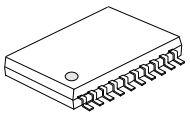
3V TO 5.5V MULTICHANNEL RS-232 LINE TRANSCEIVERS WITH ±15kV ESD PROTECTION



TSSOP-20

■ DESCRIPTION

The UTC **UT3222** have two receivers and two transmitters, and a dual charge-pump circuit with ±15kV ESD protection pin to pin (serial-port connection pins, including GND). 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 3V to 5.5V supply. The device operates at data signaling rates up to 250 kbit/s and a maximum of 30V/μS driver output slew rate.

The UTC **UT3222** can be placed in the power-down mode by setting $\overline{\text{PWRDOWN}}$ 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_{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

* RS-232 Bus-Pin ESD Protection Exceeds±15 kV Using Human-Body Model (HBM)
* Meets or Exceeds the Requirements of TIA/EIA-232-F and ITU v.28 Standards
* Operates With 3V to 5.5V V_{CC} Supply
* Operates Up To 250 kbit/s
* Two Drivers and Two Receivers
* Low Standby Current 1μA Typical
* External Capacitors 4×0.1μF
* Accepts 5V Logic Input With 3.3V Supply

■ ORDERING INFORMATION

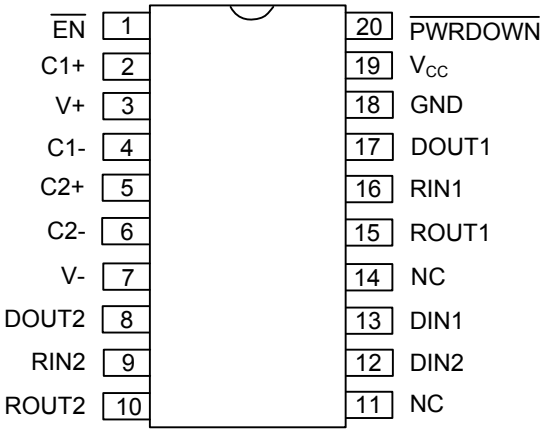
Ordering Number		Package	Packing
Lead Free	Halogen Free		
UT3222L-P20-T	UT3222G-P20-T	TSSOP-20	Tube
UT3222L-P20-R	UT3222G-P20-R	TSSOP-20	Tape Reel

UT3222L-P20-R

(1)Packing Type
(2)Package Type
(3)Lead Free

(1) T: Tube, R: Tape Reel
(2) P20: TSSOP-20
(3) L: Lead Free, G: Halogen Free

■ PIN CONFIGURATION



■ PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1	$\overline{EN}$	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 Transmitter Outputs
9	RIN2	RS-232 Receiver Inputs
10	ROUT2	TTL/CMOS Receiver Outputs
11, 14	NC	
12	DIN2	TTL/CMOS Transmitter Inputs
13	DIN1	TTL/CMOS Transmitter Inputs
15	ROUT1	TTL/CMOS Receiver Outputs
16	RIN1	RS-232 Receiver Inputs
17	DOUT1	RS-232 Transmitter Outputs
18	GND	Ground
19	V_{CC}	+3.0V to +5.5V Supply Voltage
20	$\overline{PWRDOWN}$	Shutdown Control. Active low.

■ FUNCTION TABLE

For EACH DRIVER

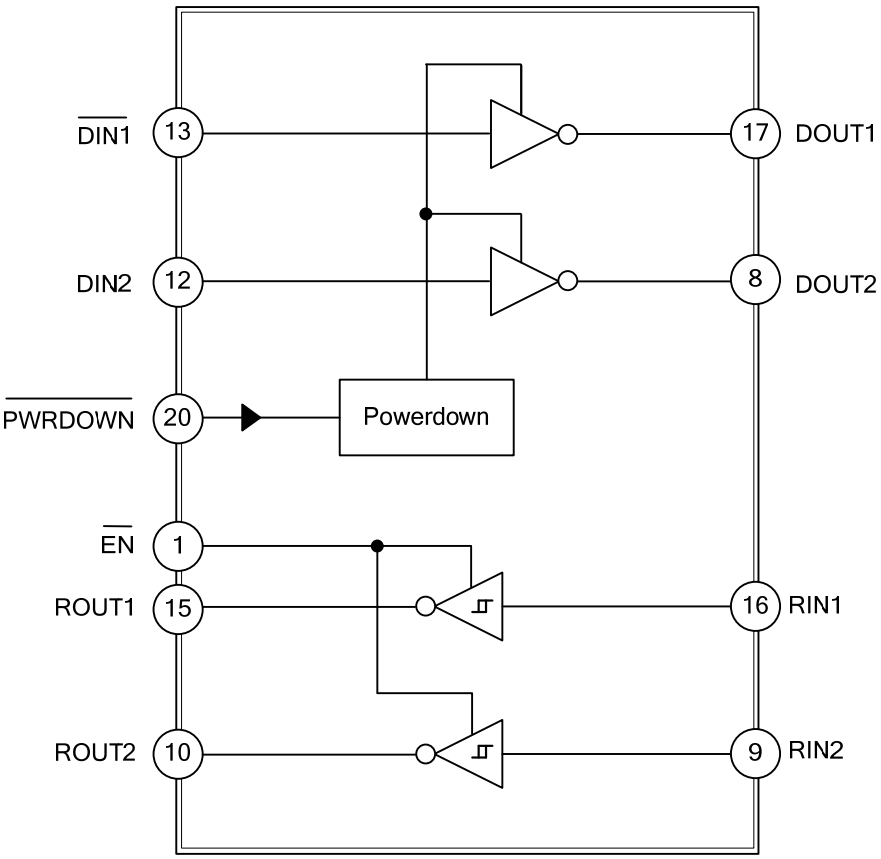
INPUTS (DIN)	INPUTS($\overline{PWRDOWN}$)	OUTPUT DOUT
X	L	Z
L	H	H
H	H	L

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	V
Positive Output Supply Voltage Range (Note 2)		V^+	-0.3 ~ 7	V
Negative Output Supply Voltage Range (Note 2)		V^-	0.3 ~ -7	V
Supply Voltage Difference (Note 2)		$V^+ - V^-$	13	V
Input Voltage	Drivers, $\overline{EN}$, $\overline{PWRDOWN}$	V_{IN}	-0.3 ~ 6	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	θ_{JA}	83	°C/W

■ RECOMMENDED OPERATING CONDITIONS (See Note & Figure 1)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Supply Voltage	V_{CC}	V_{CC}=3.3V		3	3.3	3.6	V
		V_{CC}=5V		4.5	5	5.5	V
Driver and Control High-level Input Voltage	V_{IH}	DIN, $\overline{EN}$, $\overline{PWRDOWN}$	V_{CC}=3.3V	2			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, $\overline{EN}$, $\overline{PWRDOWN}$		0		5.5	V
Receiver Input Voltage	V_{IN}			-25		25	V
Operating Free-Air Temperature	T_A			0		70	°C

Note:. Test conditions are C1−C4=0.1μF at V_{CC}=3.3V ± 0.3V; C1=0.047μF, C2−C4=0.33μF at V_{CC}=5 V±0.5V.

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

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP (Note 1)	MAX	UNIT
Input Leakage Current	I_I	($\overline{EN}$, $\overline{PWRDOWN}$)		±0.01	±1	μA
Supply Current	I_{CC}	No load, $\overline{PWRDOWN}$ at V_{CC}		0.3	1	mA
Supply Current (Powered Off)		No load, $\overline{PWRDOWN}$ at GND		1	10	μA
DRIVER SECTION						
High-Level Output Voltage	V_{OH}	DOUT at R_L=3kΩ to GND, DIN=GND	5	5.4		V
Low-Level Output Voltage	V_{OL}	DOUT at R_L=3kΩ to GND, DIN=V_{CC}	-5	-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}=±2V	300	10M		Ω
Output Leakage Current	I_{OFF}	$\overline{PWRDOWN}$ =GND, V_{CC}=3V~3.6V, V_{OUT}=±12V			±25	μA
		$\overline{PWRDOWN}$ =GND, V_{CC}=4.5~5.5V, V_{OUT}=±10V			±25	μA
RECEIVER SECTION						
High-Level Output Voltage	V_{OH}	I_{OH}=-1mA	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		1.8	2.4	V
Negative-Going Input Threshold Voltage	V_{IT-}	V_{CC}=3.3V	0.6	1.2		V
		V_{CC}=5	0.8	1.5		V
Input Hysteresis (V_{IT+}~V_{IT-})	V_{HYS}			0.3		V
Output Leakage Current	I_{OFF}	$\overline{EN}$=V_{CC}		±0.05	±10	μA
Input Resistance	R_I	V_I=±3V~±25V	3	5	7	kΩ

Notes: 1. All typical values are at V_{CC}=3.3V or V_{CC}=5V, and T_A=25°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−C4=0.1μF at V_{CC}=3.3V ± 0.3V; C1=0.047μF, C2−C4=0.33μF at V_{CC}=5 V±0.5V.
4. Pulse skew is defined as $|t_{PLH} - t_{PHL}|$ of each channel of the same device.

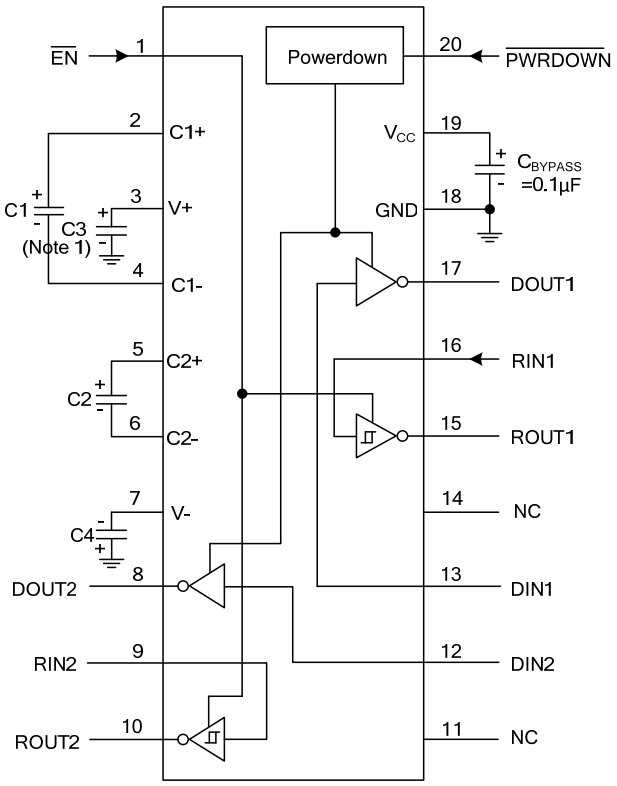
■ SWITCHING CHA RACTERISTICS over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Note 3 and Figure 1)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP (Note 1)	MAX	UNIT
DRIVER SECTION							
Maximum Data Rate		C_L=1000pF, R_L =3kΩ, One Dout switching		150	250		Kbit/s
Pulse Skew (Note 4)	$t_{SK(p)}$	C_L=150~2500pF, R_L =3~7kΩ			300		ns
Slew Rate, Transition Region	SR(tr)	R_L =3~7kΩ, V_{CC}=3.3V	C_L=150~1000pF	6		30	V/μs
			C_L=150~2500pF	4		30	
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)	$t_{SK(P)}$				300		ns

Notes: 1. All typical values are at V_{CC}=3.3V or V_{CC}=5V, and T_A=25°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−C4=0.1μF at V_{CC}=3.3V ± 0.3V; C1=0.047μF, C2−C4=0.33μF at V_{CC}=5 V±0.5V.
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

V_{CC} vs. Capacitor Values

V_{CC}	C1	C2, C3 and C4
3.3V±0.3V	0.1µF	0.1µF
5V±0.5V	0.047µF	0.33µF
3V~5.5V	0.1µF	0.47µF

Figure 1. Typical Operating Circuit and Capacitor Values