



3.0V TO 5.5V LOW POWER MULTICHANNEL RS-232 LINE TRANSCEIVERS USING FOR 0.1 μ F EXTERNAL CAPACITORS

■ DESCRIPTION

The UTC **UT3222** 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/ μ s driver output slew rate.

The UTC **UT3222** can be placed in the power-down mode by setting $\overline{\text{PWRDOWN}}$ low, which draws only 1 μ A from the power supply. When the device is powered down, the receivers remain active while the drivers are placed in the high-impedance state. Also, during power down, the onboard charge pump is disabled; V_+ is lowered to V_{CC} and V_- is raised toward GND. Receiver outputs also can be placed in the high-impedance state by setting $\overline{\text{EN}}$ high.

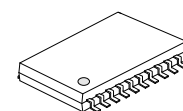
■ FEATURES

- * Exceeds $\pm 8\text{KV}$ 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
- * Low Standby Current 1 μ A Typical
- * External Capacitors 4 $\times$ 0.1 μ F
- * Accepts 5.0V Logic Input With 3.3V Supply

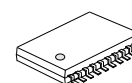
■ ORDERING INFORMATION

Ordering Number	Package	Packing
UT3222G-R20-R	SSOP-20	Tape Reel
UT3222G-P20-R	TSSOP-20	Tape Reel

UT3222G-R20-R	
(1)Packing Type	(1) R: Tape Reel
(2)Package Type	(2) R20: SSOP-20, P20: TSSOP-20
(3)Green Package	(3) G: Halogen Free and Lead Free

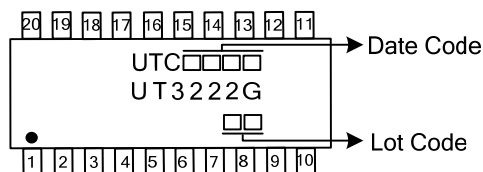


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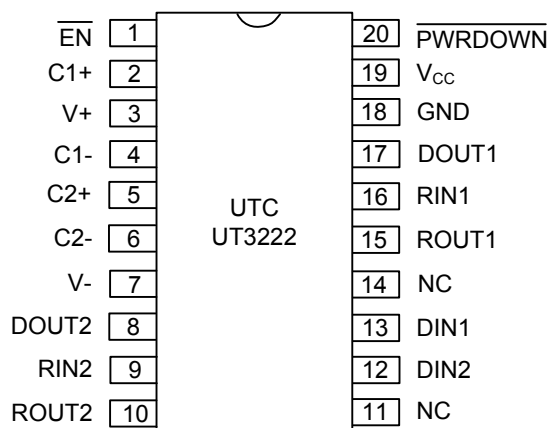


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MARKING



PIN CONFIGURATION



PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1	EN	Receiver Enable. Active low.
2	C1+	Positive Terminal of Voltage-Doubler Charge-Pump Capacitor
3	V+	+5.5V Generated by the Charge Pump
4	C1-	Negative Terminal of Voltage-Doubler Charge-Pump Capacitor
5	C2+	Positive Terminal of Inverting Charge-Pump Capacitor
6	C2-	Negative Terminal of Inverting Charge-Pump Capacitor
7	V-	-5.5V Generated by the Charge Pump
8	DOUT2	RS-232 Driver Outputs
9	RIN2	RS-232 Receiver Inputs
10	ROUT2	TTL/CMOS Receiver Outputs
11, 14	NC	
12	DIN2	TTL/CMOS Driver Inputs
13	DIN1	TTL/CMOS Driver Inputs
15	ROUT1	TTL/CMOS Receiver Outputs
16	RIN1	RS-232 Receiver Inputs
17	DOUT1	RS-232 Driver Outputs
18	GND	Ground
19	V _{CC}	+3.0V to +5.5V Supply Voltage
20	PWRDOWN	Shutdown Control. Active low.

■ FUNCTION TABLE

For EACH DRIVER

INPUTS (DIN)	INPUTS(PWRDOWN)	OUTPUT DOUT
X	L	Z
L	H	H
H	H	L

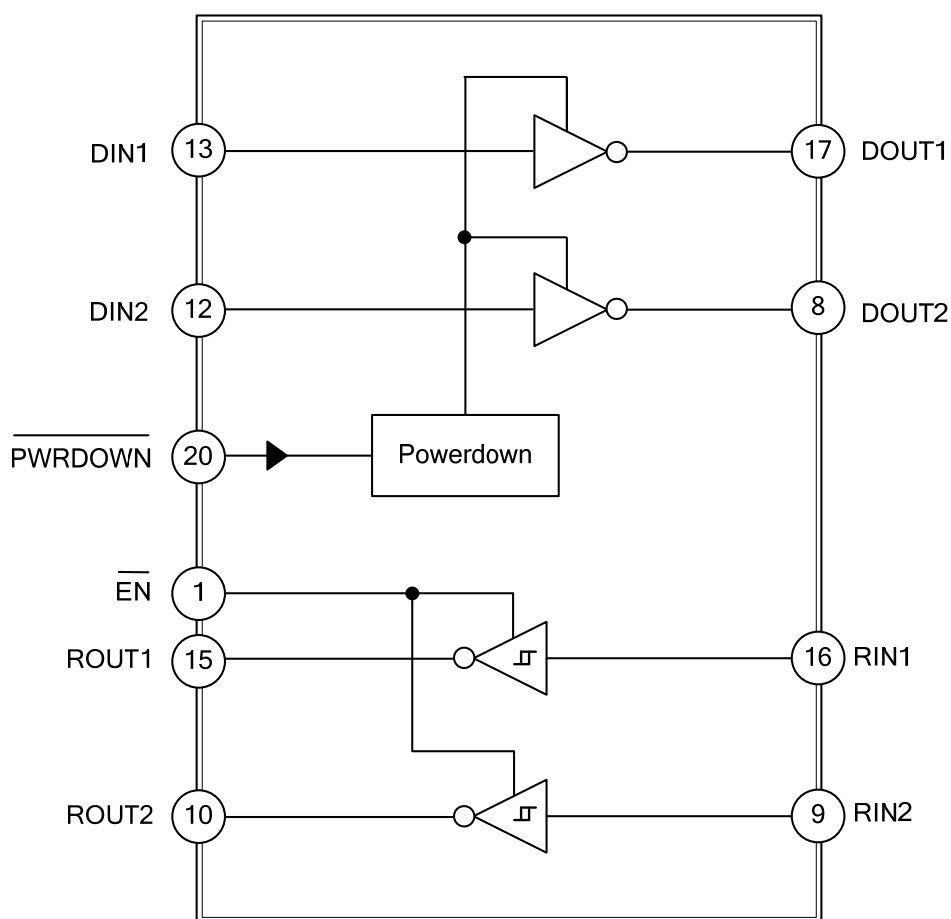
For EACH RECEIVER

INPUTS(RIN)	INPUTS ($\overline{\text{EN}}$)	OUTPUT ROUT
L	L	H
H	L	L
X	H	Z
OPEN	L	H

H=High Level, L=Low Level, X=Irrelevant, Z=High Impedance (off).

OPEN=Input disconnected or connected driver off.

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING [Over operating free-air temperature range (unless otherwise noted)]

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage Range	V_{CC}	-0.3 ~ +6.0	V
Positive Output Supply Voltage Range (Note 2)	V_{+}	-0.3 ~ +7.0	V
Negative Output Supply Voltage Range (Note 2)	V_{-}	+0.3 ~ -7.0	V
Supply Voltage Difference (Note 2)	$V_{+} - V_{-}$	+13	V
Input Voltage	Drivers, $\overline{EN}$, $\overline{PWRDOWN}$	V_{IN}	-0.3 ~ +6.0
	Receivers		-25 ~ +25
Output Voltage	Drivers	V_{OUT}	-13.2 ~ +13.2
	Receivers		-0.3 ~ $V_{CC}+0.3$
Operating Virtual Junction Temperature	T_J	+150	°C
Storage Temperature	T_{STG}	-65 ~ + 150	°C

Notes: 1. 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.

2. All voltages are with respect to network GND.

■ THERMAL DATA

PARAMETER	SYMBOL	RATING	UNIT
Junction to Ambient	θ_{JA}	90	°C/W

■ RECOMMENDED OPERATING CONDITIONS (See Note & Table 1)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Voltage	V_{CC}	$V_{CC}=3.3V$	3.0	3.3	3.6	V
		$V_{CC}=5.0V$	4.5	5.0	5.5	V
Driver and Control High-level Input Voltage	V_{IH}	DIN, $\overline{EN}$, $\overline{PWRDOWN}$	$V_{CC}=3.3V$	2.0		V
			$V_{CC}=5.5V$	2.4		
Driver and Control Low-level Input Voltage	V_{IL}	DIN, $\overline{EN}$, $\overline{PWRDOWN}$			0.8	V
Driver and Control Input Voltage	V_{IN}	DIN, $\overline{EN}$, $\overline{PWRDOWN}$			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 $V_{CC}=3.3V\pm0.3V$; C1=0.047μF, C2~C4=0.33μF at $V_{CC}=5.0V\pm0.5V$.

■ **ELECTRICAL CHARACTERISTICS** [(over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Note 3 & Table 1)]

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP (Note 1)	MAX	UNIT
Input Leakage Current	I _{IN}	($\overline{EN}$, $\overline{PWRDOWN}$)		±0.01	±1	μA
Supply Current	I _{CC}	No load, $\overline{PWRDOWN}$ at V _{CC}		0.3	1.0	mA
Supply Current (Powered Off)		No load, $\overline{PWRDOWN}$ at GND		1.0	10	μA
DRIVER SECTION						
High-Level Output Voltage	V _{OH}	DOUT at RL=3kΩ to GND, DIN=GND	+5.0	+5.4		V
Low-Level Output Voltage	V _{OL}	DOUT at RL=3kΩ 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} =3.6V, V _{OUT} =0V		±35	±60	mA
		V _{CC} =5.5V, V _{OUT} =0V		±35	±60	mA
Output Resistance	r _O	V _{CC} , V+ and V- =0V, V _{OUT} =±2.0V	300	10M		Ω
Output Leakage Current	I _{OFF}	$\overline{PWRDOWN}$ =GND, V _{CC} =3.0V~3.6V, V _{OUT} =±12V			±25	μA
		$\overline{PWRDOWN}$ =GND, V _{CC} =4.5V~5.5V, V _{OUT} =±10V			±25	μA
RECEIVER SECTION						
High-Level Output Voltage	V _{OH}	I _{OH} =-1.0mA	V _{CC} -0.6V	V _{CC} - 0.1V		V
Low-Level Output Voltage	V _{OL}	I _{OL} =1.6mA			0.4	V
Positive-Going Input Threshold Voltage	V _{IT+}	V _{CC} =3.3V		1.5	2.4	V
		V _{CC} =5.0V		1.9	2.5	V
Negative-Going Input Threshold Voltage	V _{IT-}	V _{CC} =3.3V	0.6	1.2		V
		V _{CC} =5.0V	0.8	1.5		V
Input Hysteresis	V _{HYS}	V _{IT+} ~V _{IT-}		0.3		V
Output Leakage Current	I _{OFF}	$\overline{EN}$ =V _{CC}		±0.05	±10	μA
Input Resistance	R _I	V _I =±3.0V ~ ±25V	3	5	7	kΩ

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 $C1\sim C4=0.1\mu F$ at $V_{CC}=3.3V\pm 0.3V$; $C1=0.047\mu F$, $C2\sim C4=0.33\mu F$ at $V_{CC}=5.0V\pm 0.5V$.
4. Pulse skew is defined as $|t_{PLH}-t_{PHL}|$ of each channel of the same device.

■ **SWITCHING CHARACTERISTICS** [over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Note 3 and Table 1)]

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP (Note 1)	MAX	UNIT
DRIVER SECTION							
Maximum Data Rate		C _L =1000pF, R _L =3kΩ, One Driver Switching		150	250		Kbit/s
Pulse Skew (Note 4)	t _{SK(P)}	C _L =220pF~2500pF, R _L =3kΩ~7kΩ			300		ns
Slew Rate, Transition Region	SR(tr)	R _L =3kΩ~7kΩ, V _{CC} =3.3V	C _L =220pF~1000pF	5		35	V/μs
			C _L =220pF~2500pF	3		35	
RECEIVER SECTION							
Propagation Delay Time, Low-to High-Level Output	t _{PLH}	C _L =150pF			300		ns
Propagation Delay Time, High-to Low-Level Output	t _{PHL}	C _L =150pF			300		ns
Output Enable Time	t _{EN}	C _L =150pF, R _L =3kΩ			200		ns
Output Disable Time	t _{DIS}	C _L =150pF, R _L =3kΩ			200		ns
Pulse Skew (Note 4)	t _{SK(P)}	t _{PLH} -t _{PHL}			300		ns

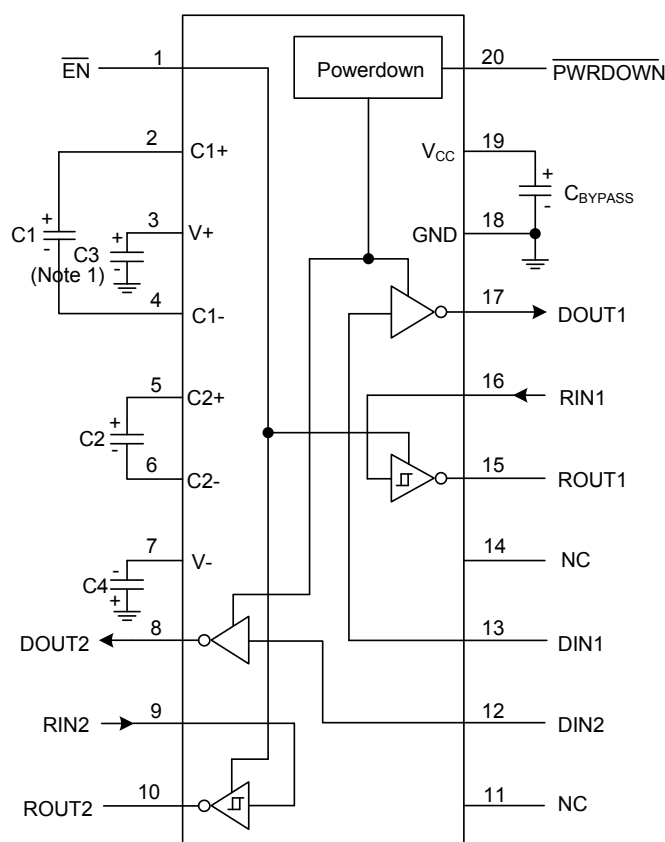
Notes: 1. All typical values are at $V_{CC}=3.3\text{V}$ or $V_{CC}=5.0\text{V}$, and $T_A=25^\circ\text{C}$.

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 $C1\sim C4=0.1\mu\text{F}$ at $V_{CC}=3.3\text{V}\pm 0.3\text{V}$; $C1=0.047\mu\text{F}$, $C2\sim C4=0.33\mu\text{F}$ at $V_{CC}=5.0\text{V}\pm 0.5\text{V}$.

4. 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 shown 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 shown.

Table1. Typical Operating Circuit and Capacitor Values

V_{CC} (V)	C1 (μ F)	C2, C3, C4 (μ F)	C_{BYPASS} (μ F)
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

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