



CD2004A

High voltage, large current, seven-channel Darlington transistor array

Version: Rev 1.0.0 Date: 2025-6-18

Features ■■

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

Application ■■

- Relay driver
- Stepper and brushed DC motor drivers
- Lamp driver
- Display screen driver (LED and gas discharge components)
- Line driver
- Logical buffer

Description ■■

The CD2004A 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 CD2004A has a 10.5k Ω series base resistor for each Darlington pair for operation directly with 6-15V CMOS devices.

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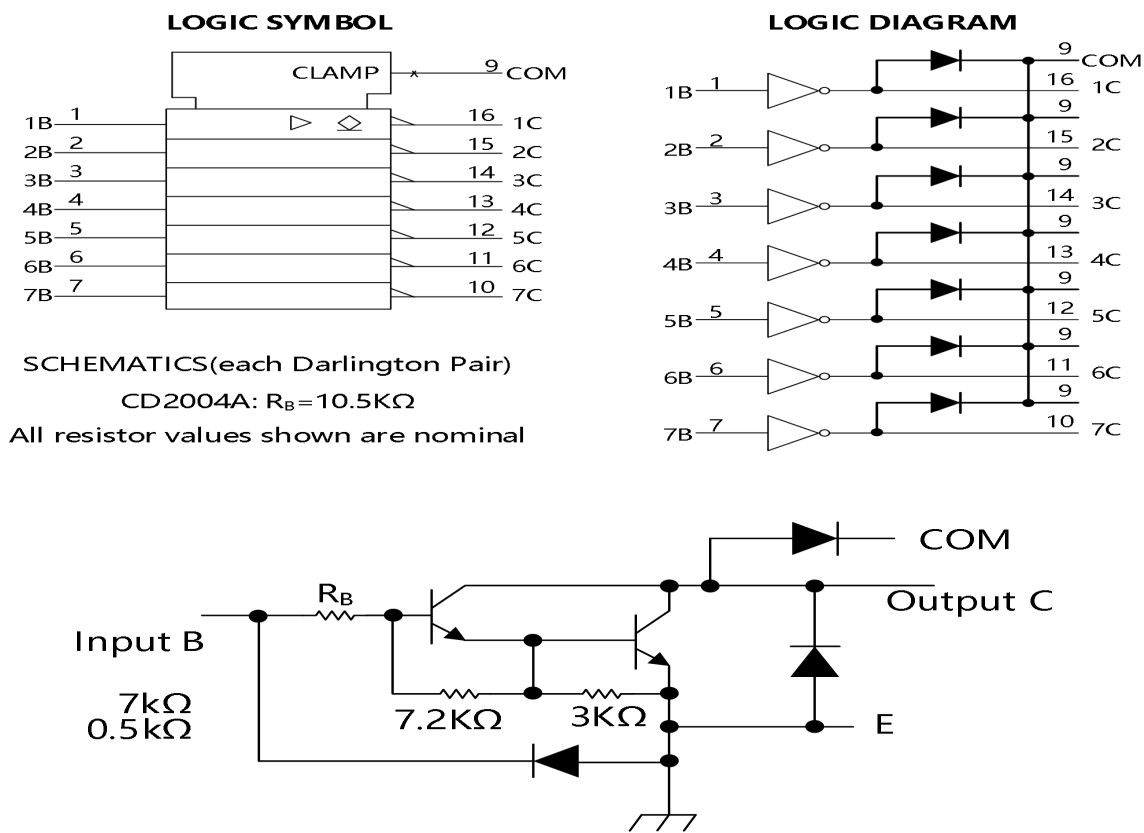
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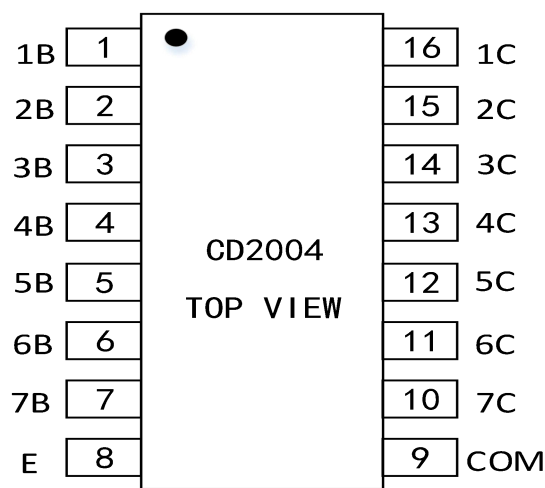
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Functional Block diagram



Pin Configurations



Pin description

Pin Num	Symbol	I/O	Pin Description
1	1B	I	Channel 1 through 7 Darlington base input
2	2B		
3	3B		
4	4B		
5	5B		
6	6B		
7	7B		
16	1C	O	Channel 1 through 7 Darlington collector output
15	2C		
14	3C		
13	4C		
12	5C		
11	6C		
10	7C		
9	COM	--	Common cathode node for flyback diodes (required for inductive loads)
8	E	--	Common emitter shared by all channels (typically tied to ground)

Absolute Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage		50	V
Input voltage(see Note 1)	V_I	30	V
Peak collector current (see Figures 14 and 15)		500	mA
Output clamp current	I_{OK}	500	mA
Total emitter-terminal current		-2.5	A
Continuous total power dissipation		See Dissipation Rating Table	
Operating free-air temperature range	T_A	-40 to 85	°C
Storage temperature range	T_{STG}	-55 to 150	°C

Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	260	°C
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NOTE 1: All voltage values are with respect to the emitter/substrate terminal E, unless otherwise noted.

Dissipation Rating Table

PACKAGE	TA=25° C POWER RATING	DERATING FACTOR above TA=25° C	TA=85° C POWER RATING
D	1210mW	7.6mW/°C	494mW
N	1420mW	9.2mW/°C	598mW

Electrical Characteristics

Symbol	Parameter	Test Fig.	Test Conditions	Min	Typ	Max	Unit
$V_{i(on)}$	Input Voltage	6	$V_{CE}=2V$ $I_C = 125mA$ $I_C = 200mA$ $I_C = 275mA$ $I_C = 350mA$			5 6 7 8	V
$V_{CE(sat)}$	Collector-emitter Saturation Voltage	5	$I_C = 100mA$ $I_B = 250mA$ $I_C = 200mA$ $I_B = 350mA$ $I_C = 350mA$ $I_B = 500mA$		0.9 1.1 1.3	1.1 1.3 1.6	V
ICEX	Output Leakage Current	2	$V_{CE} = 50V, V_i = 1V$			500	uA
V_F	Clamp Diode Forward Voltage	8	$I_F = 350mA$		1.7	2	V
$I_{i(off)}$	Off-state Input Current	3	$V_{CE}=50V, T_{AMB} = 70^{\circ}C,$ $I_C = 500mA$	50	65		uA
I_i	Input Current	4	$V_i = 5V$ $V_i = 12V$		0.35 1	0.5 1.45	mA
I_R	Clamp Reverse Current	7	$V_R = 50V$ $T_{AMB} = 70^{\circ}C, V_R = 50V$			50 100	uA
C_i	Input Capacitance				15	25	pF

Switching Characteristics, $T_A=25^{\circ}C$

T_{PLH}	Turn-on Delay Time		See Fig.9		0.25	1	us
T_{PHL}	Turn-off Delay Time		See Fig.9		0.25	1	us
V_{OH}	High level output voltage after switching		$V_S=50V, I_O=300mA$ See Fig.10	V_S-20			mV

Parameter Measurement Information

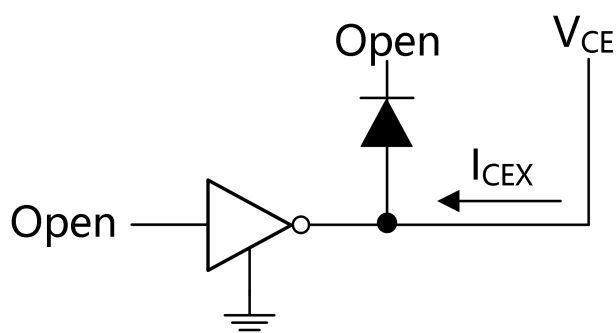


Figure 1 . I_{CEX} Test Circuit

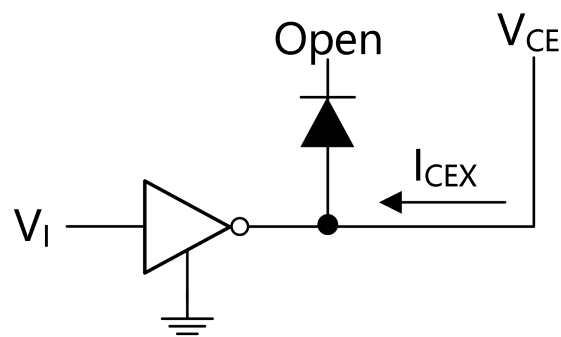


Figure 2 . I_{CEX} Test Circuit

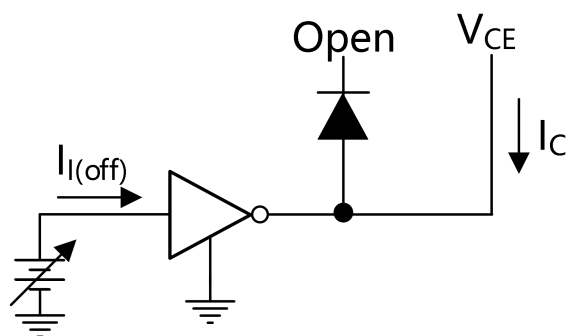


Figure 3 . $I_{L(off)}$ Test Circuit

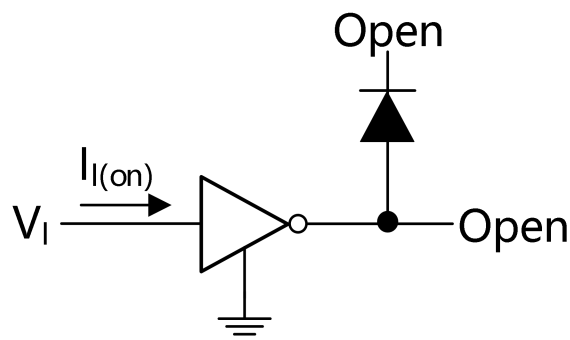
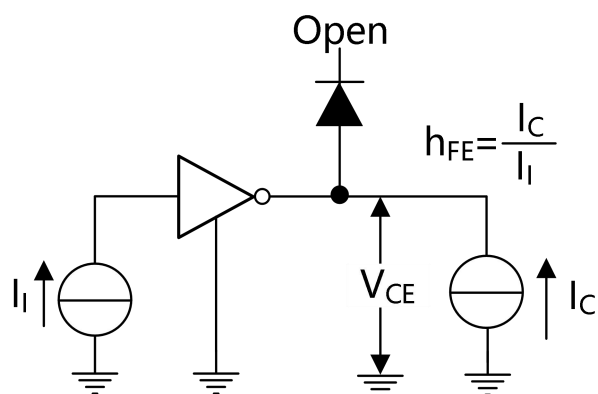


Figure 4 . I_L Test Circuit



Note: I_I is fixed for measuring $V_{CE(sat)}$, Variable or measuring $h = E$

Figure 5 . $H_{FE} V_{CE}$ Test Circuit

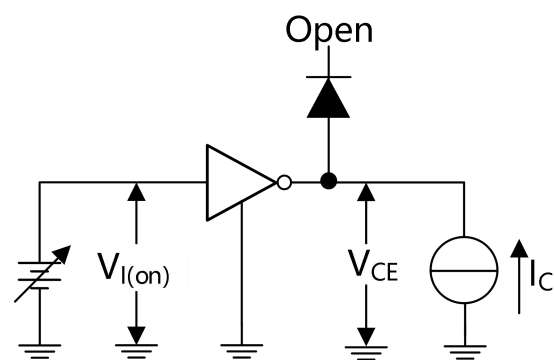


Figure 6 . $V_{IL(on)}$ Test Circuit

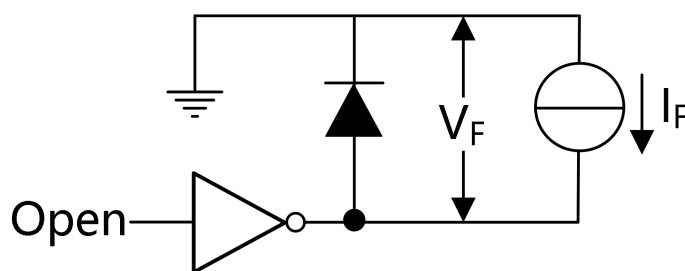
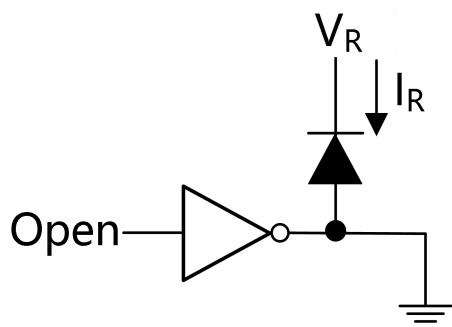
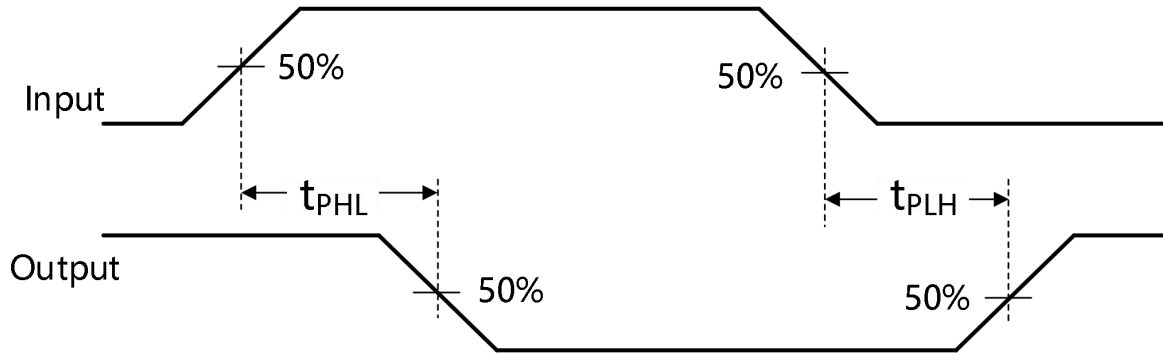


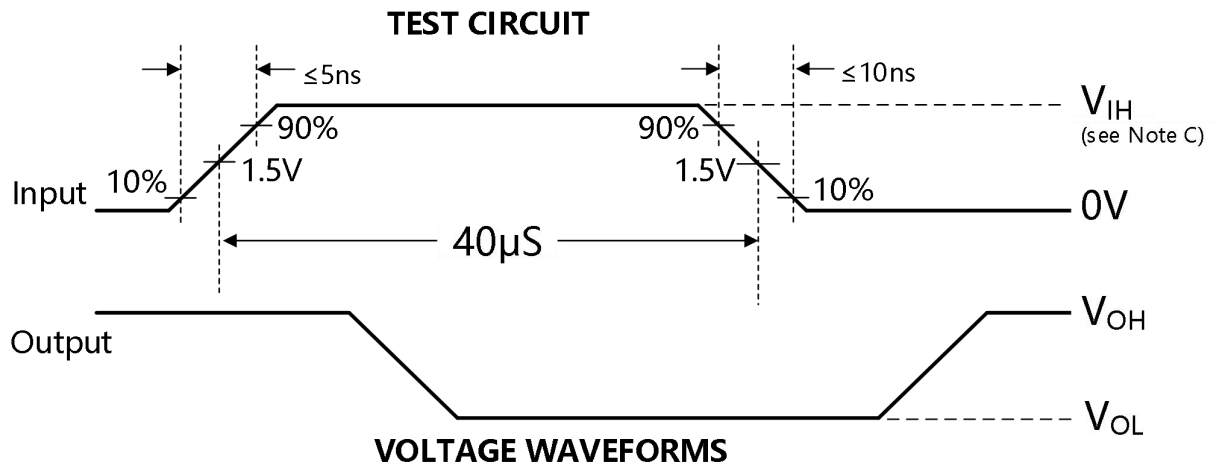
Figure 7 . I_R Test Circuit

Figure 8 . V_F Test Circuit



VOLTAGE WAVEFORMS

Figure 9. Propagation Delay-Time Waveforms



VOLTAGE WAVEFORMS

Figure 10. Latch-Up Test Circuit and Voltage Waveforms

NOTES:

- A. The pulse generator has the following characteristics: PRR = 12.5 kHz, ZO=50.
- B. CL includes probe and jig capacitance.
- C. V_{IH} = 12V.

Typical Characteristics

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

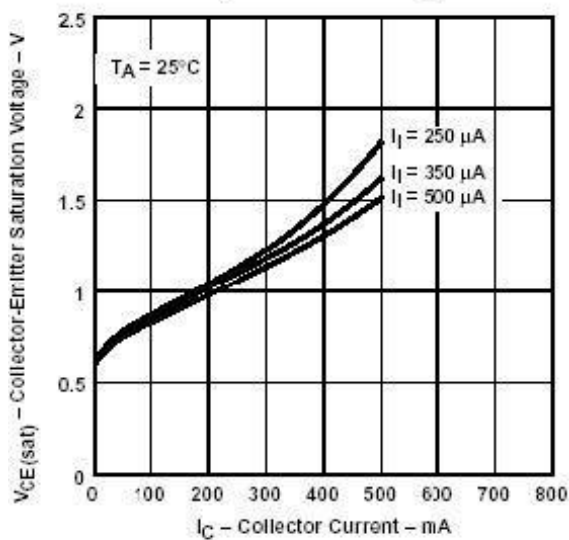


Figure 11

COLLEC TOR-EM ITTER
SATURATION VOLTAGE
VS
TOTAL COLLECTOR CURRENT
TWO DARLINGTONS PARALLELED

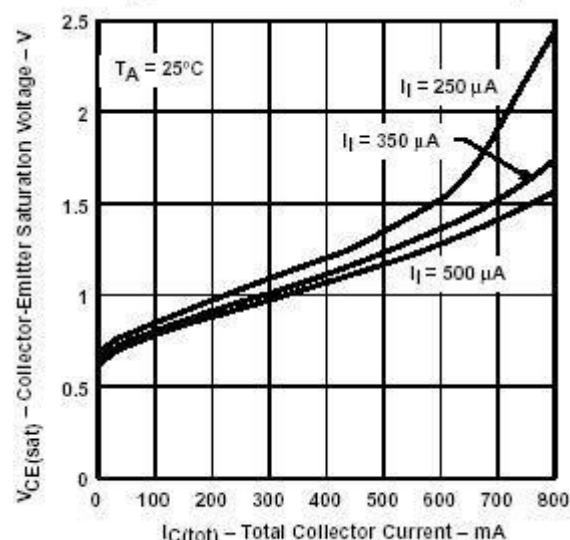


Figure 12

COLLECTOR CURRENT
VS
INPUT CURRENT

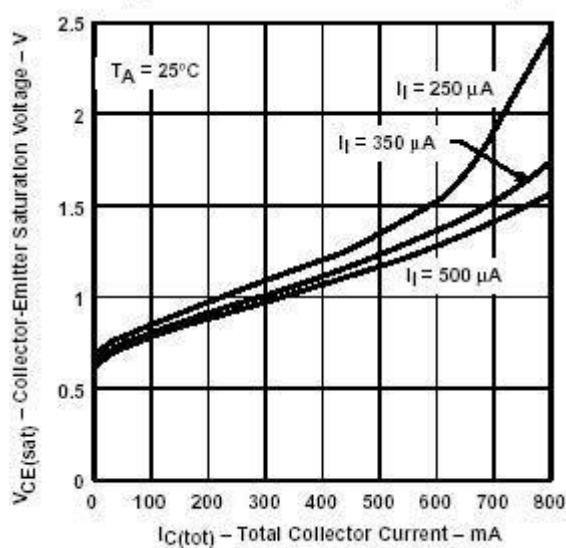


Figure 12

Figure 13

Thermal Information

D PACKAGE
MAXIMUM COLLECTOR CURRENT
VS
DUTY CYCLE

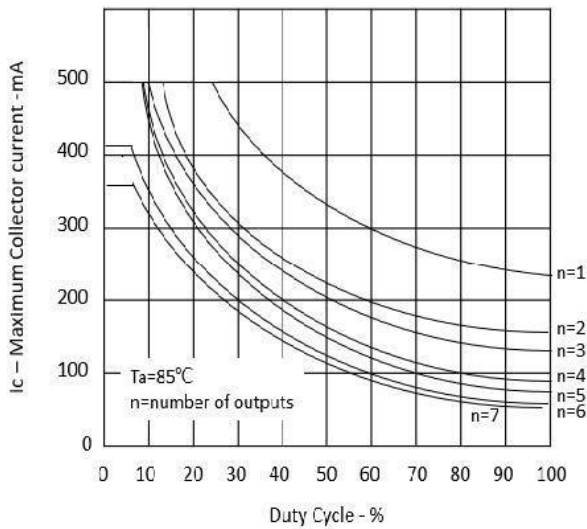


Figure 14

N PACKAGE
MAXIMUM COLLECTOR CURRENT
VS
DUTY CYCLE

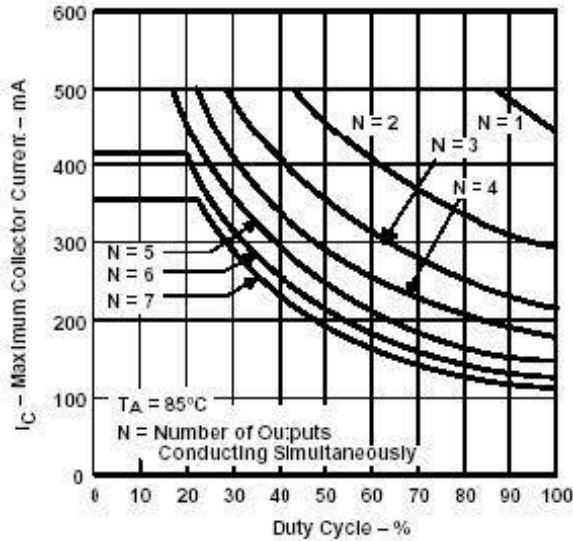
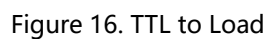
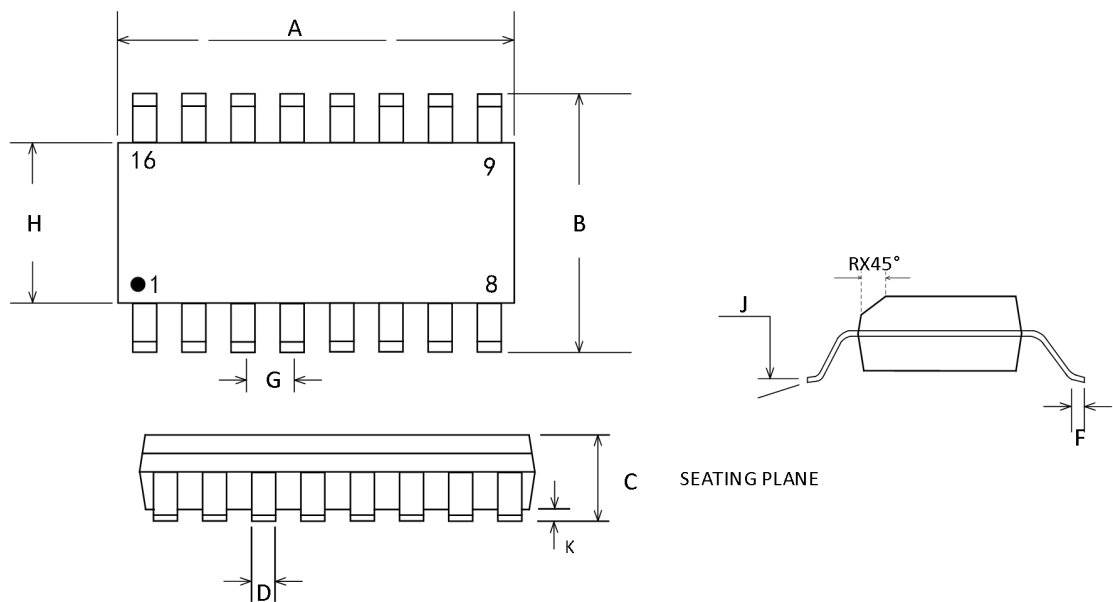


Figure 15



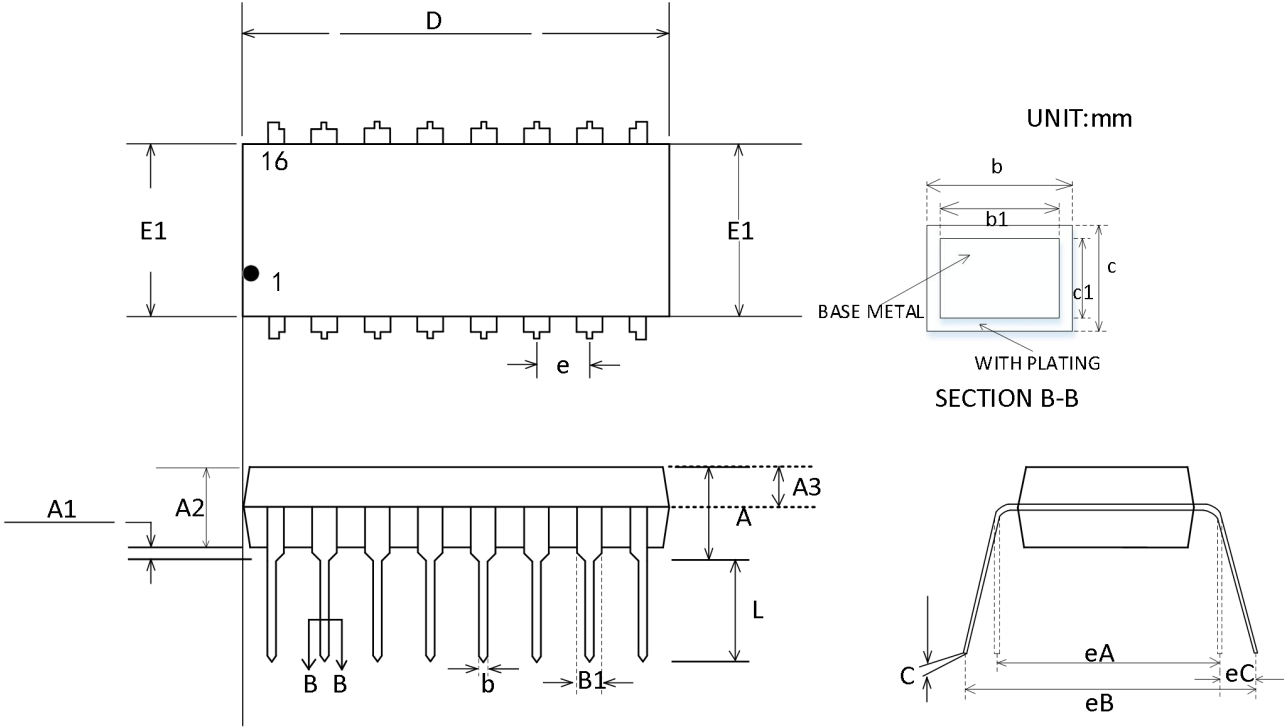
Package Outline Dimensions

SOP-16



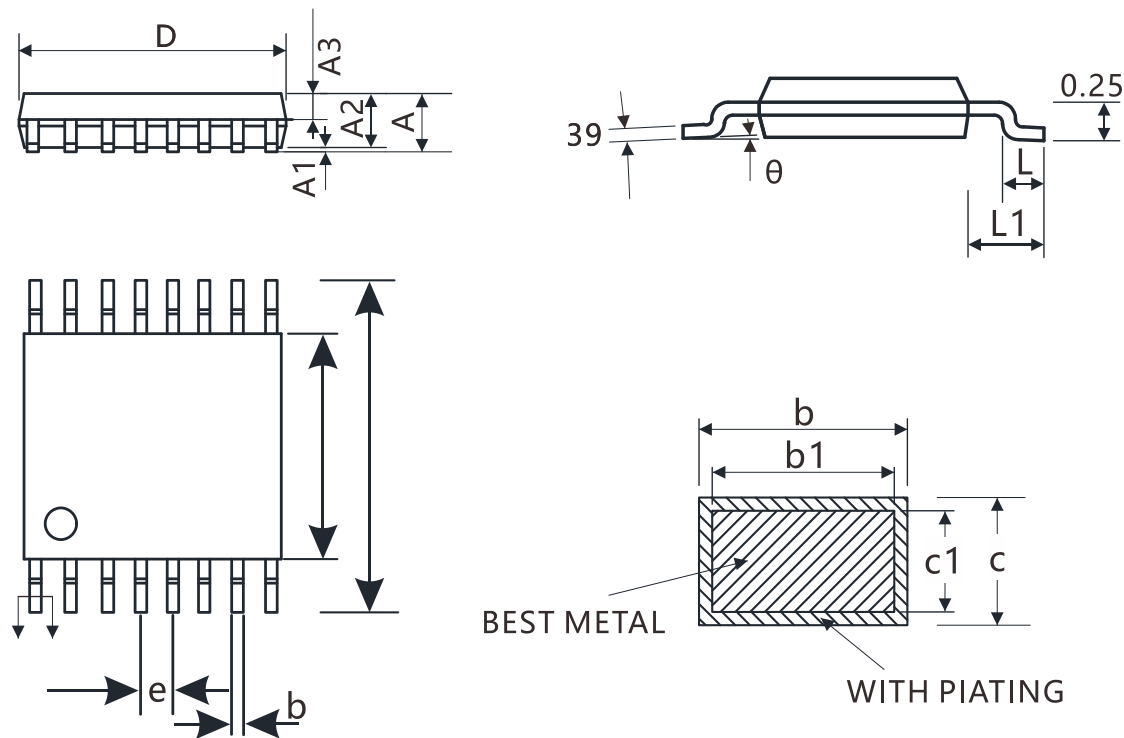
SYMBOL	MILLIMETER (MM)	
	MIN	MAX
A	9.80	9.98
B	5.80	6.20
C	1.52	1.72
D	0.33	0.51
F	0.40	1.27
G	1.27BSC	
H	3.81	3.99
J	0°	8°
K	0.10	0.25
R	0.25	0.5

DIP-16



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

TSSOP-16



SYMBOL	MILLIMETER (MM)			SYMBOL	MILLIMETER (MM)		
	MIN	NOM	MAX		MIN	NOM	MAX
A			1.75	D	9.70	9.90	10.10
A1	0.10		0.25	E	5.80	6.00	6.20
A2	1.35	1.40	1.45	E1	3.70	3.90	4.10
A3	0.60	0.65	0.70	e	1.27 BSC		
b	0.39		0.48	L	0.50		0.80
b1	0.38	0.41	0.43	L1	1.05 BSC		
c	0.21		0.26	θ	0°		8°
c1	0.19	0.20	0.21				
L/F 载体尺寸 (mm)		75×75					
		90×110					
		70×180					

Package/Ordering Information

MODEL	TEMPERATURE	PACKAGE DESCRIPTION	PACKAGE OPTION
CD2004AS16	-40℃~85℃	SOP-16	Tape and Reel, 2500
CD2004AS16-RL	-40℃~85℃	SOP-16	Tape and Reel, 3000
CD2004AS16-REEL	-40℃~85℃	SOP-16	Tape and Reel, 4000
CD2004ATS16	-40℃~85℃	TSSOP-16	Tape and Reel, 2500
CD2004ATS16-RL	-40℃~85℃	TSSOP-16	Tape and Reel, 3000
CD2004ATS16-REEL	-40℃~85℃	TSSOP-16	Tape and Reel, 4000
CD2004ADP16	-40℃~85℃	DIP-16	Tube, 2500

Revision Log

Version	Revision date	Change content	Reason for Change	Modified by	Reviewed By	Note
V1.0	2025.6.18	Initial version	Regular update	WW	LYL	