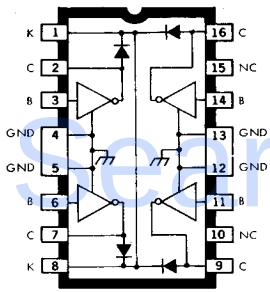
2061 THRU 2074

1.5 A DARLINGTON SWITCHES

ULN2064/65B



Dwg. No. A-9765A

ABSOLUTE MAXIMUM RATINGS at +25°C Free-Air Temperature for Any One Driver (unless otherwise noted)

Output Voltage, V_{CEX} . . . . . **See Guide**
Output Sustaining Voltage, $V_{CE(SUS)}$ . . . . . **See Guide**
Output Current, I_{OUT} (Note 1) . . . . . **1.75 A**
Input Voltage, V_{IN} (Note 2) . . . . . **See Guide**
Input Current, I_B (Note 3) . . . . . **25 mA**
Supply Voltage, V_S (ULN2068B/LB & 2069B) . . . . . **10 V**
Total Package Power Dissipation, P_D . . . . . **See Graph**
Operating Temperature Range, T_A . . . . . **-20°C to +85°C**
Storage Temperature Range, T_S . . . . . **-55°C to -150°C**

1. Allowable combinations of output current, number of outputs conducting, and duty cycle are shown on following pages.
2. Input voltage is referenced to the substrate (no connection to other pins) for the ULN2061/62M and ULN2074B, reference is ground for all other types.
3. Input current may be limited by maximum allowable input voltage.

High-voltage, high-current Darlington arrays ULN2061M through ULN2074B are designed for interface between low-level logic and a variety of peripheral loads such as relays, solenoids, dc and stepper motors, magnetic print hammers, multiplexed LED and incandescent displays, heaters, and similar loads. Output OFF voltage ratings of 50 V and 80 V are available. In the DIP, the quad drivers can drive resistive loads to 480 watts (1.5 A x 80 V, 26% duty cycle). For inductive loads, sustaining voltages of 35 V and 50 V at 100 mA are specified.

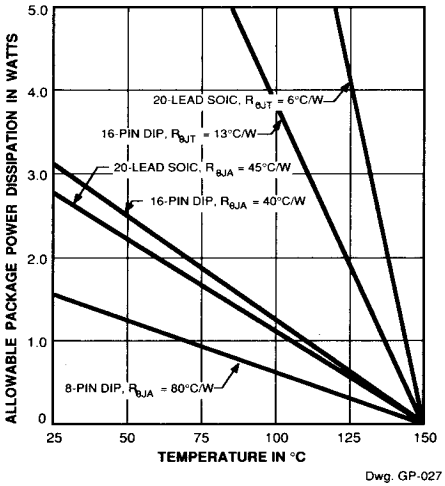
Dual-driver arrays ULN2061M and the higher-voltage ULN2062M are used for common-emitter (externally connected) or emitter-follower applications. They are supplied in 8-pin plastic mini-DIPs.

Quad drivers ULN2064B/LB, ULN2065B, ULN2068B/LB, and ULN2069B are intended for use with TTL, low-speed TTL, and 5 V MOS logic. The ULN2065B and ULN2069B are selected for the 80 V minimum output breakdown specification. The ULN2068B/LB and ULN2069B have pre-driver stages and are recommended for applications requiring high gain (low input-current loading). Isolated Darlington array ULN2074B is identical to the ULN2064B except for the isolated Darlington pinout and the deletion of suppression diodes. This switch is for emitter-follower applications. Quad-driver arrays are supplied with heat-sink contact tabs in 16-pin plastic DIPs (suffix B) and 20-lead surface-mountable wide-body SOICs (suffix LB).

FEATURES

- TTL, DTL, MOS, CMOS Compatible Inputs
- Transient-Protected Outputs
- Loads to 480 Watts
- Heat-Sink Contact Tabs on Quad Arrays

Always order by complete part number, e.g., **ULN2061M** . See matrix on next page. Note that all devices are not available in all package types.



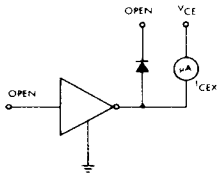
Dwg. GP-027

SELECTION GUIDE

Part Number*	Max. V_{CEX}	Min. $V_{CE(SUS)}$	Max. V_{IN}	Application
ULN2061M	50 V	35 V	30 V	TTL, DTL, Schottky TTL, and 5 V CMOS
ULN2062M	80 V	50 V	60 V	
ULN2064B ULN2064LB	50 V	35 V	15 V	TTL, DTL, Schottky TTL, and 5 V CMOS
ULN2065B	80 V	50 V	15 V	
ULN2068B ULN2068LB	50 V	35 V	15 V	TTL, DTL, Schottky TTL, and 5 V CMOS
ULN2069B	80 V	50 V	15 V	
ULN2074B	50 V	35 V	30 V	General Purpose

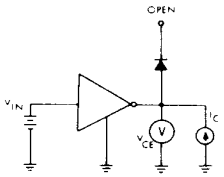
* Suffixes 'LB' are SOICs, 'B' and 'M' are DIPs.

TEST FIGURES



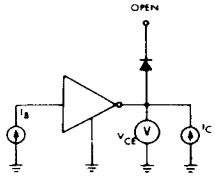
Dwg. No. A-9729A

FIGURE 1



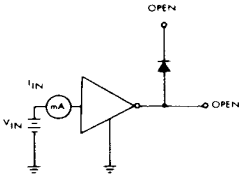
Dwg. No. A-10,350

FIGURE 2



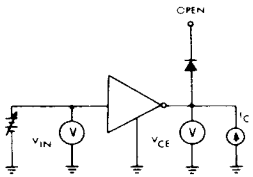
Dwg. No. A-10,349

FIGURE 3



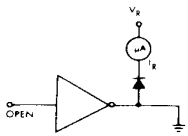
Dwg. No. A-9732

FIGURE 4



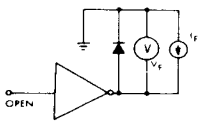
Dwg. No. A-9734A

FIGURE 5



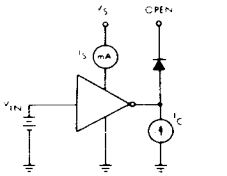
Dwg. No. A-9735A

FIGURE 6



Dwg. No. A-9736

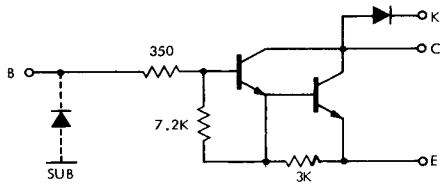
FIGURE 7



Dwg. No. A-10,351

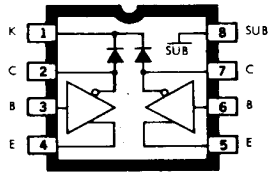
FIGURE 8

PARTIAL SCHEMATIC



Dwg. No. A-10,352B

ULN2061/62M



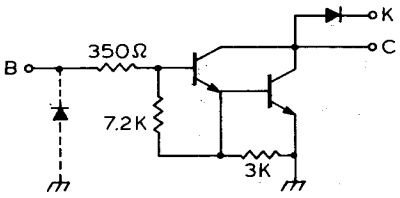
Dwg. No. A-10,230A

ELECTRICAL CHARACTERISTICS at +25°C (unless otherwise noted).

Characteristic	Symbol	Test Fig.	Applicable Devices	Test Conditions	Limits Min.	Limits Max.	Units
Output Leakage Current	I_{CEX}	1	ULN2061M	V_{CE} = 50 V	—	100	µA
				V_{CE} = 50 V, T_A = 70°C	—	500	µA
			ULN2062M	V_{CE} = 80 V	—	100	µA
				V_{CE} = 80 V, T_A = 70°C	—	500	µA
Output Sustaining Voltage	$V_{CE(SUS)}$	2	ULN2061M	I_C = 100 mA, V_{IN} = 0.4 V	35	—	V
			ULN2062M	I_C = 100 mA, V_{IN} = 0.4 V	50	—	V
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$	3	Both	I_C = 500 mA, I_B = 625 µA	—	1.1	V
				I_C = 750 mA, I_B = 935 µA	—	1.2	V
				I_C = 1.0 A, I_B = 1.25 mA	—	1.3	V
				I_C = 1.25 A**, I_B = 2.0 mA	—	1.4	V
			ULN2062M	I_C = 1.5 A**, I_B = 2.25 mA	—	1.5	V
Input Current	$I_{IN(ON)}$	4	Both	V_{IN} = 2.4 V	1.4	4.3	mA
				V_{IN} = 3.75 V	3.3	9.6	mA
Input Voltage	$V_{IN(ON)}$	5	Both	V_{CE} = 2.0 V, I_C = 1.0 A	—	2.0	V
			ULN2061M	V_{CE} = 2.0 V, I_C = 1.25 A**	—	2.5	V
			ULN2062M	V_{CE} = 2.0 V, I_C = 1.5 A**	—	2.5	V
Turn-On Delay	t_{PLH}	—	Both	0.5 E_{in} to 0.5 E_{out}	—	1.0	µs
Turn-Off Delay	t_{PHL}	—	Both	0.5 E_{in} to 0.5 E_{out}	—	1.5	µs
Clamp Diode Leakage Current	I_R	6	ULN2061M	V_R = 50 V	—	50	µA
				V_R = 50 V, T_A = 70°C	—	100	µA
			ULN2062M	V_R = 80 V	—	50	µA
				V_R = 80 V, T_A = 70°C	—	100	µA
Clamp Diode Forward Voltage	V_F	7	Both	I_F = 1.0 A	—	1.75	V
				I_F = 1.5 A	—	2.0	V

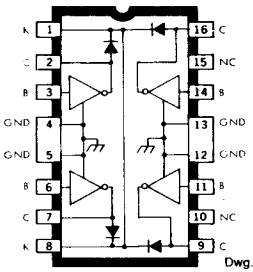
**Pulse-Test

PARTIAL SCHEMATIC



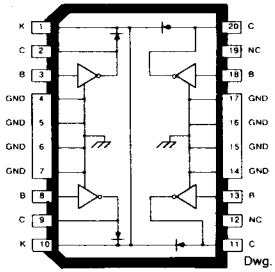
Dwg. No. A-10,353C

ULN2064/65B



Dwg. No. A-9765A

ULN2064LB



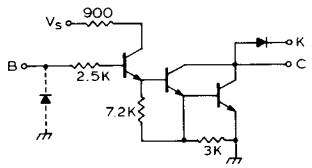
Dwg. No. A-14,326

ELECTRICAL CHARACTERISTICS at +25°C (unless otherwise noted).

Characteristic	Symbol	Test Fig.	Applicable Devices	Test Conditions	Limits Min.	Limits Max.	Units
Output Leakage Current	I_{CEX}	1	ULN2064*	V_{CE} = 50 V	—	100	µA
				V_{CE} = 50 V, T_A = 70°C	—	500	µA
			ULN2065B	V_{CE} = 80 V	—	100	µA
				V_{CE} = 80 V, T_A = 70°C	—	500	µA
Output Sustaining Voltage	$V_{CE(SUS)}$	2	ULN2064*	I_C = 100 mA, V_{IN} = 0.4 V	35	—	V
			ULN2065B	I_C = 100 mA, V_{IN} = 0.4 V	50	—	V
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$	3	Both	I_C = 500 mA, I_B = 625 µA	—	1.1	V
				I_C = 750 mA, I_B = 935 µA	—	1.2	V
				I_C = 1.0 A, I_B = 1.25 mA	—	1.3	V
				I_C = 1.25 A, I_B = 2.0 mA	—	1.4	V
			ULN2065B	I_C = 1.5 A, I_B = 2.25 mA	—	1.5	V
Input Current	$I_{IN(ON)}$	4	Both	V_{IN} = 2.4 V	1.4	4.3	mA
				V_{IN} = 3.75 V	3.3	9.6	mA
Input Voltage	$V_{IN(ON)}$	5	Both	V_{CE} = 2.0 V, I_C = 1.0 A	—	2.0	V
			ULN2064*	V_{CE} = 2.0 V, I_C = 1.25 A	—	2.5	V
			ULN2065B	V_{CE} = 2.0 V, I_C = 1.5 A	—	2.5	V
Turn-On Delay	t_{PLH}	—	Both	0.5 E_{in} to 0.5 E_{out}	—	1.0	µs
Turn-Off Delay	t_{PHL}	—	Both	0.5 E_{in} to 0.5 E_{out}	—	1.5	µs
Clamp Diode Leakage Current	I_R	6	ULN2064*	V_R = 50 V	—	50	µA
				V_R = 50 V, T_A = 70°C	—	100	µA
			ULN2065B	V_R = 80 V	—	50	µA
				V_R = 80 V, T_A = 70°C	—	100	µA
Clamp Diode Forward Voltage	V_F	7	Both	I_F = 1.0 A	—	1.75	V
				I_F = 1.5 A	—	2.0	V

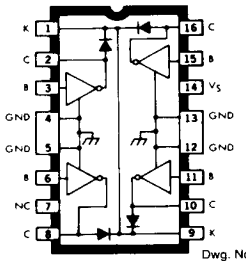
* Complete part number includes suffix to identify package style: B = DIP with heat sink tabs, LB = SOIC with heat sink tabs.

PARTIAL SCHEMATIC



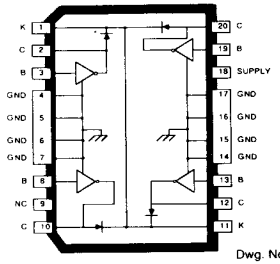
Dwg. No. A-10,354C

ULN2068/69B



Dwg. No. A-10,310

ULN2068LB



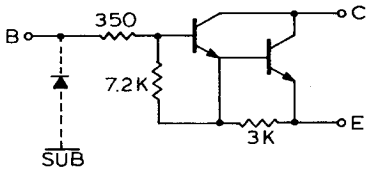
Dwg. No. A-14,327

ELECTRICAL CHARACTERISTICS at +25°C, V_S = 5.0 V (unless otherwise noted).

Characteristic	Symbol	Test Fig.	Applicable Devices	Test Conditions	Limits Min.	Limits Max.	Limits Units
Output Leakage Current	I_{CEX}	1	ULN2068*	V_{CE} = 50 V	—	100	µA
				V_{CE} = 50 V, T_A = 70°C	—	500	µA
			ULN2069B	V_{CE} = 80 V	—	100	µA
				V_{CE} = 80 V, T_A = 70°C	—	500	µA
Output Sustaining Voltage	$V_{CE(SUS)}$	2	ULN2069*	I_C = 100 mA, V_{IN} = 0.4 V	35	—	V
			ULN2069B	I_C = 100 mA, V_{IN} = 0.4 V	50	—	V
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$	3	Both	I_C = 500 mA, V_{IN} = 2.75 V	—	1.1	V
				I_C = 750 mA, V_{IN} = 2.75 V	—	1.2	V
				I_C = 1.0 A, V_{IN} = 2.75 V	—	1.3	V
				I_C = 1.25 A, V_{IN} = 2.75 V	—	1.4	V
			ULN2069B	I_C = 1.5 A, V_{IN} = 2.75 V	—	1.5	V
Input Current	$I_{IN(ON)}$	4	Both	V_{IN} = 2.75 V	—	550	µA
				V_{IN} = 3.75 V	—	1000	µA
Input Voltage	$V_{IN(ON)}$	5	ULN2068*	V_{CE} = 2.0 V, I_C = 1.25 A	—	2.75	V
			ULN2069B	V_{CE} = 2.0 V, I_C = 1.5 A	—	2.75	V
Supply Current	I_S	8	Both	I_C = 500 mA, V_{IN} = 2.75 V	—	6.0	V
Turn-On Delay	t_{PLH}	—	Both	0.5 E_{in} to 0.5 E_{out}	—	1.0	µs
Turn-Off Delay	t_{PHL}	—	Both	0.5 E_{in} to 0.5 E_{out}, I_C = 1.25 A	—	1.5	µs
Clamp Diode Leakage Current	I_R	6	ULN2068*	V_R = 50 V	—	50	µA
				V_R = 50 V, T_A = 70°C	—	100	µA
			ULN2069B	V_R = 80 V	—	50	µA
				V_R = 80 V, T_A = 70°C	—	100	µA
Clamp Diode Forward Voltage	V_F	7	Both	I_F = 1.0 A	—	1.75	V
				I_F = 1.5 A	—	2.0	V

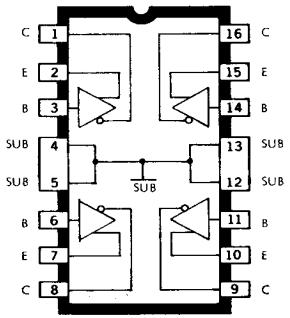
*Complete part number includes suffix to identify package style: B = DIP with heat sink tabs, LB = SOIC with heat sink tabs.

PARTIAL SCHEMATIC



Dwg. No. A-10,355B

ULN2074B

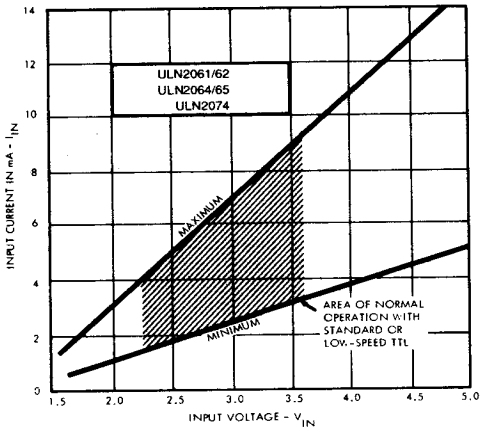


Dwg. No. A-9766

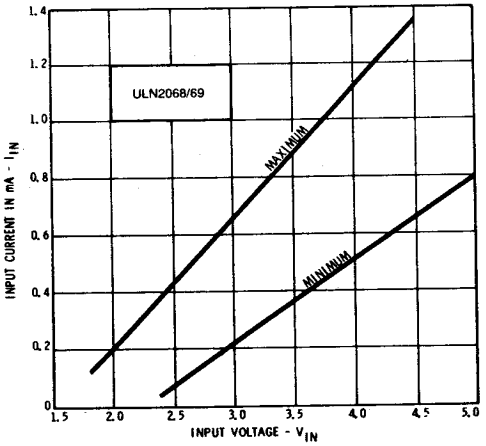
ELECTRICAL CHARACTERISTICS at +25°C (unless otherwise noted).

Characteristic	Symbol	Test Fig.	Test Conditions	Limits Min.	Limits Max.	Units
Output Leakage Current	I_{CEX}	1	V_{CE} = 50 V	—	100	µA
			V_{CE} = 50 V, T_A = 70°C	—	500	µA
Output Sustaining Voltage	$V_{CE(SUS)}$	2	I_C = 100 mA, V_{IN} = 0.4 V	35	—	V
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$	3	I_C = 500 mA, I_B = 625 µA	—	1.1	V
			I_C = 750 mA, I_B = 935 µA	—	1.2	V
			I_C = 1.0 A, I_B = 1.25 mA	—	1.3	V
			I_C = 1.25 A, I_B = 2.0 mA	—	1.4	V
Input Current	$I_{IN(ON)}$	4	V_{IN} = 2.4 V	1.4	4.3	mA
			V_{IN} = 3.75 V	3.3	9.6	mA
Input Voltage	$V_{IN(ON)}$	5	V_{CE} = 2.0 V, I_C = 1.0 A	—	2.0	V
			V_{CE} = 2.0 V, I_C = 1.25 A	—	2.5	V
Turn-On Delay	t_{PLH}	—	0.5 E_{in} to 0.5 E_{out}	—	1.0	µs
Turn-Off Delay	t_{PHL}	—	0.5 E_{in} to 0.5 E_{out}	—	1.5	µs

INPUT CURRENT AS A FUNCTION OF INPUT VOLTAGE AT +25°C

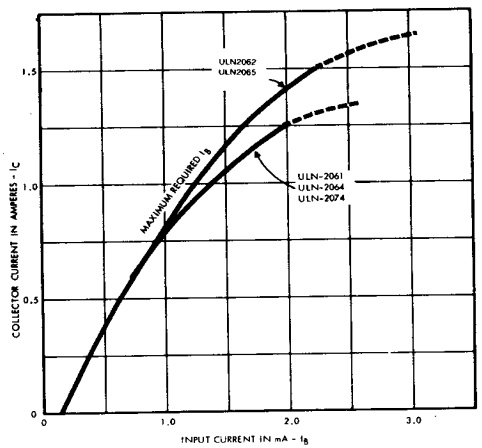


Dwg. No. A-10,363C

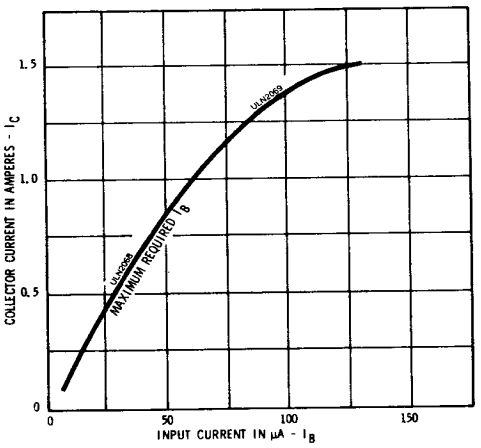


Dwg. No. A-12,306A

COLLECTOR CURRENT AS A FUNCTION OF INPUT CURRENT AT +25°C

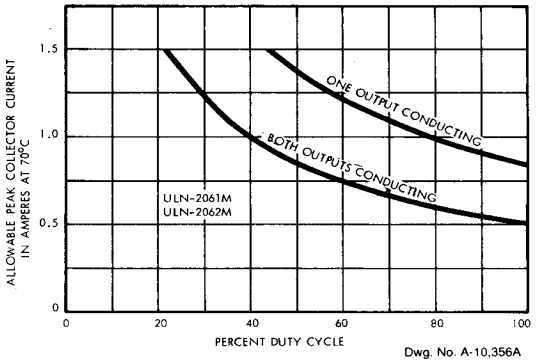


Dwg. No. A-10,358C

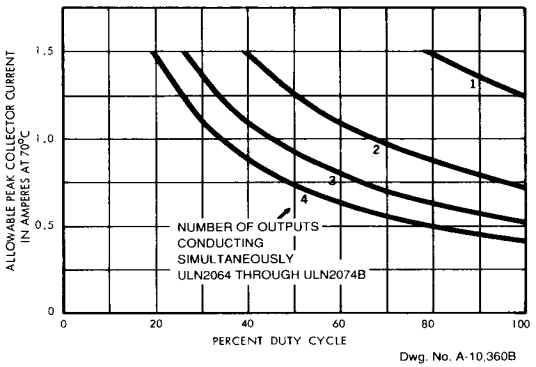


Dwg. No. A-12,306A

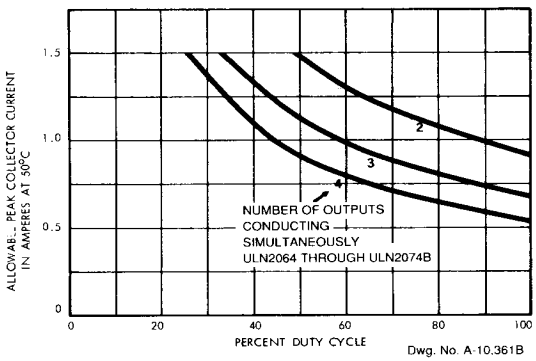
PEAK COLLECTOR CURRENT AS A FUNCTION OF DUTY CYCLE
(DUAL IN-LINE PACKAGED DEVICES)



Dwg. No. A-10,356A



Dwg. No. A-10,360B



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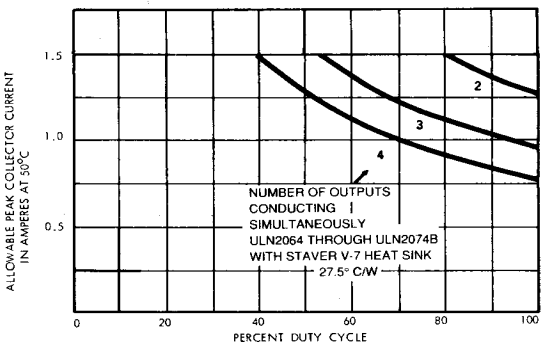
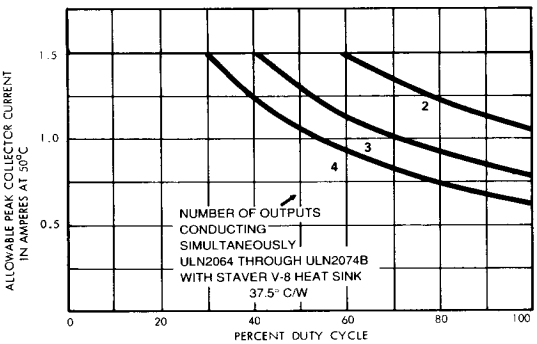
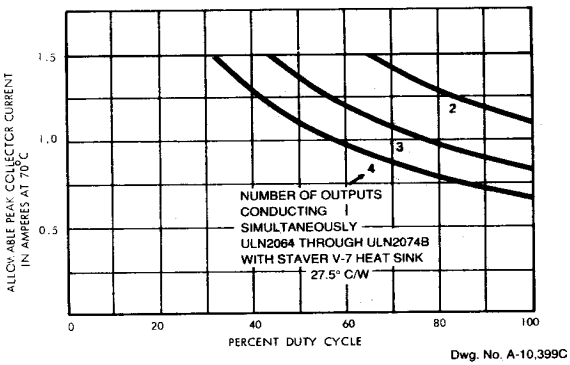


Dwg. No. A-10,398C

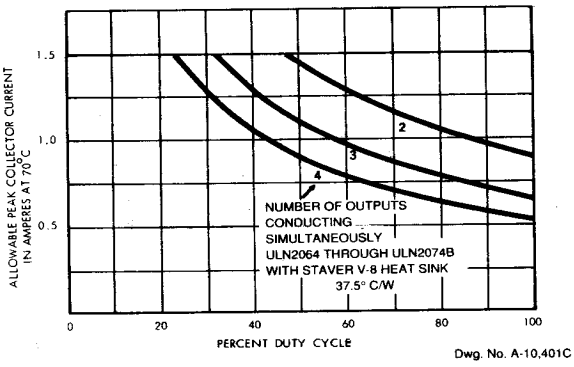


Dwg. No. A-10,400C

PEAK COLLECTOR CURRENT AS A FUNCTION OF DUTY CYCLE
(DUAL IN-LINE PACKAGED DEVICES, cont'd)

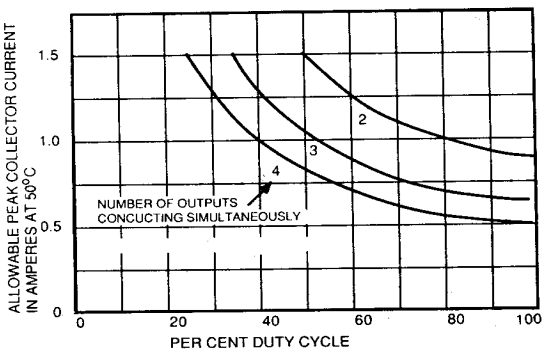


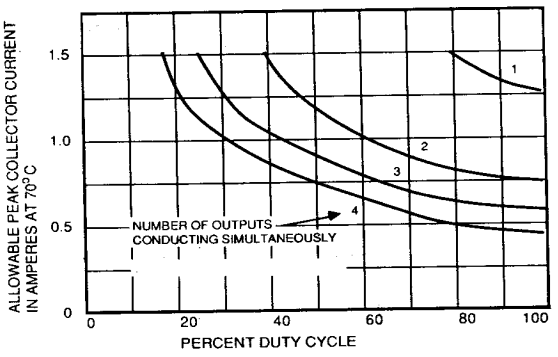
Dwg. No. A-10,399C



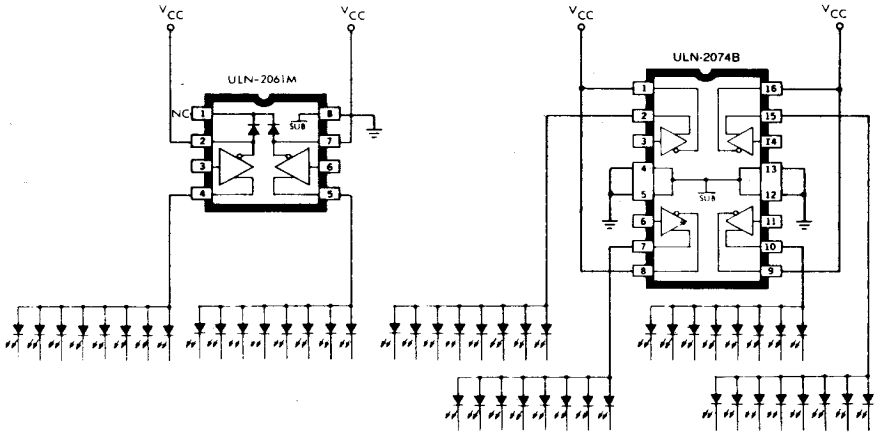
Dwg. No. A-10,401C

(ULN2064LB and ULN2068LB only)





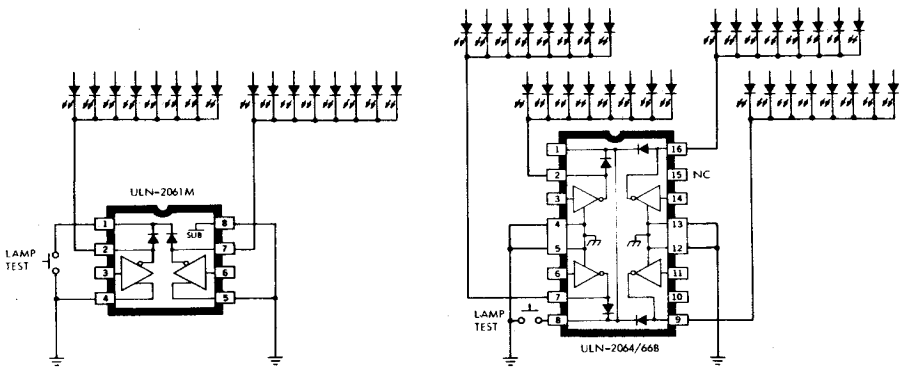
TYPICAL APPLICATIONS



Dwg. No. B-1364A

COMMON-ANODE LED DRIVERS

(Series UDN2980A/EP/LW devices can be used in similar applications at currents of up to 500 mA)



Dwg. No. B-1365

COMMON-CATHODE LED DRIVERS

(Type ULN2068B/LB is also applicable)