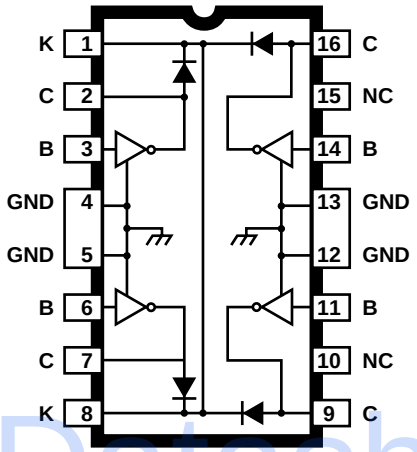
2064 THRU 2069

Data Sheet 29305H‡

QUAD 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} ..... **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.

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/LB, ULN2065B/LB, ULN2068B/LB, and ULN2069B/LB 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., **ULN2068B** .

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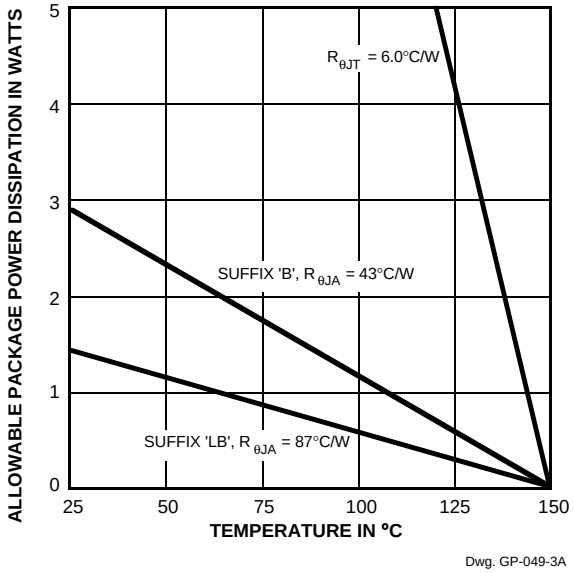
QUAD 1.5 A DARLINGTON SWITCHES



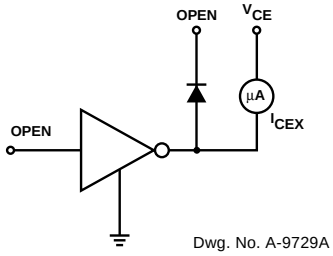
Dwg. GP-049-3A

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 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	

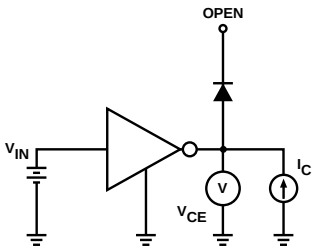
* Suffix ‘B’ is a 16-pin DIP; ‘LB’ is a 20-lead SOIC.

TEST FIGURES



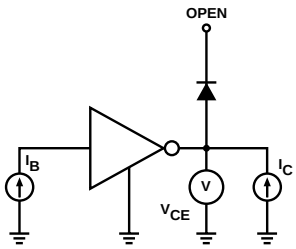
Dwg. No. A-9729A

FIGURE 1



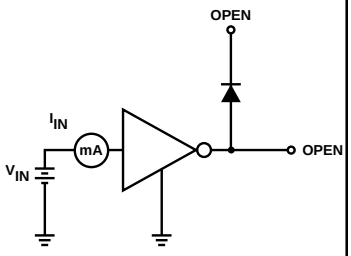
Dwg. No. A-10,350

FIGURE 2



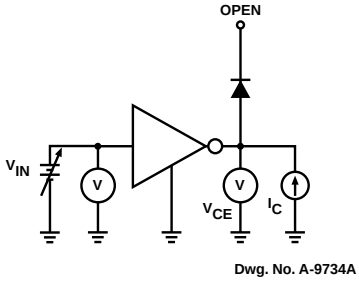
Dwg. No. A-10,349

FIGURE 3



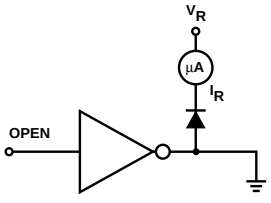
Dwg. No. A-9732A

FIGURE 4



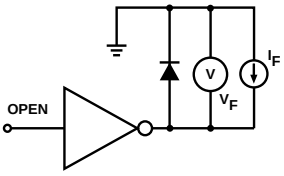
Dwg. No. A-9734A

FIGURE 5



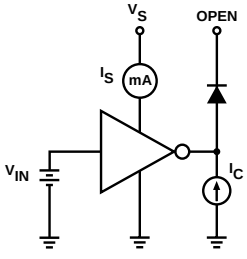
Dwg. No. A-9735A

FIGURE 6



Dwg. No. A-9736

FIGURE 7



Dwg. No. A-10,351

FIGURE 8

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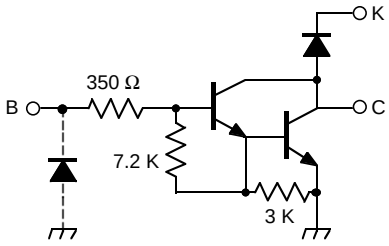
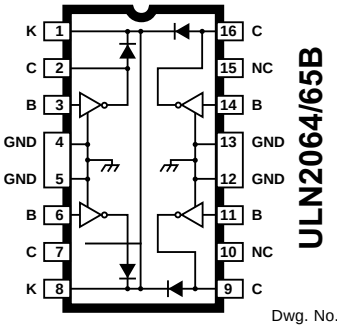
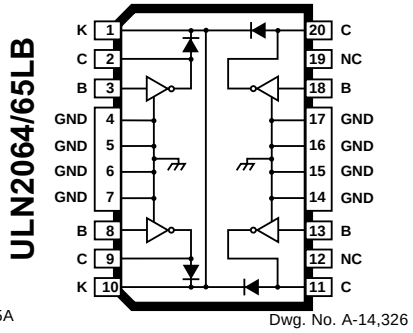
PARTIAL SCHEMATIC



Dwg. FP-052



Dwg. No. A-9765A



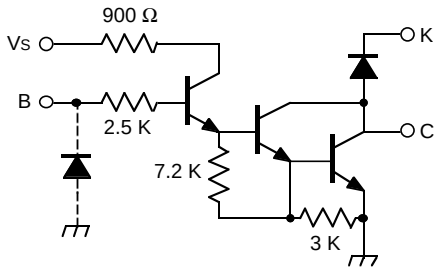
Dwg. No. A-14,326

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

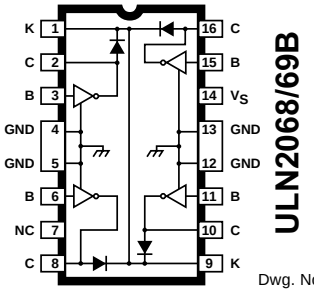
Characteristic	Symbol	Test Fig.	Applicable Devices	Test Conditions	Limits Min.	Limits Max.	Limits Units
Output Leakage Current	I_{CEX}	1	ULN2064B/LB	V_{CE} = 50 V	—	100	µA
				V_{CE} = 50 V, T_A = 70°C	—	500	µA
			ULN2065B/LB	V_{CE} = 80 V	—	100	µA
				V_{CE} = 80 V, T_A = 70°C	—	500	µA
Output Sustaining Voltage	$V_{CE(SUS)}$	2	ULN2064B/LB	I_C = 100 mA, V_{IN} = 0.4 V	35	—	V
			ULN2065B/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, 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/LB	I_C = 1.5 A, I_B = 2.25 mA	—	1.5	V
Input Current	$I_{IN(ON)}$	4	All	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	All	V_{CE} = 2.0 V, I_C = 1.0 A	—	2.0	V
			ULN2064B/LB	V_{CE} = 2.0 V, I_C = 1.25 A	—	2.5	V
			ULN2065B/LB	V_{CE} = 2.0 V, I_C = 1.5 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 V	—	50	µA
				V_R = 50 V, T_A = 70°C	—	100	µA
			ULN2065B/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
QUAD 1.5 A DARLINGTON SWITCHES

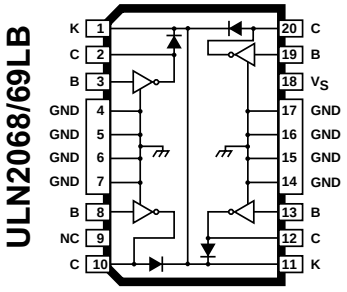
PARTIAL SCHEMATIC



Dwg. FP-052-1



Dwg. No. A-10,310



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.	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

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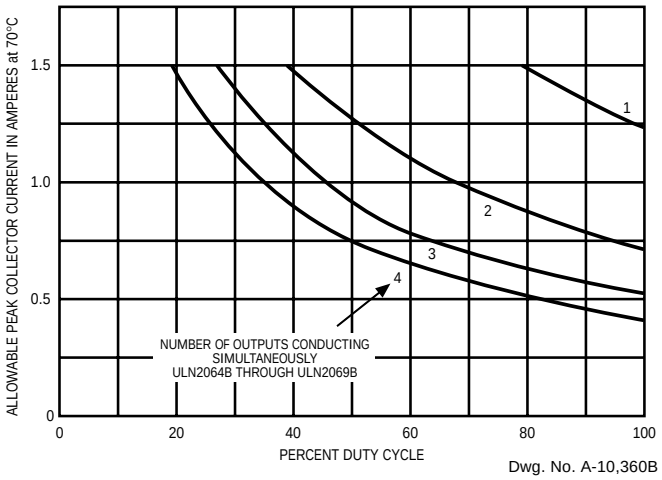
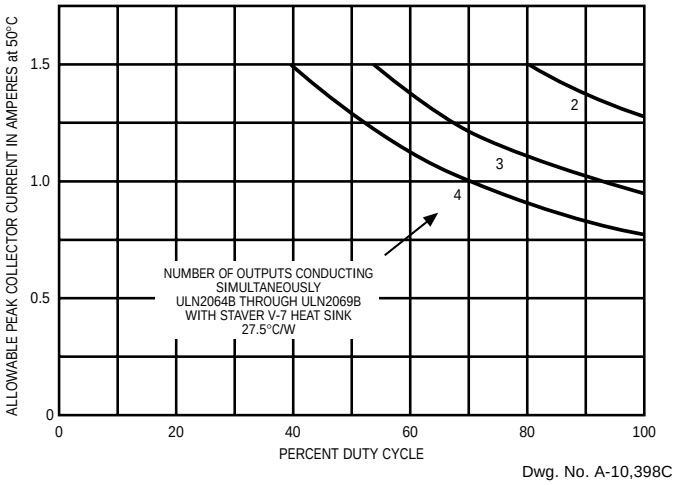
PEAK COLLECTOR CURRENT AS A FUNCTION OF DUTY CYCLE
(Dual in-line packaged devices)



Dwg. No. A-10,360B



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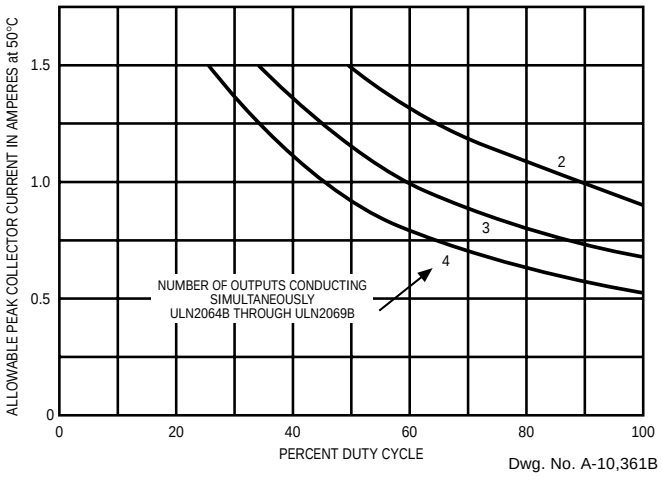

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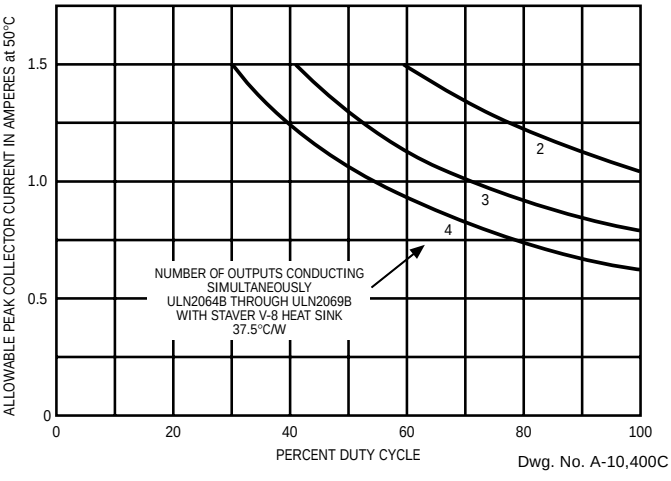
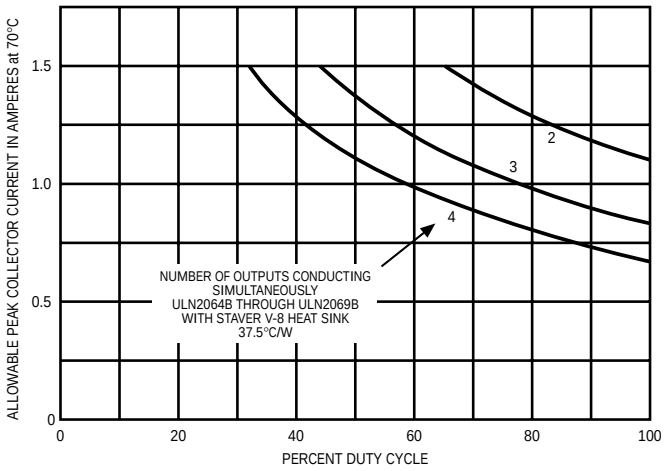
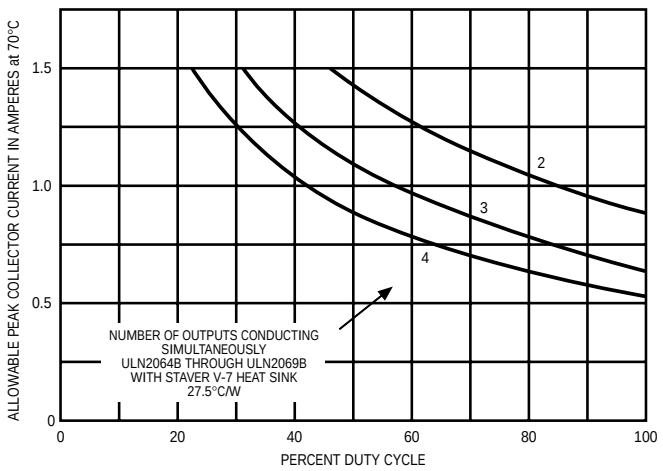


Dwg. No. A-10,400C

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



Dwg. No. A-10,399C



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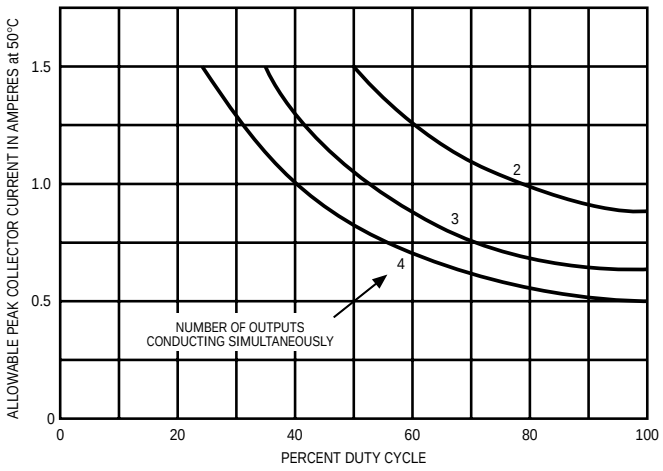
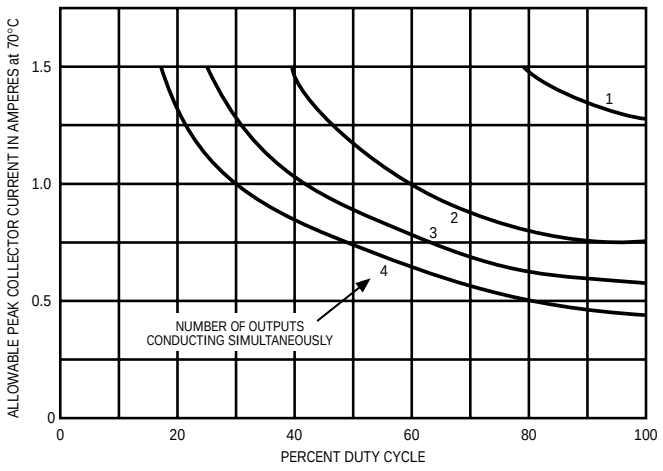
PEAK COLLECTOR CURRENT AS A FUNCTION OF DUTY CYCLE
(SOIC packaged devices)



Dwg. GP-045



Dwg. GP-045-1

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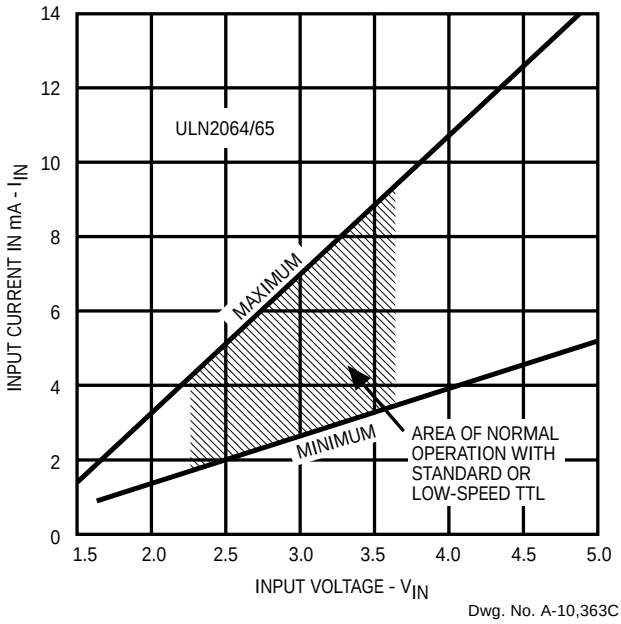
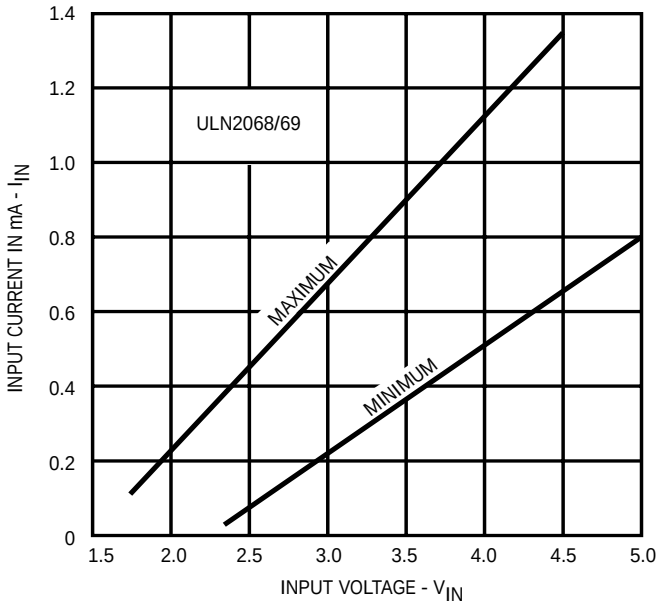
INPUT CURRENT AS A FUNCTION OF INPUT VOLTAGE AT +25°C

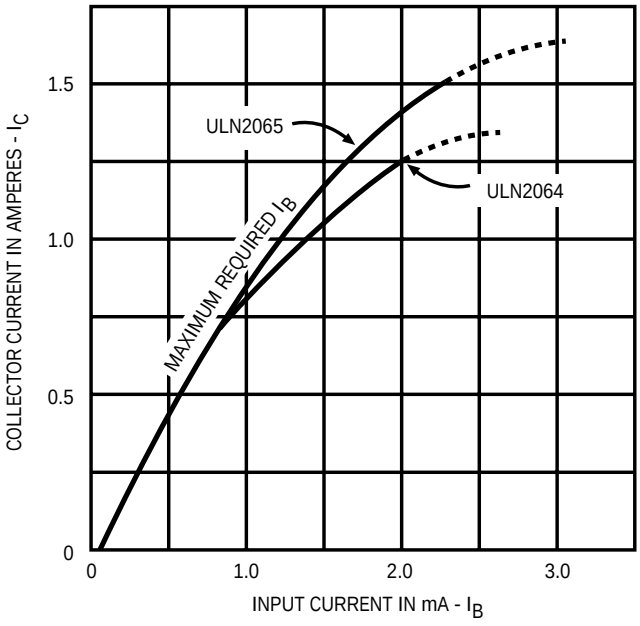


Dwg. No. A-10,363C



Dwg. No. A-12,306A

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



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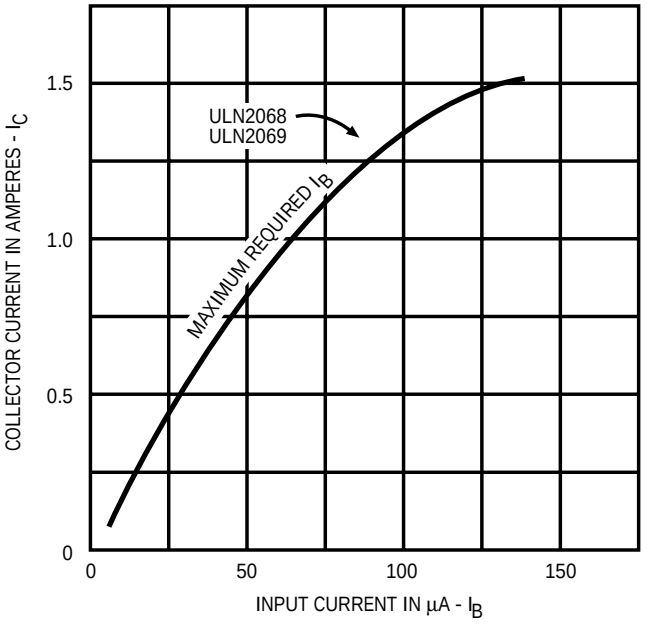
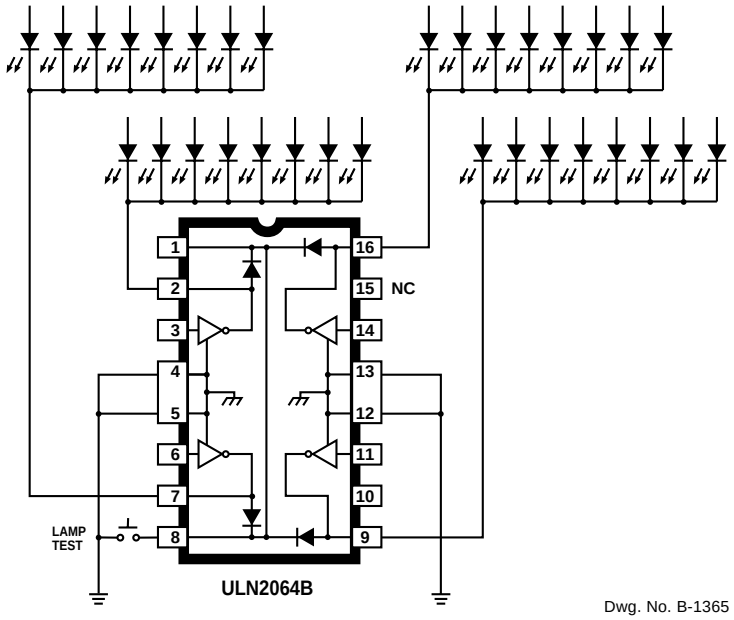


Dwg. No. A-12,305A

TYPICAL APPLICATION



Dwg. No. B-1365

COMMON-CATHODE LED DRIVERS
(Types ULN2065B, ULN2065LB, ULN2068B, and ULN2068LB are also applicable)

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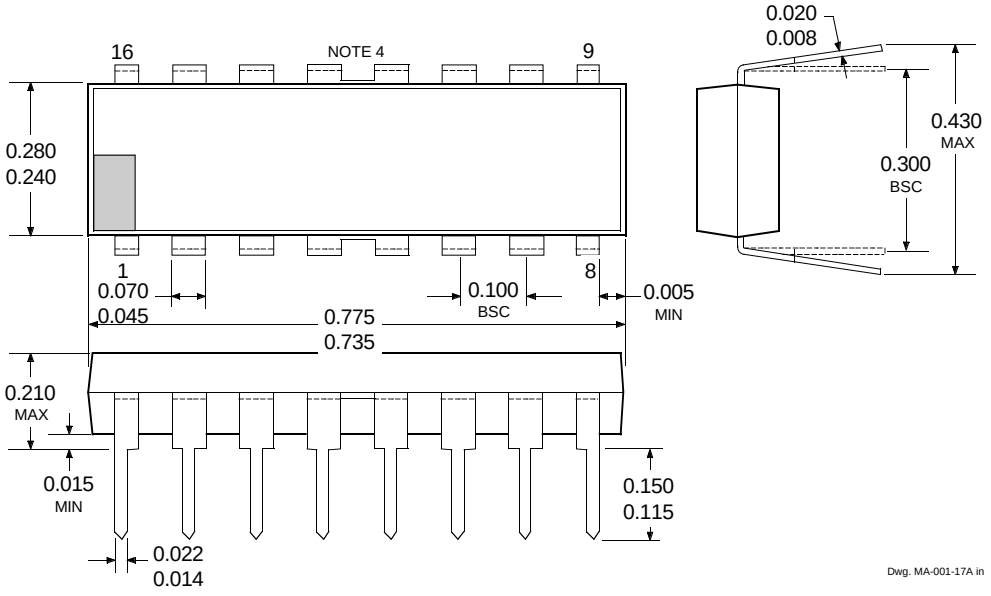
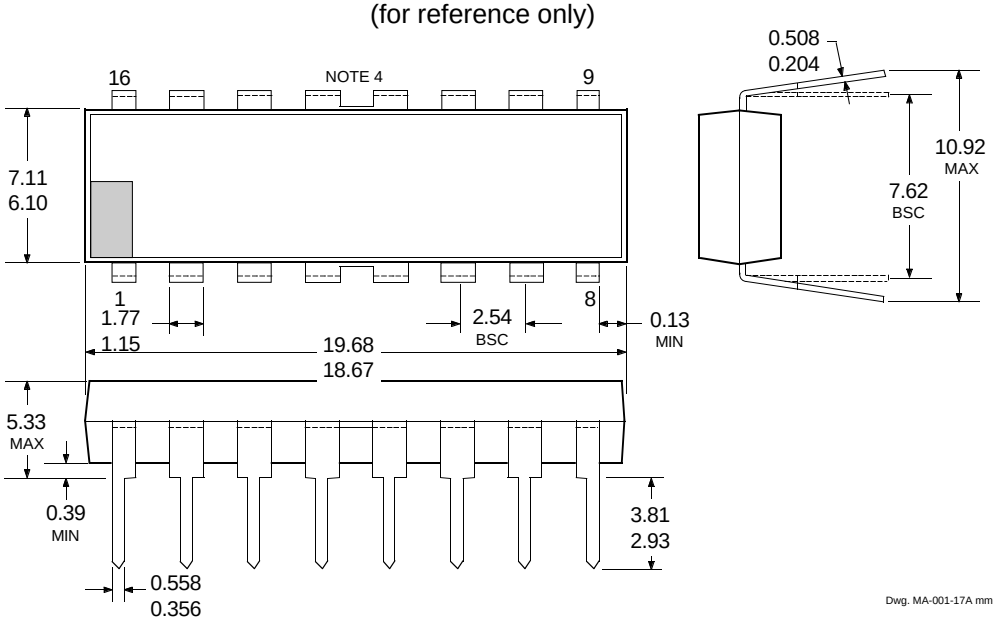
ULN2064B, ULN2065B, ULN2068B, and ULN2069B

Dimensions in Inches
(controlling dimensions)



Dimensions in Millimeters
(for reference only)

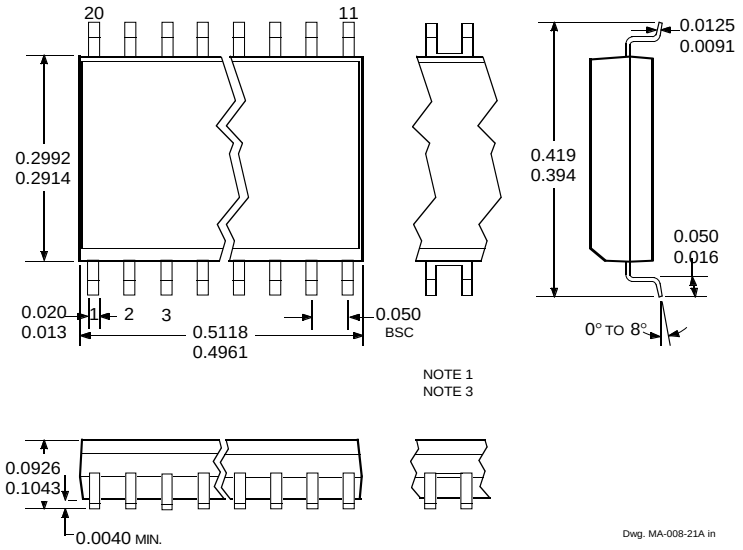


NOTES:
1. Exact body and lead configuration at vendor's option within limits shown.
2. Lead spacing tolerance is non-cumulative.
3. Lead thickness is measured at seating plane or below.
4. Webbed lead frame. Leads 4, 5, 12, and 13 are internally one piece.
5. Supplied in standard sticks/tubes of 25 devices.

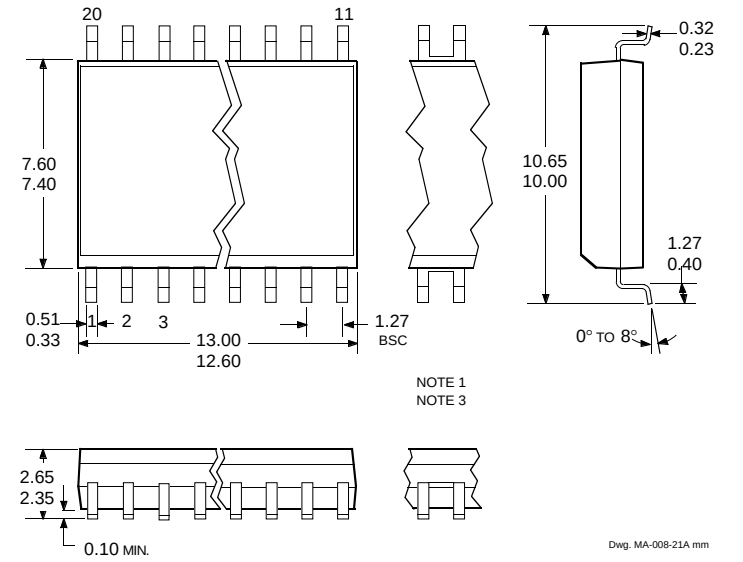
ULN2064LB, ULN2065LB, ULN2068LB, and ULN2069LB

(add “TR” to part number for tape and reel)

Dimensions in Inches
(for reference only)



Dimensions in Millimeters
(controlling dimensions)



NOTES:
1. Exact body and lead configuration at vendor’s option within limits shown.
2. Lead spacing tolerance is non-cumulative.
3. Webbed lead frame. Leads 4 through 7 and 14 through 17 are internally one piece.
4. Lead thickness is measured at seating plane or below.
5. Supplied in standard sticks/tubes of 37 devices or add “TR” to part number for tape and reel.

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The products described here are manufactured under one or more U.S. patents or U.S. patents pending.

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2064 THRU 2069
QUAD 1.5 A DARLINGTON SWITCHES

POWER SINK DRIVERS

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

Output Ratings *			Features					
			Serial	Latched	Diode		Internal	
mA	V	#	Input	Drivers	Clamp	Outputs	Protection	Part Number†
75	17	8	X	X	–	constant current	–	6275
	17	16	X	X	–	constant current	–	6276
100	20	8	–	–	–	saturated	–	2595
	30	32	X	X	–	–	–	5833
	40	32	X	X	–	saturated	–	5832
	50	8	addressable decoder/driver			DMOS	–	6B259
	50	8	–	X	–	DMOS	–	6B273
	50	8	X	X	–	DMOS	–	6B595
120	24	8	X	X	–	constant current	–	6277
250	50	8	addressable decoder/driver			DMOS	–	6259
	50	8	–	X	–	DMOS	–	6273
	50	8	X	X	–	DMOS	–	6595
	50	8	–	–	X	saturated	–	2596
	60	4	–	–	X	saturated	X	2557
350	50	4	–	X	X	–	–	5800
	50	7	–	–	X	–	–	2003
	50	7	–	–	X	–	–	2004
	50	8	–	–	X	–	–	2803
	50	8	–	X	X	–	–	5801
	50	8	X	X	–	–	–	5821
	50	8	X	X	X	–	–	5841
	50	8	addressable decoder/driver			DMOS	–	6A259
	50	8	X	X	–	DMOS	–	6A595
	80	8	X	X	–	–	–	5822
	80	8	X	X	X	–	–	5842
	95	7	–	–	X	–	–	2023
	95	7	–	–	X	–	–	2024
450	30	28	dual 4- to 14-line decoder/driver			–	–	6817
600	60	4	–	–	–	saturated	X	2547
	60	4	–	–	X	saturated	X	2549 and 2559
700	60	4	–	–	X	saturated	X	2543
750	50	8	–	–	X	saturated	–	2597
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
1800	50	4	–	–	X	–	–	2540
3000	46	4	stepper motor controller/driver			MOS	–	7026
	46	4	microstepping controller/driver			MOS	–	7044
4000	50	4	–	–	X	–	–	2878

* 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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