

**Interface transceiver of RS-232 standard with one supply voltage
(compatible to MAX232 (MAXIM USA))**

1. INTRODUCTION

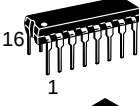
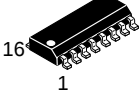
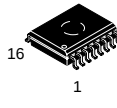
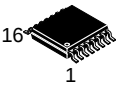
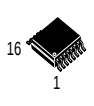
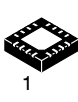
HT232A is purposed for application in high-performance information processing systems and control devices of wide application. Input voltage levels are compatible with standard CMOS levels

- Output voltage levels are compatible with input levels of K-MOS, N-MOS and TTL integrated circuits.
- Low input current: 1.0 μ A; 0.1 μ A at T = 25 °C.
- Output current 24 mA.
- Latching current not less than 450 mA at T = 25°C
- Tolerable value of static potential not less than 10000V

Truth table

Inputs	Outputs
R_{IN}, T_{IN}	R_{OVT}, T_{OVT}
H	L
L	H

Note -
H – voltage high level;
L – low voltage level

	DIP16 N SUFFIX HT232ANZ
	SOP16 R SUFFIX HT232ARZ
	WSOP16 W SUFFIX HT232ARWZ
	TSSOP16 T SUFFIX HT232ARTZ
	SSOP16 S SUFFIX HT232ARSZ
	QFN16-3*3 Q SUFFIX HT232ARQZ

$T_A = -40^{\circ}$ to 125° C for all packages

2. MAXIMUM CONDITIONS

Symbol	Parameter	Rate		Unit
		min	max	
V_{CC}	Supply voltage	-0.3	6.0	V
V_{+}	Transmitter high output voltage	$V_{CC} - 0.3$	14	
V_{-}	Transmitter low output voltage	-0.3	-14	
V_{TIN}	Transmitter input voltage	-0.3	$V_{+} + 0.3$	
V_{RIN}	Receiver input voltage	-30	30	
I_{SC}	Output current of transmitter short circuit	-	Continuously	mA
T_a	Ambient temperature	-60	150	$^{\circ}$ C

3. ABSOLUTE MAXIMUM CONDITIONS

Symbol	Parameter	Rate		Unit
		min	max	
V_{CC}	Supply voltage	4.5	5.5	V
V_{+}	Transmitter output high voltage	5.0	-	
V_{-}	Transmitter output low voltage	-5.0	-	
V_{TIN}	Transmitter input voltage	0	V_{CC}	
V_{RIN}	Receiver input voltage	-30	30	
I_{SC}	Transmitter short circuit output current	-	± 60	mA
T_a	Ambient temperature	-40	125	$^{\circ}$ C

4. STATIC PARAMETERS

Symbol	Parameter	Test conditions	Rate				Unit
			25°C		from -40°C to 125°C		
			min	max	min	max	
I _{CC}	Consumption current static	V _{CC} =5.5 V V _{IL} = 0 V	-	10.0	-	14.0*	mA
Receiver electrical parameters							
V _h	Hysteresis voltage	V _{CC} =5.0 V	0.2	0.9	0.2	1.0	V
V _{On}	On (operation) voltage	V _O ≤ 0.1 V I _{OL} ≤ 20 mKA	-	2.4	-	2.3	
V _{off}	Off (dropout) voltage	V _O ≥ V _{CC} -0.1 V I _{OH} ≤ -20 μA	0.8	-	0.9	-	
V _{OL}	Output low voltage	I _{OL} = 3.2 mA V _{CC} = 4.5 V V _{IH} = 2.4 V	-	0.3	-	0.4	
V _{OH}	Output high voltage	I _{OH} = -1.0 mA V _{CC} = 4.5 V V _{IL} = 0.8 V	3.6	-	3.5	-	
R _I	Input resistance	V _{CC} = 5.0 V	3.0	7.0	3.0	7.0	kOhm
Transmitter electrical parameters							
V _{OL}	Output low voltage	V _{CC} = 4.5 V V _{IH} = 2.0 V R _L = 3.0 kOhm	-	-5.2	-	-5.0	V
V _{OH}	Output high voltage	V _{CC} = 4.5 V V _{IL} = 0.8 V R _L = 3.0 kOhm	5.2	-	5.0	-	
I _{IL}	Input low current	V _{CC} =5.5 V V _{IL} = 0 V	-	-1.0	-	-10.0	μA
I _{IH}	Input high current	V _{CC} =5.5 V V _{IH} = V _{CC}		1.0		10.0	
SR	Speed of output front change	V _{CC} =5.0 V C _L =50 - 1000 pF R _L = 3.0 - 7.0 kOhm	3.0	30	2.7	27	V/mks
R _O	Output resistance	V _{CC} = V+ = V- = 0 V V _O = ± 2 V	350	-	300	-	Ohm
I _{SC}	Short circuit output current	V _{CC} =5.5 V V _O = 0 V V _I = V _{CC} V _I = 0 V		-50 50		-60 60	mA
ST	Speed of information transmission	V _{CC} =4.5 V C _L = 1000 pF R _L = 3.0 kOhm t _w = 7μS (for extreme -t _w = 8μS)	140	-	120	-	kbps

5. DYNAMIC PARAMETERS ($V_{CC} = 5V \pm 10\%$)

Symbol	Parameter	Test conditions	Rate				Unit
			25°C		from -40°C to 125 °C		
			min	max	min	max	
t _{PHLR} (t _{PLHR})	Signal propagation delay time when switching on (off)	V _{CC} = 4.5 V C _L = 150 pF V _{IL} = 0 V V _{IH} = 3.0 V t _{LH} = t _{HL} ≤ 10 ns	-	9.7	-	10	μS
t _{PHLT} (t _{PLHT})	Signal propagation delay time when switching on (off)	V _{CC} = 4.5 V C _L = 2500 pF V _{IL} = 0 V V _{IH} = 3.0 V R _L = 3 kOhm t _{LH} = t _{HL} ≤ 10 ns		5.0*		6.0*	

6. CAPACITANCE

Symbol	Parameter	V_{CC}, V	Rate	Unit
C_{IN}	Input capacitance	5.0	9.0	pF
C_{PD}	Dynamic capacitance		90	

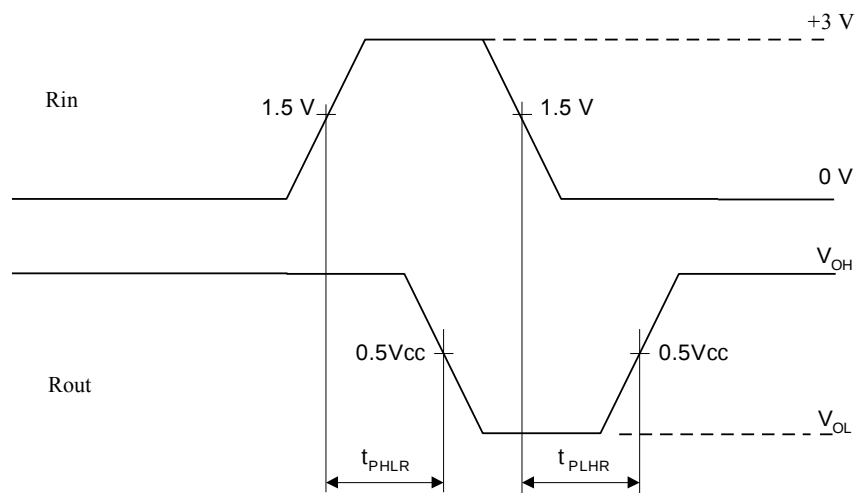
7. TIMING DIAGRAM WHEN MEASURING IC DYNAMIC PARAMETERS


Figure 1

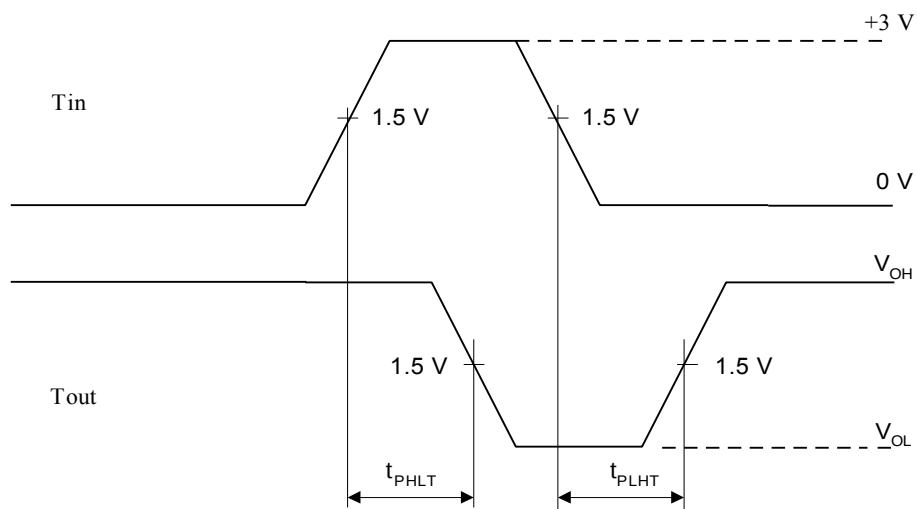


Figure 2

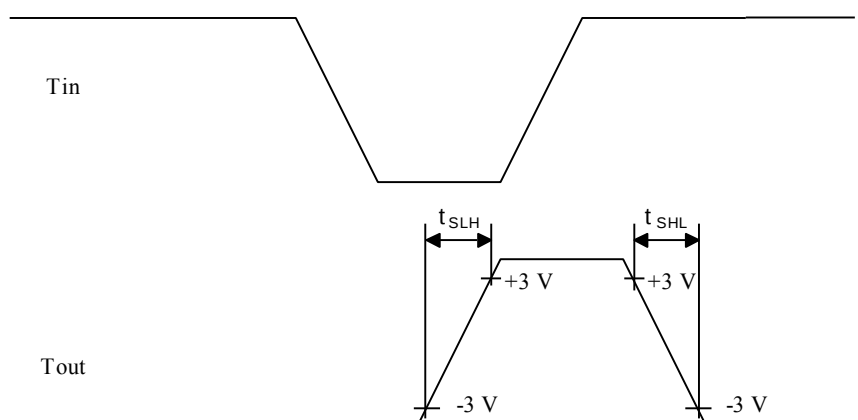


Figure 3

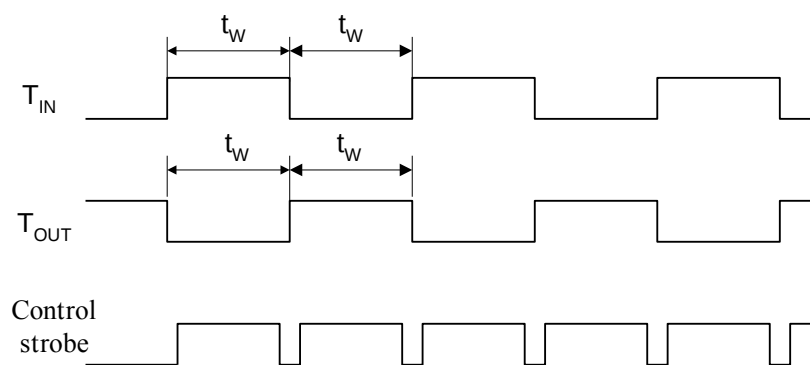
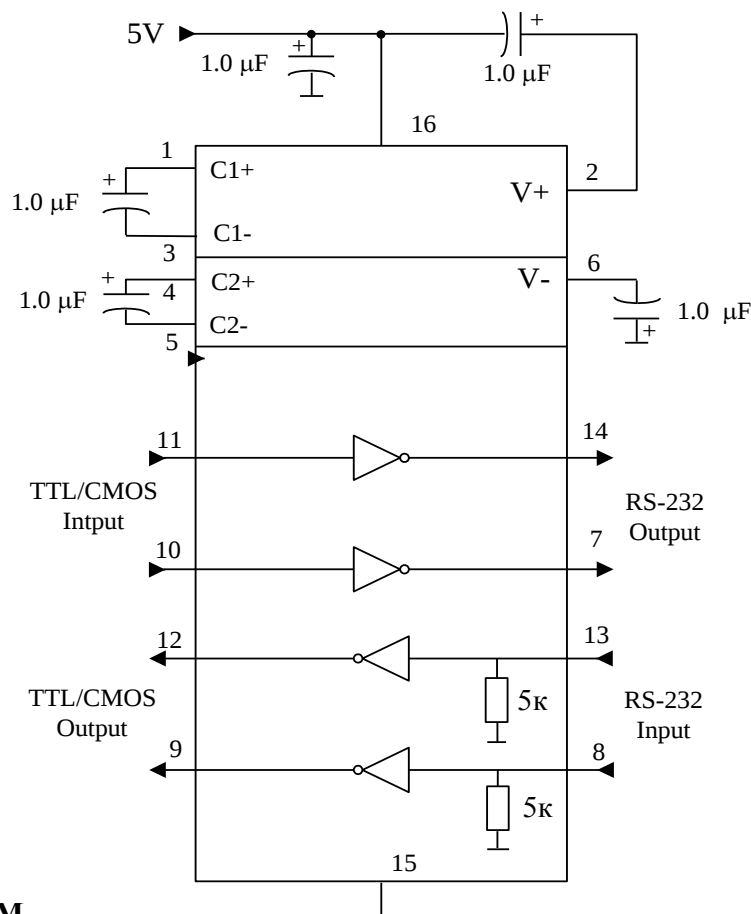


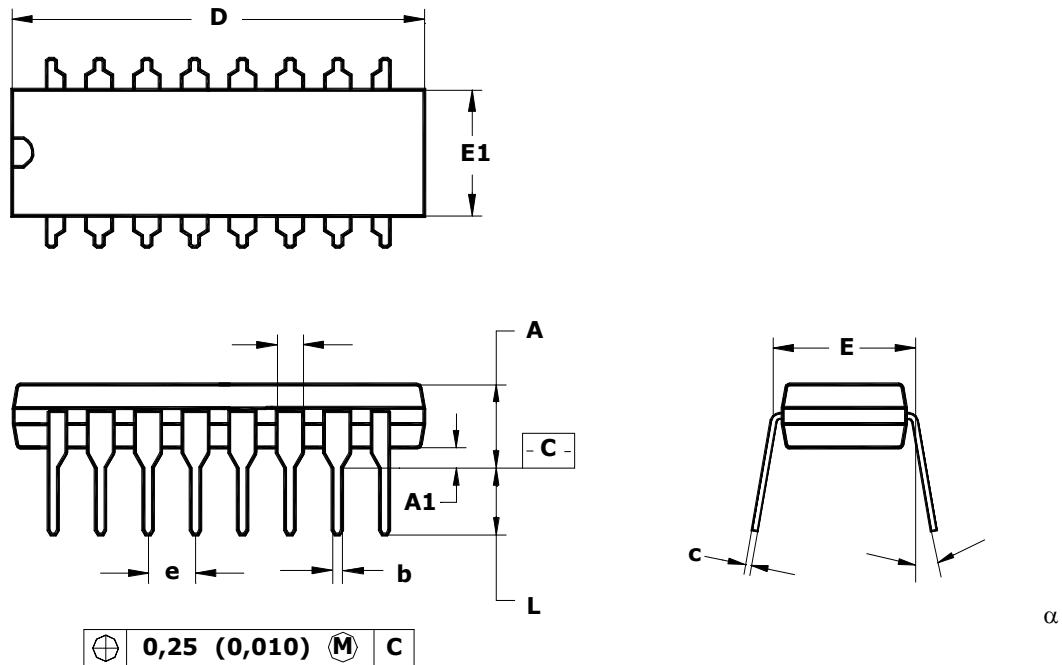
Figure 4

8. TYPICAL APPLICATION CIRCUIT



9. PIN DIAGRAM

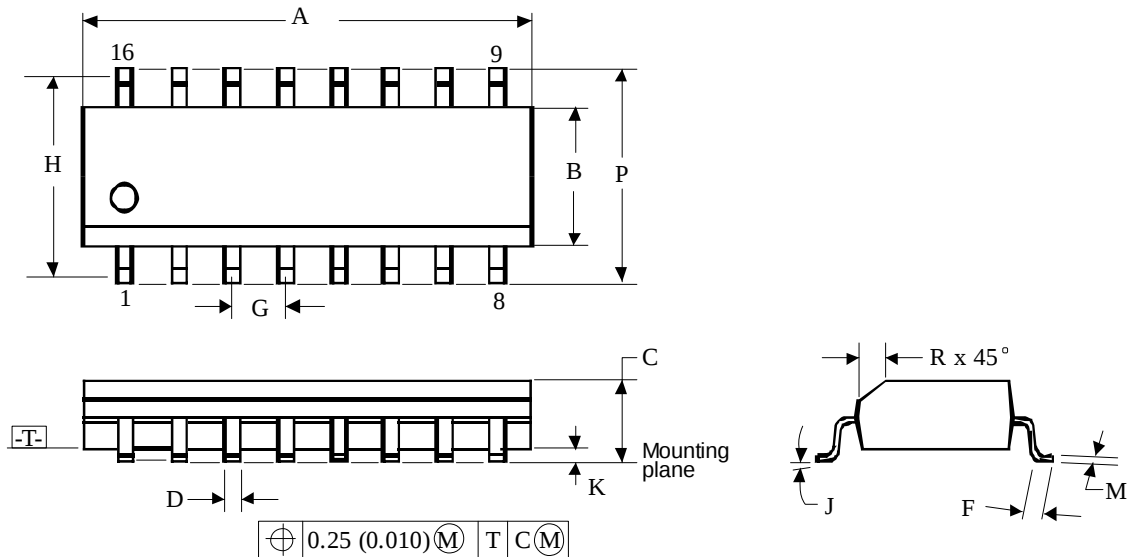
Pin No.	Symbol	Pin name
01	C1 ₊	Output of external capacitance of positive voltage multiplier unit
02	V ₊	Output of positive voltage of multiplier unit
03	C1 ₋	Output of external capacitance of positive voltage multiplier unit
04	C2 ₊	Output of external capacitance of negative voltage multiplier unit
05	C2 ₋	Output of external capacitance of negative voltage multiplier unit
06	V ₋	Output of negative voltage of multiplier unit
07	T2 _{OUT}	Output of transmitter data (levels RS – 232)
08	R2 _{IN}	Input of receiver data (levels RS – 232)
09	R2 _{OUT}	Output of receiver data (levels TTL/KMOS)
10	T2 _{IN}	Input of transmitter data (levels TTL/KMOS)
11	T1 _{IN}	Input of transmitter data (levels TTL/KMOS)
12	R1 _{OUT}	Output of receiver data (levels TTL/KMOS)
13	R1 _{IN}	Input of receiver data (levels RS – 232)
14	T1 _{OUT}	Output of transmitter data (levels RS – 232)
15	GND	Common output
16	V _{CC}	Supply output of voltage source

Package Dimensions
DIP-package MS-001BB


Note - Dimensions D, E1 do not include the fin value, which should not exceed 0.25 mm (0.010) per side.

	D	E1	A	b	b2	e	α	L	E	c	A1
mm											
min	18.93	6.07	—	0.36	1.14	2.54	0°	2.93	7.62	0.20	0.38
max	19.43	7.11	5.33	0.56	1.78		15°	3.81	8.26	0.36	—
Inches											
min	0.355	0.240	—	0.014	0.045	0.1	0°	0.115	0.300	0.008	0.015
max	0.400	0.280	0.210	0.022	0.070		15°	0.150	0.325	0.014	—

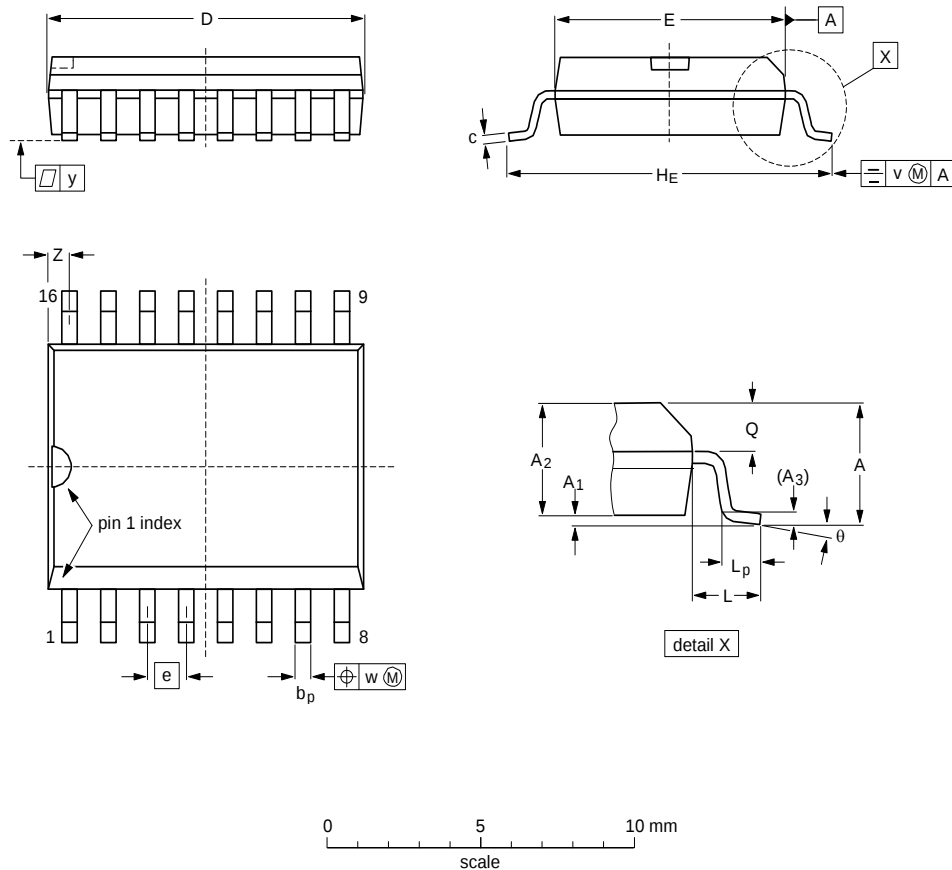
Package Dimensions **SOP-package MS-012AC**


Note:

1. Dimensional sizes A and B are preset without consideration of fin and the metal bulges.
2. Availability of the fin and the metal bulges for A – up to 0.15 mm (0.006) per side; for B – up to 0.25 mm (0.010) per side.

Identifi- cation	Sizes, mm	
	MIN	MAX
A	9.80	10.0
B	3.80	4.00
C	1.35	1.75
D	0.33	0.51
F	0.40	1.27
G	1.27	
H	5.72	
J	0°	8°
K	0.10	0.25
M	0.19	0.25
P	5.80	6.20
R	0.25	0.50

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



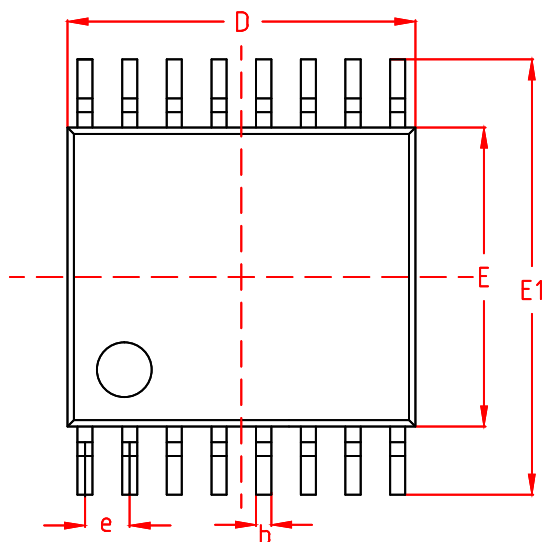
DIMENSIONS (inch dimensions are derived from the original mm dimensions)

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° 0°
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	

TSSOP16: plastic small outline package; 16 leads; body width 4.4 mm

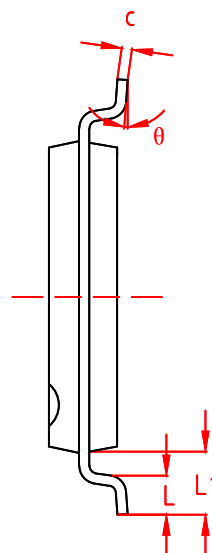
TOP VIEW

正视图



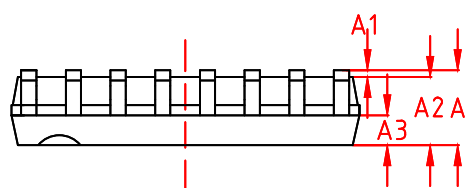
SIDE VIEW

侧视图



SIDE VIEW

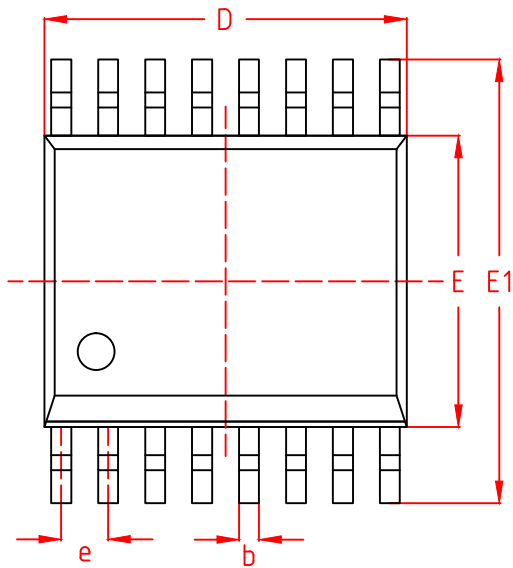
侧视图



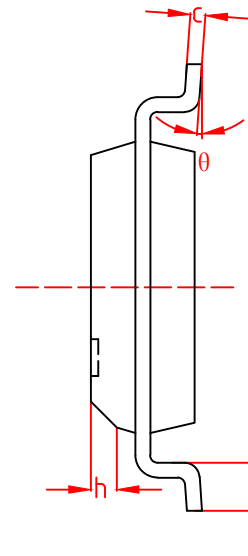
机械尺寸/mm Dimensions			
字符 SYMBOL	最小值 MIN	典型值 NOMINAL	最大值 MAX
A	-	-	1.20
A1	0.05	-	0.15
A2	0.90	1.00	1.05
A3	0.39	0.44	0.49
b	0.20	-	0.28
c	0.13	-	0.17
D	4.90	5.00	5.10
E	4.30	4.40	4.50
E1	6.20	6.40	6.60
e	0.65 BSC		
L1	1.00REF		
L	0.45	0.60	0.75
θ	0°	-	8°

SSOP16: plastic small outline package; 16 leads; body width 3.9 mm

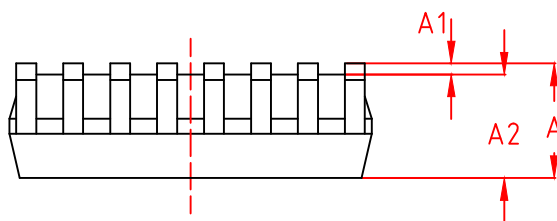
TOP VIEW
正视图



SIDE VIEW
侧视图



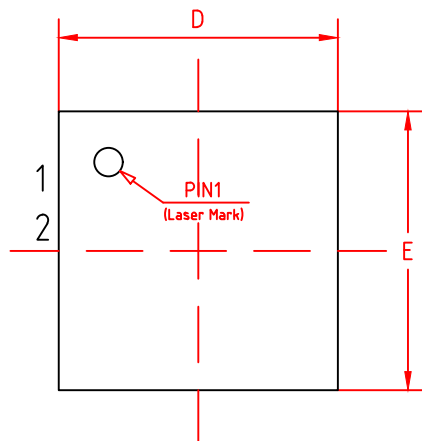
SIDE VIEW
侧视图



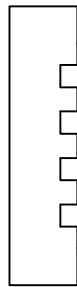
机械尺寸/mm Dimensions			
字符 SYMBOL	最小值 MIN	典型值 NOMINAL	最大值 MAX
A	—	—	1.75
A1	0.10	0.15	0.25
A2	1.35	1.45	1.55
b	0.23	—	0.31
c	0.19	—	0.25
D	4.80	4.90	5.00
E	3.80	3.90	4.00
E1	5.80	6.00	6.20
e	0.635 BSC		
h	0.30	—	0.50
L	0.50	—	0.80
θ	0°	—	8°

QFN16-3x3x0.75-P0.5

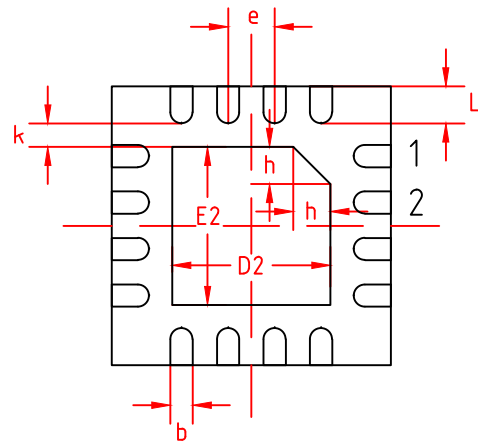
TOP VIEW
正视图



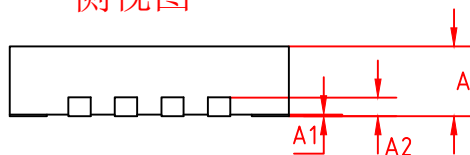
SIDE VIEW
侧视图



BOTTOM VIEW
背视图



SIDE VIEW
侧视图



机械尺寸/mm

字符 SYMBOL	最小值 MIN	典型值 NOMINAL	最大值 MAX
A	0.70	0.75	0.80
A1	0	0.02	0.05
A2	0.203 REF		
b	0.18	0.24	0.30
D	2.90	3.00	3.10
E	2.90	3.00	3.10
e	0.50 BSC		
D2	1.6	1.7	1.8
E2	1.6	1.7	1.8
K	0.20	0.25	0.30
L	0.30	0.40	0.50
h	0.35	0.40	0.45