availability and specifications.
- (3) Human Body Model, 1.5k Ω in series with 100pF
- (4) Machine model, 0 Ω in series with 200pF

Operating Ratings

Supply Voltage V _S	4.5V to 5.5V	
Ambient Temperature Range, T _A	Commercial (C)	0°C to +70°C
	Industrial (I)	-40°C to +85°C
Package Thermal Resistance ⁽¹⁾	D Package	71°C/W
	DW Package	55°C/W

- (1) The maximum power dissipation is a function of T_{J(MAX)}, θ_{JA} , and T_A. The maximum allowable power dissipation at any ambient temperature is P_D = (T_{J(MAX)} - T_A) / θ_{JA} . All numbers apply for packages soldered directly onto a PC board.

Electrical Characteristics

Over recommended operating supply and temperature ranges unless otherwise specified

$C_1 = C_2 = C_3 = C_4 = C_{bp} = 0.1\mu\text{F}$

Symbol	Parameter	Conditions	Min ⁽¹⁾	Typ ⁽²⁾	Max ⁽¹⁾	Units
DC Characteristics						
I_S	Supply Current	No Load, $T_A = 25^\circ\text{C}$		1	7	mA
Logic						
I_{INPUT}	Input Leakage Current	$T_{\text{IN}} = 0\text{V to } V_S$			± 10	μA
V_{THL}	Input Logic Theshold Low	T_{IN}			0.8	V
V_{THH}	Input Logic Theshold High	T_{IN}	2.0			V
V_{OL}	TTL/CMOS Output Voltage Low	$R_{\text{OUT}}, I_{\text{OUT}} = 3.2\text{mA}$			0.4	V
V_{OH}	TTL/CMOS Output Voltage High	$R_{\text{OUT}}, I_{\text{OUT}} = -1.0\text{mA}$	3.5	$V_S - 0.1$		V
RS-232 Receiver Inputs						
V_{RI}	Receiver Input Voltage Range		-30		+30	V
V_{RTHL}	Receiver Input Theshold Low	$V_S = 5\text{V}, T_A = 25^\circ\text{C}$	0.8	1.4		V
V_{RTHH}	Receiver Input Theshold High	$V_S = 5\text{V}, T_A = 25^\circ\text{C}$		2	2.4	V
V_{HYST}	Receiver Input Hysteresis	$V_S = 5\text{V}$	0.2	0.6	1.0	V
R_I	Receiver Input Resistance	$V_S = 5\text{V}, T_A = 25^\circ\text{C}$	3	5	7	k Ω
RS-232 Transmitter Outputs						
V_O	Transmitter Output Voltage Swing	All transmitters loaded with 3k Ω to GND	± 5	± 8		V
R_O	Output Resistance	$V_S = V_+ = V_- = 0\text{V},$ $V_O = \pm 2\text{V}$	300			Ω
I_{OS}	Output Short Circuit Current			± 11	± 60	mA
Timing Characteristics						
DR	Maximum Data Rate	$C_L = 50\text{pF to } 1000\text{pF},$ $R_L = 3\text{k}\Omega \text{ to } 7\text{k}\Omega$	230			kbps
T_{RPLH} T_{RPHL}	Receiver Propagation Delay	$C_L = 150\text{pF}$		0.08	1	μs
T_{DPLH} T_{DPHL}	Transmitter Propagation Delay	$R_L = 3\text{k}\Omega, C_L = 2500\text{pF}$ All transmitters loaded		2.4		μs
V_{SLEW}	Transition Region Slew Rate	$T_A = 25^\circ\text{C}, V_S = 5\text{V}$ $C_L = 50\text{pF to } 1000\text{pF}, R_L = 3\text{k}\Omega \text{ to } 7\text{k}\Omega$ Measured from +3V to -3V or vice versa	3	6	30	V/ μs

- (1) All limits are ensured by testing or statistical analysis
(2) Typical Values represent the most likely parametric norm.

Typical Characteristics

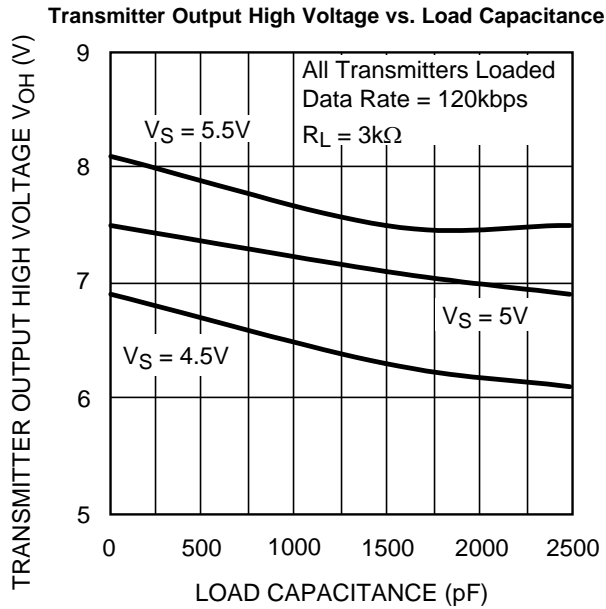


Figure 2.

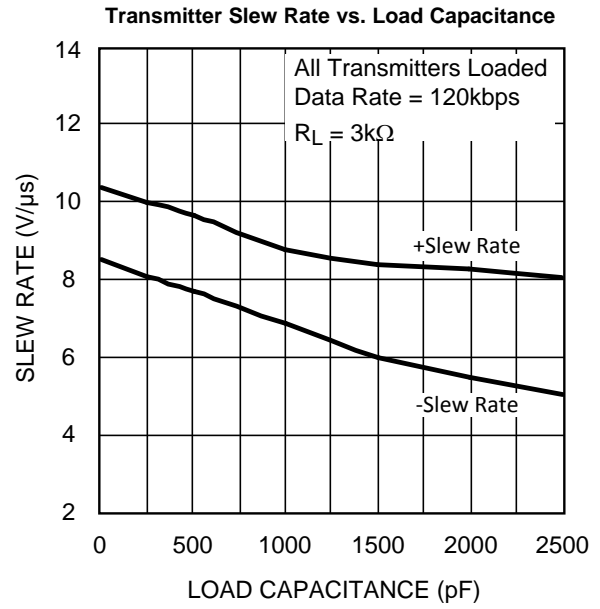


Figure 3.

APPLICATION INFORMATION

CAPACITOR SELECTION

The recommended capacitors are 0.1 μ F. However, larger capacitors for the charge pump may be used to minimized ripples on V+ and V- pins.

POWER SUPPLY DECOUPLING

In some applications that are sensitive to power supply noise from the charge pump, place a decoupling capacitor, C_{bp}, from V_S to GND. Use at least a 0.1 μ F capacitor or the same size as the charge pump capacitors (C1 – C4).

CHARGED PUMP

The dual internal charged-pump provides the ± 10 V to the to transmitters. Using capacitor C1, the charge pump converts +5V to +10V then stores the +10V in capacitor C3. The charge pump uses capacitor C2 to invert the +10V to -10V. The -10V is then stored in capacitor C4.

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