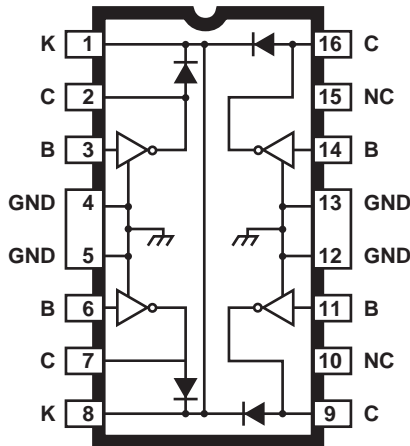


2064 THRU 2069

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}	See Guide
Input Current, I_B (Note 2)	25 mA
Supply Voltage, V_S (ULN2068B/LB & 2069B/LB) ...	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 the following pages.
2. Input current may be limited by maximum allowable input voltage.

1.5 A DARLINGTON SWITCHES

High-voltage, high-current Darlington arrays ULN2064B/LB through ULN2069B/LB 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. These 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.

Quad drivers ULN2064B, ULN2064LB, ULN2065B, ULN2065LB, ULN2068B, ULN2068LB, ULN2069B, and ULN2069LB are intended for use with TTL, low-speed TTL, and 5 V MOS logic. The ULN2065B/LB and ULN2069B/LB are selected for the 80 V minimum output breakdown specification. The ULN2068B/LB and ULN2069B/LB have pre-driver stages and are recommended for applications requiring high gain (low input-current loading). 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').

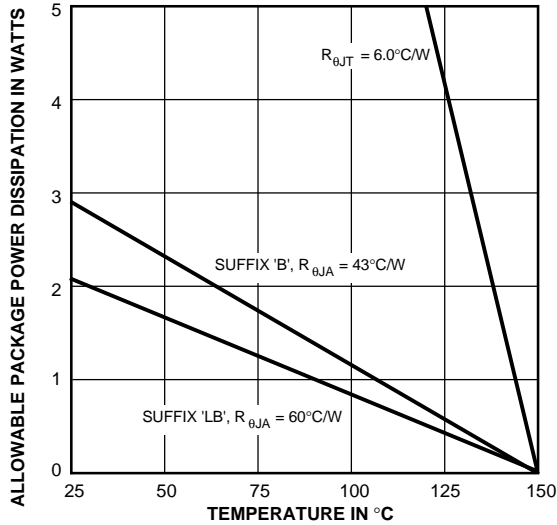
FEATURES

- TTL, DTL, MOS, CMOS Compatible Inputs
- Transient-Protected Outputs
- Loads to 480 Watts
- Heat-Sink Contact Tabs
- Automotive Capable

Always order by complete part number, e.g., **ULN2064B**.

2064 THRU 2069 1.5 A DARLINGTON SWITCHES

SELECTION GUIDE



Dwg. GP-049-3

Part Number*	Max. V_{CEX}	Min. $V_{CE(SUS)}$	Max. V_{IN}	Application
ULN2064B ULN2064LB	50 V	35 V	15 V	TTL, DTL, Schottky TTL, and 5 V CMOS
ULN2065B ULN2065LB	80 V	50 V	15 V	
ULN2068B ULN2068LB	50 V	35 V	15 V	TTL, DTL, Schottky TTL, and 5 V CMOS
ULN2069B ULN2069LB	80 V	50 V	15 V	

* Suffix 'B' is a 16-pin DIP; 'LB' is a 20-lead SOIC.

TEST FIGURES

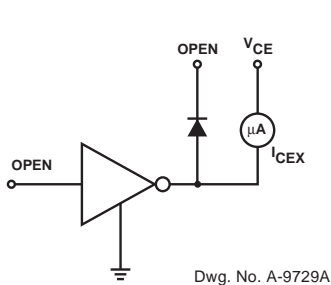


FIGURE 1

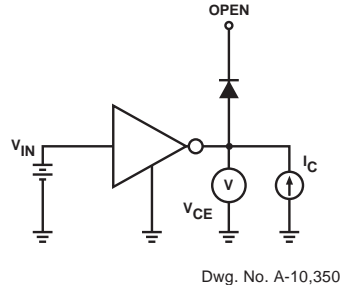


FIGURE 2

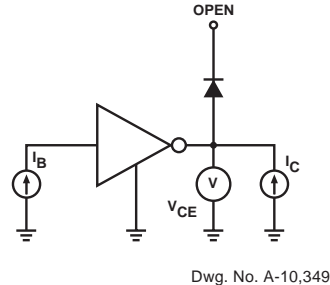


FIGURE 3

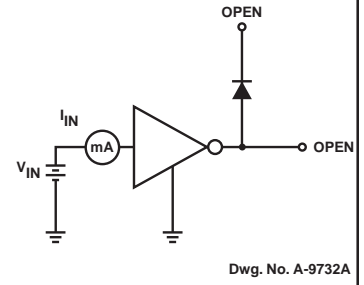


FIGURE 4

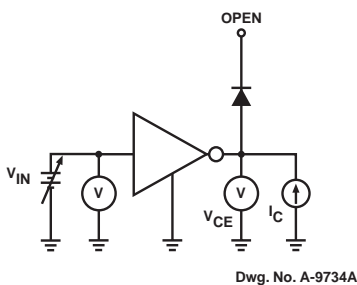


FIGURE 5

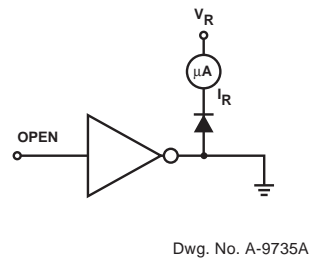


FIGURE 6

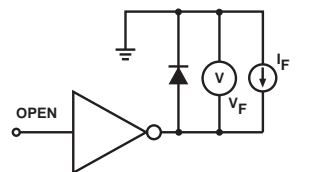


FIGURE 7

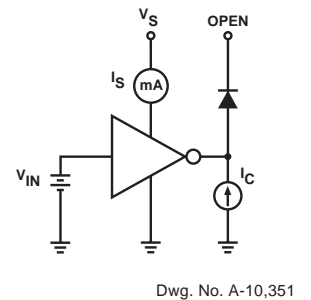
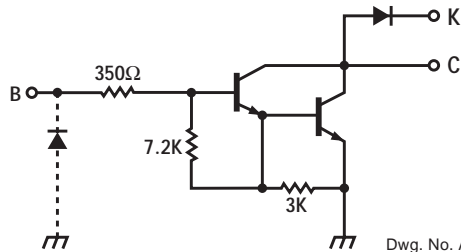


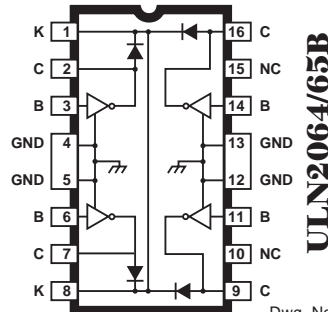
FIGURE 8

2064 THRU 2069 1.5 A DARLINGTON SWITCHES

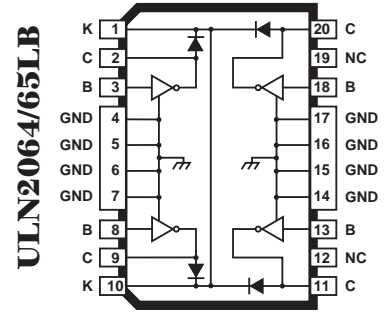
PARTIAL SCHEMATIC



Dwg. No. A-10,353C



Dwg. No. A-9765A



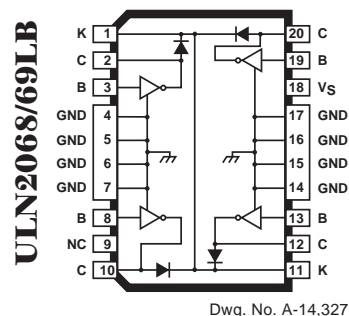
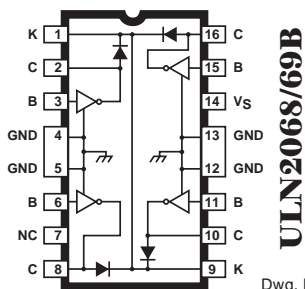
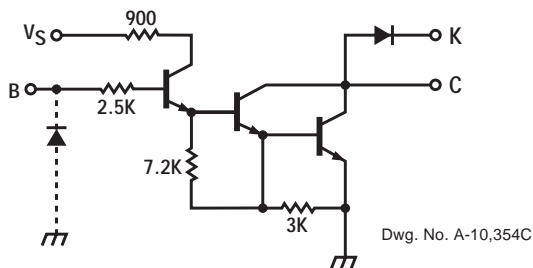
Dwg. No. A-14,326

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

Characteristic	Symbol	Test Fig.	Applicable Devices	Test Conditions	Limits		
					Min.	Max.	Units
Output Leakage Current	I_{CEX}	1	ULN2064B/LB	$V_{CE} = 50 \text{ V}$	—	100	μA
				$V_{CE} = 50 \text{ V}, T_A = 70^\circ\text{C}$	—	500	μA
			ULN2065B/LB	$V_{CE} = 80 \text{ V}$	—	100	μA
				$V_{CE} = 80 \text{ V}, T_A = 70^\circ\text{C}$	—	500	μA
Output Sustaining Voltage	$V_{CE(SUS)}$	2	ULN2064B/LB	$I_C = 100 \text{ mA}, V_{IN} = 0.4 \text{ V}$	35	—	V
			ULN2065B/LB	$I_C = 100 \text{ mA}, V_{IN} = 0.4 \text{ V}$	50	—	V
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$	3	All	$I_C = 500 \text{ mA}, I_B = 625 \mu\text{A}$	—	1.1	V
				$I_C = 750 \text{ mA}, I_B = 935 \mu\text{A}$	—	1.2	V
				$I_C = 1.0 \text{ A}, I_B = 1.25 \text{ mA}$	—	1.3	V
				$I_C = 1.25 \text{ A}, I_B = 2.0 \text{ mA}$	—	1.4	V
			ULN2065B/LB	$I_C = 1.5 \text{ A}, I_B = 2.25 \text{ mA}$	—	1.5	V
Input Current	$I_{IN(ON)}$	4	All	$V_{IN} = 2.4 \text{ V}$	1.4	4.3	mA
				$V_{IN} = 3.75 \text{ V}$	3.3	9.6	mA
Input Voltage	$V_{IN(ON)}$	5	All	$V_{CE} = 2.0 \text{ V}, I_C = 1.0 \text{ A}$	—	2.0	V
			ULN2064B/LB	$V_{CE} = 2.0 \text{ V}, I_C = 1.25 \text{ A}$	—	2.5	V
			ULN2065B/LB	$V_{CE} = 2.0 \text{ V}, I_C = 1.5 \text{ A}$	—	2.5	V
Turn-On Delay	t_{PLH}	—	All	$0.5 E_{in}$ to $0.5 E_{out}$	—	1.0	μs
Turn-Off Delay	t_{PHL}	—	All	$0.5 E_{in}$ to $0.5 E_{out}$	—	1.5	μs
Clamp Diode Leakage Current	I_R	6	ULN2064B/LB	$V_R = 50 \text{ V}$	—	50	μA
				$V_R = 50 \text{ V}, T_A = 70^\circ\text{C}$	—	100	μA
			ULN2065B/LB	$V_R = 80 \text{ V}$	—	50	μA
				$V_R = 80 \text{ V}, T_A = 70^\circ\text{C}$	—	100	μA
Clamp Diode Forward Voltage	V_F	7	All	$I_F = 1.0 \text{ A}$	—	1.75	V
				$I_F = 1.5 \text{ A}$	—	2.0	V

2064 THRU 2069 1.5 A DARLINGTON SWITCHES

PARTIAL SCHEMATIC

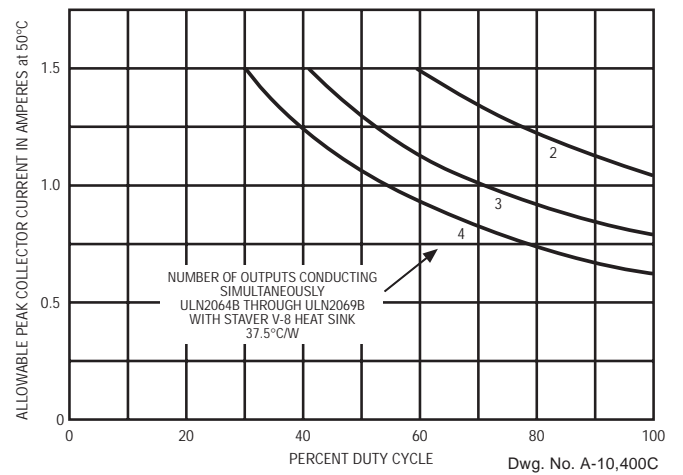
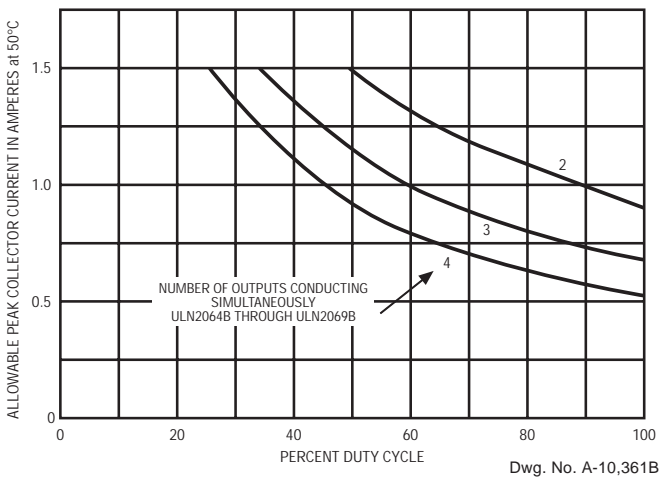
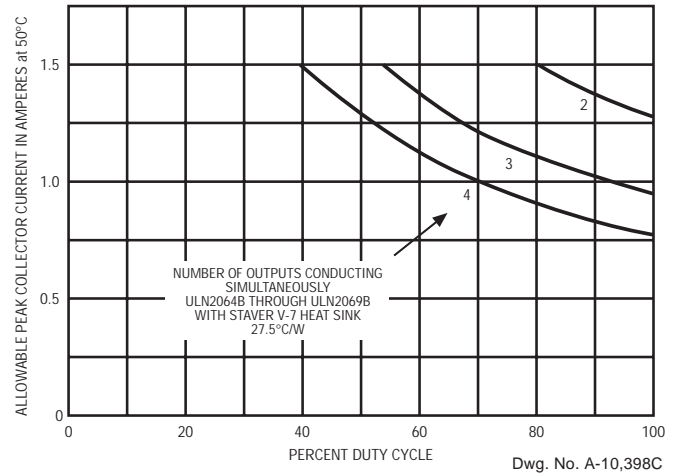
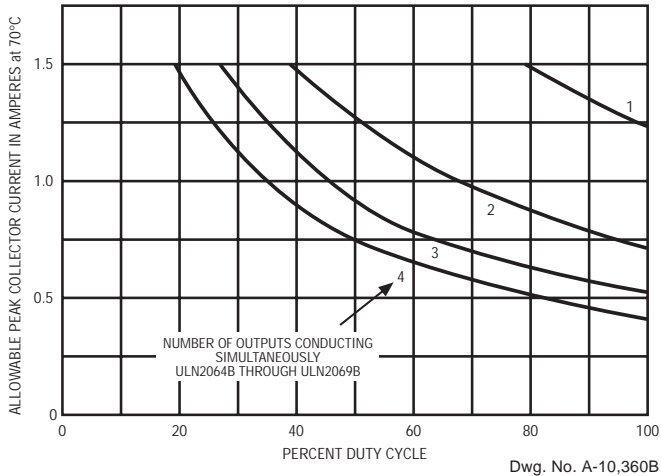


ELECTRICAL CHARACTERISTICS at +25°C, V_S = 5.0 V (unless otherwise noted).

Characteristic	Symbol	Test Fig.	Applicable Devices	Test Conditions	Limits		
					Min.	Max.	Units
Output Leakage Current	I _{CEX}	1	ULN2068B/LB	V _{CE} = 50 V	—	100	μA
				V _{CE} = 50 V, T _A = 70°C	—	500	μA
			ULN2069B/LB	V _{CE} = 80 V	—	100	μA
				V _{CE} = 80 V, T _A = 70°C	—	500	μA
Output Sustaining Voltage	V _{CE(SUS)}	2	ULN2068B/LB	I _C = 100 mA, V _{IN} = 0.4 V	35	—	V
			ULN2069B/LB	I _C = 100 mA, V _{IN} = 0.4 V	50	—	V
Collector-Emitter Saturation Voltage	V _{CE(SAT)}	3	All	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/LB	I _C = 1.5 A, V _{IN} = 2.75 V	—	1.5	V
Input Current	I _{IN(ON)}	4	All	V _{IN} = 2.75 V	—	550	μA
				V _{IN} = 3.75 V	—	1000	μA
Input Voltage	V _{IN(ON)}	5	ULN2068B/LB	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	All	I _C = 500 mA, V _{IN} = 2.75 V	—	6.0	mA
Turn-On Delay	t _{PLH}	—	All	0.5 E _{in} to 0.5 E _{out}	—	1.0	μs
Turn-Off Delay	t _{PHL}	—	All	0.5 E _{in} to 0.5 E _{out} , I _C = 1.25 A	—	1.5	μs
Clamp Diode Leakage Current	I _R	6	ULN2068B/LB	V _R = 50 V	—	50	μA
				V _R = 50 V, T _A = 70°C	—	100	μA
			ULN2069B/LB	V _R = 80 V	—	50	μA
				V _R = 80 V, T _A = 70°C	—	100	μA
Clamp Diode Forward Voltage	V _F	7	All	I _F = 1.0 A	—	1.75	V
				I _F = 1.5 A	—	2.0	V

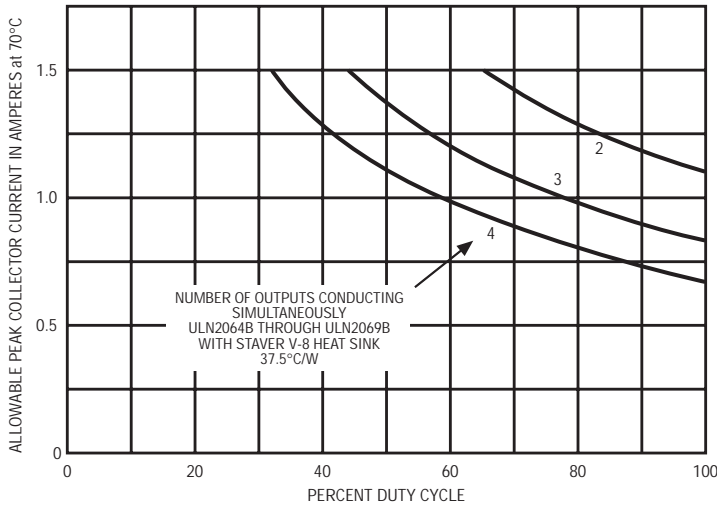
2064 THRU 2069 1.5 A DARLINGTON SWITCHES

PEAK COLLECTOR CURRENT AS A FUNCTION OF DUTY CYCLE (Dual in-line packaged devices)

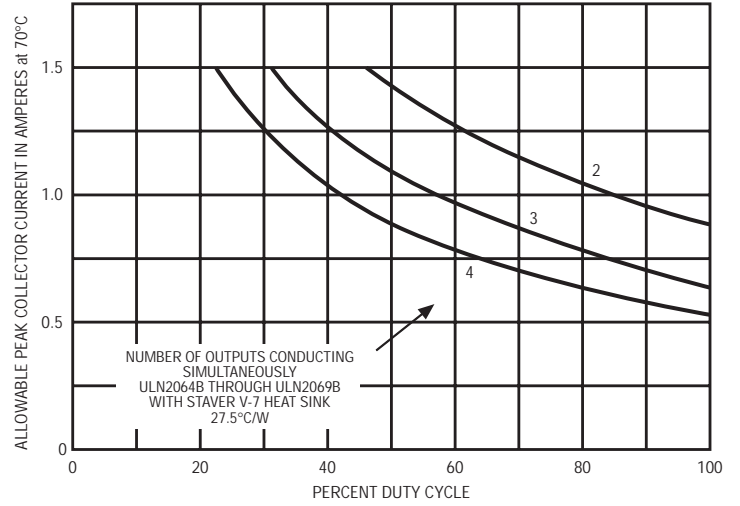


2064 THRU 2069 1.5 A DARLINGTON SWITCHES

PEAK COLLECTOR CURRENT AS A FUNCTION OF DUTY CYCLE (Dual in-line packaged devices)

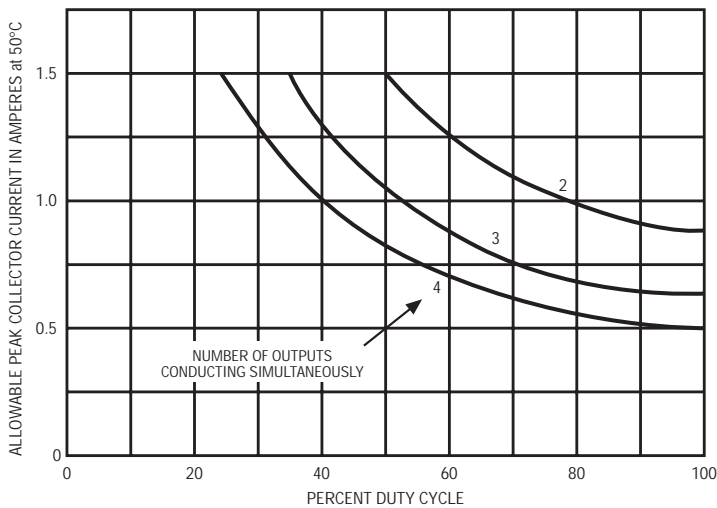


Dwg. No. A-10,399C

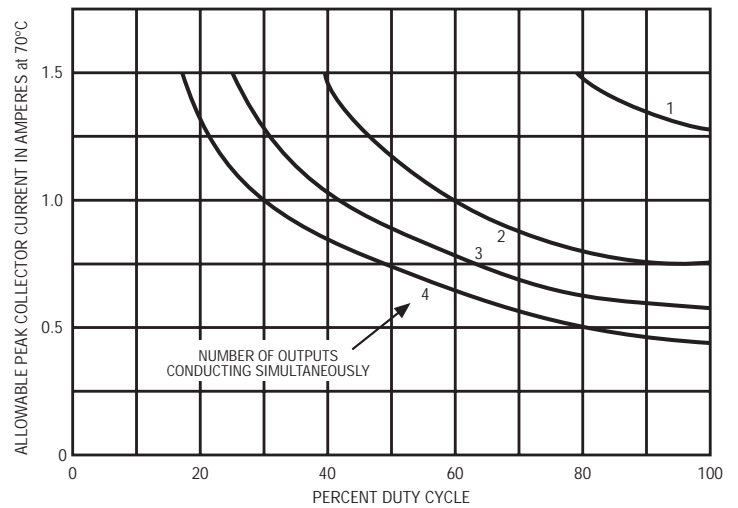


Dwg. No. A-10,401C

PEAK COLLECTOR CURRENT AS A FUNCTION OF DUTY CYCLE (SOIC packaged devices)



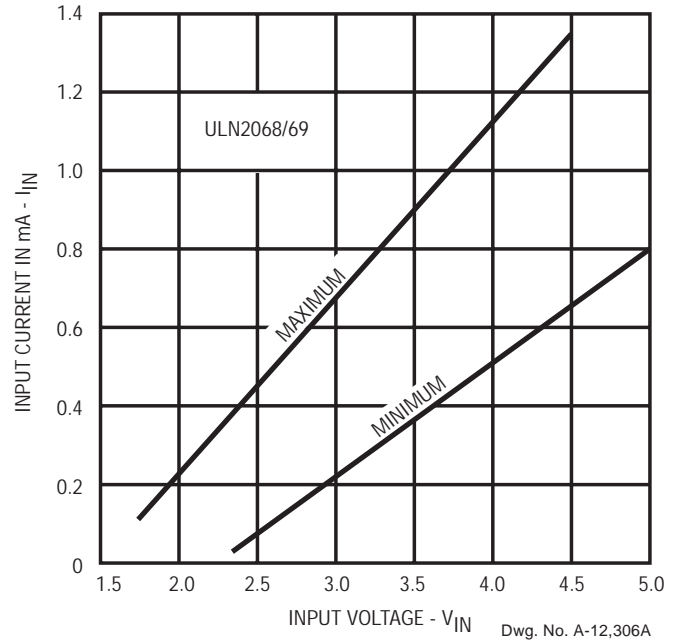
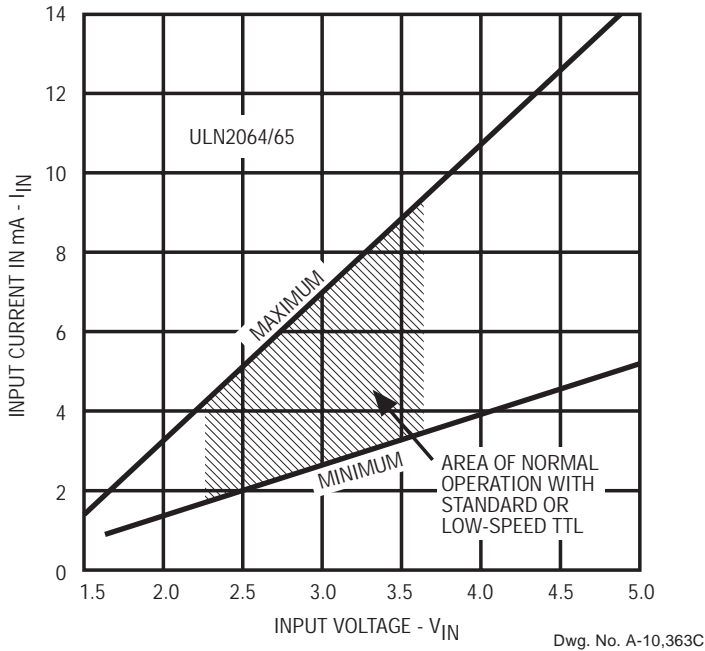
Dwg. GP-045



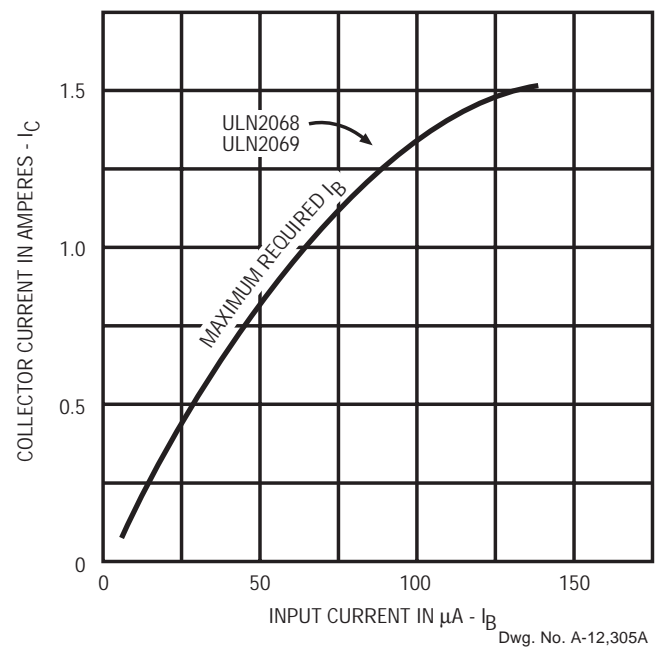
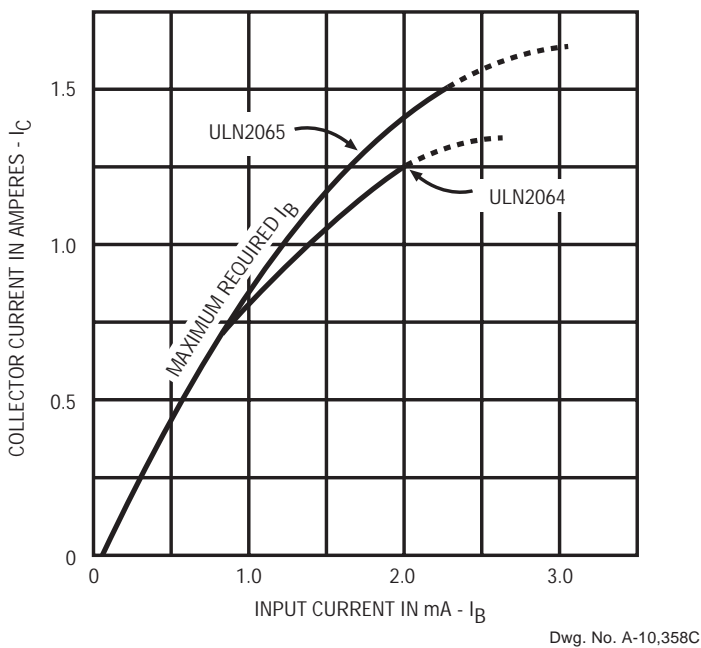
Dwg. GP-045-1

2064 THRU 2069 1.5 A DARLINGTON SWITCHES

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

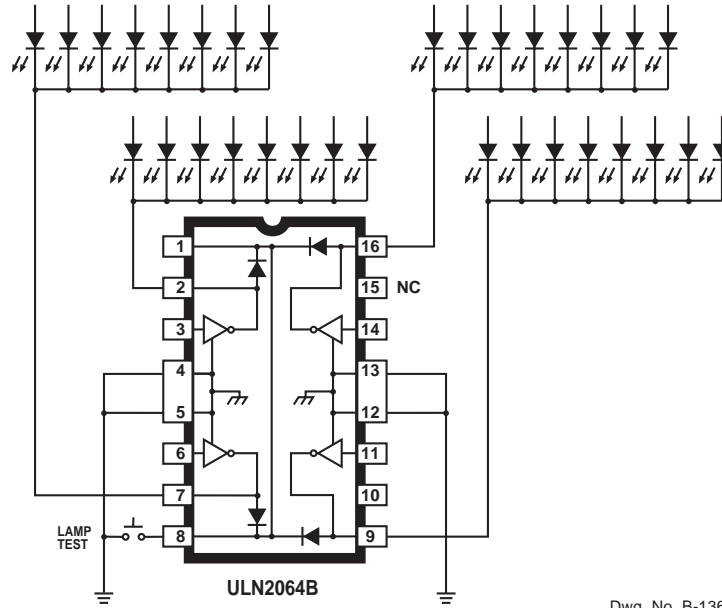


COLLECTOR CURRENT AS A FUNCTION OF INPUT CURRENT AT +25°C



2064 THRU 2069 1.5 A DARLINGTON SWITCHES

TYPICAL APPLICATION

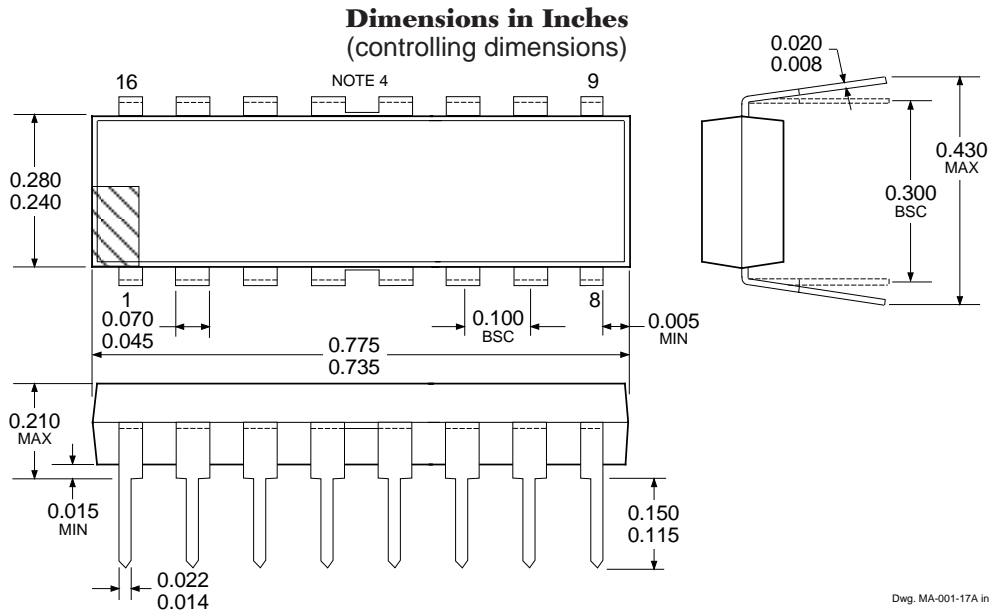


Dwg. No. B-1365

COMMON-CATHODE LED DRIVERS (Types ULN2068B and ULN2068LB are also applicable)

2064 THRU 2069
1.5 A DARLINGTON
SWITCHES

ULN2064B, ULN2065B, ULN2068B, and ULN2069B

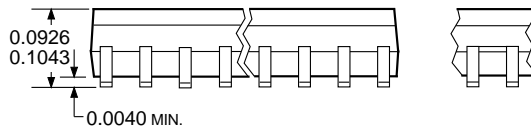
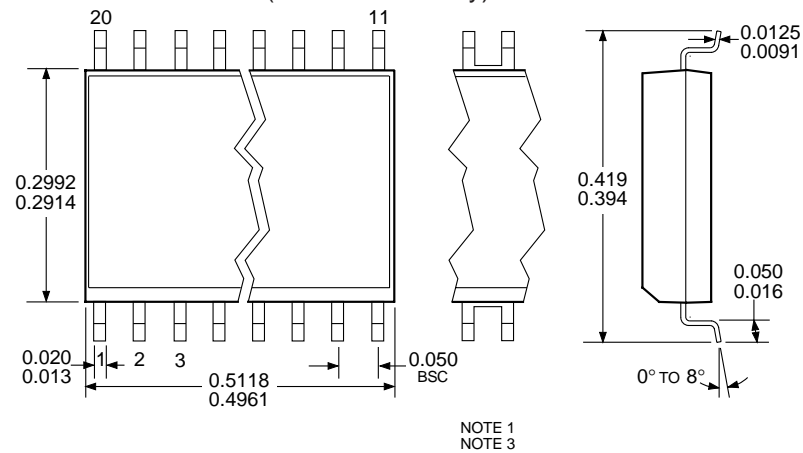


- NOTES: 1. Exact body and lead configuration at vendor's option within limits shown.
 2. Lead spacing tolerance is non-cumulative
 3. Lead thickness is measured at seating plane or below.
 4. Webbed lead frame. Leads 4, 5, 12, and 13 are internally one piece.

2064 THRU 2069 1.5 A DARLINGTON SWITCHES

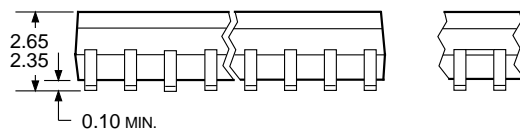
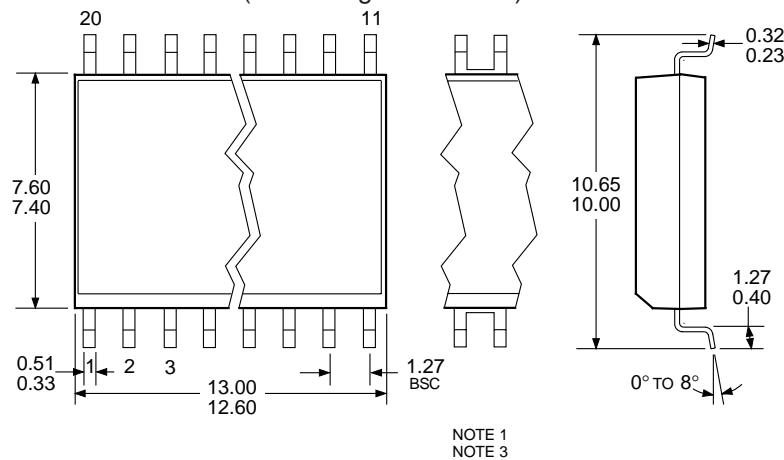
ULN2064LB, ULN2065LB, ULN2068LB, and ULN2069LB

Dimensions in Inches (for reference only)



Dwg. MA-008-21A in

Dimensions in Millimeters (controlling dimensions)



Dwg. MA-008-21A mm

- NOTES: 1. Exact body and lead configuration at vendor's option within limits shown.
 2. Lead spacing tolerance is non-cumulative
 3. Lead thickness is measured at seating plane or below.
 4. Webbed lead frame. Leads 4 through 7 and 14 through 17 are internally one piece.

2064 THRU 2069
1.5 A DARLINGTON
SWITCHES

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POWER SINK DRIVERS SELECTION GUIDE

IN ORDER OF 1) OUTPUT CURRENT, 2) OUTPUT VOLTAGE, 3) NUMBER OF DRIVERS

Output Ratings *			Features					Part Number †
mA	V	#	Serial Input	Latched Drivers	Diode Clamp	Saturated Outputs	Internal Protection	
100	20	8	–	–	–	X	–	2595
	30	32	X	X	–	–	–	5833
	40	32	X	X	–	X	–	5832
250	150	7	–	–	X	–	–	7003
300	45	1		Hall Sensor/Driver	X	–	X	5140
	50	8	–	–	X	X	–	2596
	60	2		Hall Sensor/Driver	–	X	–	5275
350	50	4	–	X	X	–	–	5800
	50	8	–	X	X	–	–	5801
	50	8	X	X	–	–	–	5821
	50	8	X	X	X	–	–	5841
	80	8	X	X	X	–	–	5842
450	30	28		Dual 4 to 14-Line Decoder/Driver	–	–	–	6817
600	60	4	–	–	–	X	X	2547
	60	4	–	–	X	X	X	2549
700	60	4	–	–	X	X	X	2543 and 2559
750	50	8	–	–	X	X	–	2597
900	14	2		Hall Sensor/Driver	X	X	X	3625
	26	2		Hall Sensor/Driver	X	X	X	3626
1000	46	4		Stepper Motor Controller/Driver		MOS	–	7024 and 7029
1200	46	4		Microstepping Controller/Driver		MOS	–	7042
1250	50	4		Stepper Motor Translator/Driver		–	X	5804
	50	4	–	–	X	–	–	2064 and 2068
1500	80	4	–	–	X	–	–	2065 and 2069
1600	50	9	X	X	–	–	X	5829
1800	50	4	–	–	X	–	–	2544
	50	4	–	–	X	–	–	2540
3000	46	4		Stepper Motor Controller/Driver		MOS	–	7026
4000	50	4	–	–	X	–	–	2878
	80	4	–	–	X	–	–	2879

* Current is maximum specified test condition, voltage is maximum rating. See specification for sustaining voltage limits or over-current protection voltage limits.

† Complete part number includes additional characters to indicate operating temperature range and package style.

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