



## UT3222

CMOS IC

### 3.0V TO 5.5V LOW POWER MULTICHANNEL RS-232 LINE TRANSCEIVERS USING FOR 0.1µF 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/µs driver output slew rate.

The UTC **UT3222** can be placed in the power-down mode by setting **PWRDOWN** low, which draws only 1µA 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<sub>CC</sub> and V- is raised toward GND. Receiver outputs also can be placed in the high-impedance state by setting **EN** high.

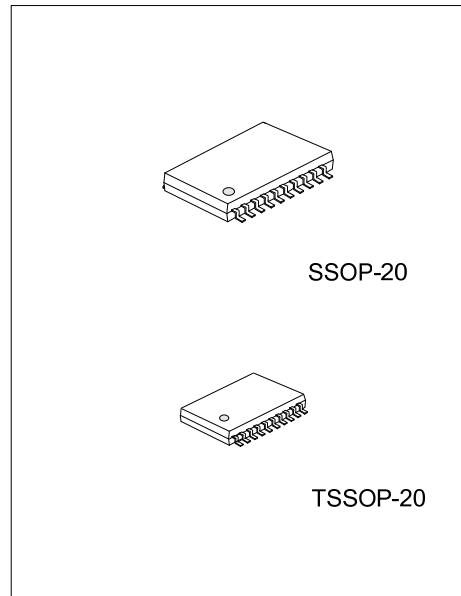
#### FEATURES

- \* 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<sub>CC</sub> Supply
- \* Operates Up To 250kbit/s Data Rate
- \* Two Drivers and Two Receivers
- \* Low Standby Current 1µA Typical
- \* External Capacitors 4×0.1µF
- \* Accepts 5.0V Logic Input With 3.3V Supply

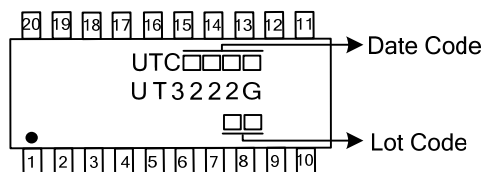
#### ORDERING INFORMATION

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

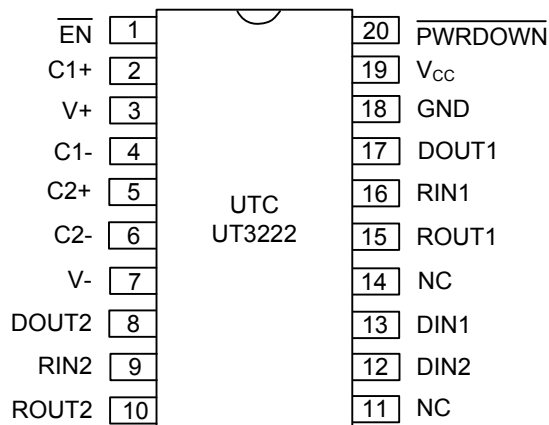
<p>UT3222G-R20-R</p> <ul style="list-style-type: none"> <li>(1)Packing Type</li> <li>(2)Package Type</li> <li>(3)Green Package</li> </ul>	<ul style="list-style-type: none"> <li>(1) R: Tape Reel</li> <li>(2) R20: SSOP-20, P20: TSSOP-20</li> <li>(3) G: Halogen Free and Lead Free</li> </ul>
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## 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 <sub>CC</sub>	+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

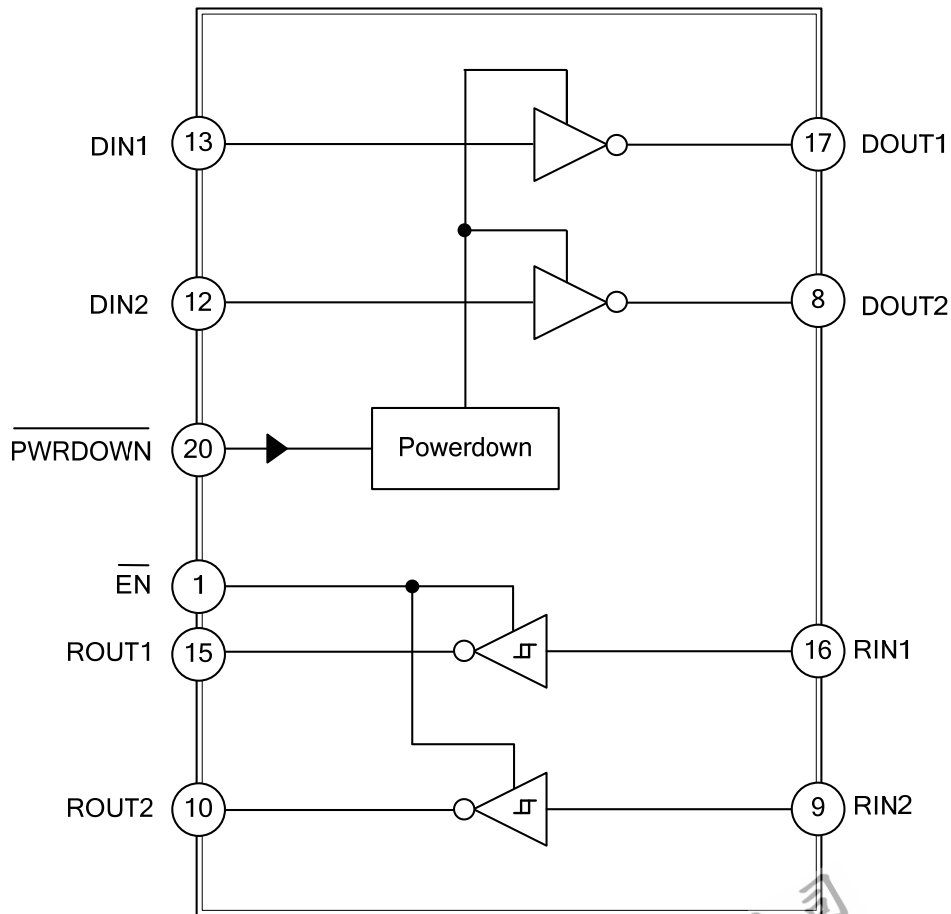
For EACH RECEIVER

INPUTS(RIN)	INPUTS ( $\overline{EN}$ )	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	V
	Receivers		-25 ~ +25	V
Output Voltage	Drivers	$V_{OUT}$	-13.2 ~ +13.2	V
	Receivers		-0.3 ~ $V_{CC}+0.3$	V
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	$\theta_{JA}$	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  $V_{CC}=3.3V\pm 0.3V$ ; C1=0.047μF, C2~C4=0.33μF at  $V_{CC}=5.0V\pm 0.5V$ .

■ **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	$I_{IN}$	( $\overline{EN}$ , $\overline{PWRDOWN}$ )		$\pm 0.01$	$\pm 1$	$\mu A$
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	$\mu A$
<b>DRIVER SECTION</b>						
High-Level Output Voltage	$V_{OH}$	DOUT at $R_L=3k\Omega$ to GND, $DIN=GND$	+5.0	+5.4		V
Low-Level Output Voltage	$V_{OL}$	DOUT at $R_L=3k\Omega$ to GND, $DIN=V_{CC}$	-5.0	-5.4		V
High-Level Input Current	$I_{OH}$	$V_I=V_{CC}$		$\pm 0.01$	$\pm 1$	$\mu A$
Low-Level Input Current	$I_{OL}$	$V_I$ at GND		$\pm 0.01$	$\pm 1$	$\mu A$
Short-Circuit Output Current (Note 2)	$I_{OS}$	$V_{CC}=3.6V$ , $V_{OUT}=0V$		$\pm 35$	$\pm 60$	mA
		$V_{CC}=5.5V$ , $V_{OUT}=0V$		$\pm 35$	$\pm 60$	mA
Output Resistance	$r_O$	$V_{CC}$ , $V+$ and $V- = 0V$ , $V_{OUT}=\pm 2.0V$	300	10M		$\Omega$
Output Leakage Current	$I_{OFF}$	$\overline{PWRDOWN}=GND$ , $V_{CC}=3.0V\sim 3.6V$ , $V_{OUT}=\pm 12V$			$\pm 25$	$\mu A$
		$\overline{PWRDOWN}=GND$ , $V_{CC}=4.5V\sim 5.5V$ , $V_{OUT}=\pm 10V$			$\pm 25$	$\mu A$
<b>RECEIVER SECTION</b>						
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	$V_{HYS}$	$V_{IT+}\sim V_{IT-}$		0.3		V
Output Leakage Current	$I_{OFF}$	$\overline{EN}=V_{CC}$		$\pm 0.05$	$\pm 10$	$\mu A$
Input Resistance	$R_I$	$V_I=\pm 3.0V \sim \pm 25V$	3	5	7	k $\Omega$

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.

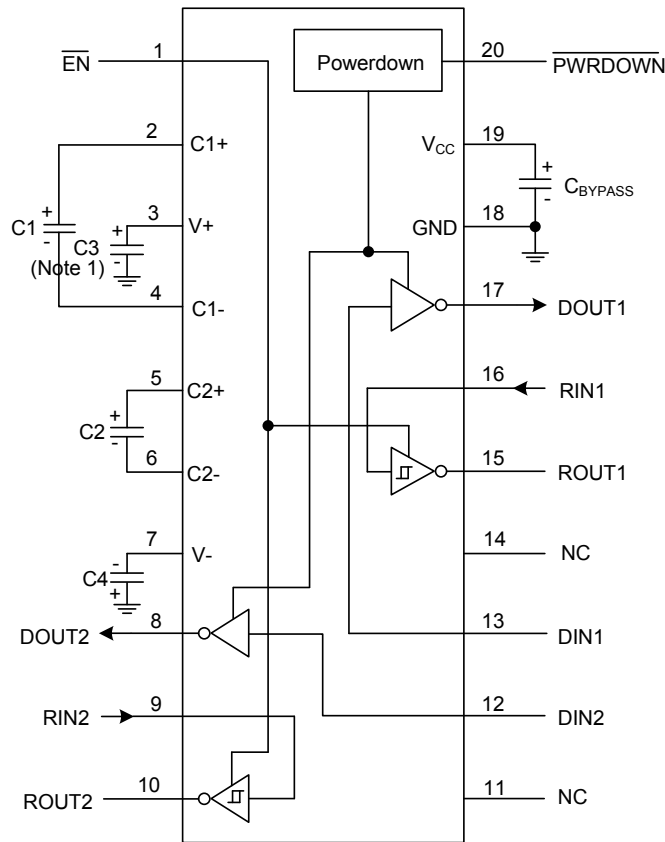
■ **SWITCHING CHARACTERISTICS** [over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Note 3 and Table 1)]

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP (Note 1)	MAX	UNIT
<b>DRIVER SECTION</b>						
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)	$t_{SK(P)}$	$C_L=220\text{pF}\sim 2500\text{pF}$ , $R_L=3\text{k}\Omega\sim 7\text{k}\Omega$		300		ns
Slew Rate, Transition Region	SR(tr)	$R_L=3\text{k}\Omega\sim 7\text{k}\Omega$ , $C_L=220\text{pF}\sim 1000\text{pF}$	5		35	V/ $\mu\text{s}$
		$V_{CC}=3.3\text{V}$ , $C_L=220\text{pF}\sim 2500\text{pF}$	3		35	
<b>RECEIVER SECTION</b>						
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: 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<sub>CC</sub> 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 <sub>CC</sub> (V)	C1 (μF)	C2, C3, C4 (μF)	C <sub>BYPASS</sub> (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

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