µA9665 • µA9666
µA9667 • µA9668
High Current/Voltage Darlington Drivers

Linear Division Interface Products

Description

The µA9665, µA9666, µA9667, and µA9668 are comprised of seven high voltage, high current NPN Darlington transistor pairs. All units feature common emitter, open collector outputs. To maximize their effectiveness, these units contain suppression diodes for inductive loads and appropriate emitter base resistors for leakage.

The µA9665 is a general purpose array which may be used with DTL, TTL, PMOS, CMOS, etc. Input current limiting is done by connecting an appropriate discrete resistor to each input.

The µA9666 version does away with the need for any external discrete resistors, since each unit has a resistor and a Zener diode in series with the input. The µA9666 was specifically designed for direct interface from PMOS logic (operating at supply voltages from 14 V to 25 V) to solenoids or relays.

The µA9667 has a series base resistor to each Darlington pair, thus allowing operation directly with TTL or CMOS operating at supply voltages of 5.0 V.

The µA9668 has an appropriate input resistor to allow direct operation from CMOS or PMOS outputs operating from supply voltages of 6.0 V to 15 V.

The µA9665, µA9666, µA9667, and µA9668 offer solutions to a great many interface needs, including solenoids, relays, lamps, small motors, and LEDs. Applications requiring sink currents beyond the capability of a single output may be accommodated by paralleling the outputs.

- **Seven High Gain Darlington Pairs**
- **High Output Voltage (V_{CE} = 50 V)**
- **High Output Current (I_C = 350 mA)**
- **DTL, TTL, PMOS, CMOS Compatible**
- **Suppression Diodes For Inductive Loads**
- **2 Watt Molded DIP On Copper Lead Frame**
- **Extended Temperature Range**

Connection Diagram
16-Lead DIP
(Top View)
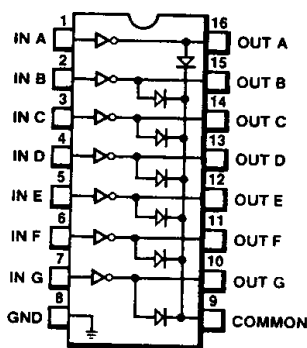
CD00940F

Order Information

Device Code	Package Code	Package Description
µA9665DC	6B	Ceramic DIP
µA9665PC	9B	Molded DIP
µA9666DM	6B	Ceramic DIP
µA9666DC	6B	Ceramic DIP
µA9666PC	9B	Molded DIP
µA9667DM	6B	Ceramic DIP
µA9667DC	6B	Ceramic DIP
µA9667PC	9B	Molded DIP
µA9668DM	6B	Ceramic DIP
µA9668DC	6B	Ceramic DIP
µA9668PC	9B	Molded DIP

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Absolute Maximum Ratings

Storage Temperature Range
    Ceramic DIP   –65°C to +175°C
    Molded DIP   –65°C to +150°C
Operating Temperature Range
    Extended (μA9666/7/8M)   –55°C to +125°C
    Commercial (μA9665/6/7/8C)   0°C to +70°C
Lead Temperature
    Ceramic DIP (soldering, 60 s)   300°C
    Molded DIP (soldering, 10 s)   265°C
Internal Power Dissipation[1, 2]
    16L-Ceramic DIP   1.50 W
    16L-Molded DIP   1.04 W
Input Voltage   30 V
Output Voltage   55 V
Emitter-Base Voltage   6.0 V
Continuous Collector Current   500 mA
Continuous Base Current   25 mA

Notes

1. $T_{J\ Max} = 175°C$ for the Ceramic DIP, and 150°C for the Molded DIP.
2. Ratings apply to ambient temperature at 25°C. Above this temperature, derate the 16L-Ceramic DIP at 10 mW/°C, and the 16L-Molded DIP at 8.3 mW/°C.
3. Under normal operating conditions, these units will sustain 350 mA per output with $V_{CE(Sat)} = 1.6$ V at 70°C with a pulse width of 20 ms and a duty cycle of 30%.
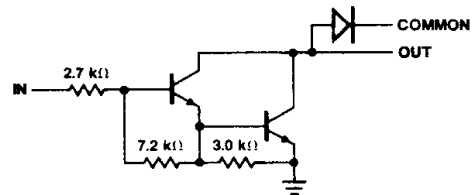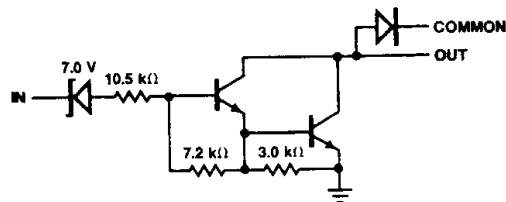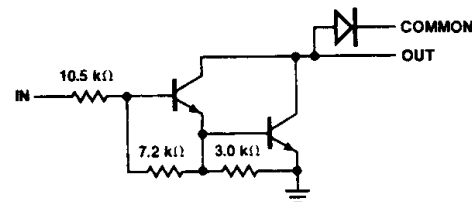
Equivalent Circuits
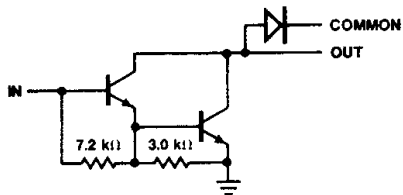
μA9665

EQ00321F

μA9667

EQ00341F

μA9666

EQ00331F

μA9668

EQ00351F

μA9665/6/7/8
Electrical Characteristics $T_A = 25°C$, unless otherwise specified.

| Symbol	Characteristic	Conditions[1]		Test Figure	Min	Typ	Max	Unit
I_{CEX}	Output Leakage Current	$T_A = 70°C$ for Commercial $V_{CE} = 50$ V		1a			100	μA
		$V_{CE} = 50$ V, $V_I = 6.0$ V	μA9666	1b			500	
		$V_{CE} = 50$ V, $V_I = 1.0$ V	μA9668	1b			500	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 350$ mA, $I_B = 500$ μA		2		1.25	1.6	V
		$I_C = 200$ mA, $I_B = 350$ μA		2		1.1	1.3	
		$I_C = 100$ mA, $I_B = 250$ μA		2		0.9	1.1	
$I_{I(ON)}$	Input Current	$V_I = 17$ V	μA9666	3		0.85	1.3	mA
		$V_I = 3.85$ V	μA9667	3		0.93	1.35	
		$V_I = 5.0$ V	μA9668	3		0.35	0.5	
		$V_I = 12$ V		3		1.0	1.45	
$I_{I(OFF)}$	Input Current[2]	$T_A = 70°C$ for Commercial $I_C = 500$ μA		4	50	65		μA
$V_{I(ON)}$	Input Voltage[3]	$V_{CE} = 2.0$ V, $I_C = 300$ mA	μA9666	5			13	V
		$V_{CE} = 2.0$ V, $I_C = 200$ mA	μA9667	5			2.4	
		$V_{CE} = 2.0$ V, $I_C = 250$ mA		5			2.7	
		$V_{CE} = 2.0$ V, $I_C = 300$ mA		5			3.0	
		$V_{CE} = 2.0$ V, $I_C = 125$ mA	μA9668	5			5.0	
		$V_{CE} = 2.0$ V, $I_C = 200$ mA		5			6.0	
		$V_{CE} = 2.0$ V, $I_C = 275$ mA		5			7.0	
		$V_{CE} = 2.0$ V, $I_C = 350$ mA		5			8.0	
h_{FE}	DC Forward Current Transfer Ratio	$V_{CE} = 2.0$ V, $I_C = 350$ mA	μA9665	2	1000			
C_I	Input Capacitance					15	30	pF
t_{PLH}	Turn-On Delay	0.5 V_I to 0.5 V_O				1.0	5.0	μs
t_{PHL}	Turn-Off Delay	0.5 V_I to 0.5 V_O				1.0	5.0	μs
I_R	Clamp Diode Leakage Current	$V_R = 50$ V		6			50	μA
V_F	Clamp Diode Forward Voltage	$I_F = 350$ mA		7		1.7	2.0	V

Notes
1. All limits stated apply to the complete Darlington series except as specified for a single device type.
2. The $I_{I(OFF)}$ current limit guaranteed against partial turn-on of the output.
3. The $V_{I(ON)}$ voltage limit guarantees a minimum output sink current per the specified test conditions.
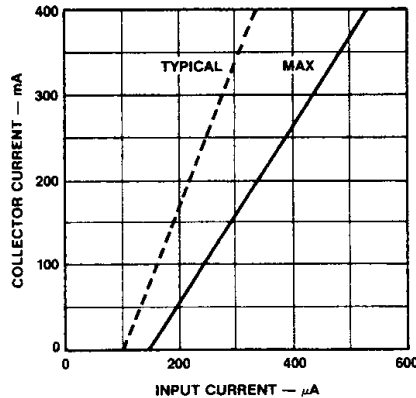
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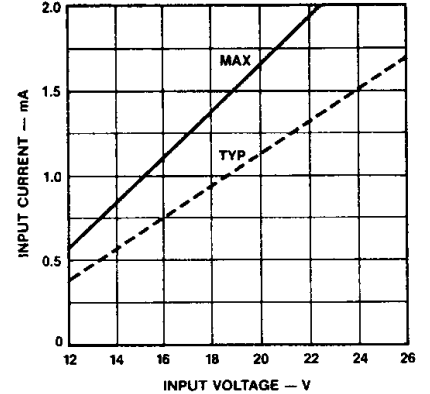## Typical Performance Curves

Collector Current vs Saturation Voltage
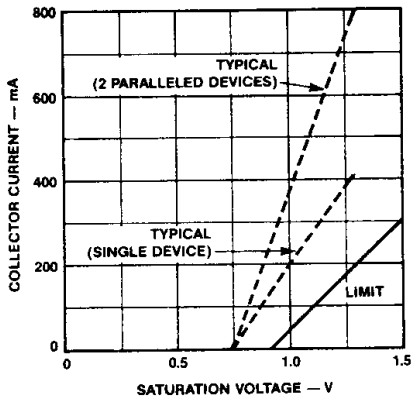
PC06231F

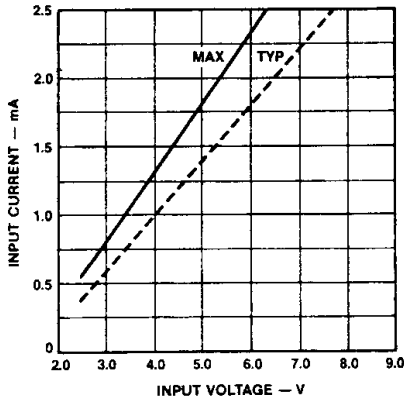### Collector Current vs Input Current

PC06241F

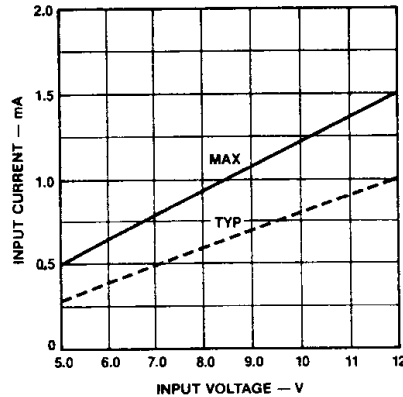### μA9666 Input Current vs Input Voltage

PC06251F

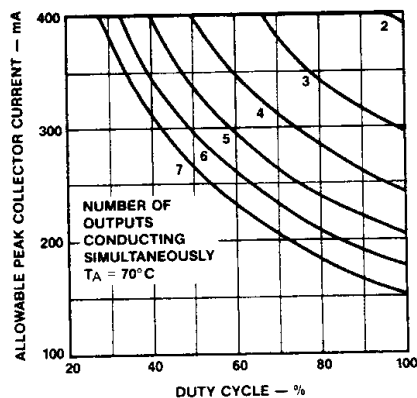### μA9667 Input Current vs Input Voltage

PC06261F
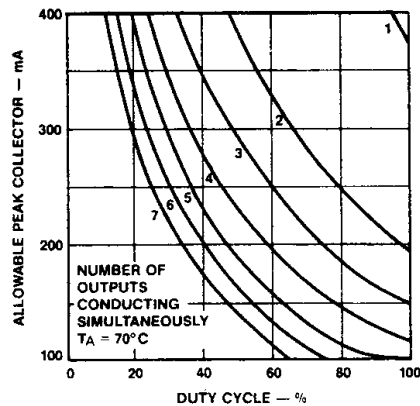
μA9668 Input Current vs Input Voltage

PC06271F

Peak Collector Current vs Duty Cycle and Number of Outputs (Molded Package)

PC06291F

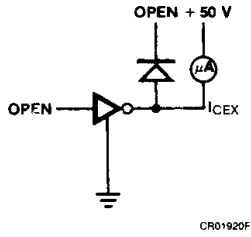### Peak Collector Current vs Duty Cycle and Number of Outputs (Ceramic Package)

PC06301F

9-146

Test Circuits

Figure 1a

CR01920F

Figure 1b

CR01940F

Figure 2

CR01960F

Figure 3

CR01980F

Figure 4
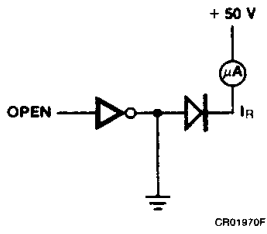

CR01930F

Figure 5

CR01950F

Figure 6

CR01970F

Figure 7

CR01990F

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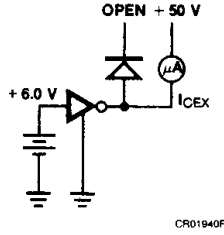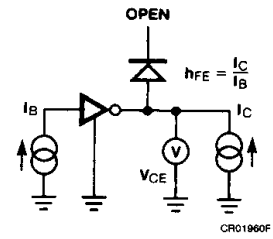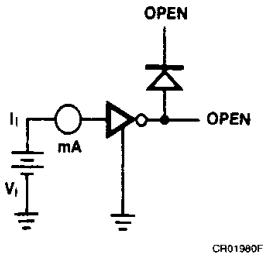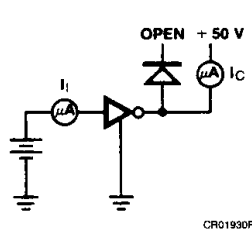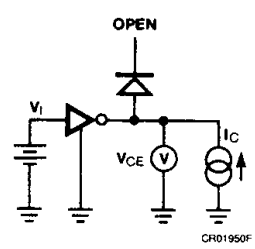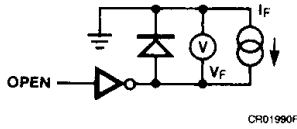
Typical Applications

PMOS to Load

PMOS OUTPUT

μA9666

V₁   V₂
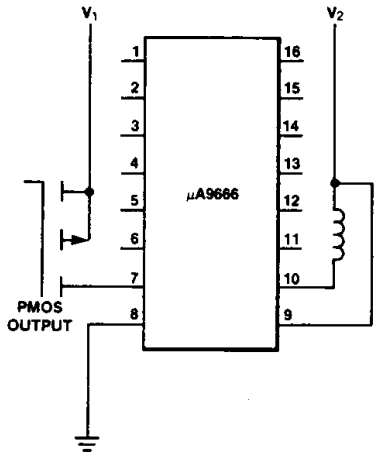
CR02000F

Buffer for Higher Current Loads

μA9667

TTL OUTPUT

LAMP TEST

V₁   V₂

CR02010F

TTL to Load

μA9668

CMOS OUTPUT

200 Ω
200 Ω
2N4901

V₁   V₂

CR02020F