MOTOROLA

ULN2068

Quad 1.5 A Sinking High Current Switch

QUAD 1.5 A DARLINGTON SWITCH

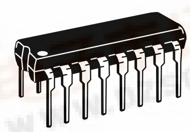
SEMICONDUCTOR TECHNICAL DATA

The ULN2068B is a high–voltage, high–current quad Darlington switch array designed for high current loads, both resistive and reactive, up to 300 W. It is intended for interfacing between low level (TTL, DTL, LS and 5.0 V CMOS) logic families and peripheral loads such as relays, solenoids, dc and stepping motors, multiplexer LED and incandescent displays, heaters, or other high voltage, high current loads.

The Motorola ULN2068B is specified with minimum guaranteed breakdown of 50 V and is 100% tested for safe area using an inductive load. It includes integral transient suppression diodes. Use of a predriver stage reduces input current while still allowing the device to switch 1.5 Amps.

It is supplied in an improved 16–Pin plastic DIP package with heat sink contact tabs (Pins 4, 5, 12 and 13). A copper alloy lead frame allows maximum power dissipation using standard cooling techniques. The use of the contact tab lead frame facilitates attachment of a DIP heat sink while permitting the use of standard layout and mounting practices.

- TTL, DTL, LS, CMOS Compatible Inputs
- 1.5 A Maximum Output Current
- Low Input Current
- Internal Freewheeling Clamp Diodes
- 100% Inductive Load Tested
- Heat Tab Copper Alloy Lead Frame for Increased Dissipation



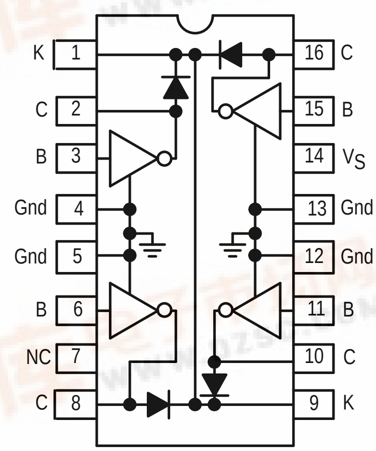
B SUFFIX
PLASTIC PACKAGE
CASE 648C

MAXIMUM RATINGS (T_A = 25°C and ratings apply to any one device in the package, unless otherwise noted)

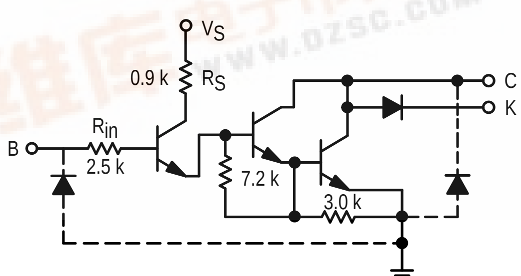
Rating	Symbol	Value	Unit
Output Voltage	V_O	50	V
Input Voltage (Note 1)	V_I	15	V
Supply Voltage	V_S	10	V
Collector Current (Note 2)	I_C	1.75	A
Input Current (Note 3)	I_I	25	mA
Operating Ambient Temperature Range	T_A	0 to +70	°C
Storage Temperature Range	T_{stg}	–55 to +150	°C
Junction Temperature	T_J	150	°C

NOTES: 1. Input voltage referenced to ground.
2. Allowable output conditions shown in Figures 11 and 12.
3. May be limited by max input voltage.

PIN CONNECTIONS



Partial Schematic



ORDERING INFORMATION*

Device	Operating Temperature Range	Package
ULN2068B	T_A = 0 to +70°C	Plastic DIP

*Other options of this ULN2060/2070 series are available for volume applications. Contact your local Motorola Sales Representative.

ULN2068

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
Output Leakage Current (Figure 1) (V_{CE} = 50 V) (V_{CE} = 50 V, T_A = 70°C)	I_{CEX}	 – –	 – –	 100 500	μA
Collector–Emitter Saturation Voltage (Figure 2) (I_C = 500 mA ⎫ (I_C = 750 mA ⎬ V_{in} = 2.4 V) (I_C = 1.0 A ⎪ (I_C = 1.25 A ⎭	$V_{CE(sat)}$	 – – – –	 – – – –	 1.13 1.25 1.40 1.60	V
Input Current – On Condition (Figure 4) (V_I = 2.4 V) (V_I = 3.75 V)	$I_{I(on)}$	 – –	 – –	 0.25 1.0	mA
Input Voltage – On Condition (Figure 5) (V_{CE} = 2.0 V, I_C = 1.5 A)	$V_{I(on)}$	 –	 –	 2.4	V
Inductive Load Test (Figure 3) (V_S = 5.5 V, V_{CC} = 24.5 V, t_{PW} = 4.0 ms)	ΔV_{out}	 –	 –	 100	mV
Supply Current (Figure 8) (I_C = 500 mA, V_{in} = 2.4 V, V_S = 5.5 V)	I_S	 –	 –	 6.0	mA
Turn–On Delay Time (50% E_I to 50% E_O)	t_{PHL}	 –	 –	 1.0	μs
Turn–Off Delay Time (50% E_I to 50% E_O)	t_{PLH}	 –	 –	 4.0	μs
Clamp Diode Leakage Current (Figure 6) (V_R = 50 V) (V_R = 50 V, T_A = 70°C)	I_R	 – –	 – –	 50 100	μA
Clamp Diode Forward Voltage (Figure 7) (I_F = 1.0 A) (I_F = 1.5 A)	V_F	 – –	 – –	 1.75 2.0	V

TEST FIGURES

Figure 1.

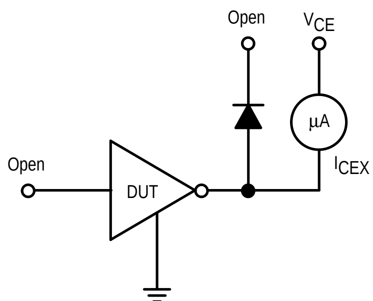


Figure 2.

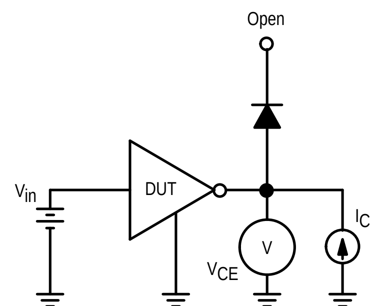


Figure 3.

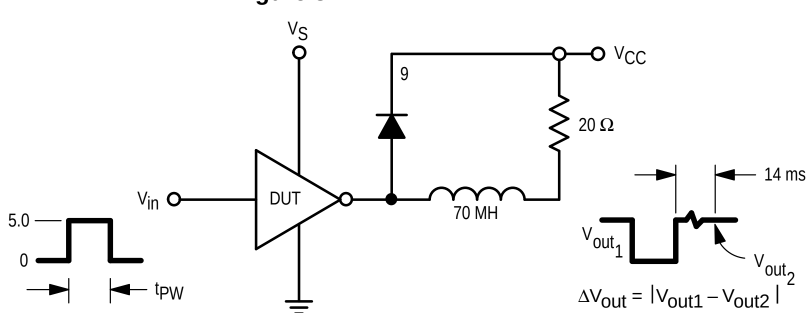
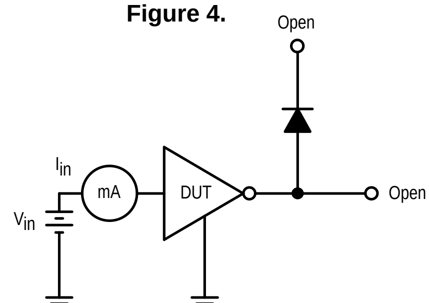


Figure 4.



TEST FIGURES (continued)

Figure 5.

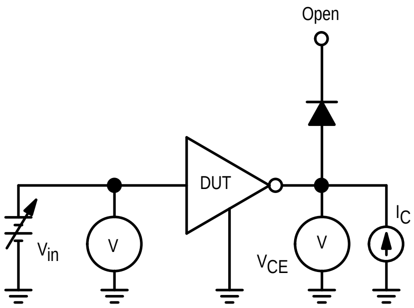


Figure 6.

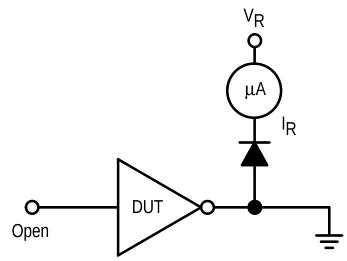


Figure 7.

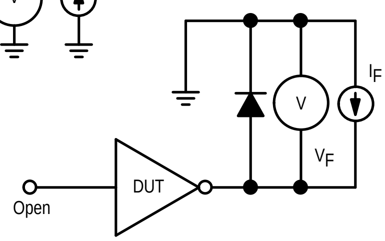
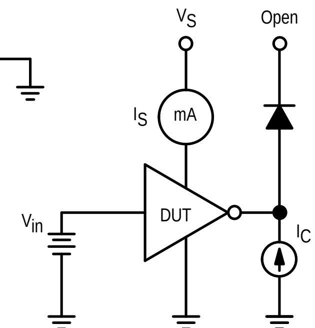


Figure 8.



TYPICAL CHARACTERISTIC CURVES – T_A = 25°C

Figure 9. Input Current versus Input Voltage

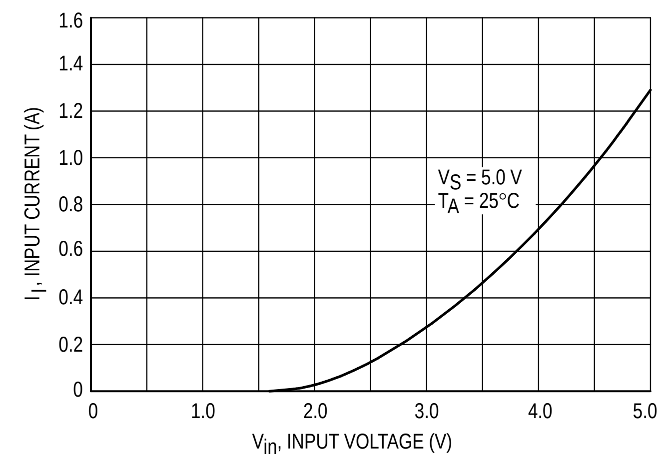


Figure 10. Collector Current versus Input Current

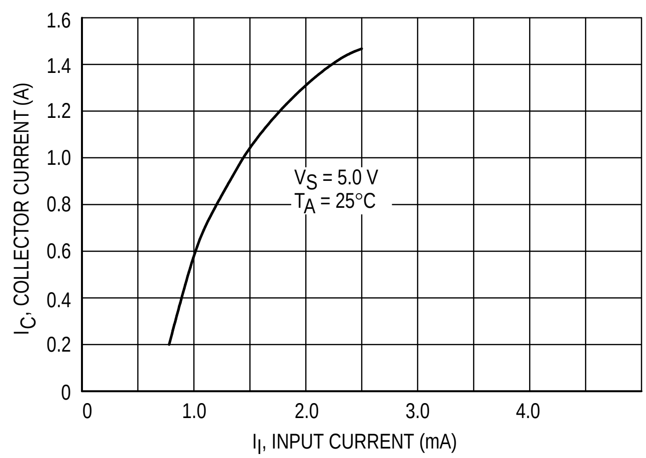


Figure 11. T_A = 70°C w/o Heat Sink

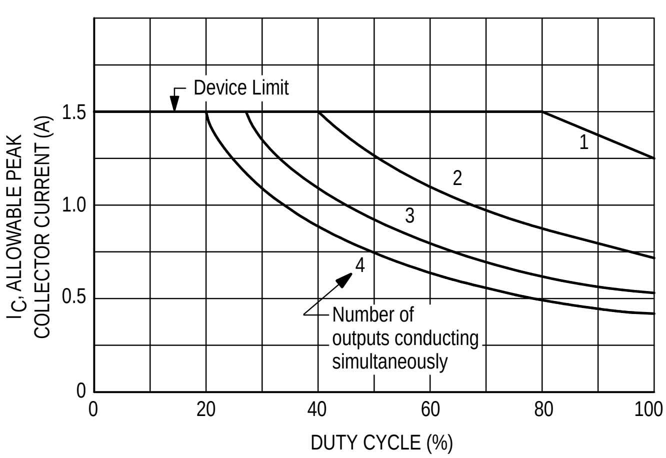


Figure 12. T_A = 70°C w/Staver V–8 Heat Sink (37.5°C/W)

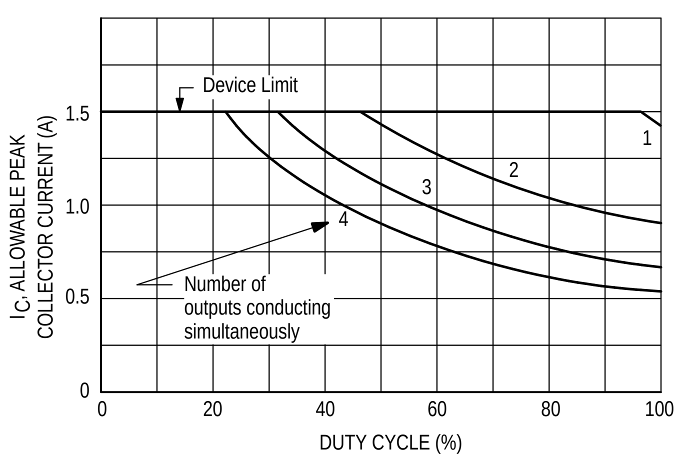


Figure 13. T_A = 70°C w/Staver V–7 Heat Sink (27.5°C/W)

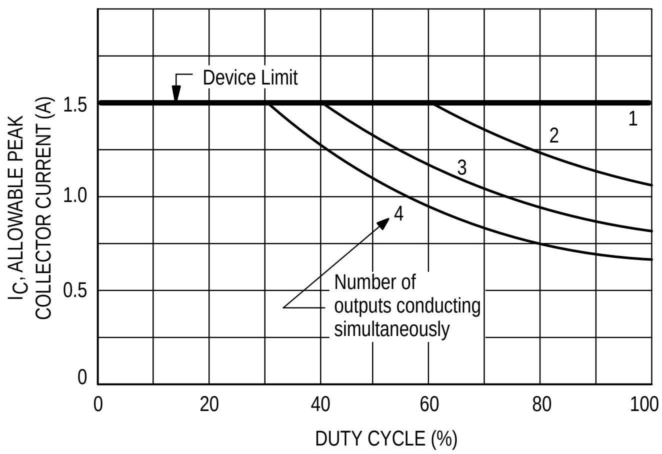


Figure 14. T_A = 50°C w/o Heat Sink

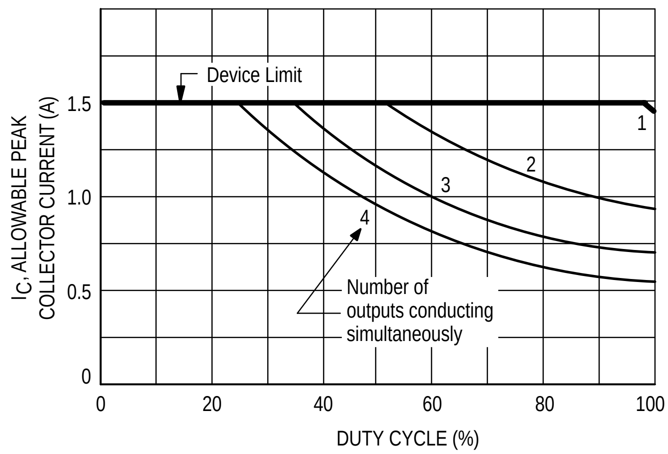


Figure 15. T_A = 50°C w/Staver V–8 Heat Sink (37.5°C/W)

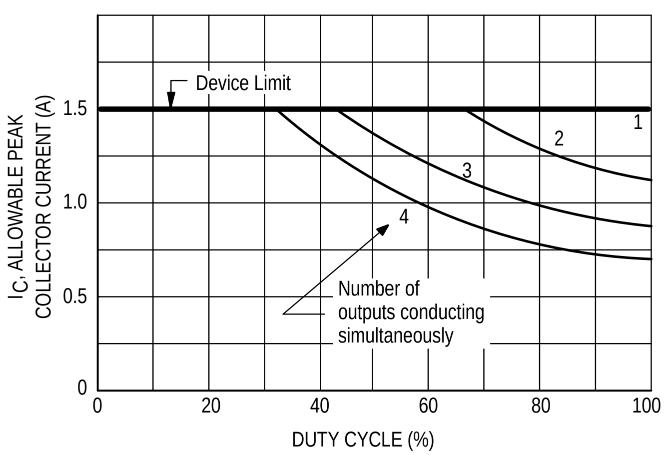
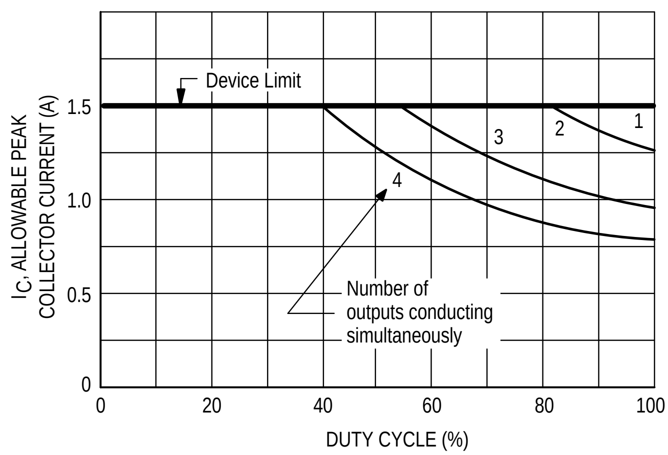
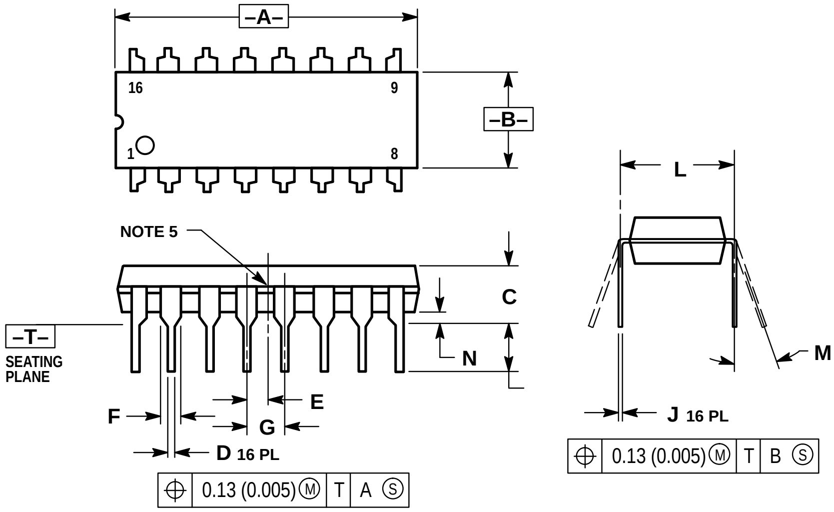


Figure 16. T_A = 50°C w/Staver V–7 Heat Sink (27.5°C/W)



OUTLINE DIMENSIONS

B SUFFIX
PLASTIC PACKAGE
CASE 648C–03
ISSUE C



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
5. INTERNAL LEAD CONNECTION BETWEEN 4 AND 5, 12 AND 13.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.740	0.840	18.80	21.34
B	0.240	0.260	6.10	6.60
C	0.145	0.185	3.69	4.69
D	0.015	0.021	0.38	0.53
E	0.050 BSC		1.27 BSC	
F	0.040	0.70	1.02	1.78
G	0.100 BSC		2.54 BSC	
J	0.008	0.015	0.20	0.38
K	0.115	0.135	2.92	3.43
L	0.300 BSC		7.62 BSC	
M	0°	10°	0°	10°
N	0.015	0.040	0.39	1.01

How to reach us:
USA / EUROPE: Motorola Literature Distribution;
P.O. Box 20912; Phoenix, Arizona 85036. 1–800–441–2447

MFAX: RMFAX0@email.sps.mot.com – TOUCHTONE (602) 244–6609
INTERNET: http://Design–NET.com

JAPAN: Nippon Motorola Ltd.; Tatsumi–SPD–JLDC, Toshikatsu Otsuki,
6F Seibu–Butsuryu–Center, 3–14–2 Tatsumi Koto–Ku, Tokyo 135, Japan. 03–3521–8315

HONG KONG: Motorola Semiconductors H.K. Ltd.; 8B Tai Ping Industrial Park,
51 Ting Kok Road, Tai Po, N.T., Hong Kong. 852–26629298