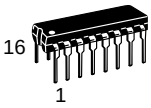
RoHS HAL Green

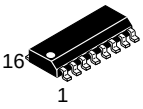
MICROCIRCUIT INTERFACE TRANSCEIVER OF THE SERIAL DATA OF THE STANDARD RS -232

(compatible to MAX3221 (TI USA)

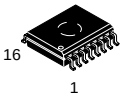
Microcircuits HT3221 is interface transceiver of serial data under RS - 232 standard with single power supply source & bipolar output voltage of transmitter, forming by build-in voltage multiplier on 4 external capacities, 0.1 μF. HT3221 correspond to EIA/TIA-232E, V.28 standard and is purposed for application in modern high efficient calculating systems with the wide range of supply voltage, fast-operating electronic devices with high level of fidelity of information exchange among distant devices.



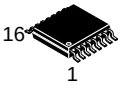
DIP16 N SUFFIX HT3221ANZ



SOP16 R SUFFIX HT3221ARZ



WSOP16 W SUFFIX HT3221ARWZ



TSSOP16 T SUFFIX HT3221ARTZ

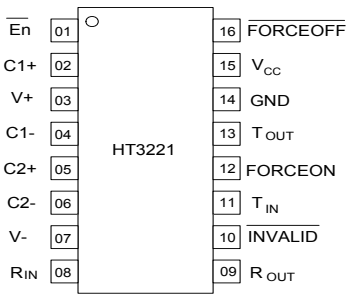
QFN16-5*5 Q SUFFIX HT3221ARQZ

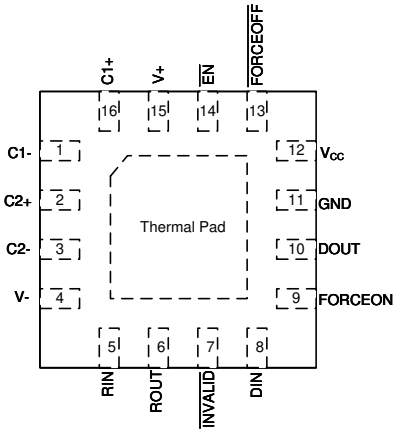
T_A= from -40 to 125 °C For all packages

Functions and structure:

- Microcircuit contains 1 transmitter and 1 receivers of the serial data of the standard RS-232.
- AutoShutdown function provide low power consumption. Supply
- The microcircuit supply voltage range is from 3.0 to 5.5 V.
- The microcircuits is available in 16-pin DIP-package (MS-001BB).
- Integrated 16KV ESD by default.

Pinning





Truth table

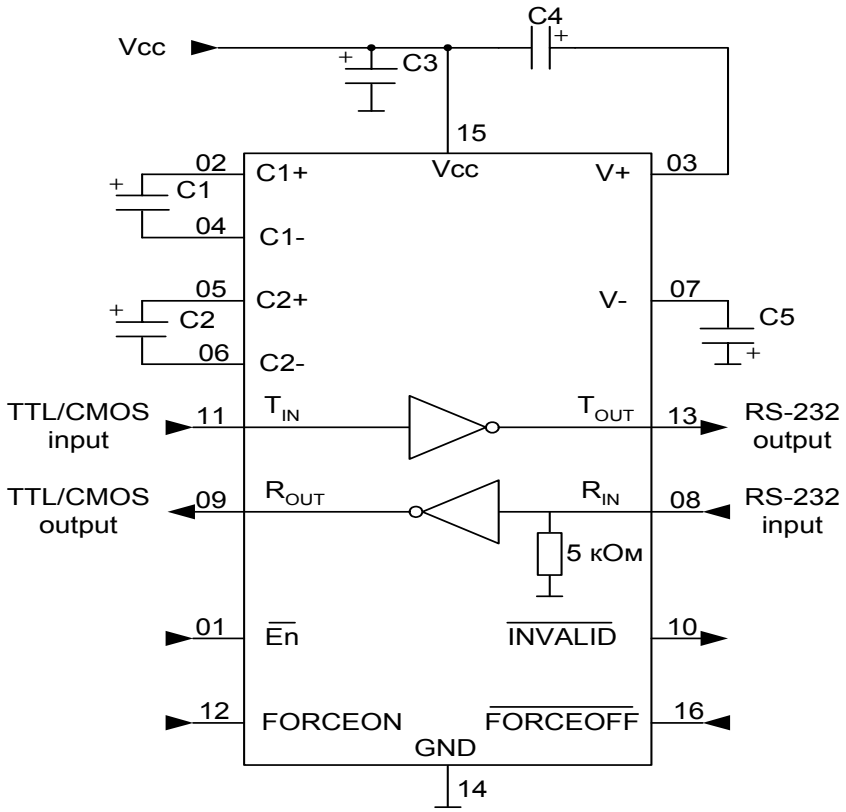
Mode	Inputs					Outputs	
	FORCEON	$\overline{\text{FORCEOFF}}$	$\overline{\text{En}}$	R_{IN}	T_{IN}	R_{OUT}	T_{OUT}
Low power consumption (without Autoshutdown function)	X	L	L	L	X	H	Z
	X	L	L	H	X	L	Z
	X	L	H	X	X	Z	Z
Data transfer (without Autoshutdown function)	H	H	L	L	L	H	H
	H	H	L	L	H	H	L
	H	H	L	H	L	L	H
	H	H	L	H	H	L	L
	H	H	H	X	L	Z	H
	H	H	H	X	H	Z	L
Data transfer (with Autoshutdown function)	L	H	L	L	L	H	H
	L	H	L	L	H	H	L
	L	H	L	H	L	L	H
	L	H	L	H	H	L	L
	L	H	H	X	H	Z	L
	L	H	H	X	L	Z	H
Low power consumption (with Autoshutdown function)	L	H	L	L_{INVL}	X	H	Z
	L	H	H	L_{INVL}	X	Z	Z

Note - H – high level;
- L – low level;
- X – any level (H or L);
- L_{INVL} – low level signal not less than -0.3 V & not more than 0.3 V with duration not less that t_{PHLINV};
- Z – third state of output

Truth table for $\overline{\text{INVALID}}$ pin

R_{IN}	$\overline{\text{INVALID}}$
L	H
H	H
L_{INVL}	L

Functional diagram



C1 – capacitor 0.1 μF ± 10 % for U_{CC} = 3.3 V ± 10% (0.047 μF ± 10 % for U_{CC} = 5.0 V ± 10%)

C2, C4, C5– capacitors 0.1 μF ± 10 % for U_{CC} = 3.3 V ± 10% (0.33 μF ± 10 % for U_{CC} = 5.0 V ± 10%)

C3 – capacitor 0.1 μF ± 10 %

Pin description table

Pin number	Symbol	Pin description
01	$\overline{En}$	Receiver enable control input
02	C1+	Positive terminal of the voltage multiplier charge-pump capacitor
03	V+	Positive voltage multiplier output
04	C1-	Negative terminal of the voltage multiplier charge-pump capacitor
05	C2+	Positive terminal of the voltage multiplier charge-pump capacitor
06	C2-	Negative terminal of the voltage multiplier charge-pump capacitor
07	V-	Negative voltage multiplier output
08	R_{IN}	RS-232 Receiver data inputs
09	R_{OUT}	TTL/CMOS Receiver data output
10	$\overline{INVALID}$	Output of the valid signal detector. Indicates if a valid RS-232 level is present on receiver inputs logic “1”.
11	T_{IN}	TTL/CMOS transmitter data input
12	FORCEON	Autoshutdown mode control input (enable active operation of the IC)
13	T_{OUT}	RS-232 transmitter data outputs
14	GND	Common pin
15	Vcc	Supply voltage
16	$\overline{FORCEOFF}$	Autoshutdown mode control input (switch the IC to low power consumption mode)

Maximum Ratings & Recommended Operating Conditions

Parameter, unit	Symbol	Recommended operating conditions		Maximum rate	
		min	max	min	max
Supply voltage, V	U_{CC}	3.0	5.5	-0.3	6.0
Voltage applied to transmitter output, B	U_{OT}	–	–	-13,2	13.2
Multiplier positive output voltage, V	U+	5.0	–	-0,3	7.0
Multiplier negative output voltage, V	U-	-5.0	–	-7,0	0.3
Receiver input voltage, V	U_{IR}	-25	25	-25	25
Receiver output voltage, V	U_{OR}	–	–	-0,3	Ucc+0.3
Transmitter low level input voltage, V	U_{IL}	0	0.8	-0,3	–
Transmitter high level input voltage, V	U_{IH}	2.0 (Ucc=3.3 V)	Ucc	–	6
		2.4 (Ucc=5.0 V)			
Multiplier outputs voltages difference, V	$U_+ + U_-$	–	–	–	13
Receiver low level threshold input voltage,V	U_{ITL}	0.6 (Ucc=3.3 V)	–	–	–
		0.8 (Ucc=5.0 V)			
Receiver high level threshold input voltage,V	U_{ITH}	–	2.4	–	–
Receiver threshold input voltage corresponding to low level on $\overline{INVALID}$ pin , V	U_{INVL}	-0.3	0.3	–	–
Receiver threshold input voltage corresponding to high level on $\overline{INVALID}$ pin , V	U_{INVH}	-2.7	2.7	–	–

Electric parameters

Parameter, unit	Symbol	Norm		Mode	T_A, °C
		Min	Max		
AutoShutdown mode supply current, μA	I_{CC1}	–	10	Ucc = 3.3; 5.0 V; FORCEON is connected to GND; $\overline{\text{FORCEOFF}}$ is connected to Vcc R_{IN} not connected	25±10
			14		-40; 85
Low power consumption mode supply current, μA	I_{CC2}	–	10	Ucc = 3.3; 5.0 V; $\overline{\text{FORCEOFF}}$ is connected to GND R_{IN} connected to GND	25±10
			14		-40; 85
AutoShutdown Disabled supply current, μA	I_{CC3}	–	1.0	Ucc = 3.3 V; 5.0 V; FORCEON & $\overline{\text{FORCEOFF}}$ is connected to Vcc without load	25±10
			1.4		-40; 85
Low level input leakage current (for control inputs), μA	I_{ILL}	–	-0.5	Ucc = 5.5 V	25±10
			-1.0		-40; 85
High level input leakage current (for control inputs) , μA	I_{ILH}	–	0.5	Ucc = 5.5 V	25±10
			1.0		-40; 85
Receiver					
Low level output voltage, V	U_{OLR}	–	0.3	U_{CC} =3.3V ±10%; U_{ITH} = 2.4V; I_{OL} = 1.6 mA; U_{INVH} = 2.7 V	25±10
			0.4		-40; 85
			0.3	U_{CC} =5.0V ±10%; U_{ITH} = 2.4V; I_{OL} = 1.6 mA; U_{INVH} = 2.7 V	25±10
			0.4		-40; 85
High level output voltage, V	U_{OHR1}	2.5	-	U_{CC} =3.3V ±10%; U_{ITL} = 0.6 V; I_{OH} = -1.0 mA; U_{INVH} = - 2.7 V	25±10
		2.37			-40; 85
	U_{OHR2}	4.0		U_{CC} =5.0V ±10%; U_{ITL} = 0.8 V; I_{OH} = -1.0 mA; U_{INVH} = - 2.7 V	25±10
		3.9			-40; 85
Receiver hysteresis, V	Uh_R	0.2	1.0	U_{CC} = 3.3 V ± 10%; 5.0 V ± 10%	25±10
Low level output voltage, V (for $\overline{\text{INVALID}}$ pin)	U_{OLINV}	–	0.3	U_{CC}=3.3V ±10 %; I_{OL} = 1.6 mA; U_{INVL} = 0.3 V or -0.3 V; FORCEON is connected to GND; $\overline{\text{FORCEOFF}}$ is connected to Vcc	25±10
			0.4		-40; 85
			0.3	U_{CC}=5.0V ±10 %; I_{OL} = 1.6 mA; U_{INVL} = 0.3 V or -0.3 V; FORCEON is connected to GND; $\overline{\text{FORCEOFF}}$ is connected to Vcc	25±10
			0.4		-40; 85
High level output voltage, V (for $\overline{\text{INVALID}}$ pin)	U_{OHINV1}	2.5	–	U_{CC}=3.3 V ±10 %; I_{OH}=-1.0 mA; U_{INVH} = 2.7 V or -2.7 V; FORCEON is connected to GND; $\overline{\text{FORCEOFF}}$ is connected to Vcc	25±10
		2.37			-40; 85
	U_{OHINV2}	4.0	–	U_{CC}=5.0V ±10%; I_{OH} = -1.0 mA; U_{INVH} = 2.7 V or -2.7 V; FORCEON is connected to GND; $\overline{\text{FORCEOFF}}$ is connected to Vcc	25±10
		3.9			-40; 85

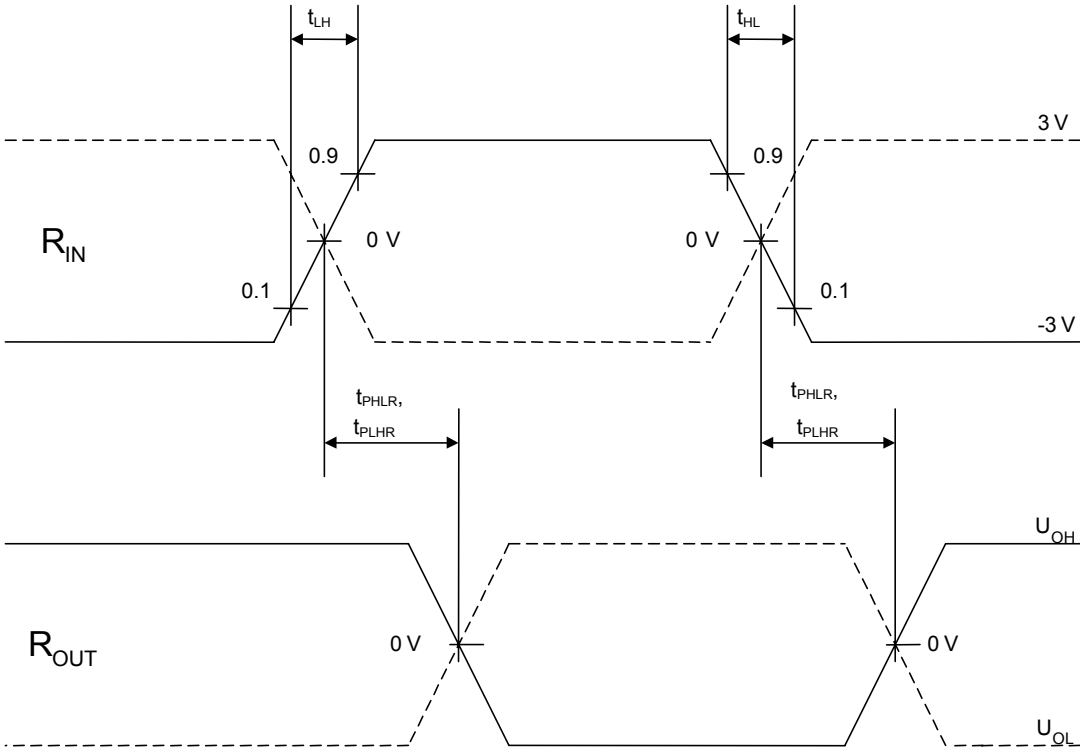
Electric parameters

Parameter, unit	Symbol	Norm		Mode	T_A, °C
		Min	Max		
Receiver					
Low level output current for OFF-state, μA	I_{OZLR}	–	-2.5	Receiver output is disabled; U_{CC}=5.5 V; U_O = 0 V	25±10
			-10		-40; 85
High level output current for “OFF”-state, μA	I_{OZHR}	–	2.5	Receiver output is disabled; U_{CC}=5.5 V; U_O = 5.5 V	25±10
			10		-40; 85
Input resistance, kOhm	R_I	3	7	-	25±10
OFF-ON switching propagation delay, ns	t_{PHLR}, t_{PLHR}	–	500	U_{CC} = 5.0V ±10 %; C_L = 150 pF; U_{IL} = 0 V; U_{IH} = 3.0 V; $t_{LH} = t_{HL} \leq 10$ ns	
Propagation delays difference, ns	t_{SKD}	–	200		
Propagation delay of transition from high (low) level state to OFF-state, ns	t_{PLZR} (t_{PHZR})	–	400	U_{CC} = 5.0V ±10 %; U_{IL} = 0 V; U_{IH} = 3.0 V; $t_{LH} = t_{HL} \leq 10$ ns; C_L = 150 pF; R_L = 1 kOhm	
Propagation delay of transition from OFF-state to high (low) level state, ns	t_{PZLR} (t_{PZHR})	–	400		
Propagation delay of transition $\overline{\text{INVALID}}$ pin to low level state, μs	t_{PHLINV}	–	80	U_{CC} = 5.0V ±10 %; U_{IL} = 0; -3.0 V; U_{IH} = 3.0; 0 V; $t_{LH} = t_{HL} \leq 10$ ns; C_L = 15 pF	
Propagation delay of transition $\overline{\text{INVALID}}$ pin to high level state, μs	t_{PLHINV}	–	2.9		
Transmitter					
Low level output voltage, V	U_{OLT1}	-	-5.07	U_{CC}=3.3V ±10%; U_{IH} = 2.0V; R_L = 3 kOhm	25±10
			-5.0		-40; 85
	U_{OLT2}	-	-5.07	U_{CC}=5.0V ±10%; U_{IH} = 2.4V; R_L = 3 kOhm	25±10
			-5.0		-40; 85
High level output voltage, V	U_{OHT}	5.07	–	U_{CC}=3.3V ±10%; U_{IL} = 0.8V; R_L = kOhm	25±10
		5.0			-40; 85
		5.07	–	U_{CC}=5.0V ±10%; U_{IL} = 0.8V; R_L = kOhm	25±10
		5.0			-40; 85
Transmitter hysteresis, V	Uh_T	0.1	1,0	U_{CC} = 3.3 V ± 10%; 5.0 V ± 10%	25±10
Output resistance , Ohm	R_O	350	–	U_{CC} = U_{V+}*= U_{V}*- = 0 V; U_O = ±2 V	25±10
		300			-40; 85
Short circuit current, mA	I_{OS}	–	53	Ucc = 3.63 V; U_{IH} = 2.0V	25±10
			60		-40; 85
			-53	Ucc = 3.63 V; U_{IH} = 2.0V	25±10
			-60		-40; 85
			53	Ucc = 5.5 V; U_{IH} = 2.0V	25±10
			60		-40; 85
			-53	Ucc = 5.5 V; U_{IH} = 2.0V	25±10
			-60		-40; 85
Low level output current for OFF-state, uA	I_{OZLT}	–	-10	U_{CC} = 0; 3.3; 5.5 V; U_O= -12 V; transmitter output is disabled	25±10
			-25		-40; 85

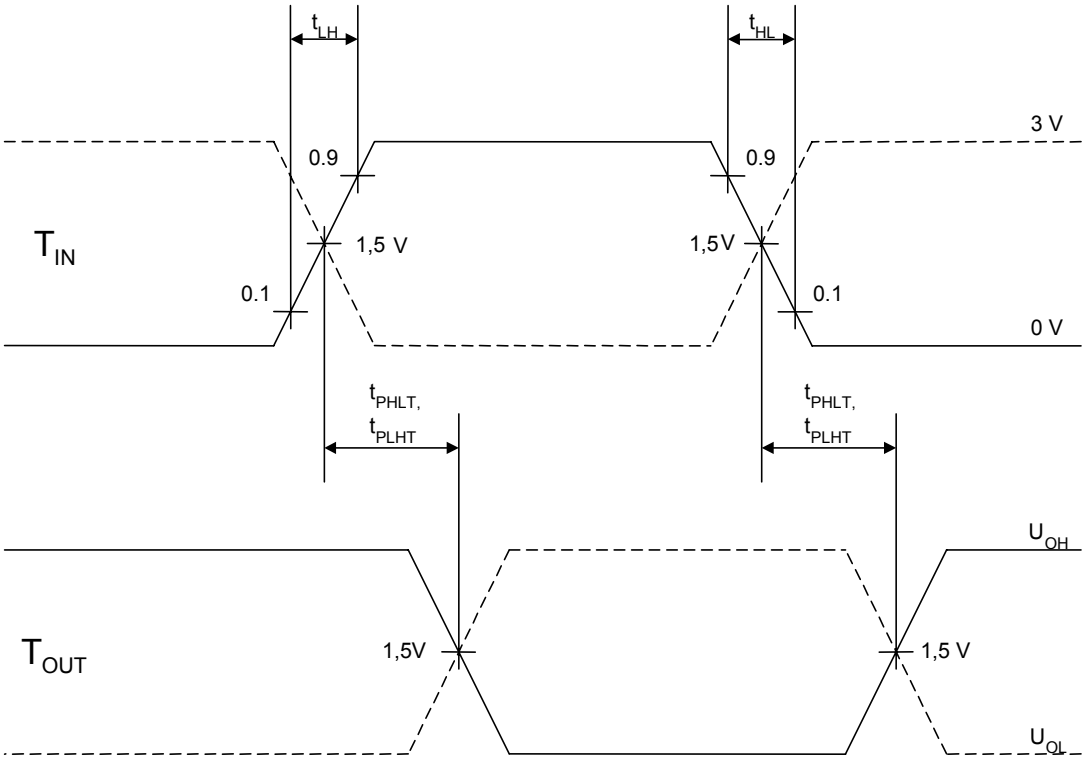
Electric parameters

Parameter, unit	Symbol	Norm Min	Norm Max	Mode	T_A, °C
Transmitter					
High level output current for OFF-state, μA	I_{OZHT}	–	10 25	U_{CC} = 0; 3.3; 5.5 V U_O = 12 V; transmitter output is disabled	25±10 -40; 85
Maximum Data Rate, Kbit/s	ST	250	1000	R_L = 3 kOhm; C_L = 1000 pF	-40÷85
Transition-Region Slew Rate, V/us	SR	6	30	U_{CC} = 3.3 V; R_L = (3-7) kOhm; U_{OT} is changing from +3 to -3 V or from -3 to +3 V; C_L = (150-1000) pF	25±10
Propagation delays difference, ns	t_{SKEW}	–	300	U_{CC} = 5.0V ±10 %; U_{IL} = 0 V; U_{IH} = 3.0 V; $t_{LH} = t_{HL} \leq 10$ ns; R_L=3 kOhm; C_L=1000 pF	
Transmitter output enable time, μS	t_{WU}	–	120	U_{CC} = 5.0V ±10 %; U_{IL} = 0 V; U_{IH} = 3.0 V; U_{IL} = -3.0 V; U_{IH} = 0 V	

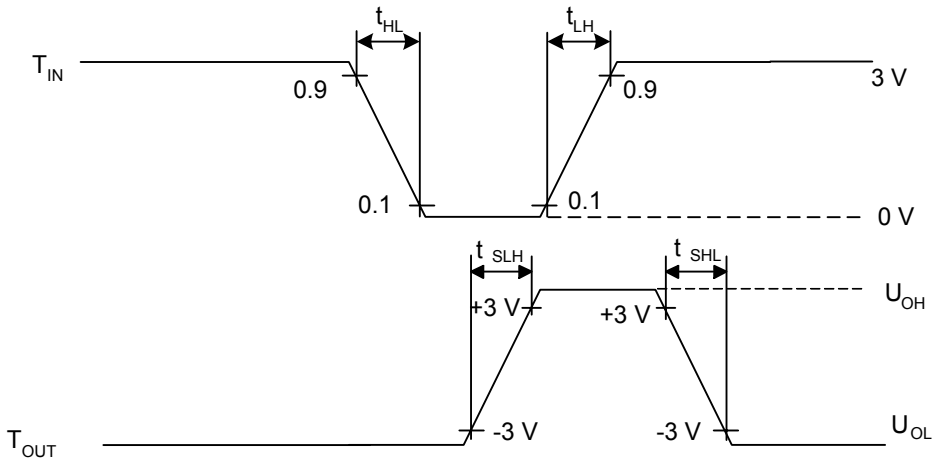
* U_{V+}, U_{V-} - voltages applied to pins 03 , 07.
Note – Electric parameters is indicated for C1=0.047 uF, C2-C4 = 0.33 μF & U_{CC} = 5.0 V±10 %
(or C1-C4 = 0.1 μF & U_{CC} = 3.3 V±10 %)



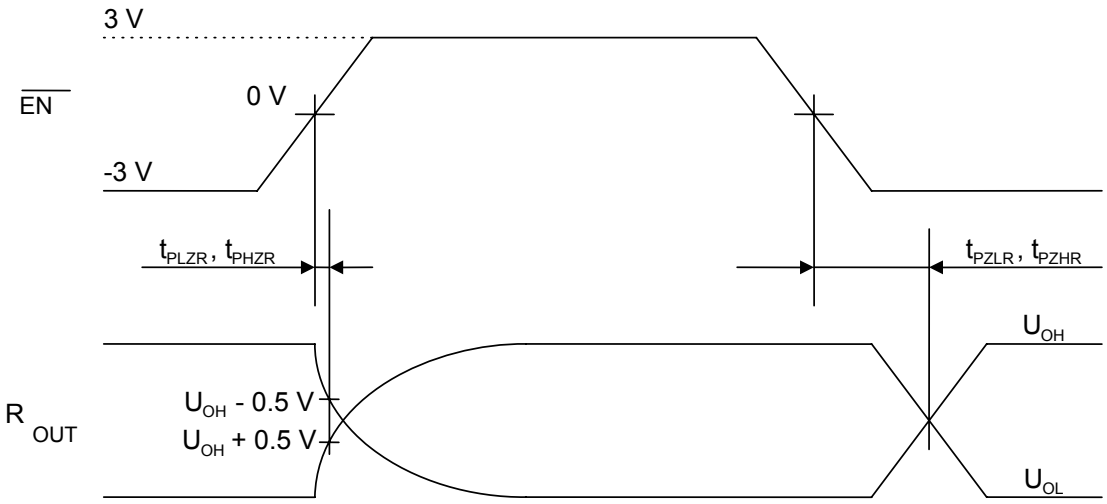
Receiver output & input signals time diagram



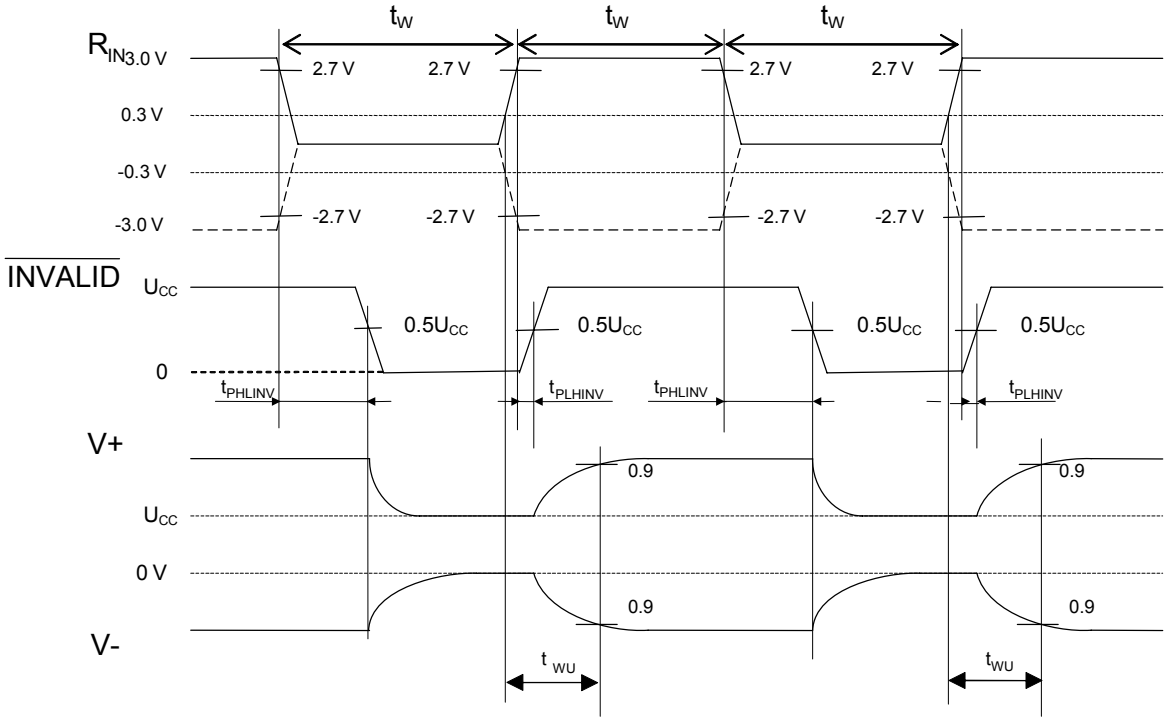
Transmitter output & input signals time diagram



Transmitter output & input signals time diagram



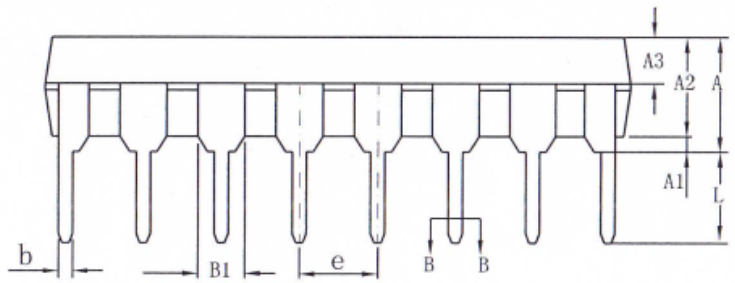
Receiver output & input signals time diagram

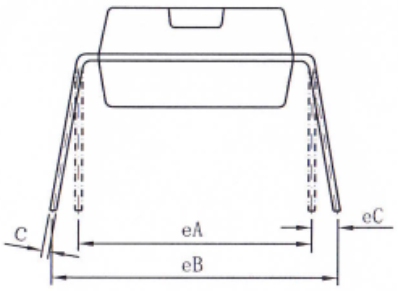


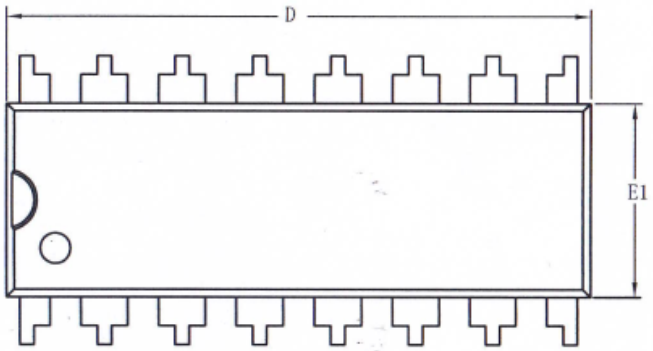
t_{PHLINV}, t_{PLHINV}, t_{WU} dynamic parameters timing diagram

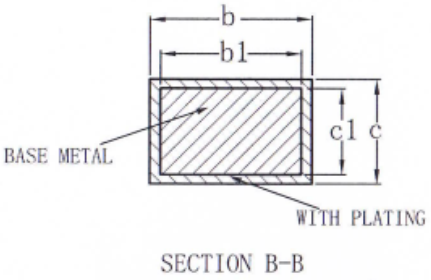
Package Dimensions

DIP16







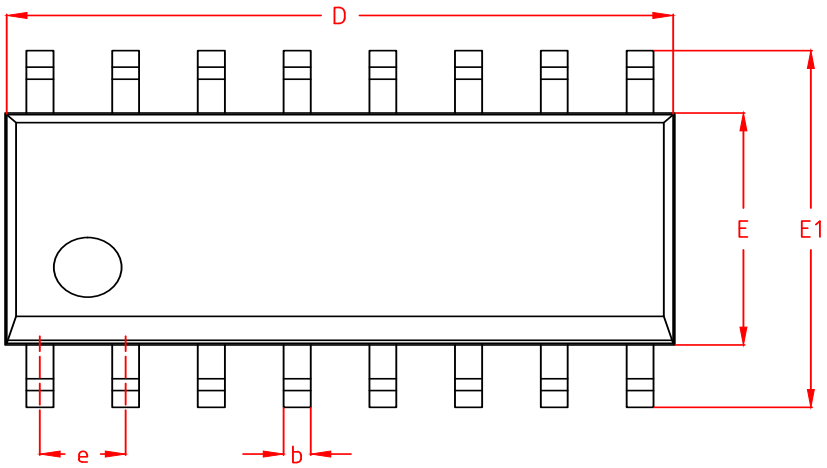


SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	3.60	3.80	4.00
A1	0.51	—	—
A2	3.20	3.30	3.40
A3	1.47	1.52	1.57
b	0.44	—	0.52
b1	0.43	0.46	0.49
B1	1.52RFE		
c	0.25	—	0.29
c1	0.24	0.25	0.26
D	19.00	19.10	19.20
E1	6.25	6.35	6.45
e	2.54BSC		
eA	7.62REF		
eB	7.62	—	9. 30
eC	0	—	0. 84
L	3.00	—	—

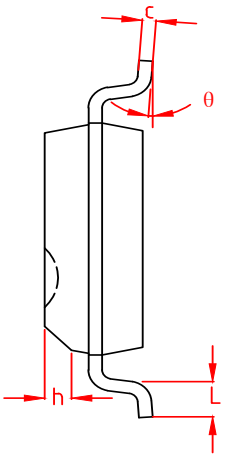
Package Dimensions

SOP16

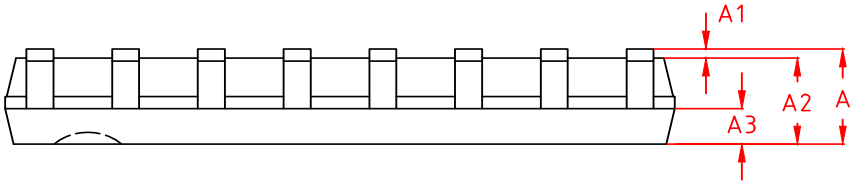
TOP VIEW
正视图



SIDE VIEW
侧视图

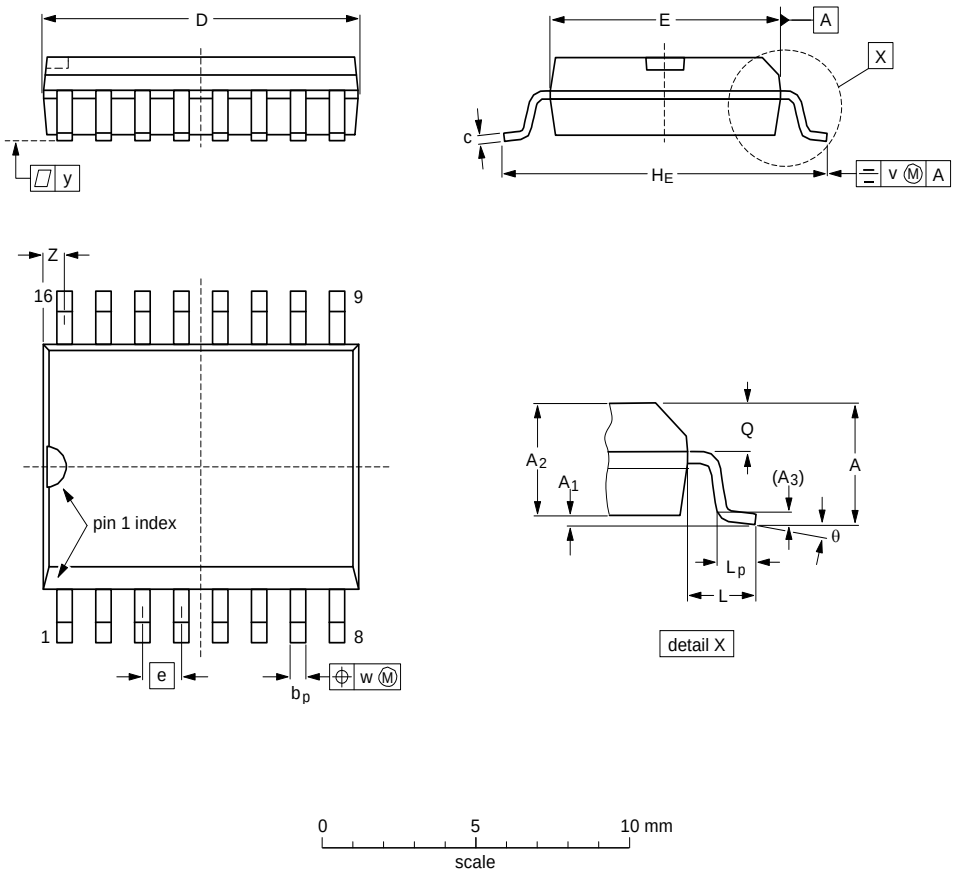


SIDE VIEW
侧视图



机械尺寸/mm Dimensions			
字符 SYMBOL	最小值 MIN	典型值 NOMINAL	最大值 MAX
A	–	–	1.75
A1	0.10	–	0.25
A2	1.35	1.45	1.55
A3	0.60	0.65	0.70
b	0.35	–	0.50
c	0.19	–	0.25
D	9.80	9.90	10.00
E	3.80	3.90	4.00
E1	5.80	6.00	6.20
e	1.27 BSC		
h	0.30	–	0.50
L	0.40	–	0.80
θ	0°	–	8°

WSOP16: plastic small outline package; 16 leads; body width 7.5 mm



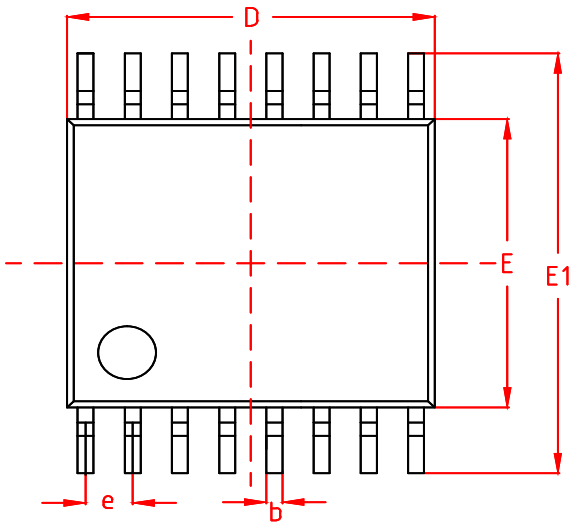
DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	D(1)	E(1)	e	H_E	L	L_p	Q	v	w	y	Z(1)	θ
mm	2.65	0.30 0.10	2.45 2.25	0.25	0.49 0.36	0.32 0.23	10.5 10.1	7.6 7.4	1.27	10.65 10.00	1.4	1.1 0.4	1.1 1.0	0.25	0.25	0.1	0.9 0.4	8^o 0^o
inches	0.10	0.012 0.004	0.096 0.089	0.01	0.019 0.014	0.013 0.009	0.41 0.40	0.30 0.29	0.050	0.419 0.394	0.055	0.043 0.016	0.043 0.039	0.01	0.01	0.004	0.035 0.016	

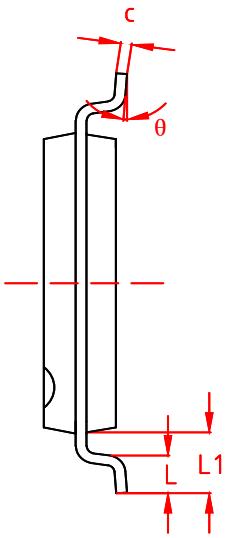
Package Dimensions

TSSOP16

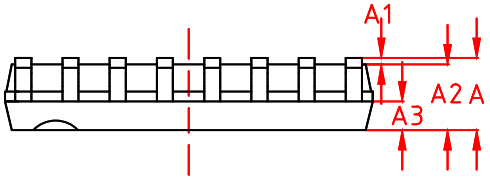
TOP VIEW
正视图



SIDE VIEW
侧视图



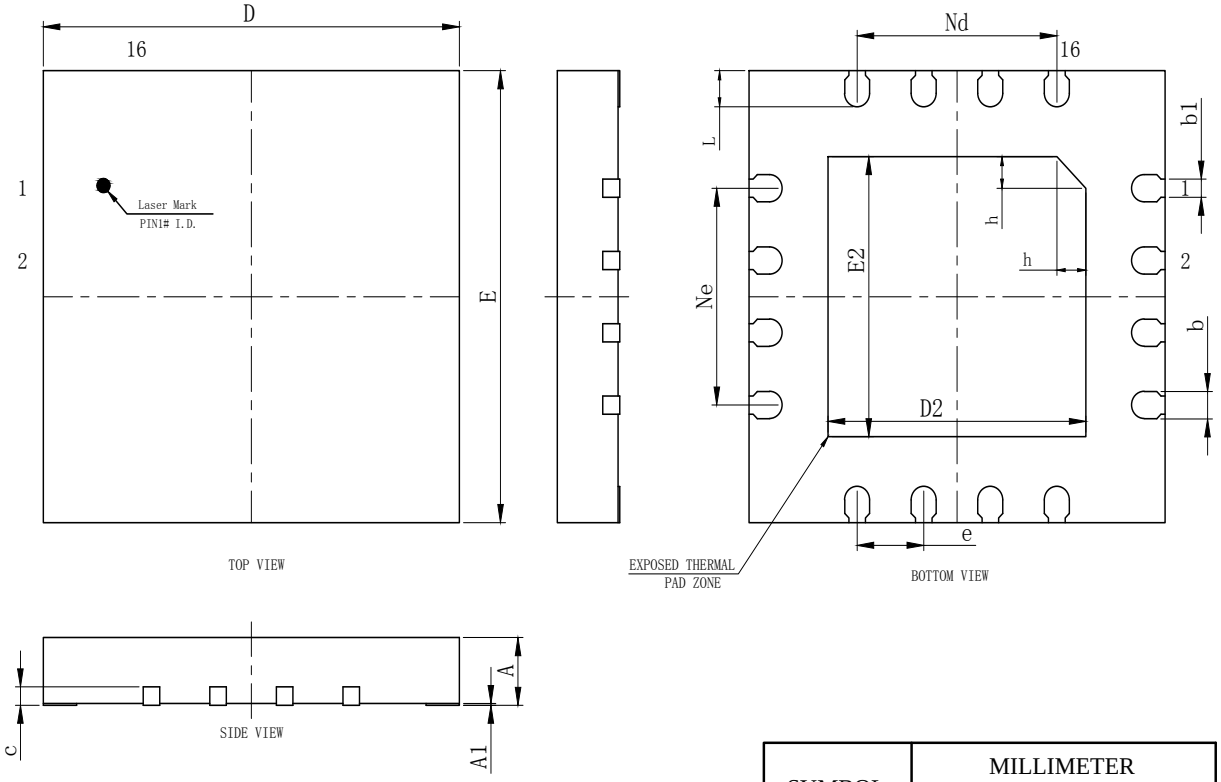
SIDE VIEW
侧视图



机械尺寸/mm Dimensions			
字符 SYMBOL	最小值 MIN	典型值 NOMINAL	最大值 MAX
A	–	–	1.20
A1	0.05	–	0.15
A2	0.90	1.00	1.05
A3	0.39	0.44	0.49
b	0.20	–	0.28
c	0.13	–	0.17
D	4.90	5.00	5.10
E	4.30	4.40	4.50
E1	6.20	6.40	6.60
e	0.65 BSC		
L1	1.00REF		
L	0.45	0.60	0.75
θ	0°	–	8°

Package Dimensions

QFN16L(0505X0.75-0.80)



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0. 70	0.75	0. 80
A1	0	0.02	0. 05
b	0. 25	0.30	0. 35
b1	0.20REF		
c	0.203REF		
D	4. 90	5. 00	5. 10
D2	3. 00	3. 10	3. 20
e	0. 80BSC		
Nd	2. 40BSC		
Ne	2. 40BSC		
E	4. 90	5. 00	5. 10
E2	3. 00	3. 10	3. 20
L	0. 35	0.40	0. 45
h	0. 30	0. 35	0. 40

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