Features and Application

- 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

Description

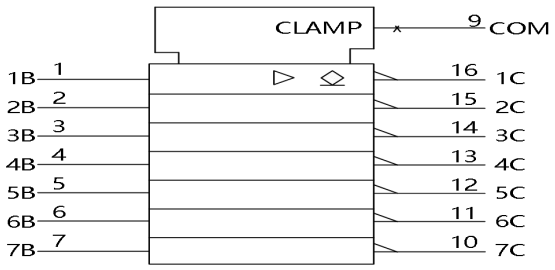
The CBM2004A are monolithic high-voltage, high-current Darlington transistor arrays. Each consists of seven n-p-n Darlington pairs that feature high-voltage outputs withcommon-cathode clamp diodes for switching inductive loads.

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.

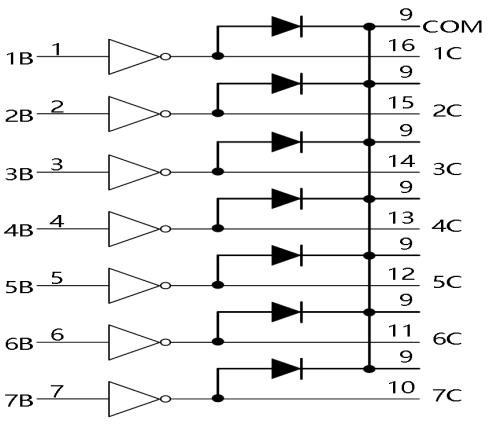
The CBM2004A has a 10.5kΩ series base resistor for each Darlington pair for operation directly with 6-15V CMOS devices.

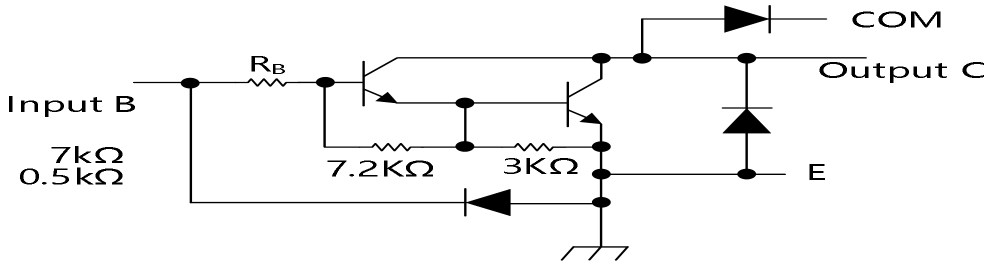
LOGIC SYMBOL



SCHEMATICS(each Darlington Pair)
CBM2004A: R_B=10.5KΩ
All resistor values shown are nominal

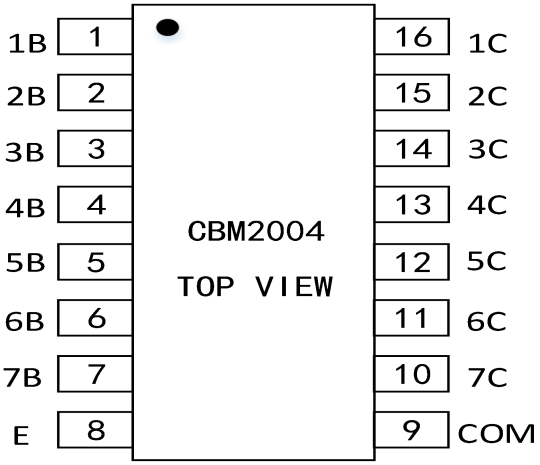
LOGIC DIAGRAM





CATALOG

Pin Configuration



Pin Description

Pin Num	Symbol	I/O	Pin Description
1	1B	I	Channel 1 through 7 Darlington base input
t	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 (T_A =25℃)

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	℃
Storage temperature range	T_{STG}	–55 to 150	℃
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds		260	℃

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

Dissipation Rating Table

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

Electrical Characteristics (T_A= 25℃ unless otherwise noted)

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 = 200 mA I_B = 350mA I_C = 350 mA 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°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°C, V_R = 50V			50 100	uA
C_i	Input Capacitance				15	25	pF
Switching Characteristics, T_A=25℃							
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

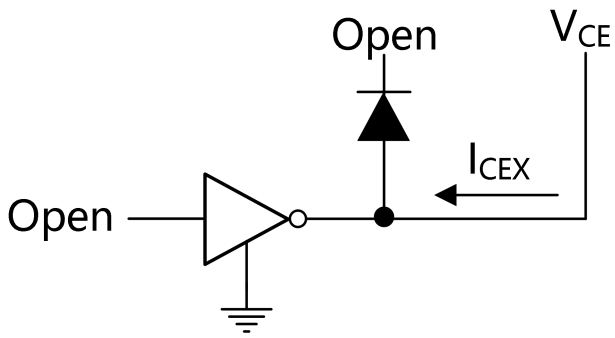


Figure 1 . I_{CEX} Test Circuit

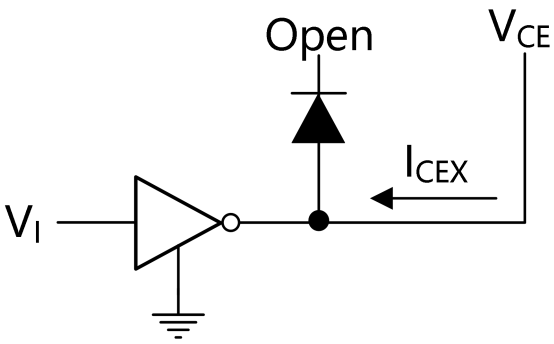


Figure 2 . I_{CEX} Test Circuit

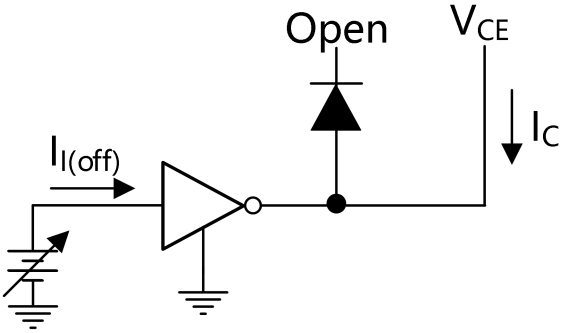


Figure 3 . $I_{I(off)}$ Test Circuit

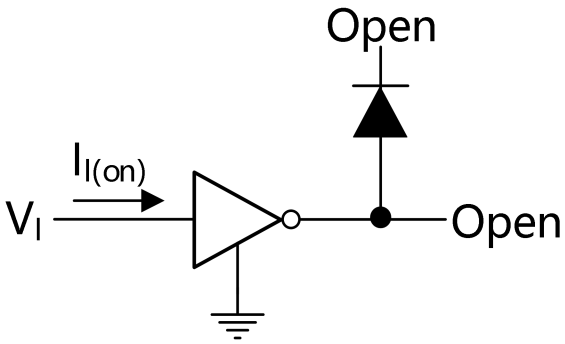
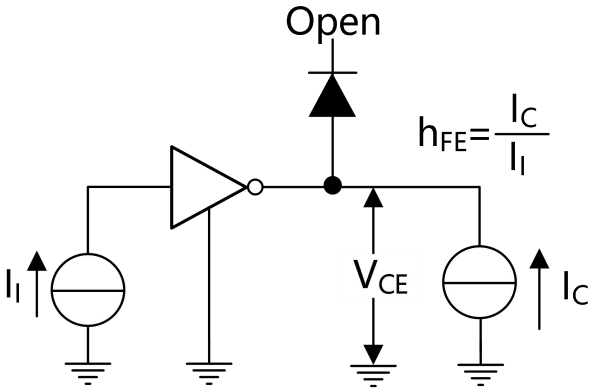


Figure 4 . I_I Test Circuit



Note:II is fixed for measursing VCE(sat),Variable or messuring h=E

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

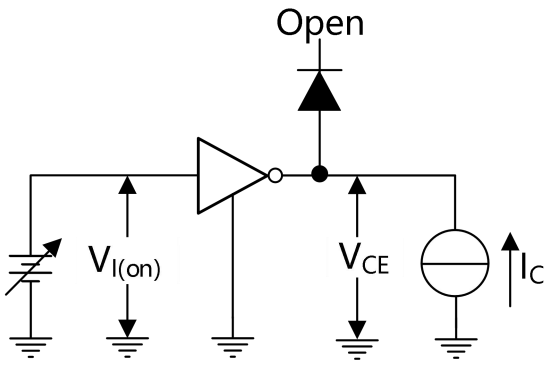


Figure 6 . $V_{I(on)}$ Test Circuit

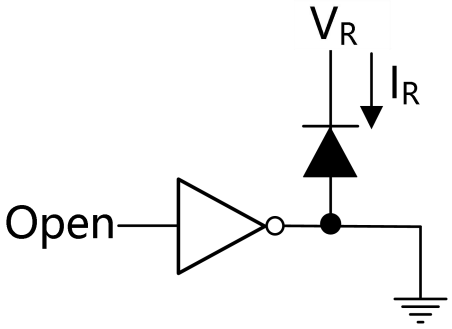


Figure 7 . I_R Test Circuit

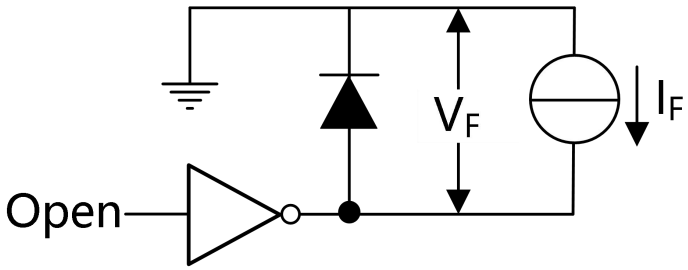


Figure 8 . V_F Test Circuit

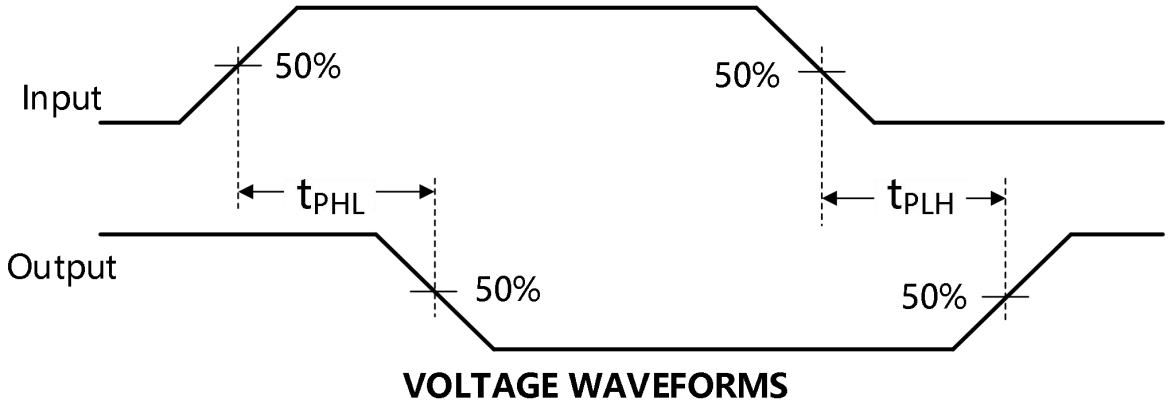


Figure 9. Propagation Delay-Time Waveforms

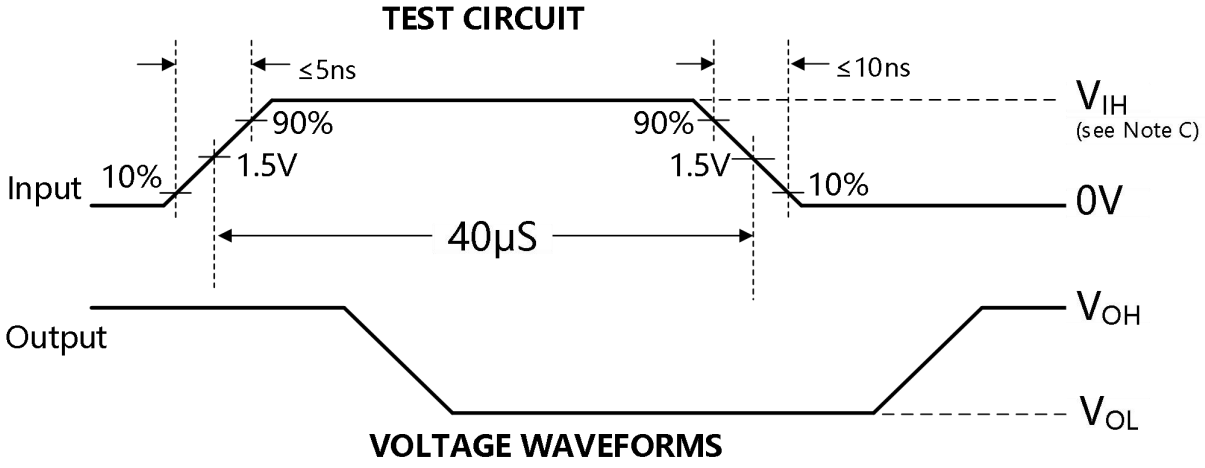


Figure 10. Latch-Up Test Circuit and Voltage Waveforms

NOTES:

A. The pulse generator has the following characteristics: PRR = 12.5 kHz, ZO=50.

B. CL includes probe and jig capacitance.

C. VIH = 12V.

Typical Characteristics

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

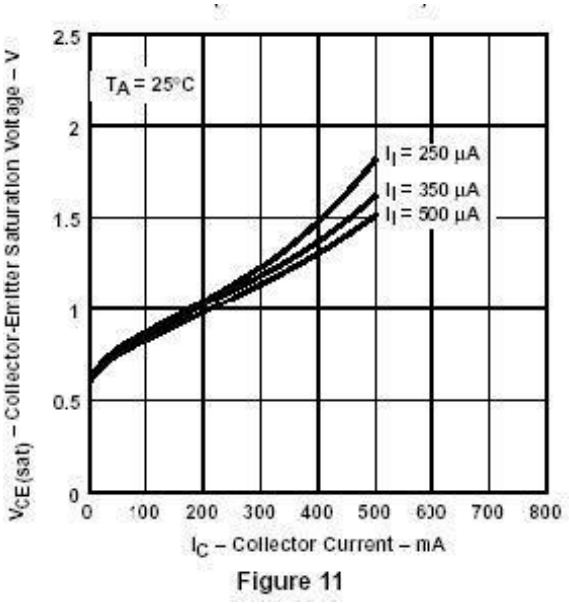


Figure 11

Figure 11

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

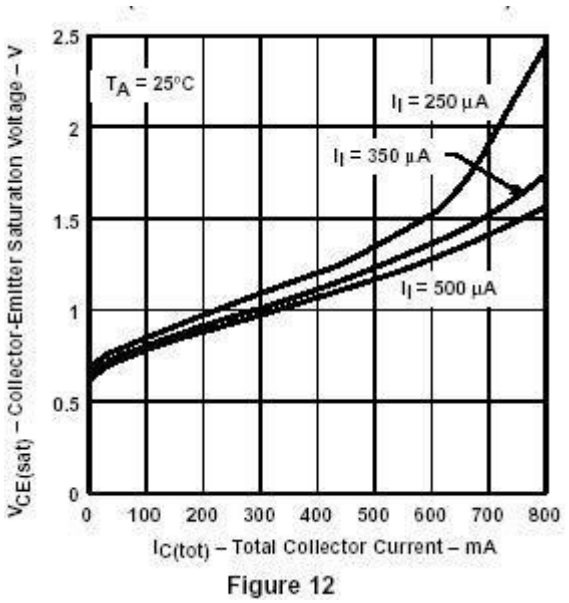


Figure 12

Figure 12

COLLECTOR CURRENT
vs
INPUT CURRENT

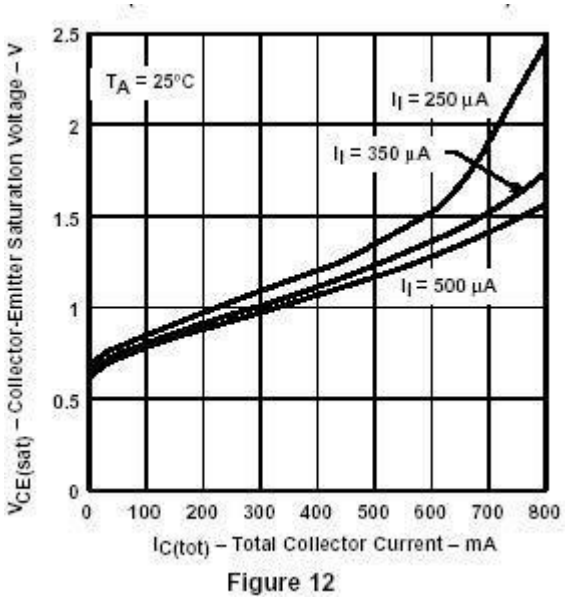


Figure 12

Figure 13

Thermal Information

D PACKAGE
MAXIMUM COLLECTOR CURRENT
vs
DUTY CYCLE

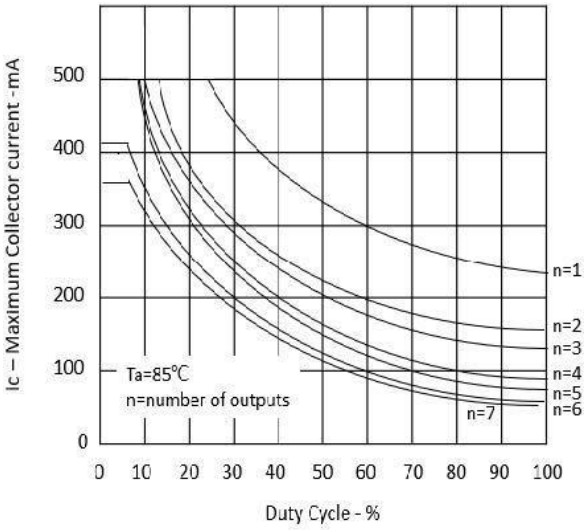


Figure 14

N PACKAGE
MAXIMUM COLLECTOR CURRENT
vs
DUTY CYCLE

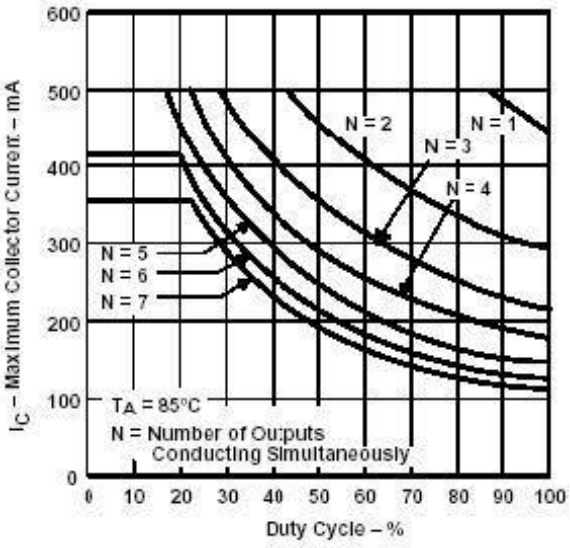


Figure 15

Application Information

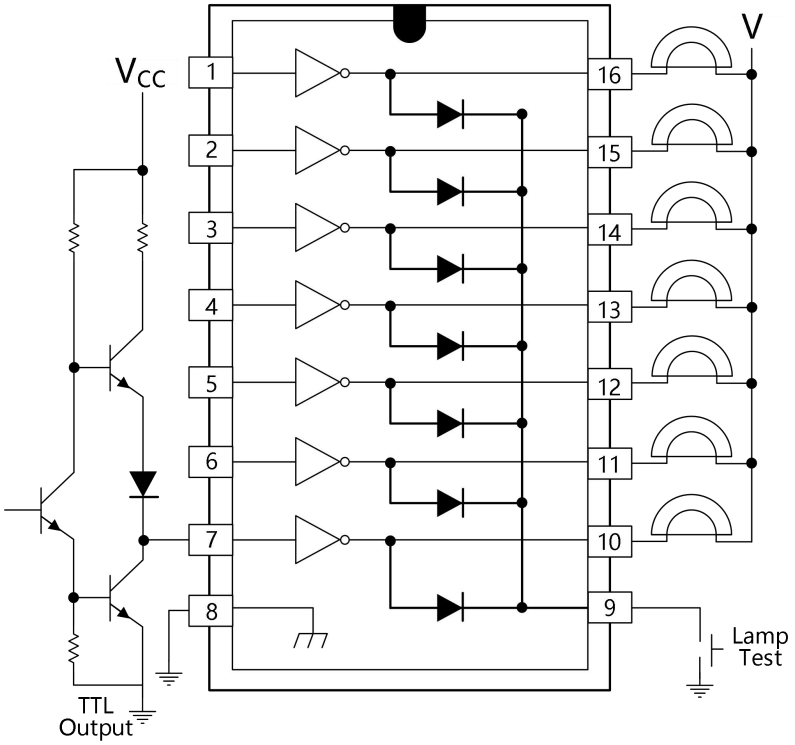


Figure 16. TTL to Load

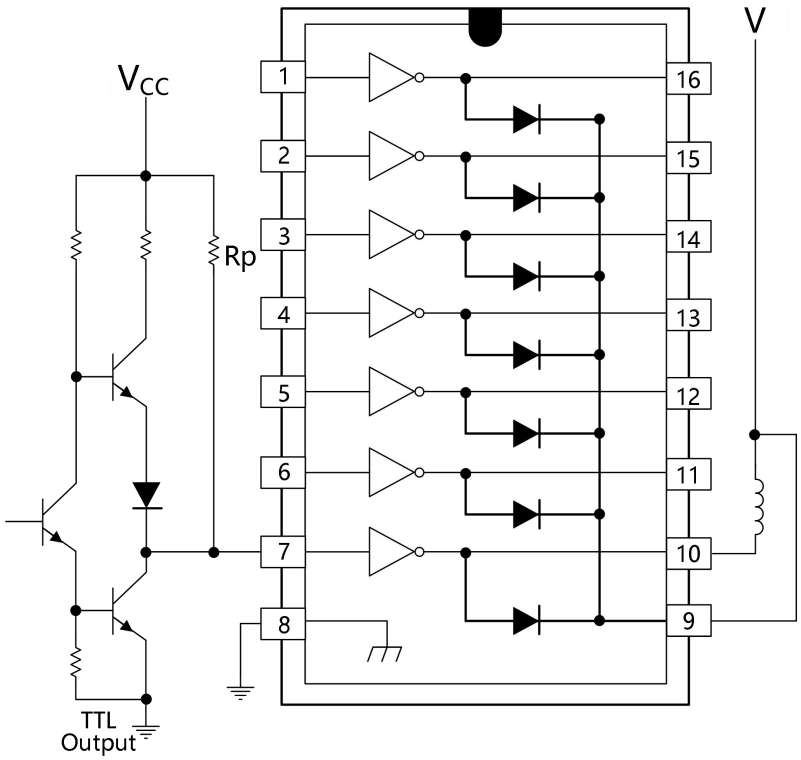
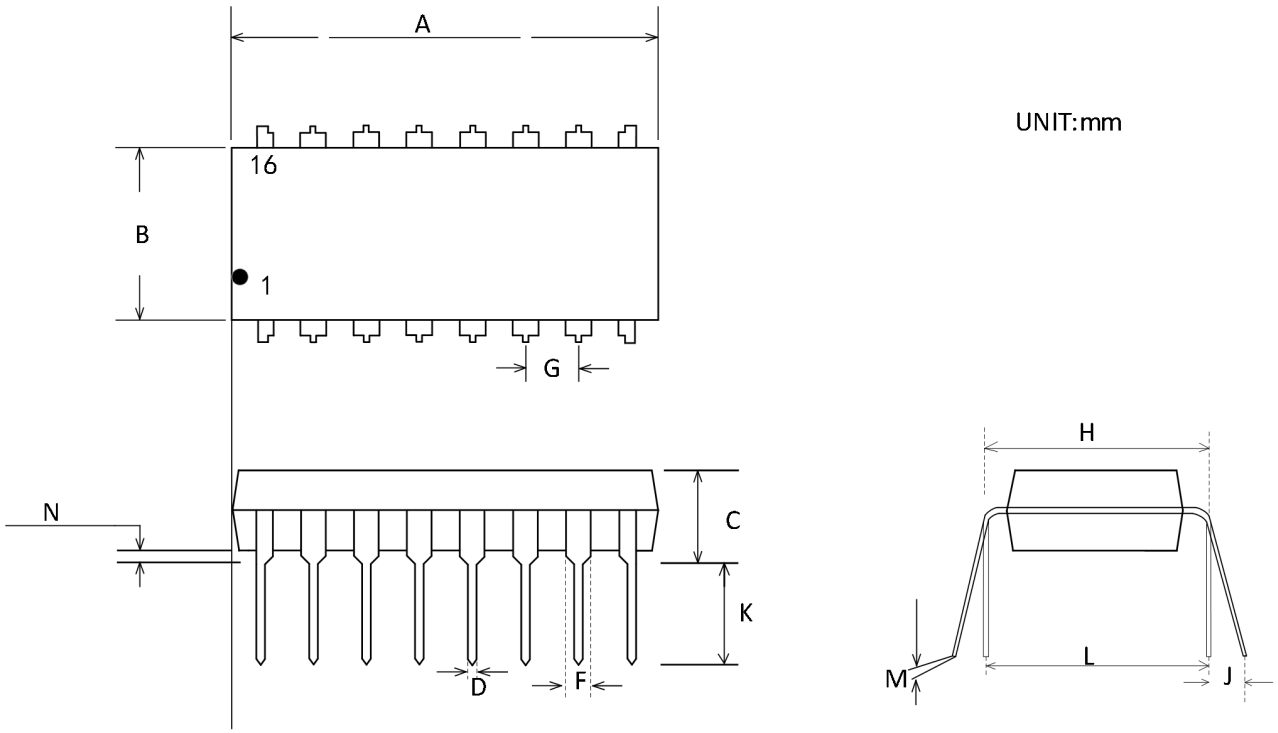


Figure 17. Use of Pullup Resistors to Increase Drive Current

Package Information

DIP-16



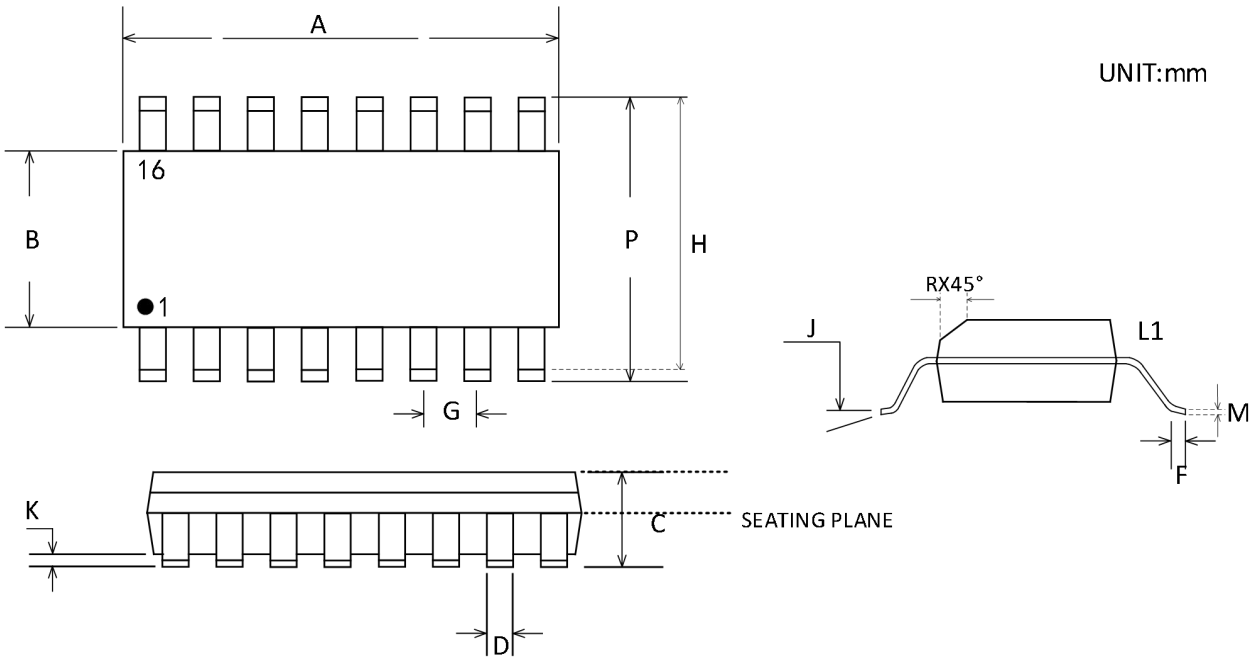
UNIT:mm

SYMBOL	MILLIMETER		SYMBOL	MILLIMETER	
	MIN	MAX		MIN	MAX
A	18.67	19.69	H	7.62	
B	6.10	7.11	J	0°	10°
C		5.33	K	2.92	3.81
D	0.36	0.56	L	7.62	8.26
F	1.14	1.78	M	0.20	0.36
G	2.54		N	0.38	

NOTES:

1. Dimensions “A”, “B” do not include mold flash or protrusions.
2. Maximum mold flash or protrusions 0.25 mm (0.010) per side.

SOP-16

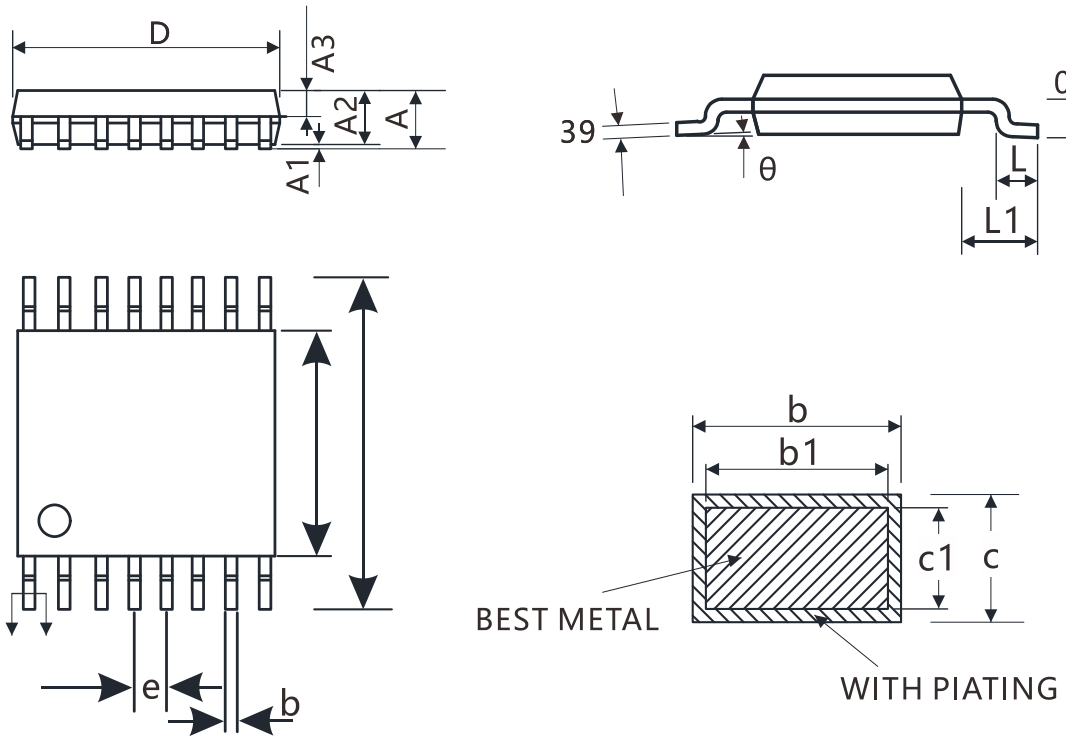


SYMBOL	MILLIMETER		SYMBOL	MILLIMETER	
	MIN	MAX		MIN	MAX
A	9.80	10.00	H	5.72	
B	3.80	4.00	J	0°	8°
C	1.35	1.75	K	0.10	0.25
D	0.33	0.51	M	0.19	0.25
F	0.40	1.27	P	5.80	6.20
G	1.27		R	0.25	0.50

NOTES:

1. Dimensions A and B do not include mold flash or protrusion.
2. Maximum mold flash or protrusion 0.15 mm (0.006) per side for A; for B - 0.25 mm (0.010) per side.

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

ORDERING	TEMPRANGE	PACKAGE	MARK	TRANSPOT
CBM2004AS16	-40℃~85℃	SOP-16	CBM2004AS	Tape and Reel,2500
CBM2004AS16-RL	-40℃~85℃	SOP-16	CBM2004AS	Tape and Reel,3000
CBM2004AS16-REEL	-40℃~85℃	SOP-16	CBM2004AS	Tape and Reel,4000
CBM2004ATS16	-40℃~85℃	TSSOP-16	CBM2004AT	Tape and Reel,2500
CBM2004ATS16-RL	-40℃~85℃	TSSOP-16	CBM2004AT	Tape and Reel,3000
CBM2004ATS16-REEL	-40℃~85℃	TSSOP-16	CBM2004AT	Tape and Reel,4000
CBM2004ADP16	-40℃~85℃	DIP-16	CBM2004AD	Tube,2500