Interface driver for microcomputer peripheral and display devices

BA13002F

The BA13002F is a high current transistor array consisting of six circuits of Darlington transistors. Because it incorporates built-in surge-absorbing diodes and base current-control resistors needed when using inductive loads such as relay coils, attachments can be kept to a minimum.
With an output withstanding voltage as high as 20V and an output current (sink current) of 320mA, this product is ideal for use with various drivers and as an interface with other elements.

●Applications
Drivers for LEDs, lamps, relays and solenoids
Interface with other elements

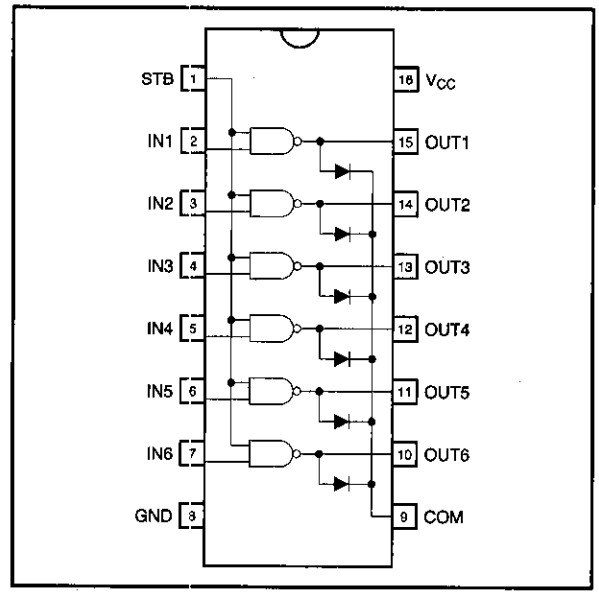
●Features
1) Output withstanding voltage (BVceo) of 20V.
2) High output current (Io) of 320mA (max.).
3) High current amplification factor (h_{FE}) of 1000 (min.).
4) Wide range of voltages (-25 to 20V) can be applied to input.
5) Equipped with output surge-absorbing clamp diode.
6) Equipped with strobe input pin.

●Absolute maximum ratings (Ta=20℃ to +75℃)

Parameter	Symbol	Limits	Unit
Power supply voltage	V_{CC}	10	V
Output withstanding voltage	V_{CEO}	−0.5~20	V
Output current	Io	320	mA
Input voltage	V_I	−25~20	V
Strobe input voltage	$V_{I\ (STB)}$	20	V
Clamp diode reverse voltage	$V_{R\ (D)}$	20	V
Clamp diode forward current	$I_{F\ (D)}$	320	mA
Power dissipation (Ta=25°C)	Pd	500 *1	mW
Operating temperature	Topr	−20~75	℃
Storage temperature	Tstg	−55~125	℃

*1 Reduced by 5.0mW for each increase in Ta of 1°C over 25°C.
(when a 50 x 50 x 1.6 mm glass epoxy PCB is used).

●Block diagram

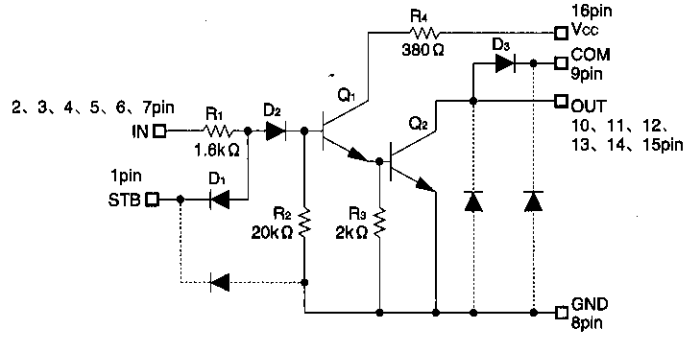


●Recommended operating conditions (Ta=-20℃ to 75℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Power supply voltage	V_{CC}	3	—	8	V	
Output voltage	V_O	0	—	20	V	
Output current	I_O	0	—	300	mA	Duty cycle of 20 % or less: Vcc=6.5 V
		0	—	150	mA	Duty cycle of 40 % or less: Vcc=6.5 V
"H" input voltage (strobe)	$V_{IH(STB)}$	2.4	—	18	V	
"L" input voltage (strobe)	$V_{IL(STB)}$	0	—	0.2	V	
"H" input voltage	V_{IH}	3.2	—	18	V	I_O=300mA
"L" input voltage	V_{IL}	0	—	0.7	V	$I_{O(leak)}$ =50 μA

●Internal circuit configuration diagram

BA13002F



(Resistor values are typical values.)

●Electrical characteristics (unless otherwise noted, Ta=-25℃ to +75℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions		Measurement Circuit
Output withstanding voltage	V_{CEO}	20	—	—	V	V_{CC}=8V, V_I=18V, $V_{I(STB)}$=0.2V, I_{CEO}=100μA		Fig.1
Output saturation voltage	$V_{CE(sat)}$	—	0.6	1.0	V	V_I=7V, $V_{I(STB)}$=2.4V	V_{CC}=6.5V, I_O=300mA	Fig.2
		—	0.5	0.85	V		V_{CC}=6.5V, I_O=250mA	
		—	0.3	0.5	V		V_{CC}=3V, I_O=120mA	
Clamp diode forward voltage	$V_{F(D)}$	—	1.4	2.4	V	$I_{F(D)}$=320mA		Fig.5
Clamp diode reverse voltage	$V_{R(D)}$	20	40	—	V	$I_{R(D)}$=100μA		Fig.6
Power supply current	I_{CC}	—	120	200	mA	V_{CC}=8V, V_I=7V(all inputs), $V_{I(STB)}$=2.4V		Fig.7
DC current amplification factor	h_{FE}	1000	3000	—		V_{CE}=4V, V_{CC}=6.5V, I_O=300mA, Ta=25℃		Fig.2
Turn-on time	t_{ON}	—	0.1	—	μS	Refer to test circuit diagrams.		Fig.8
Turn-off time	t_{OFF}	—	0.1	—				
Input current	I_I	—	0.5	1.4	mA	V_{CC}=8V, V_I=3.2V, $V_{I(STB)}$=2.4V		Fig.3
Input reverse current	I_R	—	—	−20	μA	V_{CC}=8V, V_I=−25V		
Strobe input current	$I_{I(STB)}$	—	−7.9	—	mA	V_{CC}=8V, V_I=3.2V(all inputs), $V_{I(STB)}$=0.2V		Fig.4
Strobe input reverse current	$I_{R(STB)}$	—	—	20	μA	V_{CC}=8V, V_I=0V, $V_{I(STB)}$=20V		

●Measurement circuits

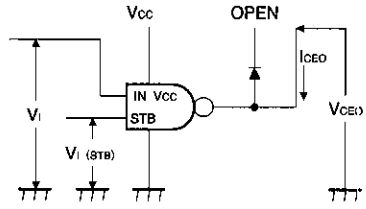


Fig.1 Output withstanding voltage V_{CEO}

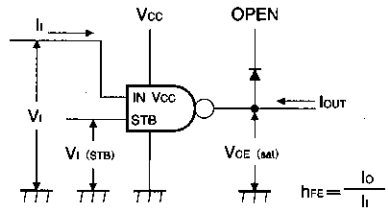


Fig.2 Output saturation voltag $V_{CE\ (sat)}$
DC current amplification factor h_{FE}

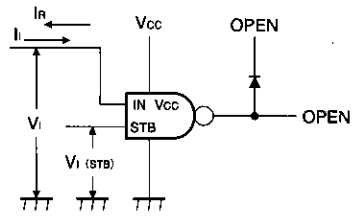


Fig.3 Input current I_I • Input reverse current I_R

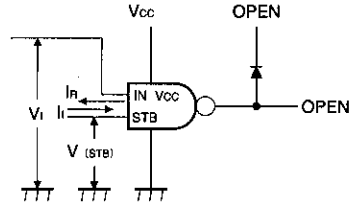


Fig.4 Strobe input current $I_{I\ (STB)}$ •
Strobe input reverse current $I_{R\ (STB)}$

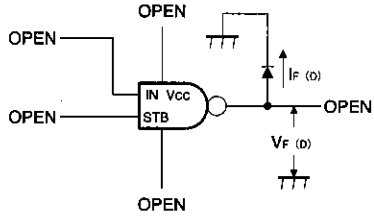


Fig.5 Clamp diode forward voltag $V_{F\ (D)}$

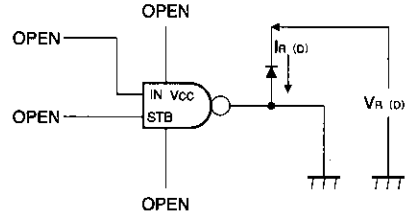


Fig.6 Clamp diode reverse voltage $V_{R\ (D)}$

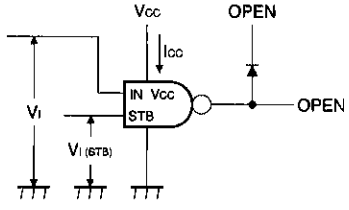


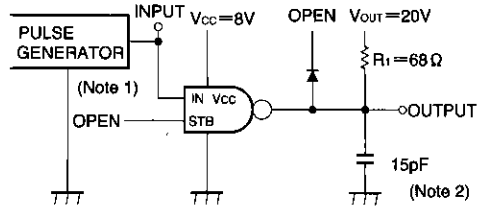
Fig.7 Power supply current I_{CC}

●Circuit operation

Input/output logic table

IN	STB	OUT
L	L	H
H	L	H
L	H	H
H	H	L

The driver operates based on the logic in the above table.



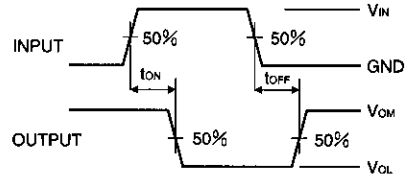
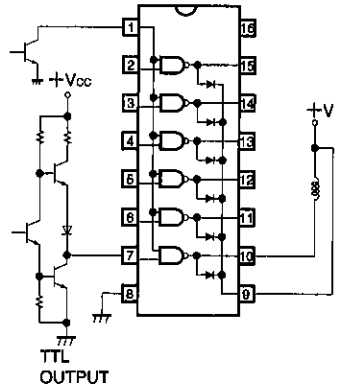


Fig.8 Turn-on time t_{ON}
Turn-off time t_{OFF}

(Note 1) Pulse width: 10 μs, duty cycle≦5 %
(Note 2) Including probe capacitance

●Application example



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●Operation notes

Make sure that the duty cycle – output current characteristic range is not exceeded.

●Thermal reduction curve

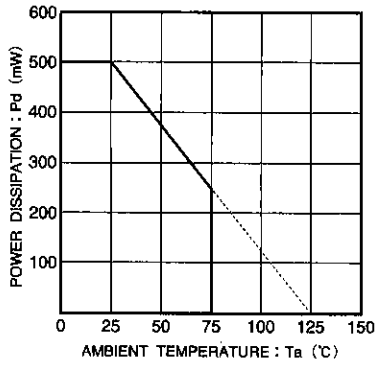


Fig.9 Thermal reduction curve

●Measurement data

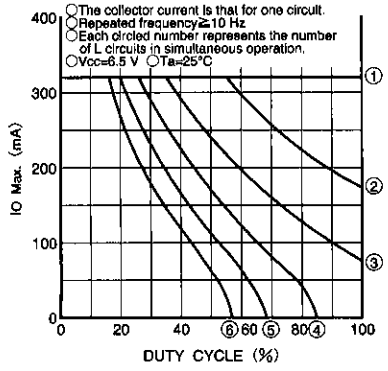


Fig.10 Duty cycle - collector current characteristics (I)

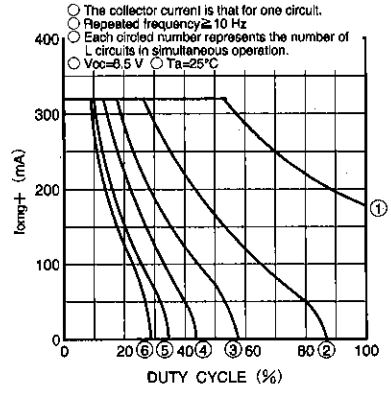


Fig.11 Duty cycle - collector current characteristics (II)

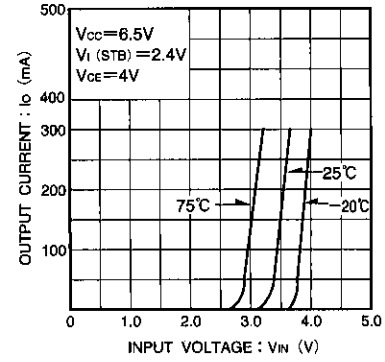


Fig.12 Output current - input voltage characteristics

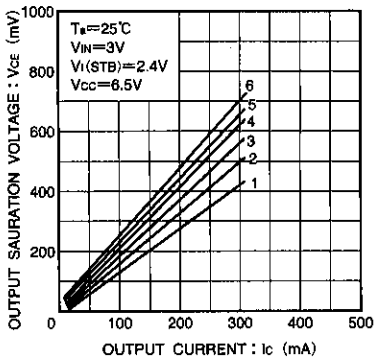


Fig.13 Output saturation voltage - output current characteristics

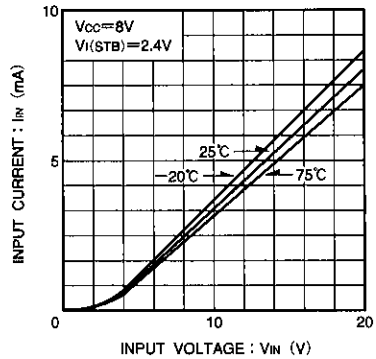


Fig.14 Input current - input voltage characteristics

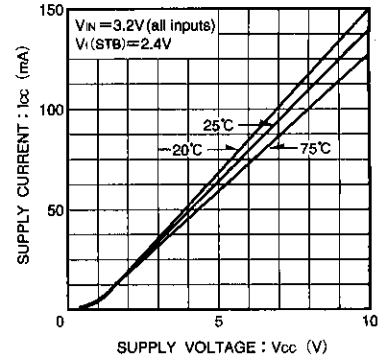


Fig.15 Power supply current - power supply voltage characteristics

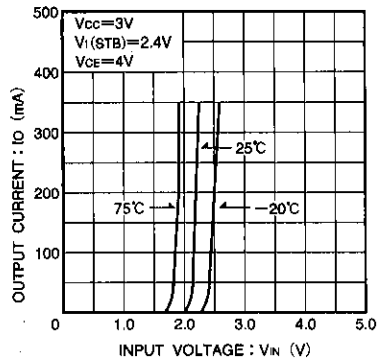


Fig.16 Output current - input voltage characteristics 1

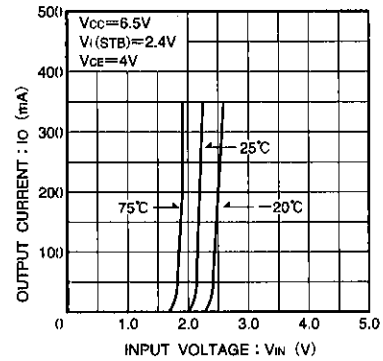


Fig.17 Output current - input voltage characteristics

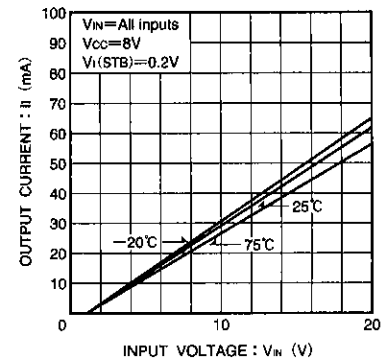


Fig.18 Input current - input voltage characteristics

●Measurement data

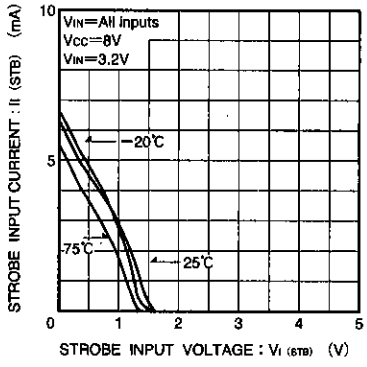


Fig.19 Strobe terminal input current - input voltage characteristics

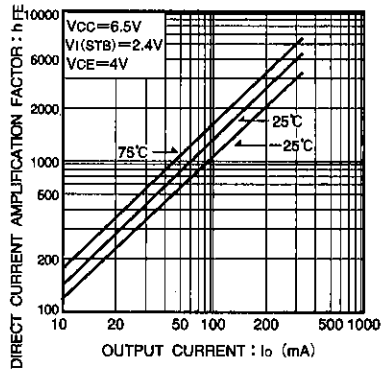
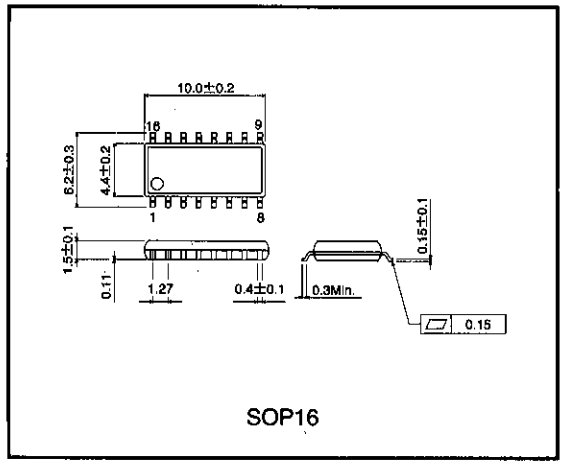


Fig.20 DC current amplification factor characteristics

●External dimensions (Units: mm)



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