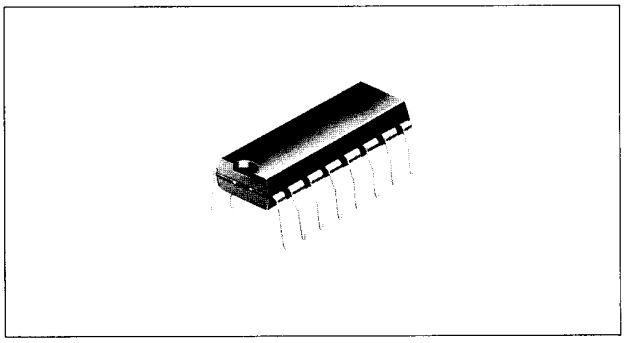
BA12003 BA12004



Dimensions (Unit: mm)

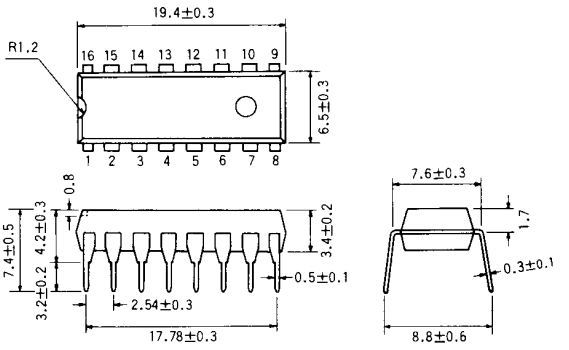


Fig. 1

The BA12003 and BA12004 are high-voltage, high-current transistor arrays each containing seven Darlington transistors. With internal surge suppressors and base current limiting resistor for inductive load driving (such as relay coils), the devices require few external components. Also featuring high output voltage (50 V) and high output sink current (500 mA), the BA12003 and BA12004 are suited for interfacing with other drivers and power devices.

Features

1. High output sink current (I_{OUT}=500 mA max.).
2. High output voltage (V_{OUT}=50 V max.).
3. Seven Darlington transistor arrays implemented on a single chip.
4. Internal surge suppressor in output stage.
5. Pin-compatible with the XR-2203/ XR-2204 by EXAR and the μPA2003C/μPA2004C by NEC.

Applications

LED, lamp, relay and solenoid drivers
Device interface

Block Diagram

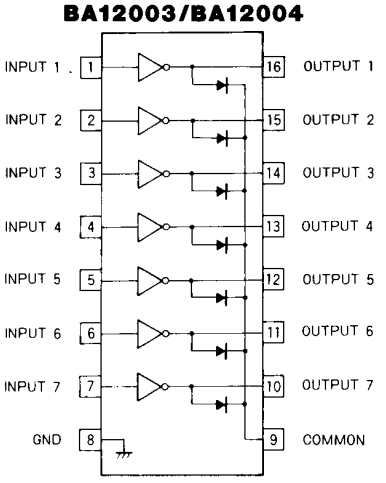


Fig. 2

Circuit Diagrams

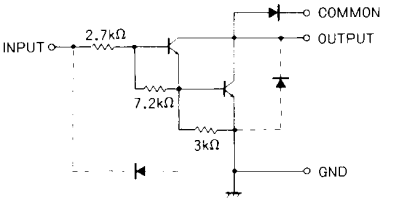


Fig. 3 1/7 BA12003 circuit

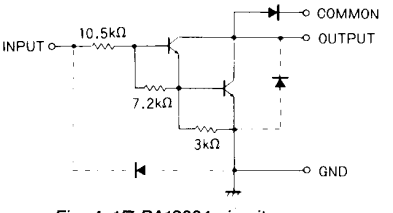


Fig. 4 1/7 BA12004 circuit

Absolute Maximum Ratings (Ta=25°C)

Parameter	Symbol	Limits	Unit
Supply voltage	V_{CE}	50	V
Power dissipation	Pd	1100*1	mW
Operating temperature range	Topr	−25~75	°C
Storage temperature range	Tstg	−55~125	°C
Input voltage	V_{IN}	−0.5~30	V
Output current	I_{OUT}	500	mA/unit
Ground pin current	I_{GND}	2.3*2	A
Diode reverse voltage	V_R	60	V
Diode forward current	I_F	500	mA

*1 Derating is done at 11mW/°C for operation above Ta=25°C.
*2 Pulse width ≦20ms, duty cycle ≦10%, same current through 7 circuits.

Recommended Operating Conditions (Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Output current	I_{OUT}	—	—	350	mA	Refer to Figs. 8, 9
Supply voltage	V_{CE}	—	—	50	V	—
Input voltage	V_{IN}	−0.5	—	30	V	—
Power dissipation	Pd	—	—	1100	mW	Refer to Fig. 7

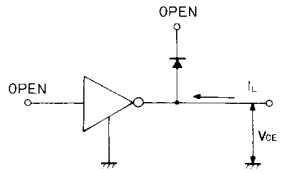
Electrical Characteristics (Unless otherwise specified, Ta=25°C)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions	Test circuit
Output leakage current		I_L	—	—	10	μA	V_{CE}=50V	Fig. 5
DC forward current transfer ratio		h_{FE}	1000	—	—	—	V_{CE}=2.0V, I_{OUT}=350mA	Fig. 5
Output saturation voltage		$V_{CE(sat)}$	—	—	1.1	V	I_{OUT}=100mA, I_{IN}=250μA	Fig. 5
Output saturation voltage		$V_{CE(sat)}$	—	—	1.3	V	I_{OUT}=200mA, I_{IN}=350μA	Fig. 5
Output saturation voltage		$V_{CE(sat)}$	—	—	1.6	V	I_{OUT}=350mA, I_{IN}=500μA	Fig. 5
Input voltage		V_{IN}	—	—	2.0(5.0)	V	V_{CE}=2.0V, I_{OUT}=100mA	Fig. 5
Input voltage		V_{IN}	—	—	2.4(6.0)	V	V_{CE}=2.0V, I_{OUT}=200mA	Fig. 5
Input voltage		V_{IN}	—	—	3.4(8.0)	V	V_{CE}=2.0V, I_{OUT}=350mA	Fig. 5
Input current	BA12003	I_{IN}	—	—	1.35	mA	V_{IN}=3.85V	Fig. 5
	BA12004		—	—	0.5		V_{IN}=5.0V	
Diode reverse current		I_R	—	—	50	μA	V_R=50V	Fig. 5
Diode forward voltage		V_F	—	—	2.0	V	I_F=350mA	Fig. 5
Input capacity		C_{IN}	—	70	—	pF	V_{IN}=0, f=1MHz	Fig. 5

Values within ( ) are for BA12003

Test Circuits

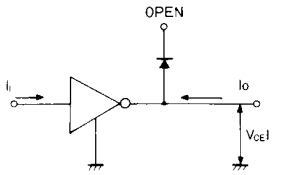
1) Output leakage current I_L



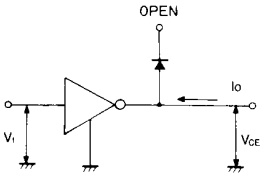
2) DC forward current transfer ratio

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

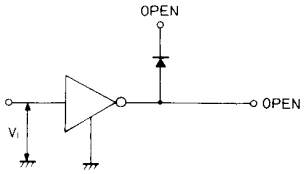
Output saturation voltage $V_{CE(sat)}$



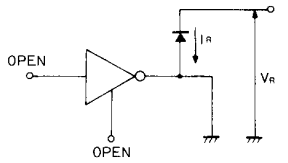
3) Input voltage V_{IN}



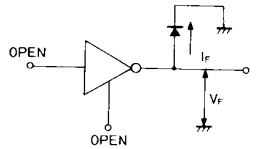
4) Input current I_{IN}



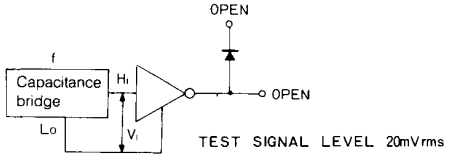
5) Diode reverse current I_R



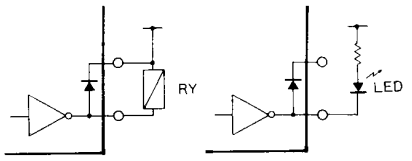
6) Diode forward voltage I_F



7) Input capacity C_{IN}



Application Examples



(1) Relay driver (2) LED driver

Fig. 6

The BA12003 is directly interfaceable with TTL and CMOS devices (operating at 5 V). To limit input current to the safety range, each input has an internal series resistor. The BA12004 is designed for direct interface with CMOS or PMOS devices operating on 6 to 15 V. To limit input current to the safety range, each input has an internal series resistor. The load should be connected across the driver output and power source. To protect the device from transient spikes, pull the COM pin (pin 9) up to the power supply.

Electrical Characteristic Curves (BA12003)

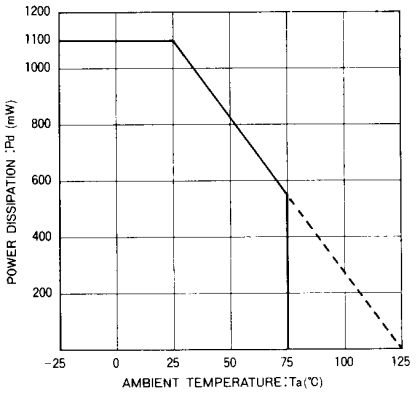


Fig. 7 Power dissipation vs. ambient temperature

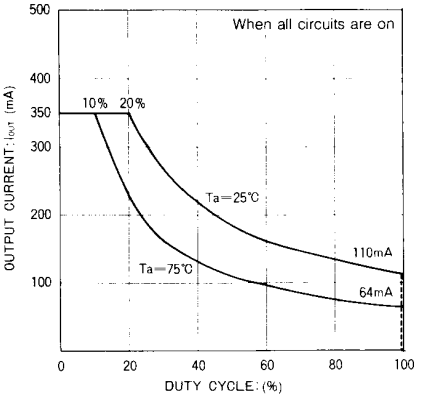


Fig. 8 Output current vs. duty cycle

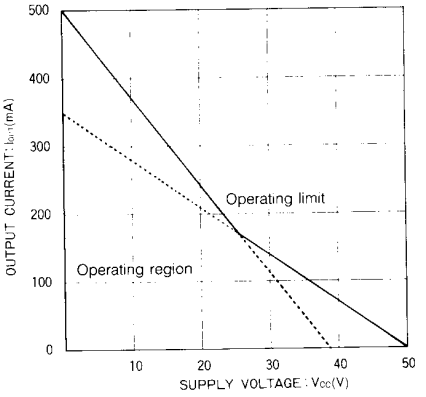


Fig. 9 Output current vs. supply voltage

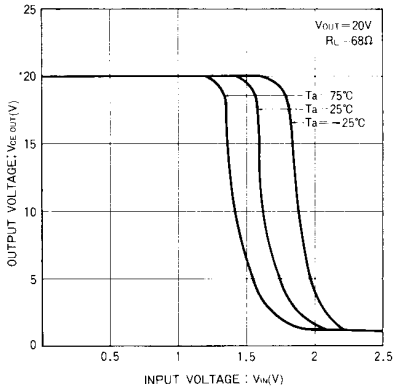


Fig. 10 Output voltage vs. input voltage

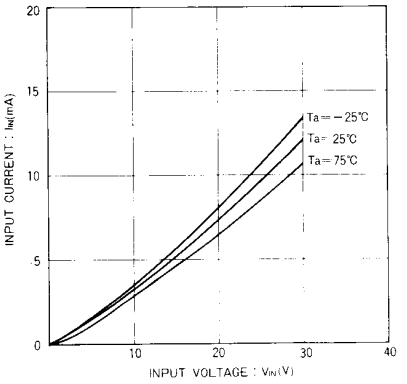


Fig. 11 Input current vs. input voltage

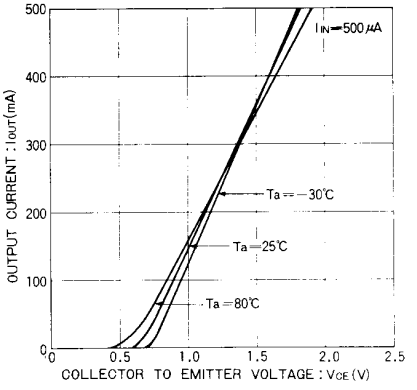


Fig. 12 Output current vs. collector to emitter voltage

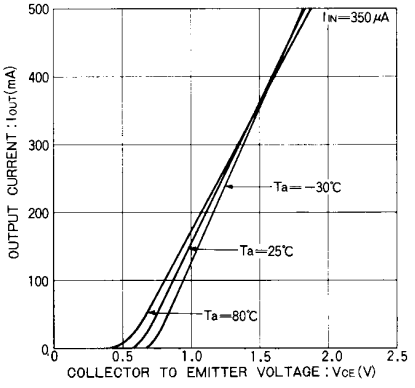


Fig. 13 Output current vs. collector to emitter voltage

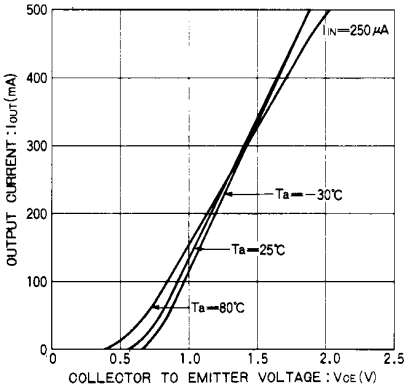


Fig. 14 Output current vs. collector to emitter voltage

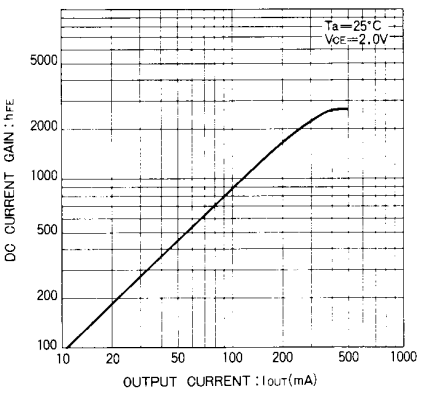


Fig. 15 DC current gain vs. output current

Electrical Characteristic Curves (BA12004)

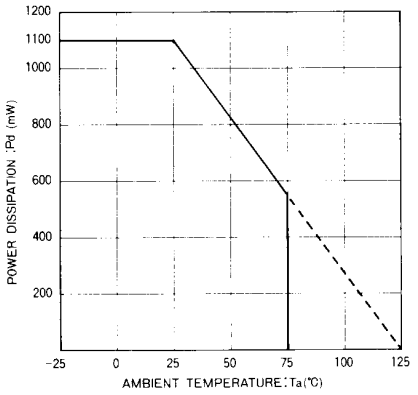


Fig. 16 Power dissipation vs. ambient temperature

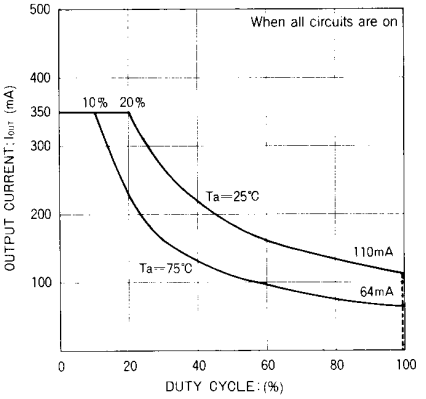


Fig. 17 Output current vs. duty cycle

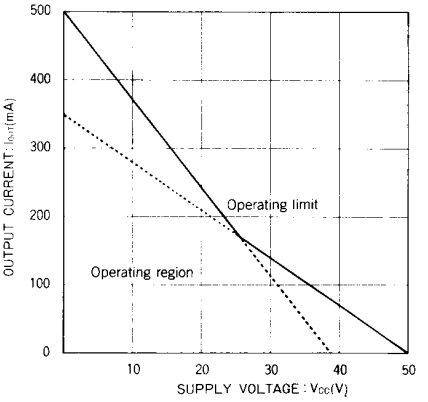


Fig .18 Output current vs. supply voltage

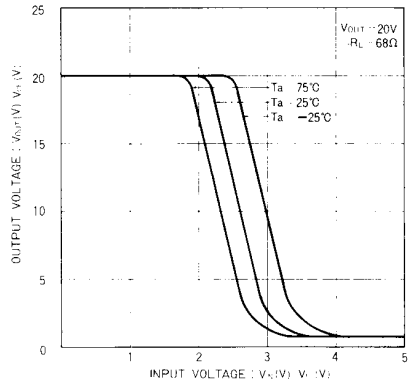


Fig. 19 Output voltage vs. input voltage

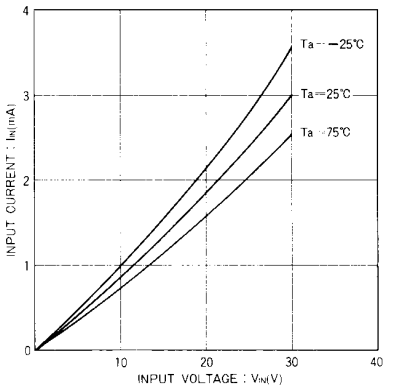


Fig. 20 Input current vs. input voltage

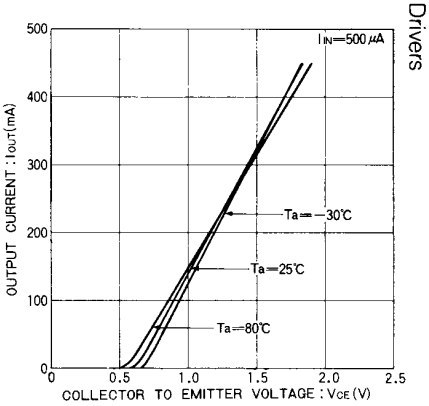


Fig. 21 Output current vs. collector to emitter voltage

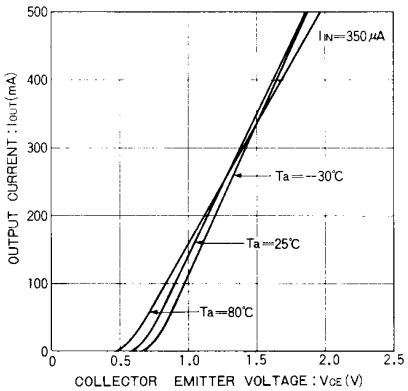


Fig. 22 Output current vs. collector to emitter voltage

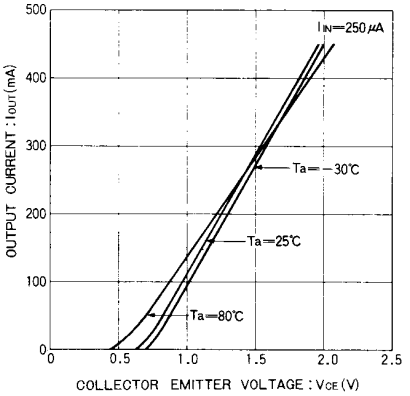


Fig. 23 Output current vs. collector to emitter voltage

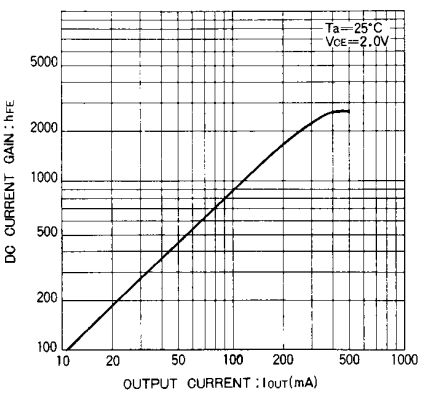


Fig. 24 DC current gain vs. output current