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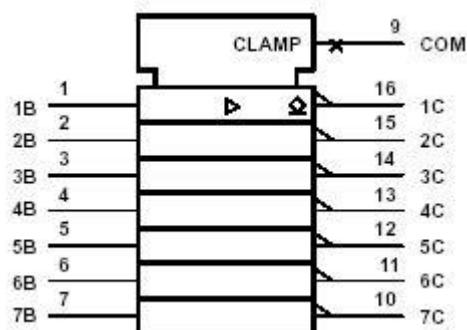
The CBM2004A are monolithic high-voltage, high-current Darlington transistor arrays. Each consists of seven n-p-n Darlington pairs that feature high-voltage outputs with common-cathode clamp diodes for switching inductive loads.

The collector-current rating of a single Darlington pair is 500 mA.
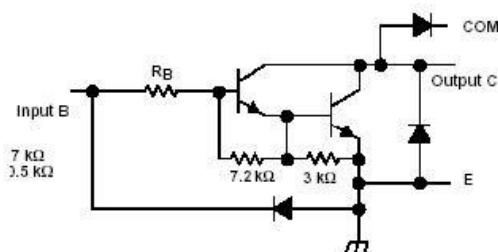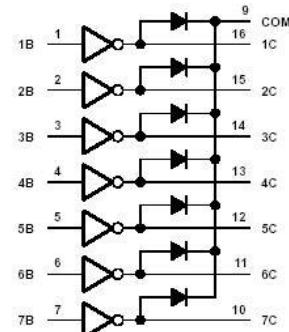
The Darlington pairs may be paralleled for higher current capability. Applications include relay drivers, hammer drivers, lamp drivers, display drivers (LED and gas discharge), line drivers, and logic buffers.

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

LOGIC SYMBOL

LOGIC DIAGRAM

SCHEMATICS (each Darlington Pair)

CBM2004: RB = 10.5kΩ

All resistor values shown are nominal.

Absolute Maximum Ratings (Ta =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	Tstg	–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

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Electrical Characteristics, T_A= 25℃ (unless otherwise noted)

| Symbol	Parameter	Test Fig.	Test Conditions	Min	Typ	Max	Unit
Vi(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
I_{CEX}	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
Ii(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
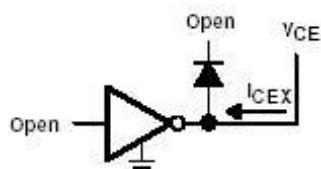
Figure 1. I_{CEX} Test Circuit
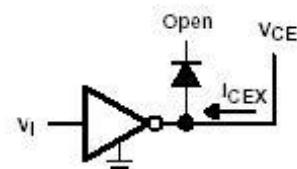
Figure 2. I_{CEX} Test Circuit
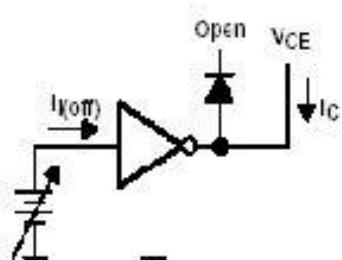
Figure 3. $I_{I(off)}$ Test Circuit
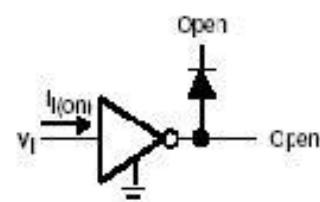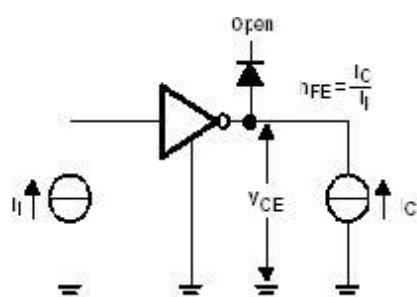
Figure 4. I_I Test Circuit

$$h_{FE} = \frac{I_C}{I_I}$$

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

Figure 5. h_{FE}, $V_{CE(sat)}$ Test Circuit
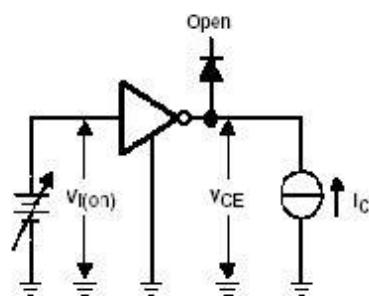
Figure 6. $V_{I(on)}$ Test Circuit

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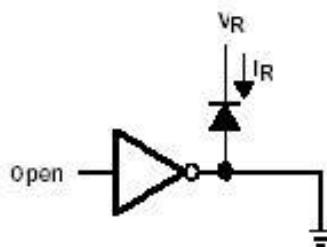
Figure 7. I_R Test Circuit
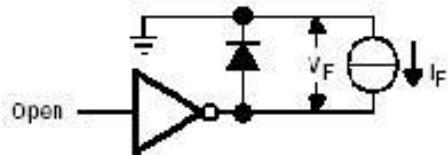
Figure 8. V_F Test Circuit
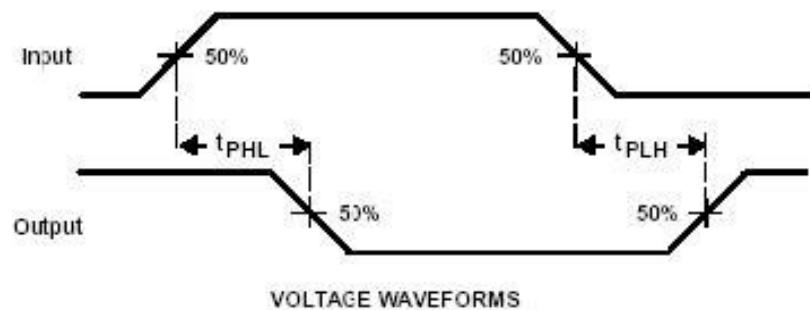
VOLTAGE WAVEFORMS

Figure 9. Propagation Delay-Time Waveforms

TEST CIRCUIT
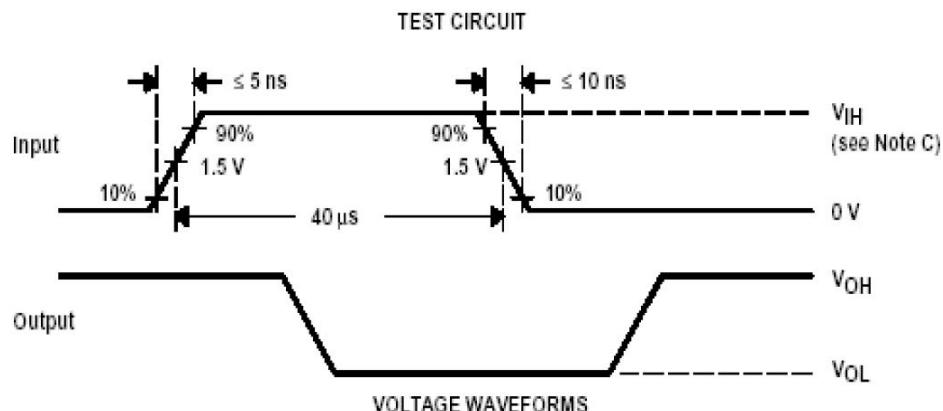
VOLTAGE WAVEFORMS

Figure 10. Latch-Up Test Circuit and Voltage Waveforms

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

B. C_L includes probe and jig capacitance.

C. V_{IH} = 12 V;

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TYPICAL CHARACTERISTICS

COLLECTOR-EMITTER
SATURATION VOLTAGE
VS
COLLECTOR CURRENT
(ONE DARLINGTON)
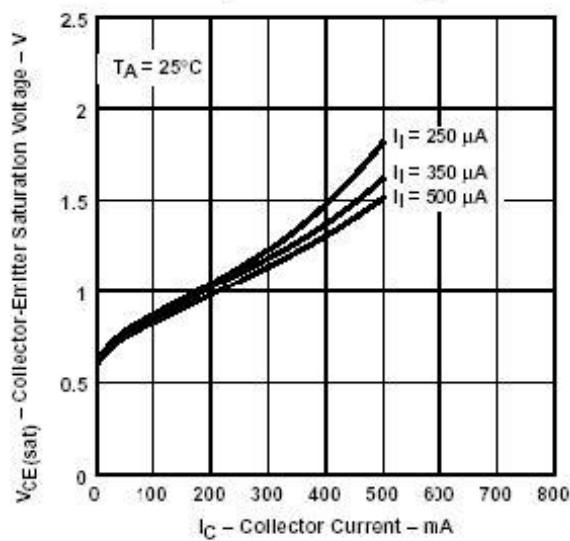
COLLEC TOR-EM ITTER
SATURATION VOLTAGE
vs
TOTAL COLLECTOR CURRENT
**TWO DARLINGTONS PARALLELED)**
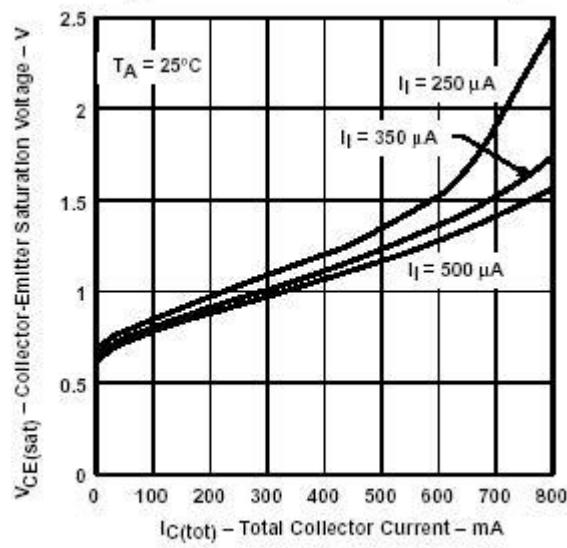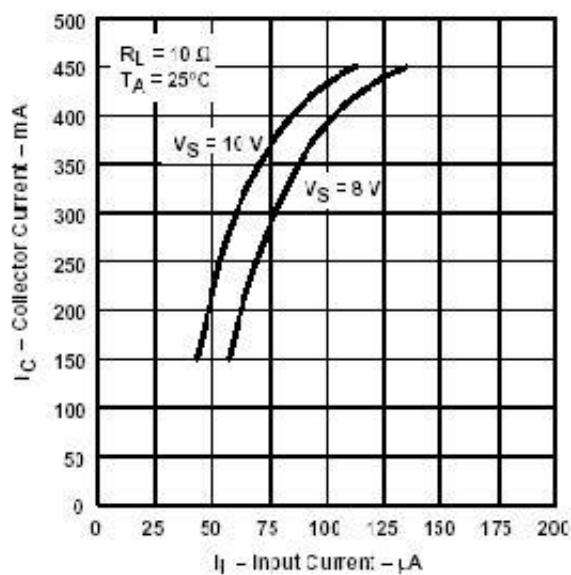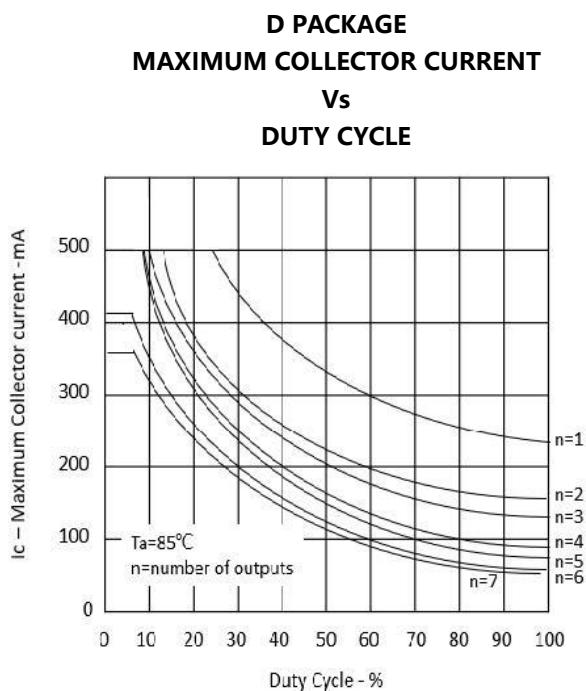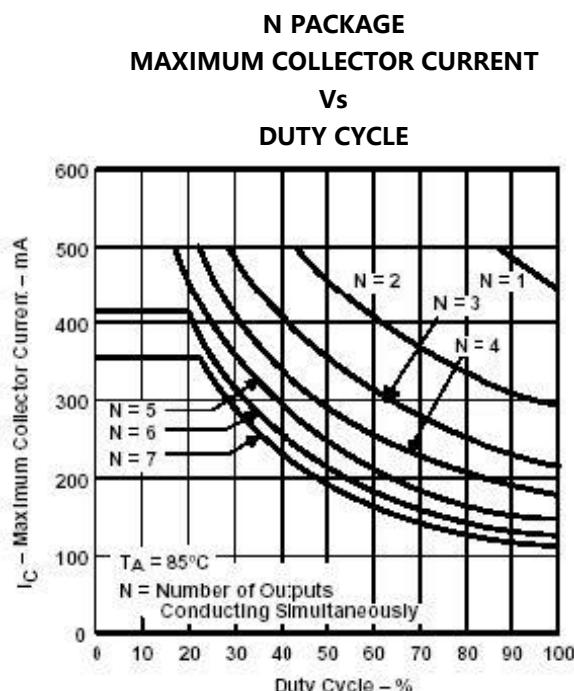
Figure 11

Figure 12

COLLECTOR CURRENT
vs
INPUT CURRENT

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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
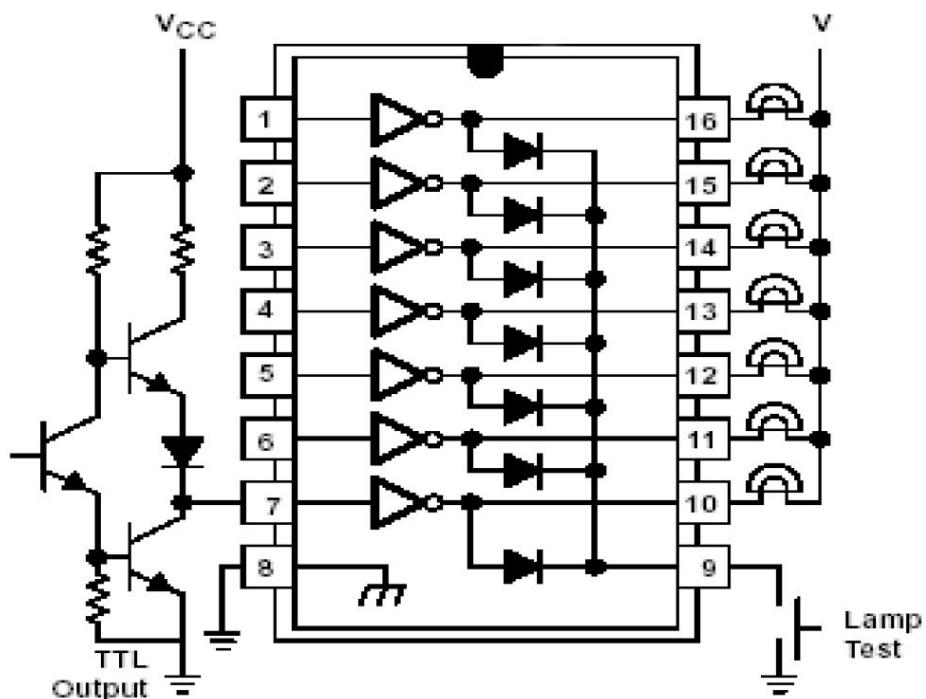
Figure 16. TTL to Load
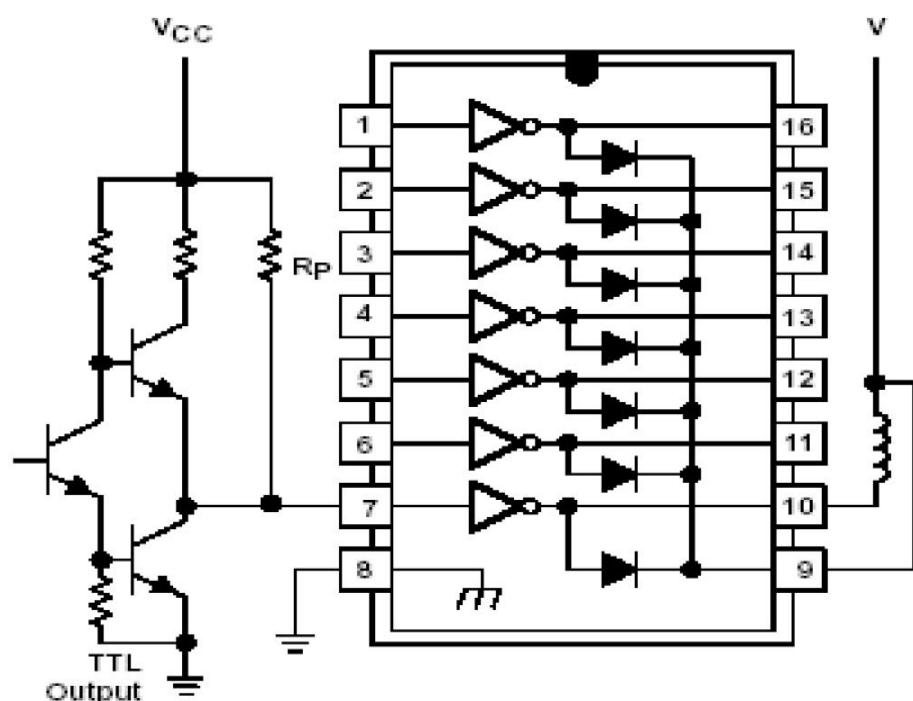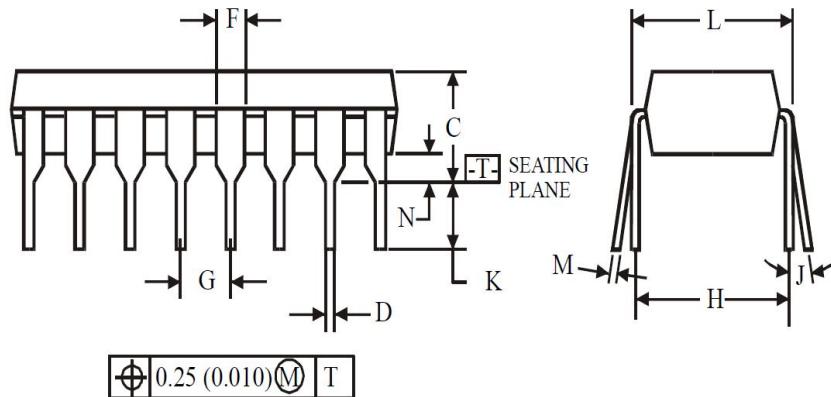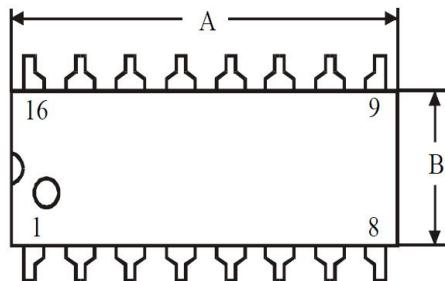
Figure 17. Use of Pullup Resistors to
Increase Drive Current

Package Dimensions
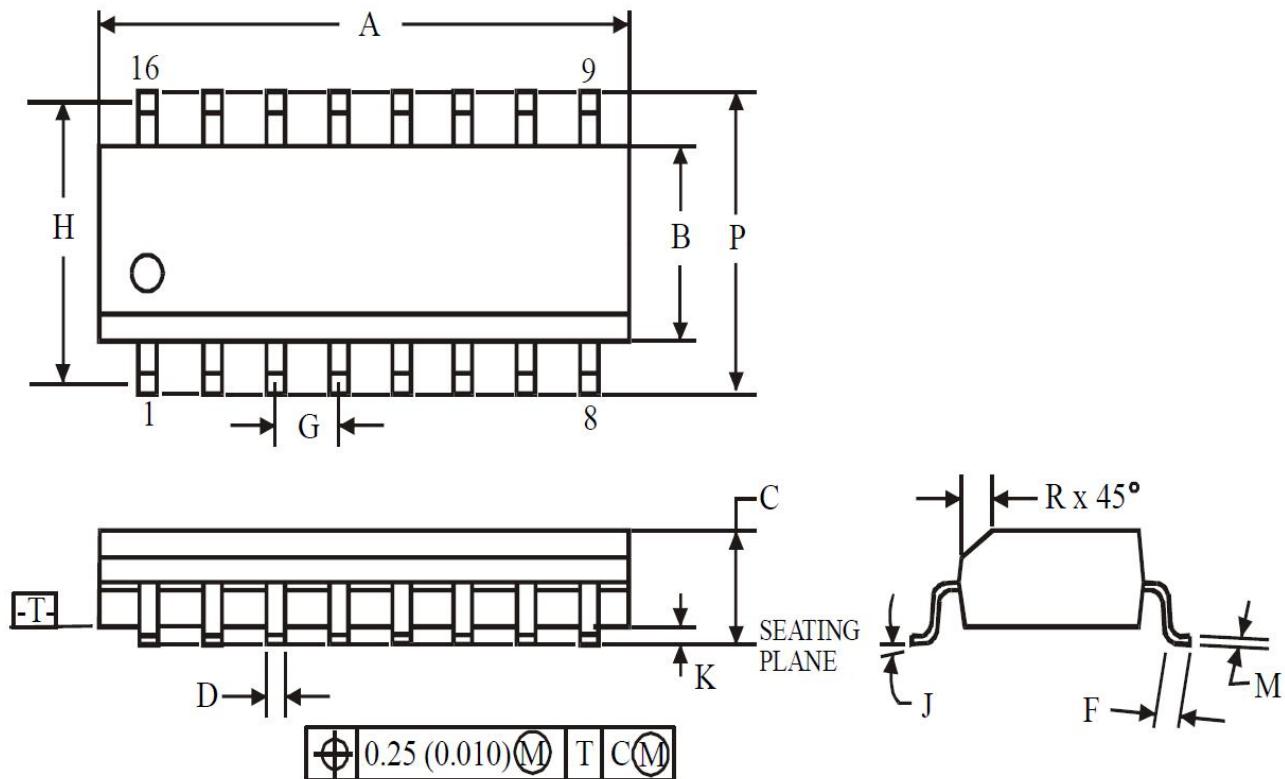
DIP-16

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.

PACKAGE/ORDERING INFORMATION

PRODUCT	ORDERING	TEMPRANGE	PACKAGE	PAKEAGE	TRANSPOT
CBM2004	CBM2004AS	-40℃~85℃	SOP-16	CBM2004AS	Tape and Reel,2500
CBM2004	CBM2004AIP	-40℃~85℃	DIP-16	CBM2004AIP	Tape and Reel,50

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