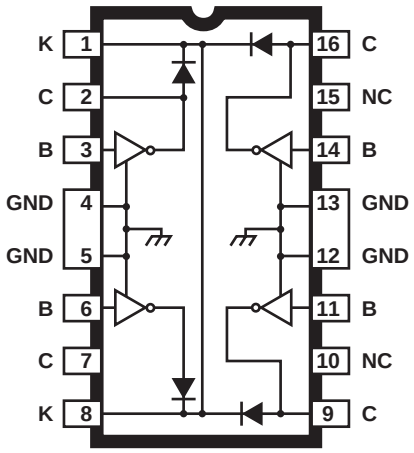
2064 THRU 2069

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) ..... **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

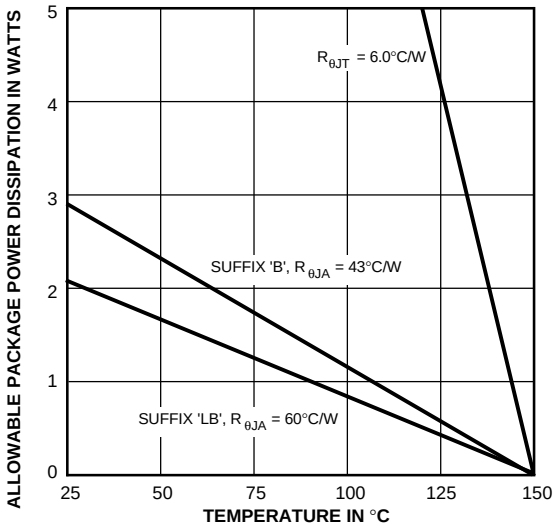
High-voltage, high-current Darlington arrays ULN2064B/LB through ULN2069B are designed for interface between low-level logic and a variety of peripheral loads such as relays, solenoids, dc and stepper motors, magnetic print hammers, multiplexed LED and incandescent displays, heaters, and similar loads. 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, ULN2068B, ULN2068LB, 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). 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** .



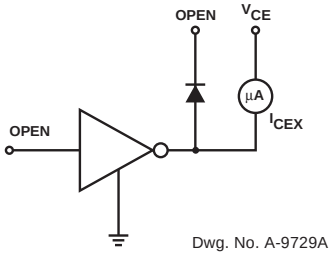
Dwg. GP-049-3

SELECTION GUIDE

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	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	

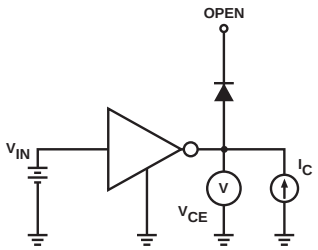
* Suffix 'B' is a 16-pin DIP; 'LB' is a 20-lead SOIC.

TEST FIGURES



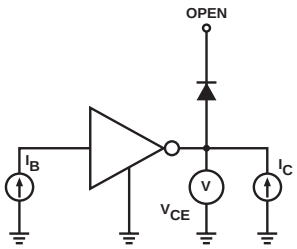
Dwg. No. A-9729A

FIGURE 1



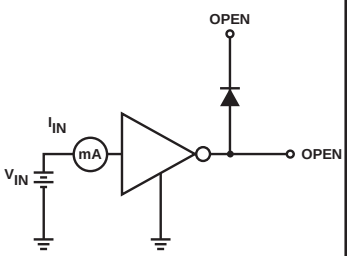
Dwg. No. A-10,350

FIGURE 2



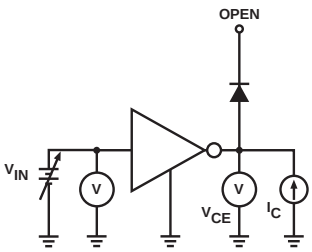
Dwg. No. A-10,349

FIGURE 3



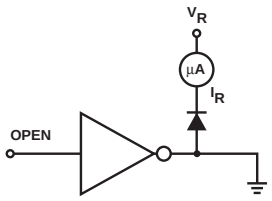
Dwg. No. A-9732A

FIGURE 4



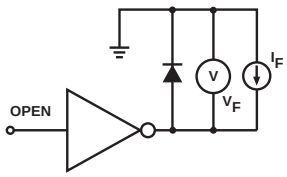
Dwg. No. A-9734A

FIGURE 5



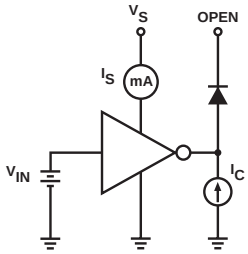
Dwg. No. A-9735A

FIGURE 6



Dwg. No. A-9736

FIGURE 7



Dwg. No. A-10,351

FIGURE 8

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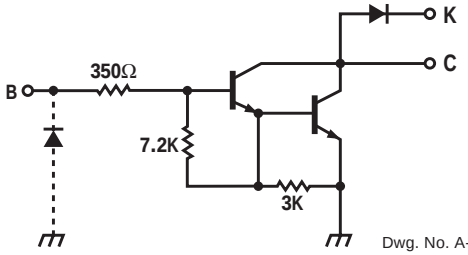
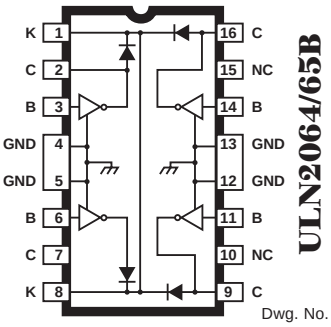
2064 THRU 2069
1.5 A DARLINGTON SWITCHES

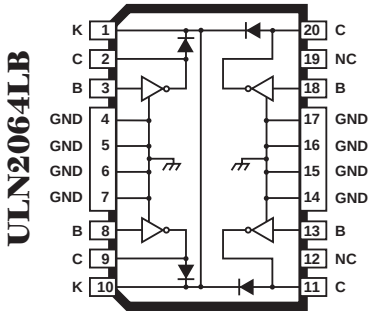
PARTIAL SCHEMATIC



Dwg. No. A-10,353C



Dwg. No. A-9765A



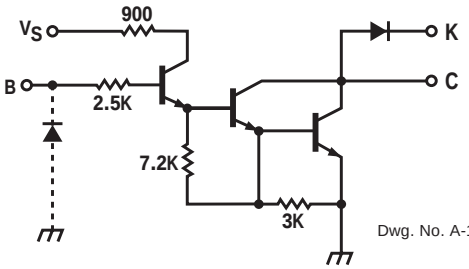
Dwg. No. A-14,326

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

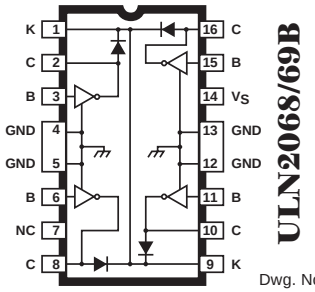
Characteristic	Symbol	Test Fig.	Applicable Devices	Test Conditions	Limits		
					Min.	Max.	Units
Output Leakage Current	I_{CEX}	1	ULN2064B	V_{CE} = 50 V	—	100	µA
				V_{CE} = 50 V, T_A = 70°C	—	500	µA
			ULN2065B	V_{CE} = 80 V	—	100	µA
				V_{CE} = 80 V, T_A = 70°C	—	500	µA
Output Sustaining Voltage	$V_{CE(SUS)}$	2	ULN2064B	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
			ULN2064B	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	ULN2064B	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

2064 THRU 2069
1.5 A DARLINGTON SWITCHES

PARTIAL SCHEMATIC

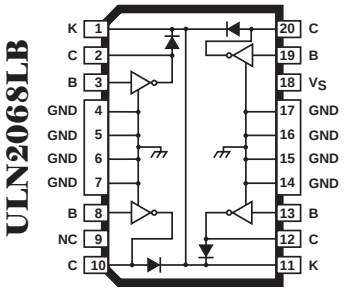


Dwg. No. A-10,354C



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	ULN2068B	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	ULN2068B	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	ULN2068B	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	mA
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	ULN2068B	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

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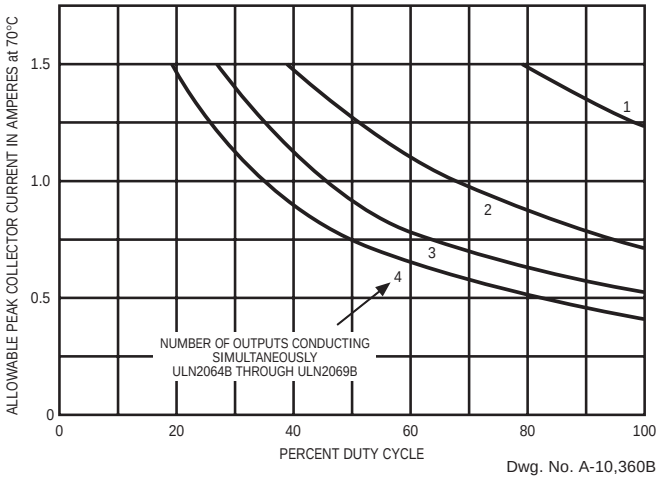
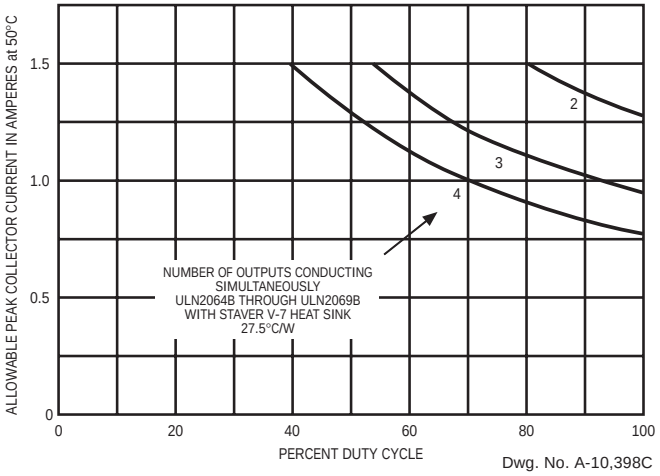
PEAK COLLECTOR CURRENT AS A FUNCTION OF DUTY CYCLE
(Dual in-line packaged devices)



Dwg. No. A-10,360B



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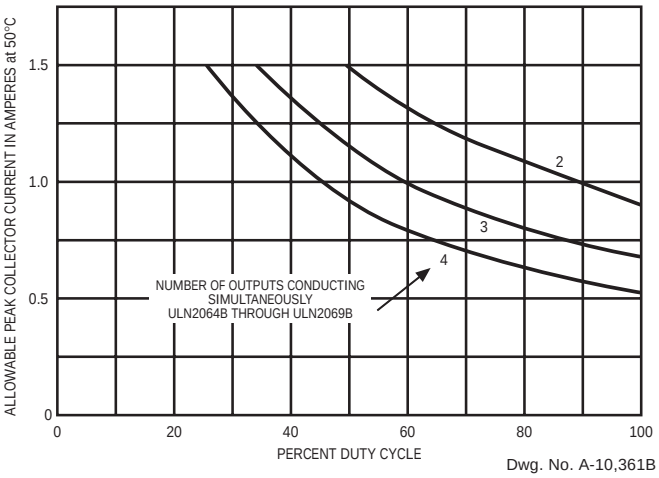
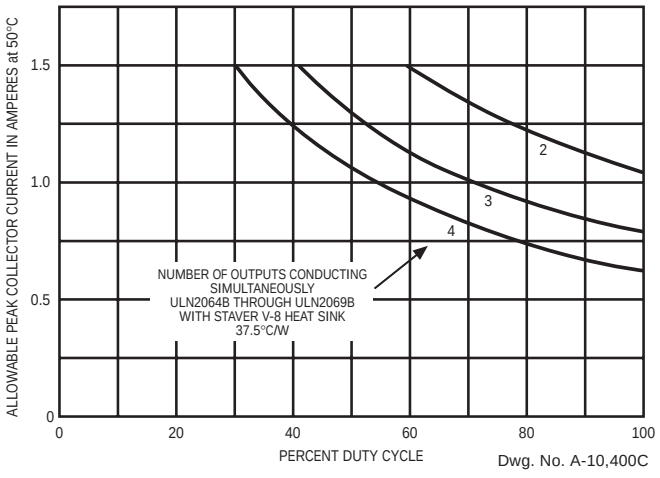
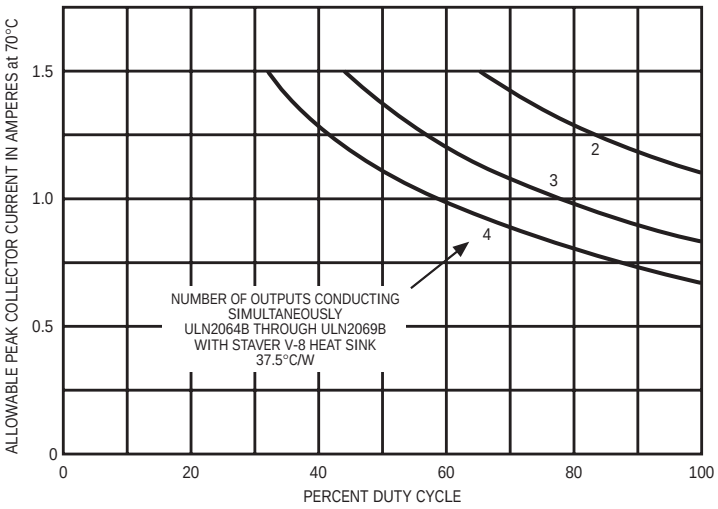


Dwg. No. A-10,361B

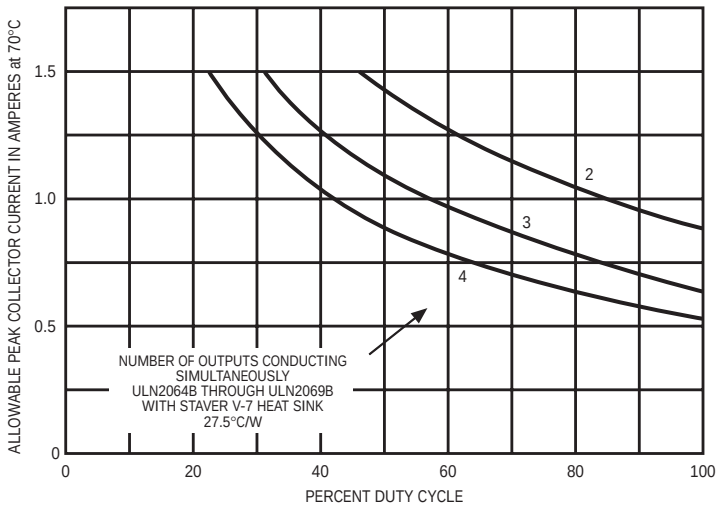


Dwg. No. A-10,400C

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



Dwg. No. A-10,399C



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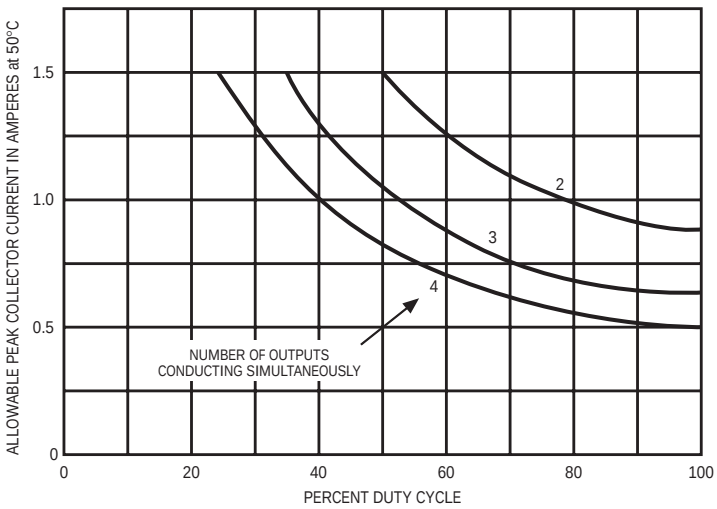
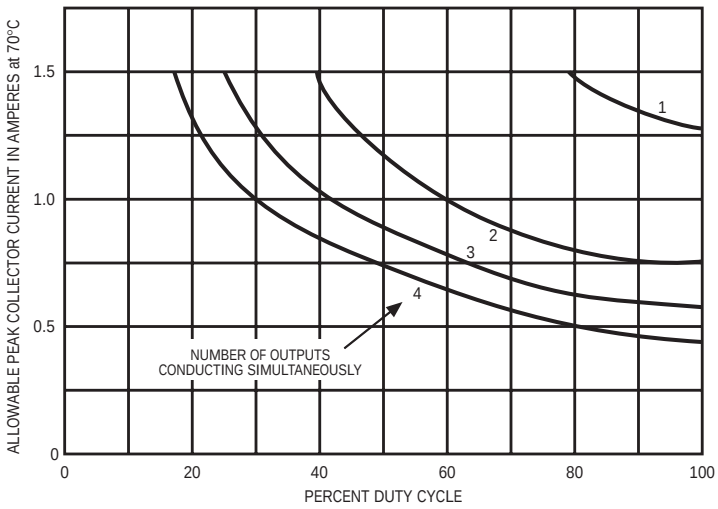
PEAK COLLECTOR CURRENT AS A FUNCTION OF DUTY CYCLE
(SOIC packaged devices)



Dwg. GP-045



Dwg. GP-045-1

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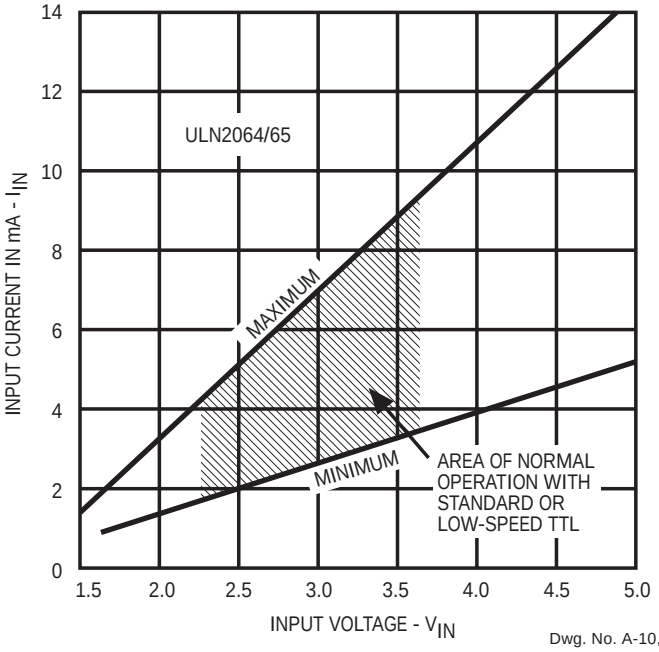
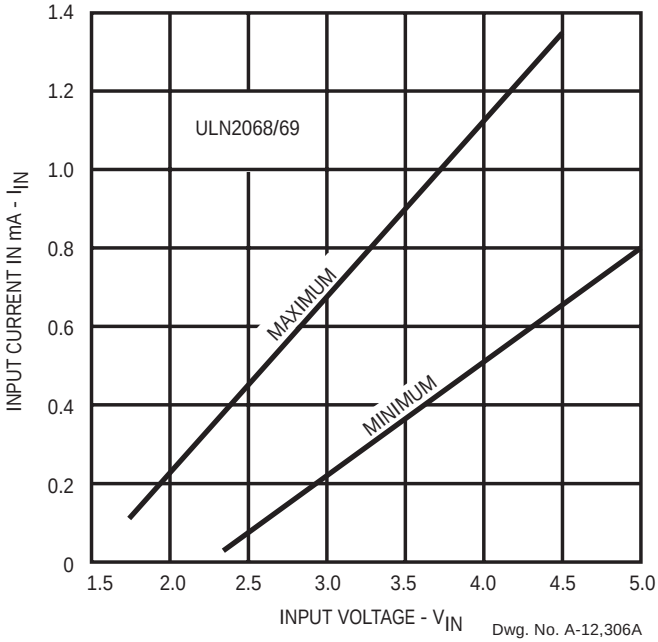
INPUT CURRENT AS A FUNCTION OF INPUT VOLTAGE AT +25°C

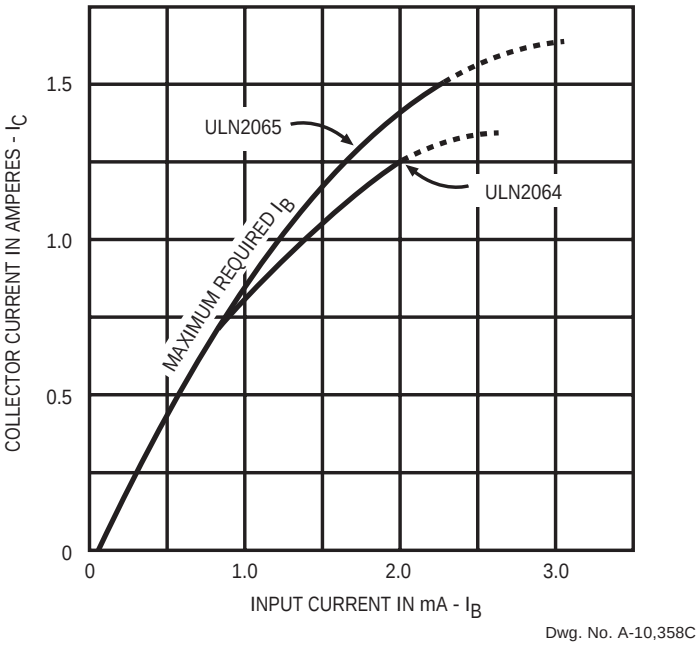


Dwg. No. A-10,363C

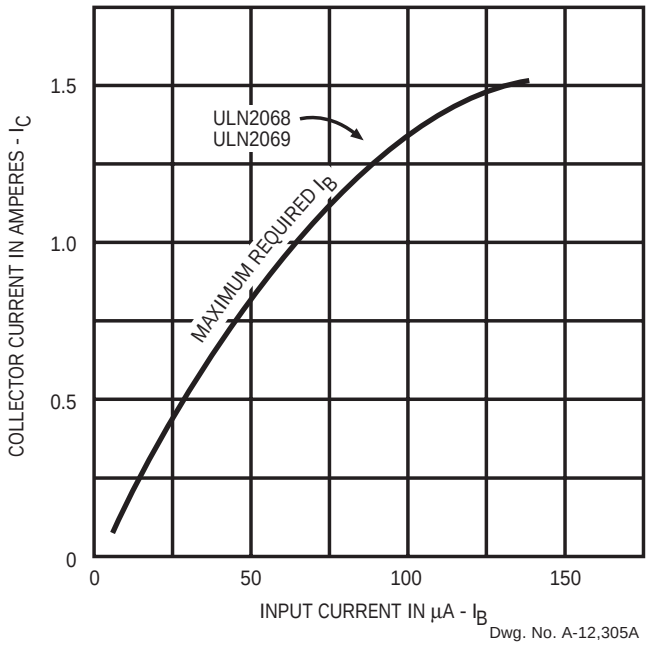


Dwg. No. A-12,306A

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

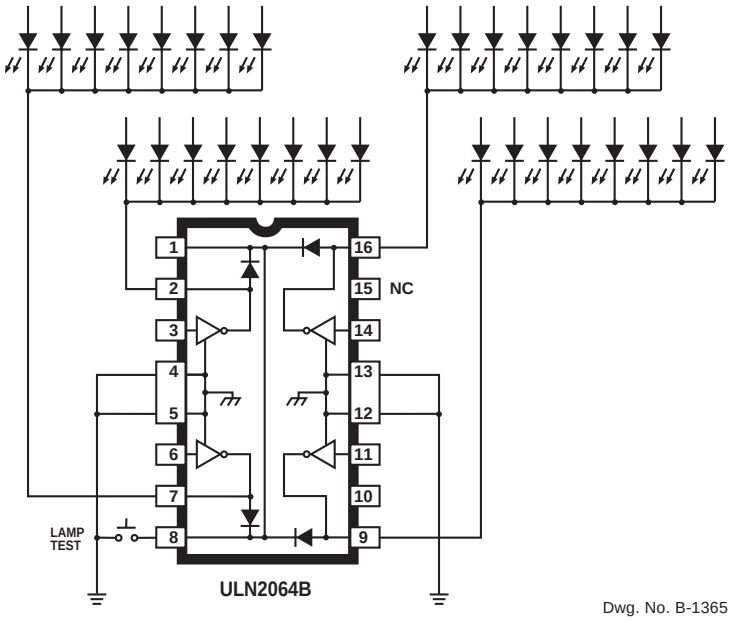


Dwg. No. A-10,358C



Dwg. No. A-12,305A

TYPICAL APPLICATION



Dwg. No. B-1365

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

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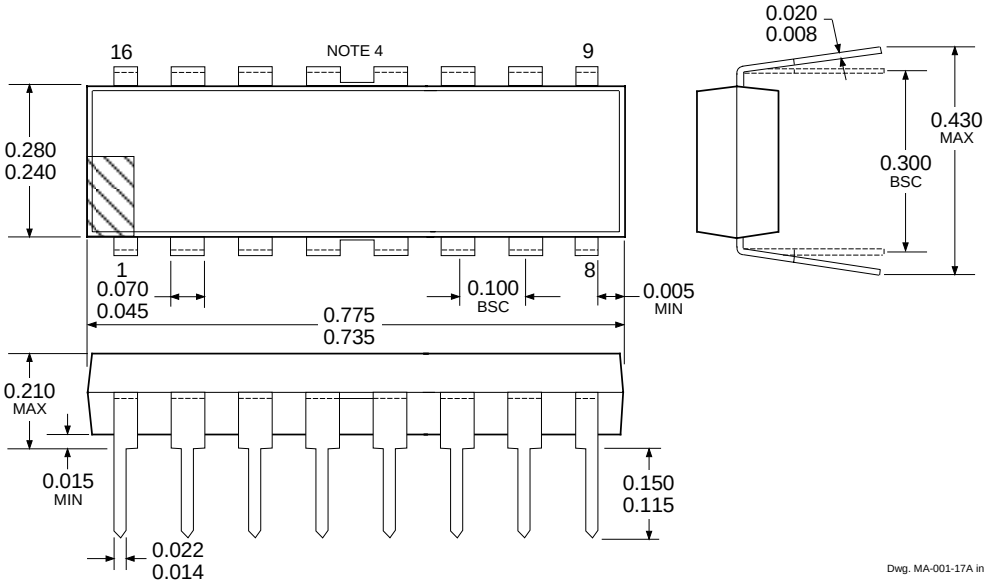
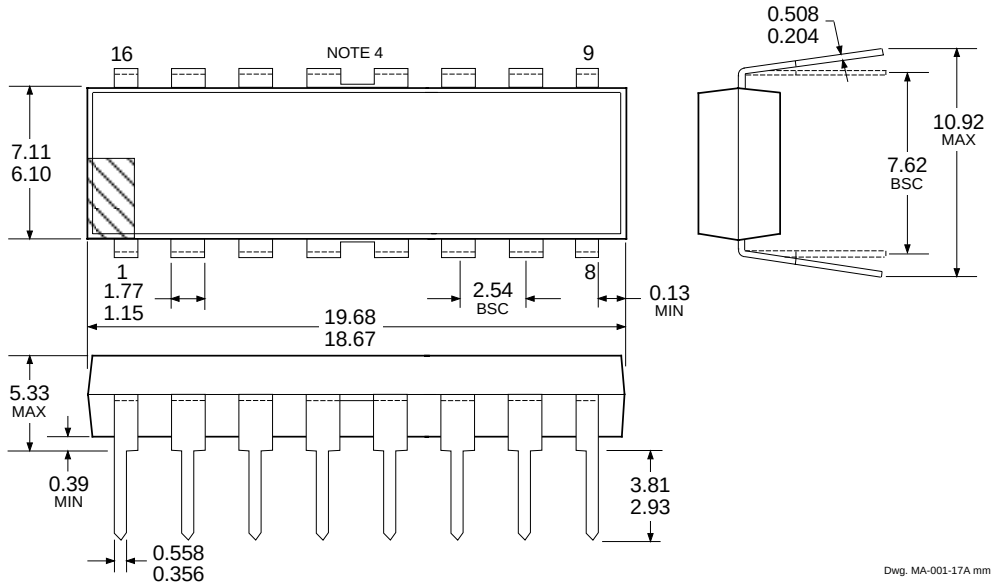
ULN2064B, ULN2065B, ULN2068B, and ULN2069B

Dimensions in Inches



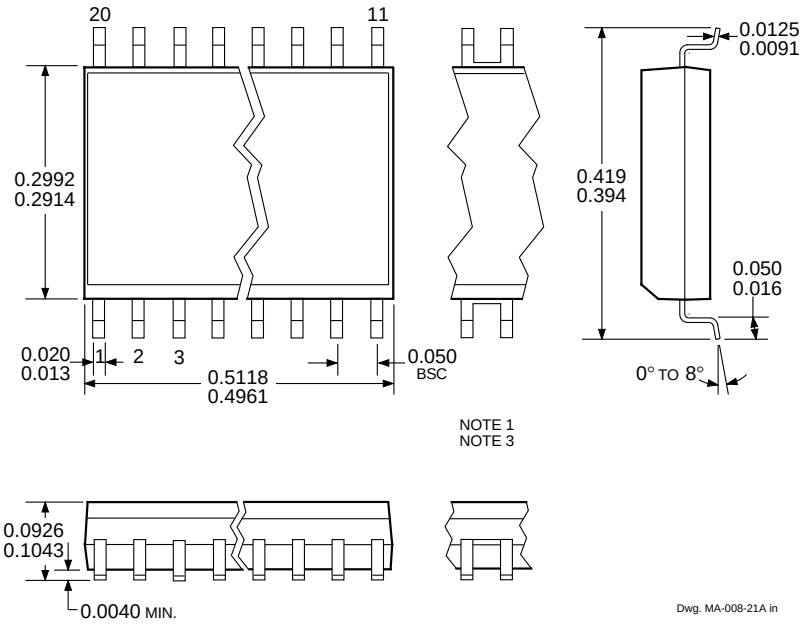
Dimensions in Millimeters (Based on 1" = 25.4 mm)



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, 5, 12, and 13 are internally one piece.

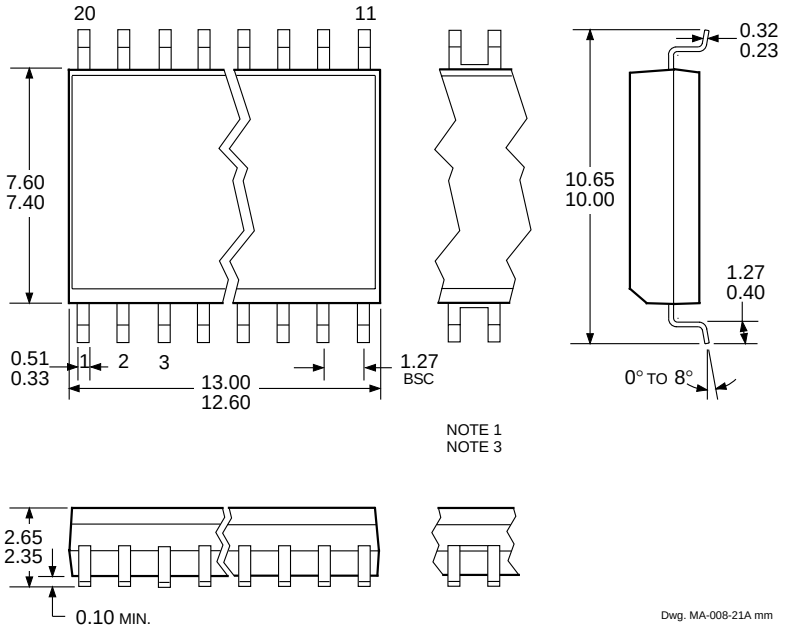
ULN2064LB and ULN2068LB

Dimensions in Inches
(Based on 1 mm = 0.03937")



Dwg. MA-008-21A in

Dimensions in Millimeters



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.

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2064 THRU 2069
1.5 A DARLINGTON SWITCHES

POWER SINK DRIVERS SELECTION GUIDE

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

Output Ratings *			Features					
mA	V	#	Serial Input	Latched Drivers	Diode Clamp	Saturated Outputs	Internal Protection	Part Number †
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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