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±15kV ESD-Protected, 5V RS-232 Transceivers

MAX202E–MAX213E, MAX232E/MAX241E

General Description

The MAX202E–MAX213E, MAX232E, and MAX241E are a family of RS-232 and V.28 transceivers with high ±15kV ESD HBM protection and integrated charge pump circuitry for single +5V supply operation. The various combinations of features are outlined in the *Selector Guide*. The drivers and receivers for all ten devices meet all EIA/TIA-232E and CCITT V.28 specifications at data rates up to 120kbps when loaded.

The MAX211E/MAX213E/MAX241E are available in 28-pin SO and SSOP packages. The MAX202E/MAX232E come in 16-pin TSSOP, narrow SO, wide SO, and DIP packages. The MAX203E comes in a 20-pin DIP/SO package, and needs no external charge-pump capacitors. The MAX205E comes in a 24-pin wide DIP package, and also eliminates external charge-pump capacitors.

Applications

- Battery-Powered Equipment
- Hand-Held Equipment
- Portable Diagnostics Equipment

Benefits and Features

- Saves Board Space
 - Integrated High ±15kV HBM ESD Protection
 - Integrated Charge Pump Circuitry
 - Eliminates the Need for a Bipolar ±12V Supply
 - Enables Single Supply Operation From +5V Supply
 - Integrated 0.1µF Capacitors (MAX203E, MAX205E)
 - 24 pin SSOP Package Saves up to 40% Versus SO Package
- Saves Power for Reduced Power Requirements
 - 1µA Shutdown Mode
 - 15µA Shutdown Mode for MAX213E

Ordering Information

PART	TEMP RANGE	PIN-PACKAGE
MAX202ECPE	0°C to +70°C	16 Plastic DIP
MAX202ECSE	0°C to +70°C	16 Narrow SO

Ordering Information continued at end of data sheet.

Pin Configurations and Typical Operating Circuits appear at end of data sheet.

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Selector Guide

PART	NO. OF RS-232 DRIVERS	NO. OF RS-232 RECEIVERS	RECEIVERS ACTIVE IN SHUTDOWN	NO. OF EXTERNAL CAPACITORS (µF)	LOW-POWER SHUTDOWN	TTL TRI-STATE
MAX202E	2	2	0	4 (0.1)	No	No
MAX203E	2	2	0	None	No	No
MAX205E	5	5	0	None	Yes	Yes
MAX206E	4	3	0	4 (0.1)	Yes	Yes
MAX207E	5	3	0	4 (0.1)	No	No
MAX208E	4	4	0	4 (0.1)	No	No
MAX211E	4	5	0	4 (0.1)	Yes	Yes
MAX213E	4	5	2	4 (0.1)	Yes	Yes
MAX232E	2	2	0	4 (1)	No	No
MAX241E	4	5	0	4 (1)	Yes	Yes

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Absolute Maximum Ratings

V _{CC}	-0.3V to +6V	20-Pin Plastic DIP (derate 11.11mW/°C above +70°C).....	889mW
V+	(V _{CC} - 0.3V) to +14V	20-Pin SO (derate 10.00mW/°C above +70°C).....	800mW
V-	-14V to +0.3V	24-Pin Narrow Plastic DIP	
Input Voltages		(derate 13.33mW/°C above +70°C)	1.07W
T_IN.....	-0.3V to (V+ + 0.3V)	24-Pin Wide Plastic DIP	
R_IN.....	±30V	(derate 14.29mW/°C above +70°C)	1.14W
Output Voltages		24-Pin SO (derate 11.76mW/°C above +70°C).....	941mW
T_OUT.....	(V- - 0.3V) to (V+ + 0.3V)	24-Pin SSOP (derate 8.00mW/°C above +70°C).....	640mW
R_OUT.....	-0.3V to (V _{CC} + 0.3V)	28-Pin SO (derate 12.50mW/°C above +70°C).....	1W
Short-Circuit Duration, T_OUT	Continuous	28-Pin SSOP (derate 9.52mW/°C above +70°C).....	762mW
Continuous Power Dissipation (T _A = +70°C)		Operating Temperature Ranges	
16-Pin Plastic DIP (derate 10.53mW/°C above +70°C) ...	842mW	MAX2__EC__	0°C to +70°C
16-Pin Narrow SO (derate 8.70mW/°C above +70°C).....	696mW	MAX2__EE__	-40°C to +85°C
16-Pin Wide SO (derate 9.52mW/°C above +70°C) ...	762mW	Storage Temperature Range	65°C to +165°C
16-Pin TSSOP (derate 9.4mW/°C above +70°C).....	755mW	Lead Temperature (soldering, 10s)	+300°C

Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Electrical Characteristics

(V_{CC} = +5V ±10% for MAX202E/206E/208E/211E/213E/232E/241E; V_{CC} = +5V ±5% for MAX203E/205E/207E; C1–C4 = 0.1µF for MAX202E/206E/207E/208E/211E/213E; C1–C4 = 1µF for MAX232E/241E; T_A = T_{MIN} to T_{MAX}; unless otherwise noted. Typical values are at T_A = +25°C.)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
DC CHARACTERISTICS							
V _{CC} Supply Current	I _{CC}	No load, T _A = +25°C	MAX202E/203E		8	15	mA
			MAX205E–208E		11	20	
			MAX211E/213E		14	20	
			MAX232E		5	10	
			MAX241E		7	15	
Shutdown Supply Current		T _A = +25°C, Figure 1	MAX205E/206E		1	10	µA
			MAX211E/241E		1	10	
			MAX213E		15	50	
LOGIC							
Input Pullup Current		T _{IN} = 0V (MAX205E–208E/211E/213E/241E)			15	200	µA
Input Leakage Current		T _{IN} = 0V to V _{CC} (MAX202E/203E/232E)				±10	µA
Input Threshold Low	V _{IL}	T _{IN} ; EN, $\overline{\text{SHDN}}$ (MAX213E) or $\overline{\text{EN}}$, SHDN (MAX205E–208E/211E/241E)				0.8	V
Input Threshold High	V _{IH}	T _{IN}			2.0		V
		EN, $\overline{\text{SHDN}}$ (MAX213E) or $\overline{\text{EN}}$, SHDN (MAX205E–208E/211E/241E)			2.4		
Output-Voltage Low	V _{OL}	R _{OUT} ; I _{OUT} = 3.2mA (MAX202E/203E/232E) or I _{OUT} = 1.6mA (MAX205E/208E/211E/213E/241E)				0.4	V
Output-Voltage High	V _{OH}	R _{OUT} ; I _{OUT} = -1.0mA		3.5	V _{CC} - 0.4		V
Output Leakage Current		$\overline{\text{EN}}$ = V _{CC} ; EN = 0V, 0V ≤ R _{OUT} ≤ V _{CC} , MAX205E–208E/211E/213E/241E outputs disabled			±0.05	±10	µA