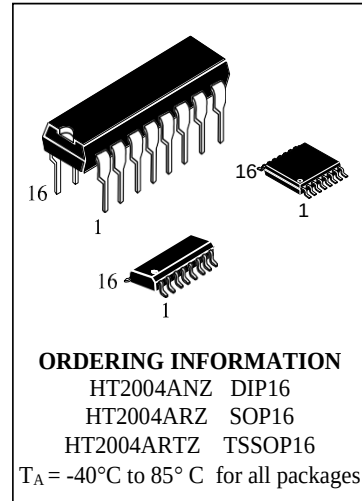


HIGH-VOLTAGE HIGH-CURRENT DARLINGTON TRANSISTOR ARRAYS

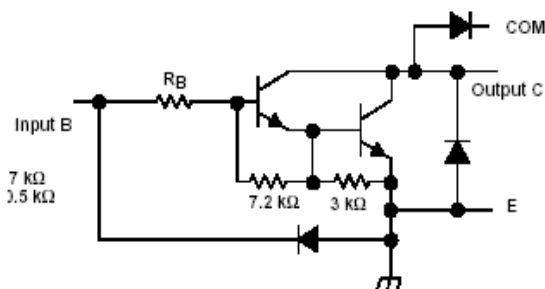
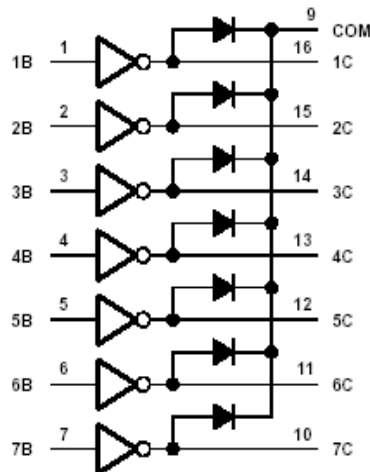
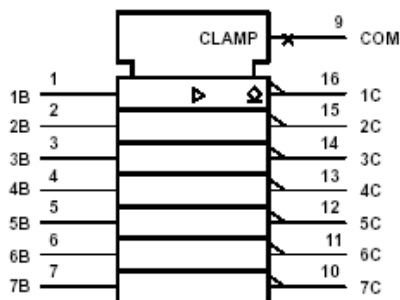
The HT2004A are monolithic high-voltage, high-current Darlington transistor arrays. Each consists of seven n-p-n Darlington pairs that feature high-voltage outputs with common-cathode clamp diodes for switching inductive loads. The collector-current rating of a single Darlington pair is 500 mA. The Darlington pairs may be paralleled for higher current capability. Applications include relay drivers, hammer drivers, lamp drivers, display drivers (LED and gas discharge), line drivers, and logic buffers.

The HT2004A has a 10.5k Ω series base resistor for each Darlington pair for operation directly with 6-15V CMOS devices.

- 500-mA Rated Collector Current (Single Output)
- High-Voltage Outputs . . . 50 V
- Output Clamp Diodes
- Inputs Compatible With Various Types of Logic
- Relay Driver Applications



LOGIC SYMBOL LOGIC DIAGRAM



SCHEMATICS (each Darlington Pair)

HT2004A: R_B = 10.5 k Ω

All resistor values shown are nominal.

Absolute maximum ratings at 25°C free-air temperature (unless otherwise noted)

Symbol	Parameter	Value	Unit
	Collector-emitter voltage	50	V
V_I	Input voltage(see Note 1)	30	V
	Peak collector current (see Figures 14 and 15)	500	mA
I_{OK}	Output clamp current	500	mA
	Total emitter-terminal current	-2.5	A
	Continuous total power dissipation	See Dissipation Rating Table	
T_A	Operating free-air temperature range	-40 to 85	°C
T_{stg}	Storage temperature range	-55 to 150	°C
	Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	260	°C

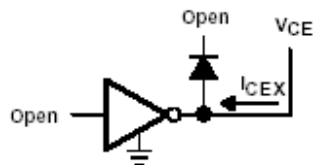
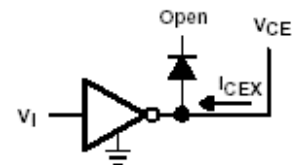
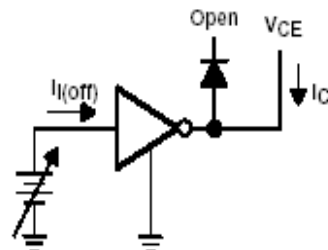
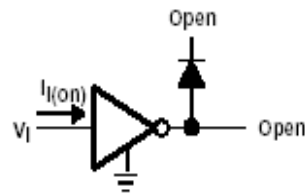
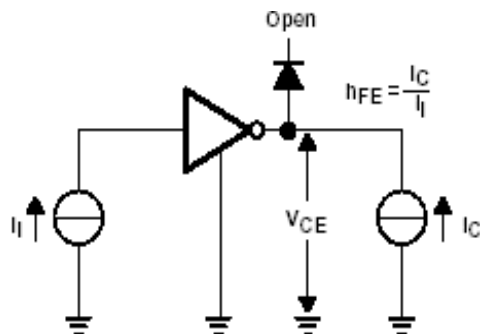
NOTE 1: All voltage values are with respect to the emitter/substrate terminal E, unless otherwise noted.

Dissipation Rating Table

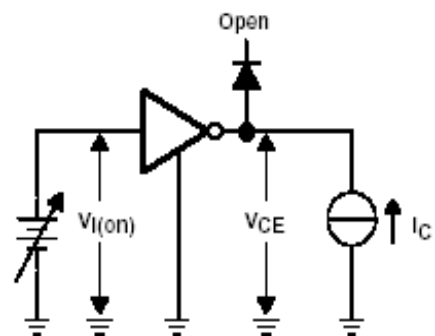
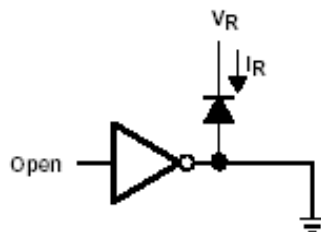
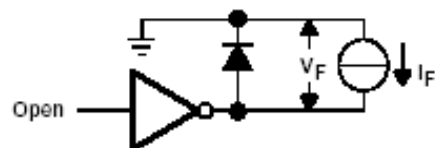
PACKAGE	$T_A=25^{\circ}\text{C}$ POWER RATING	DERATING FACTOR above $T_A=25^{\circ}\text{C}$	$T_A=85^{\circ}\text{C}$ POWER RATING
D	1210mW	7.6mW/°C	494mW
N	1420mW	9.2mW/°C	598 mW

Electrical Characteristics, $T_A = 25^{\circ}\text{C}$ (unless otherwise noted)

Symbol	Parameter	Test Figure	Test Conditions	Min.	Typ.	Max.	Unit
$V_{i(on)}$	Input Voltage	6	$V_{CE}=2\text{V}$ $I_C = 125\text{mA}$ $I_C = 200\text{mA}$ $I_C = 275\text{mA}$ $I_C = 350\text{mA}$			5 6 7 8	V
$V_{CE(sat)}$	Collector-emitter Saturation Voltage	5	$I_C = 100\mu\text{A}, I_B = 250\text{mA}$ $I_C = 200\mu\text{A}, I_B = 350\text{mA}$ $I_C = 350\mu\text{A}, I_B = 500\text{mA}$		0.9 1.1 1.3	1.1 1.3 1.6	V
I_{CEX}	Output Leakage Current	2	$V_{CE} = 50\text{V}, V_i = 1\text{V}$			500	μA
V_F	Clamp Diode Forward Voltage	8	$I_F = 350\text{mA}$		1.7	2	V
$I_{i(off)}$	Off-state Input Current	3	$V_{CE}=50\text{V}, T_{amb} = 70^{\circ}\text{C}, I_C = 500\text{mA}$	50	65		μA
I_i	Input Current	4	$V_i = 5\text{V}$ $V_i = 12\text{V}$		0.35 1	0.5 1.45	mA
I_R	Clamp Reverse Current	7	$V_R = 50\text{V}$ $T_{amb} = 70^{\circ}\text{C}, V_R = 50\text{V}$			50 100	μA
C_i	Input Capacitance				15	25	pF
Switching Characteristics, $T_A=25^{\circ}\text{C}$							
t_{PLH}	Turn-on Delay Time		See Fig.9		0.25	1	μs
t_{PHL}	Turn-off Delay Time		See Fig.9		0.25	1	μs
V_{OH}	High level output voltage after switching		$V_S=50\text{V}, I_O=300\text{mA}$ See Fig.10	V_S-20			mV

PARAMETER MEASUREMENT INFORMATION

 Figure 1. I_{CEX} Test Circuit

 Figure 2. I_{CEX} Test Circuit

 Figure 3. $I_{I(off)}$ Test Circuit

 Figure 4. I_I Test Circuit


NOTE: I_I is fixed for measuring $V_{CE(sat)}$, variable for measuring h_{FE} .

 Figure 5. h_{FE} , $V_{CE(sat)}$ Test Circuit

 Figure 6. $V_{I(on)}$ Test Circuit

 Figure 7. I_R Test Circuit

 Figure 8. V_F Test Circuit

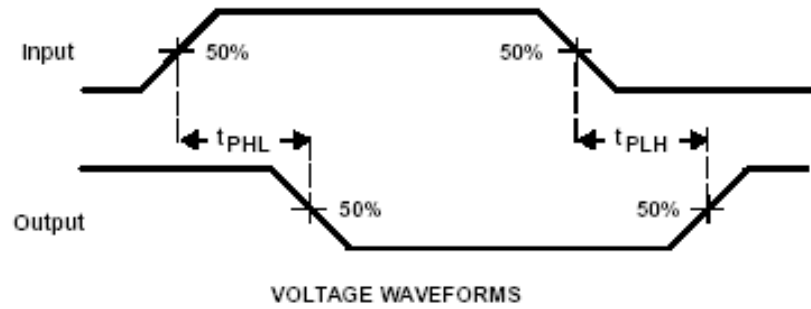
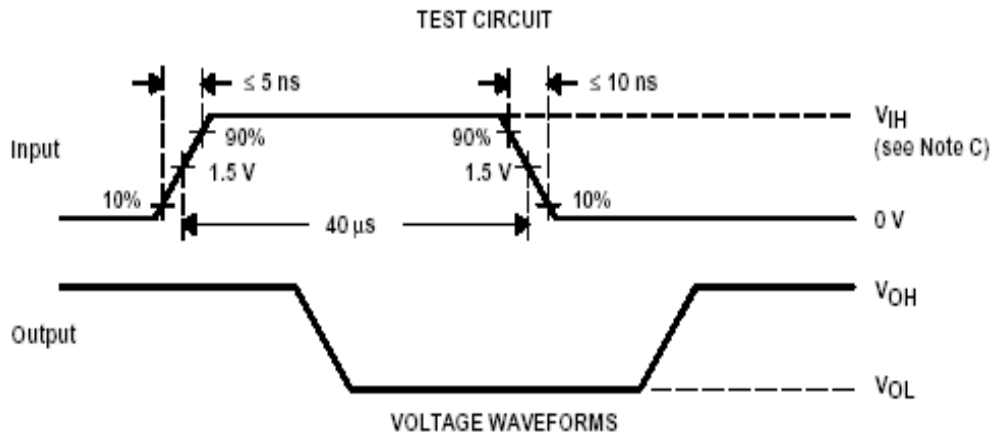


Figure 9. Propagation Delay-Time Waveforms



NOTES: A. The pulse generator has the following characteristics: PRR = 12.5 kHz, $Z_o = 50 \Omega$.
 B. C_L includes probe and jig capacitance.
 C. $V_{IH} = 12 \text{ V}$;

Figure 10. Latch-Up Test Circuit and Voltage Waveforms

TYPICAL CHARACTERISTICS

COLLECTOR-EMITTER SATURATION VOLTAGE vs
COLLECTOR CURRENT (ONE DARLINGTON)

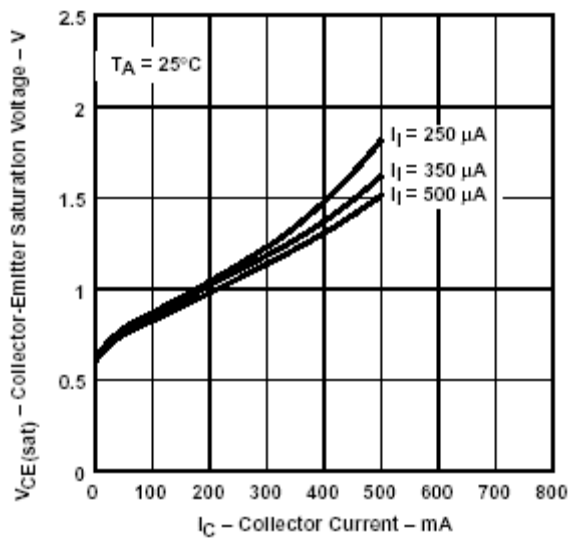


Figure 11

COLLECTOR-EMITTER SATURATION VOLTAGE vs
TOTAL COLLECTOR CURRENT TWO
DARLINGTONS PARALLELED)

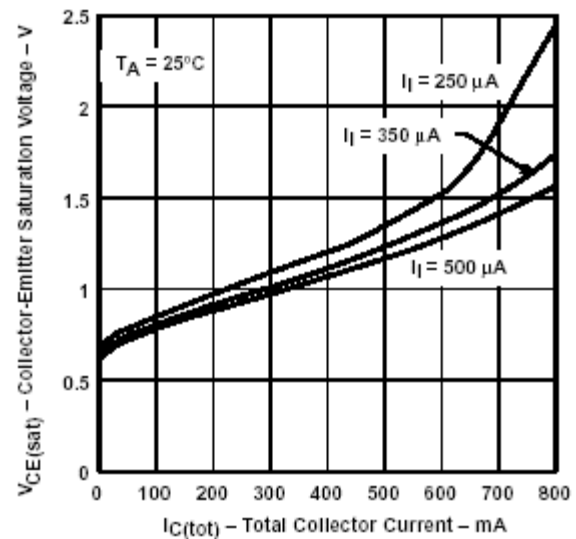


Figure 12

COLLECTOR CURRENT
vs
INPUT CURRENT

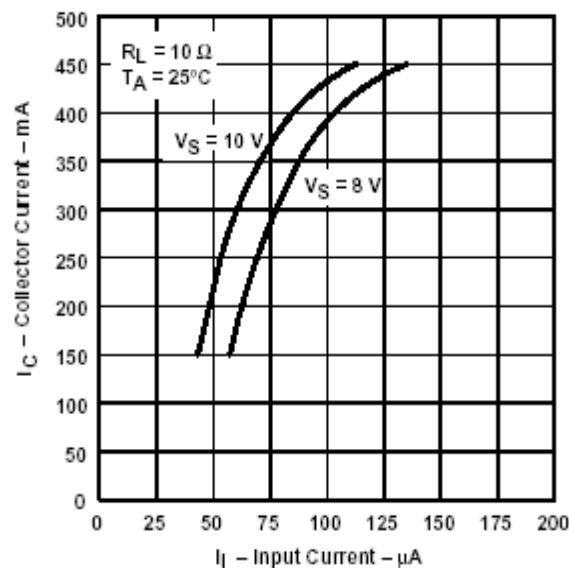


Figure 13

THERMAL INFORMATION

**D PACKAGE MAXIMUM COLLECTOR CURRENT
vs DUTY CYCLE**

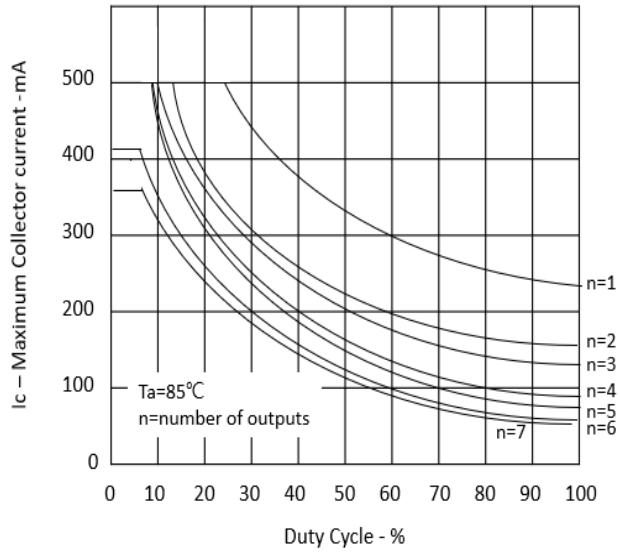


Figure 14

**N PACKAGE MAXIMUM COLLECTOR CURRENT
vs DUTY CYCLE**

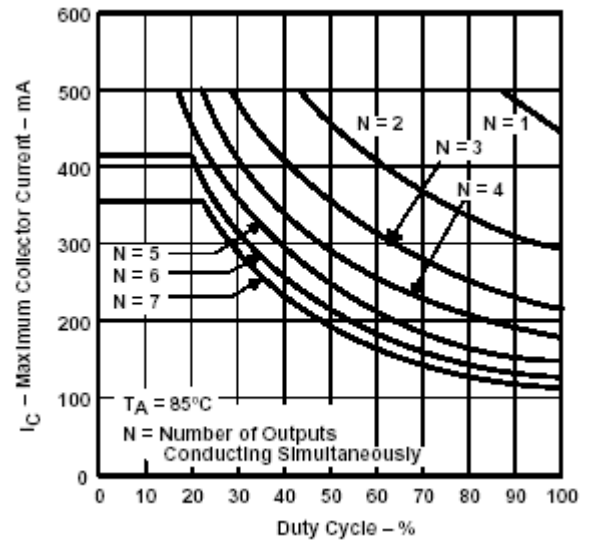


Figure 15

APPLICATION INFORMATION

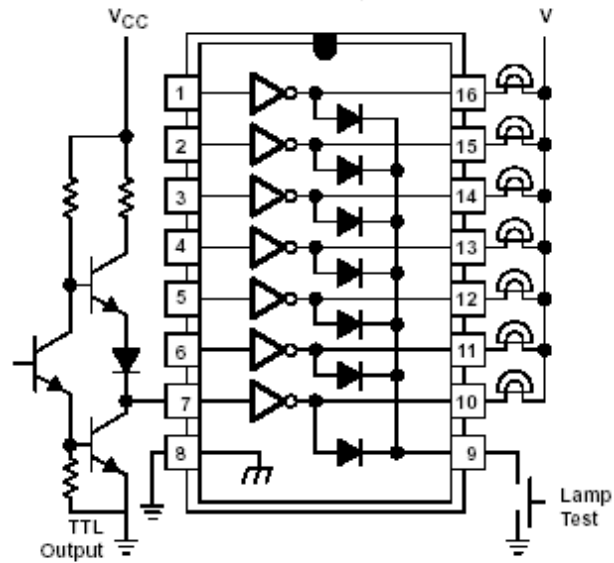


Figure 16. TTL to Load

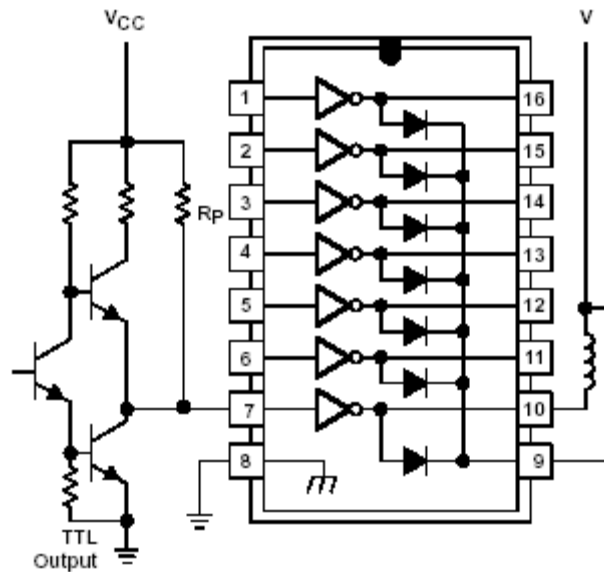
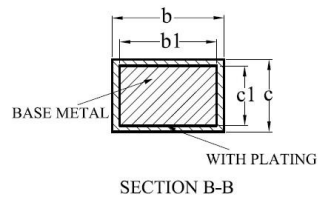
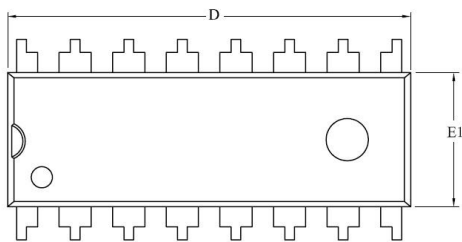
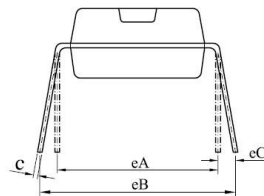
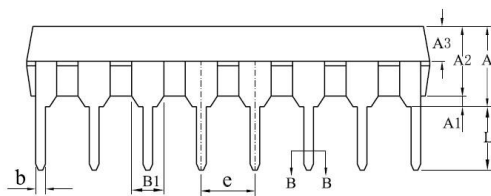
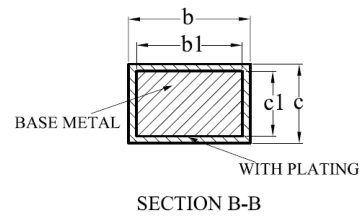
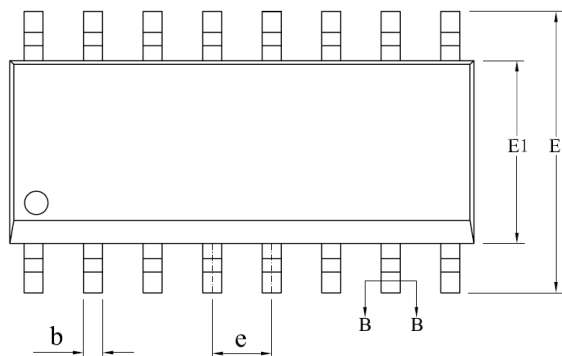
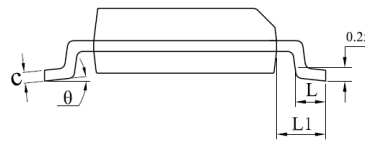
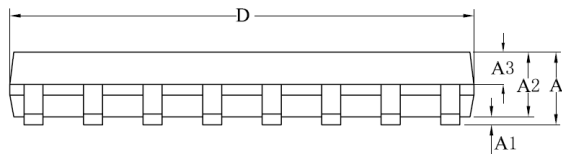


Figure 17. Use of Pullup Resistors to Increase Drive Current

DIP-16


SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	3.60	3.80	4.00
A1	0.51	—	—
A2	3.10	3.30	3.50
A3	1.42	1.52	1.62
b	0.44	—	0.53
b1	0.43	0.46	0.48
B1	1.52BSC		
c	0.25	—	0.31
c1	0.24	0.25	0.26
D	18.90	19.10	19.30
E1	6.15	6.35	6.55
e	2.54BSC		
eA	7.62BSC		
eB	7.62	—	9.50
eC	0	—	0.94
L	3.00	—	—
L/F载体尺寸 (Mil)	80*80		
	110*140		
	140*170		

SOP-16

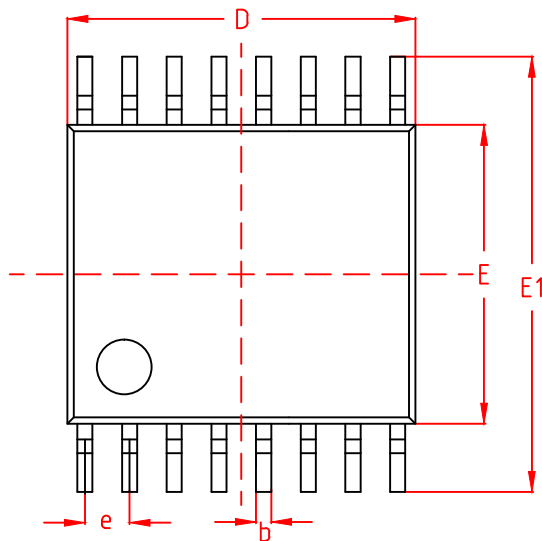


SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	—	—	1.75
A1	0.10	—	0.25
A2	1.35	1.40	1.45
A3	0.60	0.65	0.70
b	0.39	—	0.48
b1	0.38	0.41	0.43
c	0.21	—	0.26
c1	0.19	0.20	0.21
D	9.70	9.90	10.10
E	5.80	6.00	6.20
E1	3.70	3.90	4.10
e	1.27BSC		
L	0.50	—	0.80
L1	1.05BSC		
θ	0	—	8°
L/F载体尺寸 (mil)	75*75		
	90*110		
	90*180		

TSSOP-16

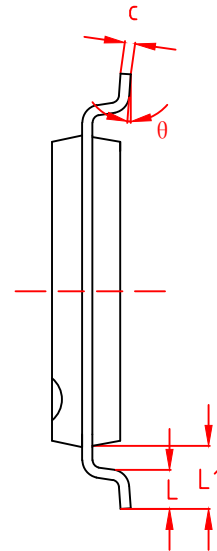
TOP VIEW

正视图



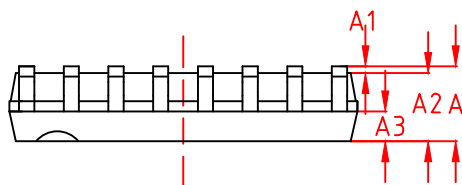
SIDE VIEW

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°