

8514019 SPRAGUE, SEMICONDS/ICS

93D 03812 D T-43-25

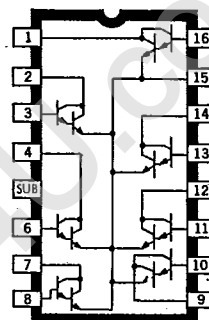
**ULN-2031A, ULN-2032A, AND ULN-2033A  
HIGH-CURRENT DARLINGTON TRANSISTOR ARRAYS**

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HIGH-CURRENT DARLINGTON TRANSISTOR ARRAYS**

SPRAGUE TYPE ULN-2031A, ULN-2032A, and ULN-2033A High-Current Darlington Transistor Arrays are comprised of seven silicon Darlington pairs on a common monolithic substrate. The Type ULN-2031A consists of 14 NPN transistors connected to form seven Darlington pairs with NPN action. The Type ULN-2032A ( $h_{FE} = 500$  min.) and the Type ULN-2033A ( $h_{FE} = 50$  min.) consist of seven NPN and seven PNP transistors connected to form seven Darlington pairs with PNP action. All devices feature a common emitter configuration.

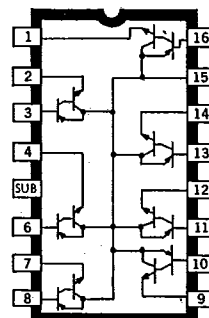
These devices are especially suited for interfacing between MOS, TTL, or DTL outputs and 7-segment LED or tungsten filament indicators. Peak inrush currents to 100 mA are allowable. They are also ideal for a variety of other driver applications such as relay control and thyristor firing.

The ULN-2031A, ULN-2032A, and ULN-2033A transistor arrays are housed in 16-lead DIP plastic packages which include a separate substrate connection for maximum circuit design flexibility.



Dwg. No. A-9202

**ULN-2031A**



Dwg. No. A-9201

**ULN-2032A  
ULN-2033A**

Additional information on transistor arrays ULN-2031A through ULN-2086A, ULS-2045H and ULS-2083H, is available from:

Sprague Electric Company  
Integrated Circuits Division  
115 Northeast Cutoff  
Worcester, Massachusetts 01606  
(617) 853-5000

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**ULN-2031A, ULN-2032A, AND ULN-2033A  
HIGH-CURRENT DARLINGTON TRANSISTOR ARRAYS**

**ABSOLUTE MAXIMUM RATINGS  
at +25°C Free-Air Temperature  
(unless otherwise noted)**

Power Dissipation (any one Darlington pair) .....	500 mW
(total package) .....	750 mW
Derating Factor Above +25°C .....	6.67 mW/°C
Ambient Temperature Range (operating), $T_A$ .....	-20°C to +85°C
Storage Temperature Range, $T_S$ .....	-55°C to +125°C
Individual Darlington Pair Ratings:	
Collector-to-Emitter Voltage, $V_{CE0}$ .....	16 V
Collector-to-Base Voltage, $V_{CB0}$ .....	40 V
Collector-to-Substrate Voltage, $V_{C10}$ .....	40 V
Emitter-to-Base Voltage, $V_{EB0}$	
Type ULN-2031A .....	5 V
Type ULN-2032A and ULN-2033A .....	40 V
Continuous Collector Current, $I_C$ .....	80 mA
Continuous Base Current, $I_B$ .....	5 mA

**NOTE:**

The substrate must be connected to a voltage which is more negative than any collector or base voltage so as to maintain isolation between transistors, and to provide normal transistor action.

**ELECTRICAL CHARACTERISTICS at  $T_A = +25^\circ\text{C}$**

Characteristic	Symbol	Test Conditions	Limits			Units
			Min.	Typ.	Max.	
Collector-Base Breakdown Voltage	$BV_{CB0}$	$I_C = 500 \mu\text{A}$	40	—	—	V
Collector-Substrate Breakdown Voltage	$BV_{C10}$	$I_C = 500 \mu\text{A}$	40	—	—	V
Collector-Emitter Breakdown Voltage	$BV_{CE0}$	$I_C = 1 \text{ mA}$	16	—	—	V
Emitter-Base Breakdown Voltage	$BV_{EB0}$	$I_E = 500 \mu\text{A}$				
Type ULN-2031A			5	—	—	V
Type ULN-2032A and ULN-2033A			40	—	—	V
D-C Forward Current Transfer Ratio	$h_{FE}$	$V_{CE} = 2 \text{ V}, I_C = 20 \text{ mA}$				
Type ULN-2031A and ULN-2032A			500	—	—	—
Type ULN-2033A			50	—	500	—
Base-Emitter Saturation Voltage	$V_{BE(SAT)}$	$I_C = 20 \text{ mA}, I_B = 500 \mu\text{A}$				
Type ULN-2031A			—	—	2	V
Type ULN-2032A and ULN-2033A			—	—	1	V
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$					
Type ULN-2031A and ULN-2032A		$I_C = 20 \text{ mA}, I_B = 40 \mu\text{A}$	—	—	1.2	V
		$I_C = 80 \text{ mA}, I_B = 1 \text{ mA}$	—	—	1.5	V
Type ULN-2033A		$I_C = 20 \text{ mA}, I_B = 400 \mu\text{A}$	—	—	1.2	V
		$I_C = 80 \text{ mA}, I_B = 2 \text{ mA}$	—	—	1.5	V
Collector Cutoff Current	$I_{CE0}$	$V_{CE} = 8 \text{ V}$	—	—	100	$\mu\text{A}$
	$I_{CB0}$	$V_{CB} = 10 \text{ V}$	—	—	10	$\mu\text{A}$