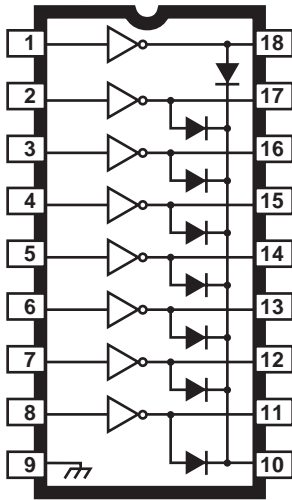


2803 THRU 2824

HIGH-VOLTAGE, HIGH-CURRENT DARLINGTON ARRAYS



Dwg. No. A-10,322A

Featuring continuous load current ratings to 500 mA for each of the eight drivers, the Series ULN28xxA and ULQ28xxA high-voltage, high-current Darlington arrays are ideally suited for interfacing between low-level logic circuitry and multiple peripheral power loads. Typical power loads totaling over 260 W (350 mA x 8, 95 V) can be controlled at an appropriate duty cycle depending on ambient temperature and number of drivers turned ON simultaneously. Typical loads include relays, solenoids, stepping motors, magnetic print hammers, multiplexed LED and incandescent displays, and heaters. All devices feature open-collector outputs with integral clamp diodes.

The ULx2803A and ULx2823A have series input resistors selected for operation directly with 5 V TTL or CMOS. These devices will handle numerous interface needs — particularly those beyond the capabilities of standard logic buffers.

The ULx2804A and ULx2824A have series input resistors for operation directly from 6 V to 15 V CMOS or PMOS logic outputs.

The ULx2803A and ULx2804A are the standard Darlington arrays. The outputs are capable of sinking 500 mA and will withstand at least 50 V in the OFF state. Outputs may be paralleled for higher load current capability. The ULx2823A and ULx2824A will withstand 95 V in the OFF state.

These Darlington arrays are furnished in 18-pin dual in-line plastic packages. All devices are pinned with outputs opposite inputs to facilitate ease of circuit board layout. Prefix “ULN” devices are rated for operation over the temperature range of -20°C to +85°C; prefix “ULQ” devices are rated for operation to -40°C.

ABSOLUTE MAXIMUM RATINGS

Output Voltage, V_{CE}

(ULx2803A and ULx2804A) 50 V

(ULx2823A and ULx2824A) 95 V

Input Voltage, V_{IN} 30 V

Continuous Output Current, I_C 500 mA

Continuous Input Current, I_{IN} 25 mA

Power Dissipation, P_D

(one Darlington pair) 1.0 W

(total package) See Graph

Operating Temperature Range, T_A

Prefix “ULN” -20°C to +85°C

Prefix “ULQ” -40°C to +85°C

Storage Temperature Range,

T_S -55°C to +150°C

FEATURES

- TTL, DTL, PMOS, or CMOS Compatible Inputs
- Output Current to 500 mA
- Output Voltage to 95 V
- Transient-Protected Outputs
- Dual In-Line Plastic Package

x = Character to identify specific device. Characteristic shown applies to family of devices with remaining digits as shown. See matrix on next page.

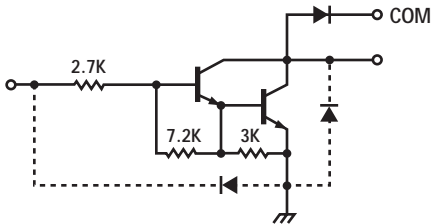
2803 THRU 2824 HIGH-VOLTAGE, HIGH-CURRENT DARLINGTON ARRAYS

DEVICE PART NUMBER DESIGNATION

$V_{CE(MAX)}$	50 V	95 V
$I_{C(MAX)}$	500 mA	500 mA
Logic	Part Number	
5V TTL, CMOS	ULN2803A ULQ2803A	ULN2823A ULQ2823A
6-15 V CMOS, PMOS	ULN2804A ULQ2804A	ULN2824A ULQ2824A

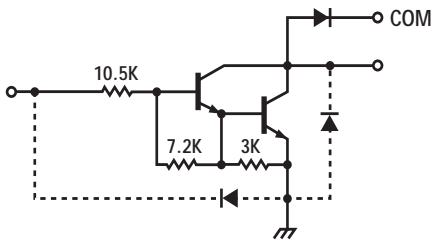
PARTIAL SCHEMATICS

ULx28x3A (Each Driver)

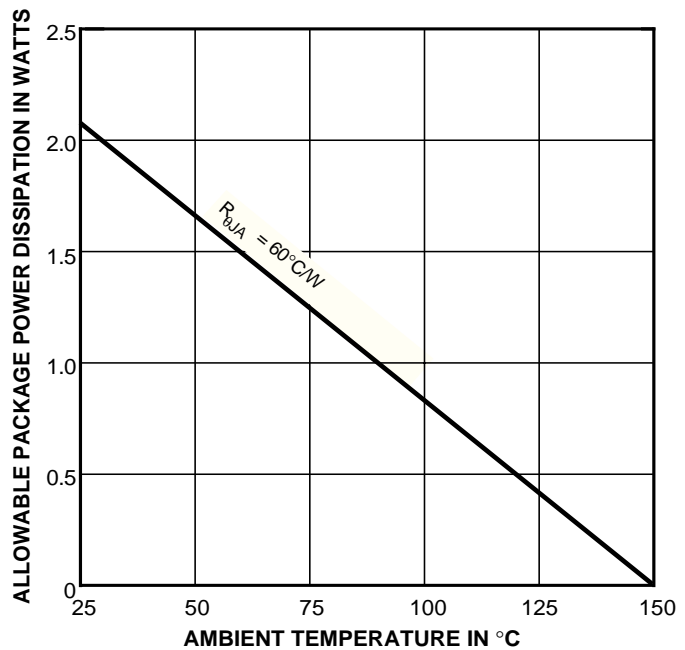


Dwg. No. A-9651

ULx28x4A (Each Driver)



Dwg. No. A-9898A



Dwg. GP-016

x = Character to identify specific device. Specification shown applies to family of devices with remaining digits as shown. See matrix above.

2803^{THRU} 2824
HIGH-VOLTAGE,
HIGH-CURRENT
DARLINGTON ARRAYS

Types ULx2803A and ULx2804A

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

Characteristic	Symbol	Test Fig.	Applicable Devices	Test Conditions	Limits			
					Min.	Typ.	Max.	Units
Output Leakage Current	I_{CEX}	1A	All	$V_{CE} = 50\text{ V}, T_A = 25^\circ\text{C}$	—	< 1	50	μA
				$V_{CE} = 50\text{ V}, T_A = 70^\circ\text{C}$	—	< 1	100	μA
		1B	ULx2804A	$V_{CE} = 50\text{ V}, T_A = 70^\circ\text{C}, V_{IN} = 1.0\text{ V}$	—	< 5	500	μA
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$	2	All	$I_C = 100\text{ mA}, I_B = 250\text{ }\mu\text{A}$	—	0.9	1.1	V
				$I_C = 200\text{ mA}, I_B = 350\text{ }\mu\text{A}$	—	1.1	1.3	V
				$I_C = 350\text{ mA}, I_B = 500\text{ }\mu\text{A}$	—	1.3	1.6	V
Input Current	$I_{IN(ON)}$	3	ULx2803A	$V_{IN} = 3.85\text{ V}$	—	0.93	1.35	mA
			ULx2804A	$V_{IN} = 5.0\text{ V}$	—	0.35	0.5	mA
				$V_{IN} = 12\text{ V}$	—	1.0	1.45	mA
	$I_{IN(OFF)}$	4	All	$I_C = 500\text{ }\mu\text{A}, T_A = 70^\circ\text{C}$	50	65	—	μA
Input Voltage	$V_{IN(ON)}$	5	ULx2803A	$V_{CE} = 2.0\text{ V}, I_C = 200\text{ mA}$	—	—	2.4	V
				$V_{CE} = 2.0\text{ V}, I_C = 250\text{ mA}$	—	—	2.7	V
				$V_{CE} = 2.0\text{ V}, I_C = 300\text{ mA}$	—	—	3.0	V
			ULx2804A	$V_{CE} = 2.0\text{ V}, I_C = 125\text{ mA}$	—	—	5.0	V
				$V_{CE} = 2.0\text{ V}, I_C = 200\text{ mA}$	—	—	6.0	V
				$V_{CE} = 2.0\text{ V}, I_C = 275\text{ mA}$	—	—	7.0	V
				$V_{CE} = 2.0\text{ V}, I_C = 350\text{ mA}$	—	—	8.0	V
Input Capacitance	C_{IN}	—	All		—	15	25	pF
Turn-On Delay	t_{PLH}	8	All	$0.5 E_{IN}$ to $0.5 E_{OUT}$	—	0.25	1.0	μs
Turn-Off Delay	t_{PHL}	8	All	$0.5 E_{IN}$ to $0.5 E_{OUT}$	—	0.25	1.0	μs
Clamp Diode Leakage Current	I_R	6	All	$V_R = 50\text{ V}, T_A = 25^\circ\text{C}$	—	—	50	μA
				$V_R = 50\text{ V}, T_A = 70^\circ\text{C}$	—	—	100	μA
Clamp Diode Forward Voltage	V_F	7	All	$I_F = 350\text{ mA}$	—	1.7	2.0	V

Complete part number includes prefix to operating temperature range: ULN = -20°C to +85°C, ULQ = -40°C to +85°C.

2803 THRU 2824 HIGH-VOLTAGE, HIGH-CURRENT DARLINGTON ARRAYS

Types ULx2823A and ULx2824A ELECTRICAL CHARACTERISTICS at +25°C (unless otherwise noted).

Characteristic	Symbol	Test Fig.	Applicable Devices	Test Conditions	Limits			
					Min.	Typ.	Max.	Units
Output Leakage Current	I_{CEX}	1A	All	$V_{CE} = 95\text{ V}, T_A = 25^\circ\text{C}$	—	< 1	50	μA
				$V_{CE} = 95\text{ V}, T_A = 70^\circ\text{C}$	—	< 1	100	μA
		1B	ULx2824A	$V_{CE} = 95\text{ V}, T_A = 70^\circ\text{C}, V_{IN} = 1.0\text{ V}$	—	< 5	500	μA
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$	2	All	$I_C = 100\text{ mA}, I_B = 250\text{ }\mu\text{A}$	—	0.9	1.1	V
				$I_C = 200\text{ mA}, I_B = 350\text{ }\mu\text{A}$	—	1.1	1.3	V
				$I_C = 350\text{ mA}, I_B = 500\text{ }\mu\text{A}$	—	1.3	1.6	V
Input Current	$I_{IN(ON)}$	3	ULx2823A	$V_{IN} = 3.85\text{ V}$	—	0.93	1.35	mA
			ULx2824A	$V_{IN} = 5.0\text{ V}$	—	0.35	0.5	mA
				$V_{IN} = 12\text{ V}$	—	1.0	1.45	mA
	$I_{IN(OFF)}$	4	All	$I_C = 500\text{ }\mu\text{A}, T_A = 70^\circ\text{C}$	50	65	—	μA
Input Voltage	$V_{IN(ON)}$	5	ULx2823A	$V_{CE} = 2.0\text{ V}, I_C = 200\text{ mA}$	—	—	2.4	V
				$V_{CE} = 2.0\text{ V}, I_C = 250\text{ mA}$	—	—	2.7	V
				$V_{CE} = 2.0\text{ V}, I_C = 300\text{ mA}$	—	—	3.0	V
			ULx2824A	$V_{CE} = 2.0\text{ V}, I_C = 125\text{ mA}$	—	—	5.0	V
				$V_{CE} = 2.0\text{ V}, I_C = 200\text{ mA}$	—	—	6.0	V
				$V_{CE} = 2.0\text{ V}, I_C = 275\text{ mA}$	—	—	7.0	V
				$V_{CE} = 2.0\text{ V}, I_C = 350\text{ mA}$	—	—	8.0	V
Input Capacitance	C_{IN}	—	All		—	15	25	pF
Turn-On Delay	t_{PLH}	8	All	$0.5 E_{IN}$ to $0.5 E_{OUT}$	—	0.25	1.0	μs
Turn-Off Delay	t_{PHL}	8	All	$0.5 E_{IN}$ to $0.5 E_{OUT}$	—	0.25	1.0	μs
Clamp Diode Leakage Current	I_R	6	All	$V_R = 95\text{ V}, T_A = 25^\circ\text{C}$	—	—	50	μA
				$V_R = 95\text{ V}, T_A = 70^\circ\text{C}$	—	—	100	μA
Clamp Diode Forward Voltage	V_F	7	All	$I_F = 350\text{ mA}$	—	1.7	2.0	V

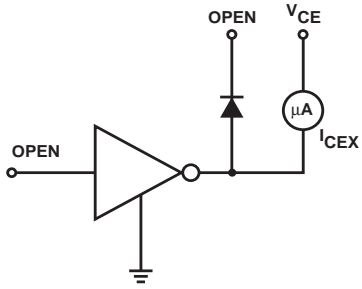
Complete part number includes prefix to indicate operating temperature range: ULN = -20°C to +85°C, ULQ = -40°C to +85°C.



2803^{THRU} 2824 HIGH-VOLTAGE, HIGH-CURRENT DARLINGTON ARRAYS

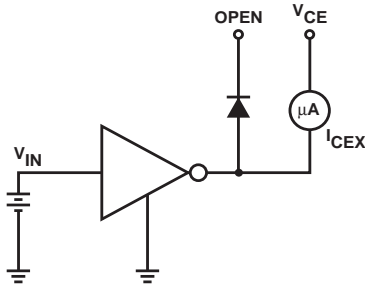
TEST FIGURES

FIGURE 1A



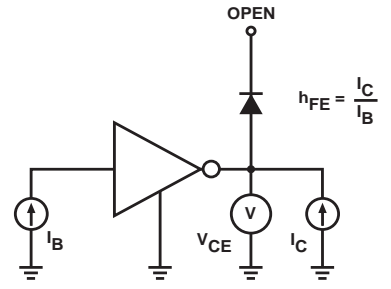
Dwg. No. A-9729A

FIGURE 1B



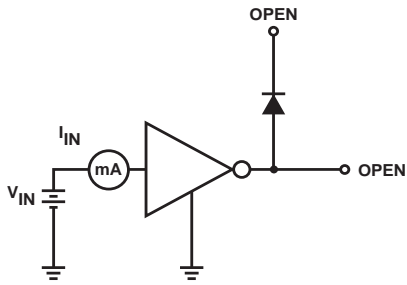
Dwg. No. A-9730A

FIGURE 2



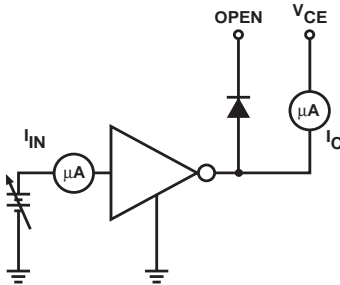
Dwg. No. A-9731A

FIGURE 3



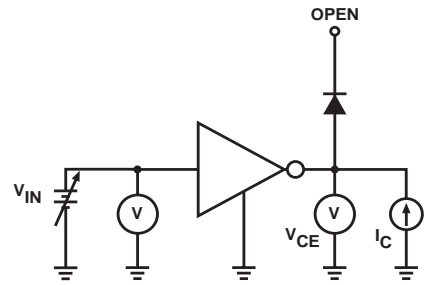
Dwg. No. A-9732A

FIGURE 4



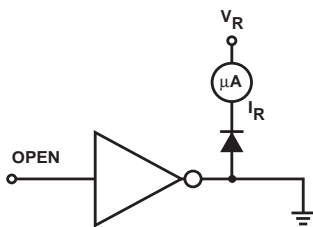
Dwg. No. A-9733A

FIGURE 5



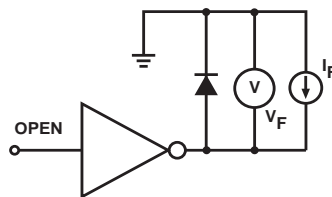
Dwg. No. A-9734A

FIGURE 6



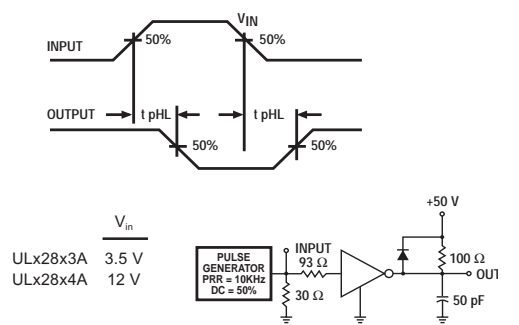
Dwg. No. A-9735A

FIGURE 7



Dwg. No. A-9736A

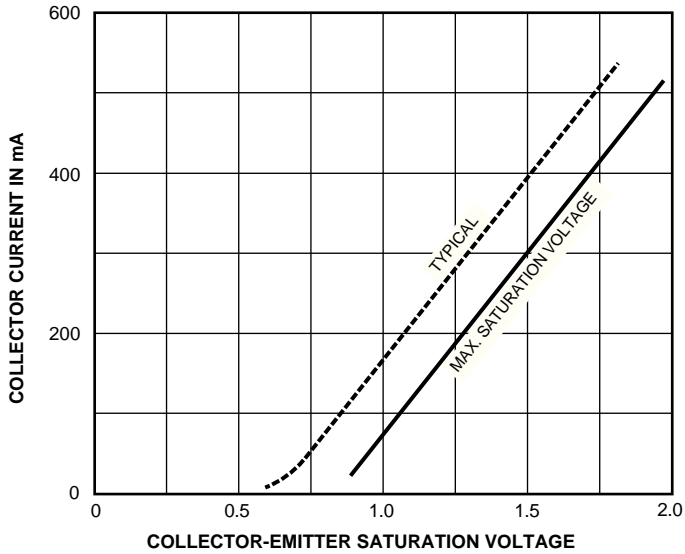
FIGURE 8



x = Character to identify specific device. Specification shown applies to family of devices with remaining digits as shown.

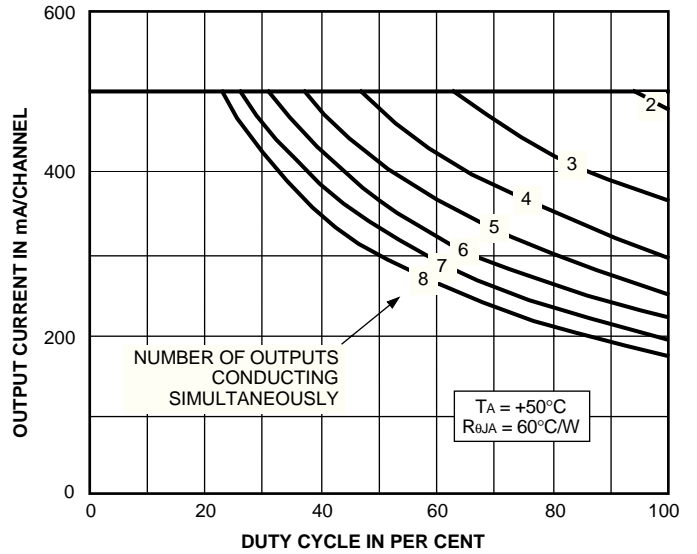
2803 THRU 2824 HIGH-VOLTAGE, HIGH-CURRENT DARLINGTON ARRAYS

SATURATION VOLTAGE AS A FUNCTION OF COLLECTOR CURRENT



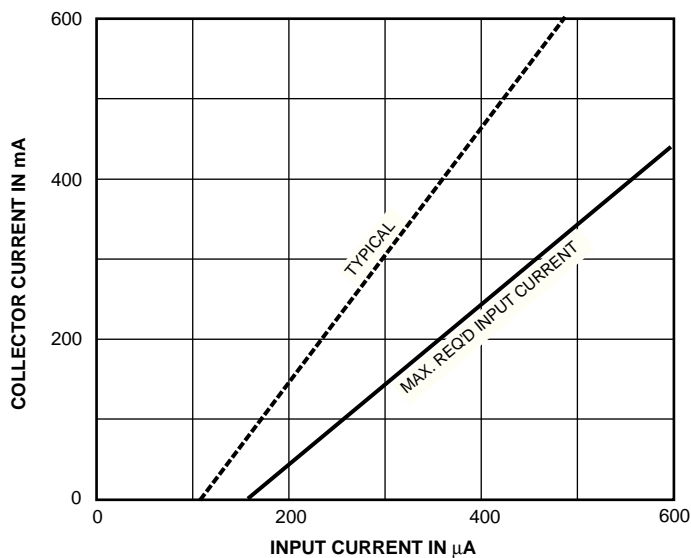
Dwg. GP-067

ALLOWABLE COLLECTOR CURRENT AS A FUNCTION OF DUTY CYCLE

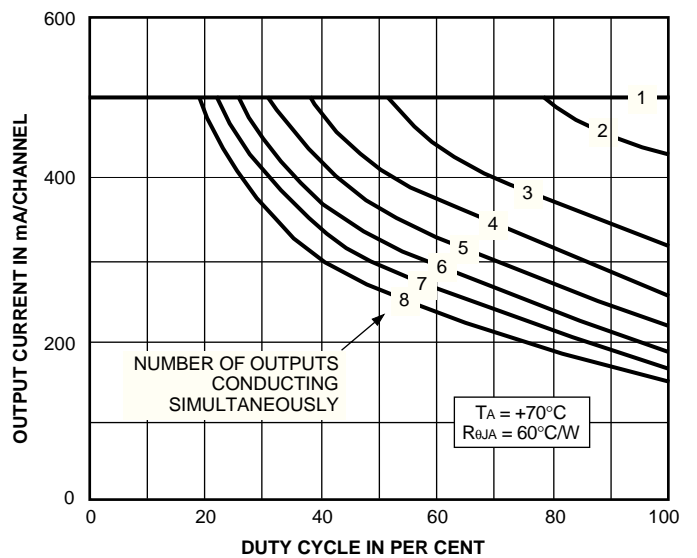


Dwg. GP-070-2

COLLECTOR CURRENT AS A FUNCTION OF INPUT CURRENT



Dwg. GP-068

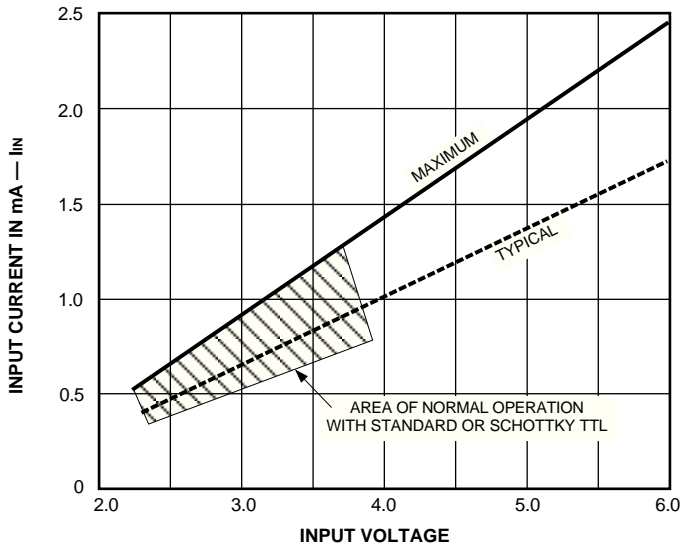


Dwg. GP-070-1



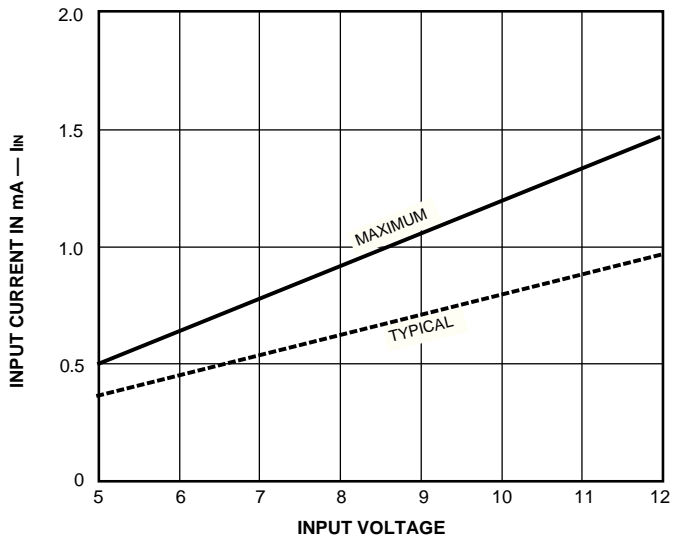
2803^{THRU} 2824 HIGH-VOLTAGE, HIGH-CURRENT DARLINGTON ARRAYS

**INPUT CURRENT AS A
FUNCTION OF INPUT VOLTAGE
ULx28x3A**



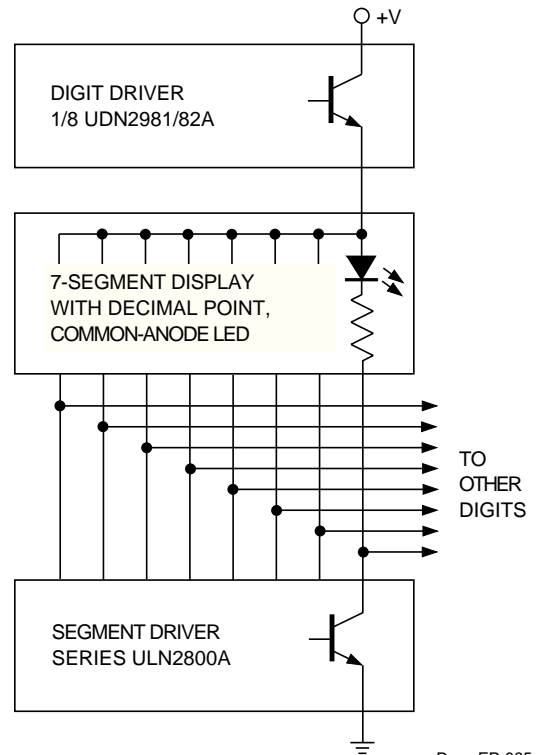
Dwg. GP-069

ULx28x4A

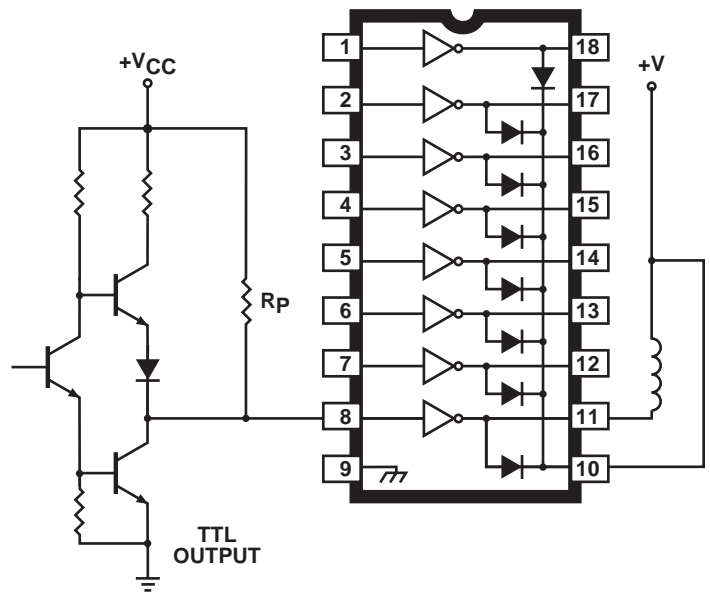


Dwg. GP-069-1

TYPICAL DISPLAY INTERFACE



Dwg. EP-065



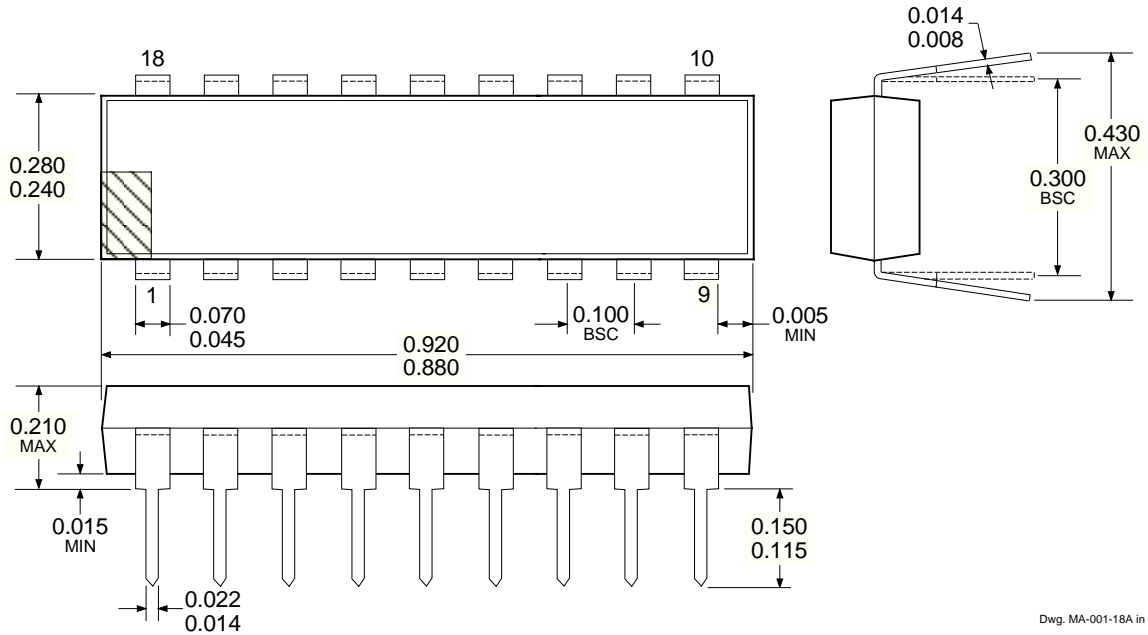
Dwg. No. A-10,384

x = Character to identify specific device. Characteristic shown applies to family of devices with remaining digits as shown. See matrix.

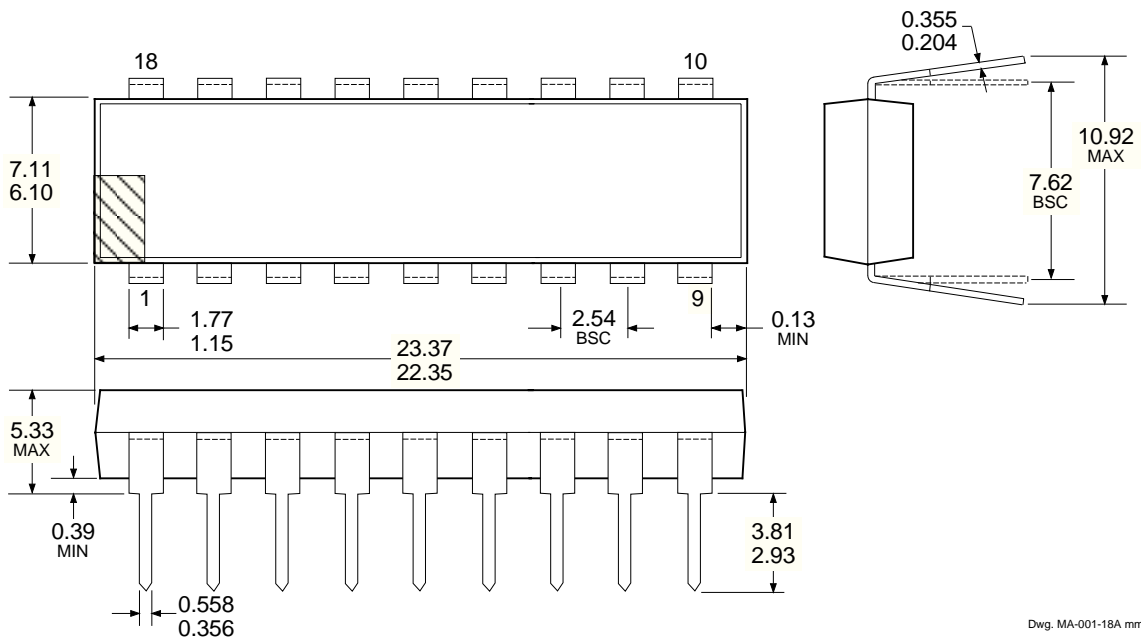
2803 THRU 2824 HIGH-VOLTAGE, HIGH-CURRENT DARLINGTON ARRAYS

PACKAGE DIMENSIONS

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.



115 Northeast Cutoff, Box 15036
Worcester, Massachusetts 01615-0036 (508) 853-5000

2803^{THRU} 2824
HIGH-VOLTAGE,
HIGH-CURRENT
DARLINGTON ARRAYS

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	7	–	–	X	–	–	2003
	50	8	–	–	X	–	–	2803
	50	8	–	–	X	X	–	2596
	60	2		Hall Sensor/Driver	–	X	–	5275
	60	4	–	–	X	X	X	2557
	95	7	–	–	X	–	–	2023
	95	8	–	–	X	–	–	2823
350	50	4	–	X	X	–	–	5800
	50	7	–	–	X	–	–	2004
	50	8	–	–	X	–	–	2804
	50	8	–	X	X	–	–	5801
	50	8	X	X	–	–	–	5821
	50	8	X	X	X	–	–	5841
	80	8	X	X	X	–	–	5842
	95	7	–	–	X	–	–	2024
	95	8	–	–	X	–	–	2824
	450	30	28		Dual 4 to 14-Line Decoder/Driver	–	–	–
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.

2803 THRU 2824
HIGH-VOLTAGE,
HIGH-CURRENT
DARLINGTON ARRAYS

Allegro MicroSystems, Inc. reserves the right to make, from time to time, such departures from the detail specifications as may be required to permit improvements in the design of its products. Components made under military approvals will be in accordance with the approval requirements.

The information included herein is believed to be accurate and reliable. However, Allegro MicroSystems, Inc. assumes no responsibility for its use; nor for any infringements of patents or other rights of third parties which may result from its use.



115 Northeast Cutoff, Box 15036
Worcester, Massachusetts 01615-0036 (508) 853-5000