INTEGRATED POWER SEMICONDUCTORS, LTD.

1.5 Amp Quad Darlington Arrays

T-43-25

Description

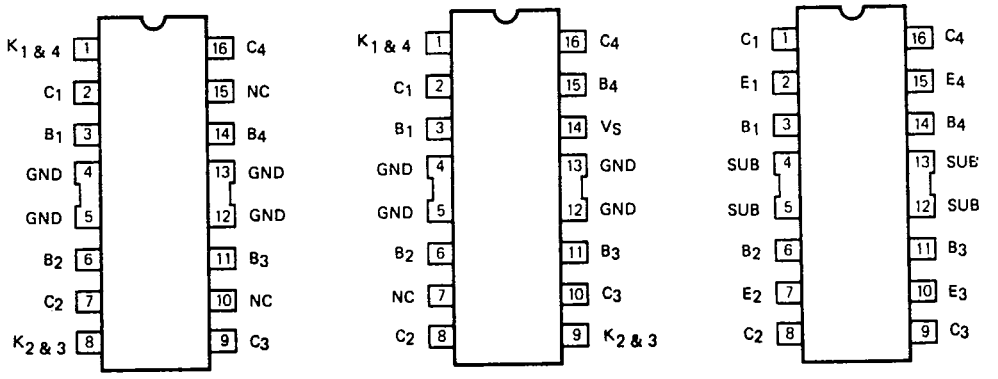
These high-voltage, high-current darlington arrays are monolithic bipolar devices especially designed for interfacing low-level control logic and peripheral loads such as relays, soleniods, DC and stepping motors, multiplexed LED and incandescent displays, and heaters. The logic inputs are designed to be compatible with TTL, DTL, LSTTL, CMOS and NMOS logic families. Several of the arrays include internal clamp diodes for driving inductive loads, and breakdown voltage ratings to 80 volts are available.

Features

- Four power drivers per package
- 1.5 amp collector currents
- 80 and 50 volt BV_{CEX} ratings
- Internal clamp diodes for inductive loads
- Compatibility with all popular logic families
- Low internal parasitics

Connections

Top View



ULN2064 - ULN2067 ULN2068 - ULN2071 ULN2074 - ULN2077

N Package

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Absolute Maximum Ratings

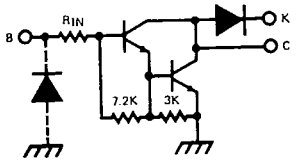
Input Voltage (Note 2)	See Selection Guide
Input Current (Note 3)	25mA
Supply Voltage	
ULN2068/2069	10V
ULN2070/2071	20V
Output Voltage	See Selection Guide
Output Current (Note 1)	1.75A
Output Sustaining Voltage	See Selection Guide

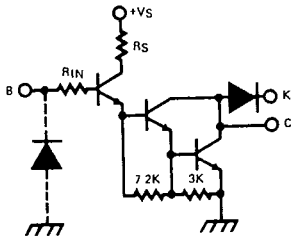
Power Dissipation at T_A = +25°C	2.77W
Thermal Resistance: junction to ambient	45°C/W
Operating Junction Temperature	+150°C
Operating Ambient Temperature Range	–20°C to +85°C
Storage Temperature Range	–55°C to +150°C
Lead Temperature (Soldering, 10 sec.)	+300°C

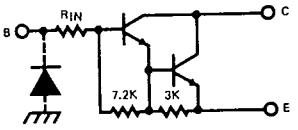
Absolute maximum ratings are those values beyond which the safety of the device cannot be guaranteed. They are not meant to imply that the device should be operated at these limits. The electrical characteristics provide conditions for actual device operation.

Note 1: Allowable combinations of output current, number of outputs conducting, and duty cycle are shown on the following pages.
Note 2: Input voltage is referenced to the substrate (no connection to other pins) for type ULN2074/75/76/77; reference is ground for all other types.
Note 3: Input current may be limited by maximum allowable input voltages.

Schematic Diagrams (Single Darlington Shown)







ULN2064/2065: R_{IN} = 350Ω
ULN2066/2067: R_{IN} = 3KΩ

ULN2068/2069: R_{IN} = 2.5KΩ, R_S = 900Ω
ULN2070/2071: R_{IN} = 11.6KΩ, R_S = 3.4KΩ

ULN2074/2075: R_{IN} = 350Ω
ULN2076/2077: R_{IN} = 3KΩ

Electrical Characteristics

(Unless otherwise indicated, electrical characteristics apply for T_A =25°C only)

Parameter	Conditions	Device	ULN2064/2067 Min	ULN2064/2067 Max	Units
Output Leakage Current, I_{CEX}	V_{CE} = 50V	2064/66		100	µA
	V_{CE} = 50V, T_A = 70°C			500	µA
	V_{CE} = 80V	2065/67		100	µA
	V_{CE} = 80V, T_A = 70°C			500	µA
Output Sustaining Voltage, $V_{CE\ (SUS)}$	I_C = 100mA, V_{IN} = 0.4V	2064/66	35		V
	I_C = 100mA, V_{IN} = 0.4V	2065/67	50		V
Collector-Emitter Saturation Voltage, $V_{CE\ (SAT)}$	I_C = 500mA, I_B = 625µA	All		1.1	V
	I_C = 750mA, I_B = 935µA			1.2	V
	I_C = 1.0A, I_B = 1.25mA			1.3	V
	I_C = 1.25A, I_B = 2.0mA			1.4	V
	I_C = 1.5A, I_B = 2.25mA	2065/67		1.5	V
Input Current, $I_{IN(ON)}$	V_{IN} = 2.4V	2064/65	1.4	4.3	mA
	V_{IN} = 3.75V		3.3	9.6	mA
	V_{IN} = 5.0V	2066/67	0.6	1.8	mA
	V_{IN} = 12V		1.7	5.2	mA
Input Voltage, $V_{IN(ON)}$	V_{CE} = 2.0V, I_C = 1.0A	2064/65		2.0	V
	V_{CE} = 2.0V, I_C = 1.25A	2064		2.5	V
	V_{CE} = 2.0V, I_C = 1.5A	2065		2.5	V
	V_{CE} = 2.0V, I_C = 1.0A	2066/67		6.5	V
	V_{CE} = 2.0V, I_C = 1.25A	2066		10	V
	V_{CE} = 2.0V, I_C = 1.5A	2067		10	V
Turn-on Delay, t_{PLH}	0.5 E_{IN} to 0.5 E_{OUT}	All		1.0	µS
Turn-off Delay, t_{PHL}	0.5 E_{IN} to 0.5 E_{OUT}	All		1.5	µS
Clamp Diode Leakage Current, I_R	V_R = 50V	2064/66		50	µA
	V_R = 50V, T_A = 70°C			100	µA
	V_R = 80V	2065/67		50	µA
	V_R = 80V, T_A = 70°C			100	µA
Clamp Diode Forward Voltage, V_F	I_F = 1.0A	All		1.75	V
	I_F = 1.5A			2.0	V

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Electrical Characteristics, Continued

(Unless otherwise indicated, electrical characteristics apply for T_A =25°C only)

Parameter	Conditions	Device	ULN2068/2071 Min	ULN2068/2071 Max	Units
Output Leakage Current, I_{CEX}	V_{CE} = 50V	2068/70		100	µA
	V_{CE} = 50V, T_A = 70°C			500	µA
	V_{CE} = 80V	2069/71		100	µA
	V_{CE} = 80V, T_A = 70°C			500	µA
Output Sustaining Voltage, $V_{CE\ (SUS)}$	I_C = 100mA, V_{IN} = 0.4V	2068/70	35		V
	I_C = 100mA, V_{IN} = 0.4V	2069/71	50		V
Collector-Emitter Saturation Voltage, $V_{CE\ (SAT)}$	I_C = 500mA, V_{IN} = 2.75V	2068/69		1.1	V
	I_C = 750mA, V_{IN} = 2.75V			1.2	V
	I_C = 1.0A, V_{IN} = 2.75V			1.3	V
	I_C = 1.25A, V_{IN} = 2.75V			1.4	V
	I_C = 1.5A, V_{IN} = 2.75V	2069		1.5	V
	I_C = 500mA, V_{IN} = 5.0V	2070/71		1.1	V
	I_C = 750mA, V_{IN} = 5.0V			1.2	V
	I_C = 1.0A, V_{IN} = 5.0V			1.3	V
	I_C = 1.25A, V_{IN} = 5.0V			1.4	V
	I_C = 1.5A, V_{IN} = 5.0V	2071		1.5	V
Input Current, $I_{IN(ON)}$	V_{IN} = 2.75V	2068/69		550	µA
	V_{IN} = 3.75V			1000	µA
	V_{IN} = 5.0V	2070/71		400	µA
	V_{IN} = 12V			1250	µA
Input Voltage, $V_{IN(ON)}$	V_{CE} = 2.0V, I_C = 1.25A	2068		2.75	V
	V_{CE} = 2.0V, I_C = 1.5A	2069		2.75	V
	V_{CE} = 2.0V, I_C = 1.25A	2070		5.0	V
	V_{CE} = 2.0V, I_C = 1.5A	2071		5.0	V
Supply Current, I_S	I_C = 500mA, V_{IN} = 2.75V	2068/69		6.0	mA
	I_C = 500mA, V_{IN} = 5.0V	2070/71		4.5	mA
Turn-on Delay, t_{PLH}	0.5 E_{IN} to 0.5 E_{OUT}	All		1.0	µS
Turn-off Delay, t_{PHL}	0.5 E_{IN} to 0.5 E_{OUT}	All		1.5	µS
Clamp Diode Leakage Current, I_R	V_R = 50V	2068/70		50	µA
	V_R = 50V, T_A = 70°C			100	µA
	V_R = 80V	2069/71		50	µA
	V_R = 80V, T_A = 70°C			100	µA
Clamp Diode Forward Voltage, V_F	I_F = 1.0A	All		1.75	V
	I_F = 1.5A			2.0	V

Electrical Characteristics, continued

(Unless otherwise indicated, electrical characteristics apply for T_A =25°C only)

Parameter	Conditions	Devices	ULN2074/2077 Min	ULN2074/2077 Max	Units
Output Leakage Current, I_{CEX}	V_{CE} = 50V	2074/76		100	µA
	V_{CE} = 50V, T_A = 70°C			500	µA
	V_{CE} = 80V	2075/77		100	µA
	V_{CE} = 80V, T_A = 70°C			500	µA
Output Sustaining Voltage, $V_{CE\ (SUS)}$	I_C = 100mA, V_{IN} = 0.4V	2074/76	35		V
	I_C = 100mA, V_{IN} = 0.4V	2075/77	50		V
Collector-Emitter Saturation Voltage, $V_{CE\ (SAT)}$	I_C = 500mA, I_B = 625µA	All		1.1	V
	I_C = 750mA, I_B = 935µA			1.2	V
	I_C = 1.0A, I_B = 1.25mA			1.3	V
	I_C = 1.25A, I_B = 2.0mA			1.4	V
	I_C = 1.5A, I_B = 2.25mA	2075/77		1.5	V
Input Current, $I_{IN(ON)}$	V_{IN} = 2.4V	2074/75	1.4	4.3	mA
	V_{IN} = 3.75V		3.3	9.6	mA
	V_{IN} = 5.0V	2076/77	0.6	1.8	mA
	V_{IN} = 12V		1.7	5.2	mA
Input Voltage, $V_{IN(ON)}$	V_{CE} = 2.0V, I_C = 1.0A	2074/75		2.0	V
	V_{CE} = 2.0V, I_C = 1.25A	2074		2.5	V
	V_{CE} = 2.0V, I_C = 1.5A	2075		2.5	V
	V_{CE} = 2.0V, I_C = 1.0A	2076/77		6.5	V
	V_{CE} = 2.0V, I_C = 1.25A	2076		10	V
	V_{CE} = 2.0V, I_C = 1.5A	2077		10	V
Turn-on Delay, t_{PLH}	0.5 E_{IN} to 0.5 E_{OUT}	All		1.0	µS
Turn-off Delay, t_{PHL}	0.5 E_{IN} to 0.5 E_{OUT}	All		1.5	µS

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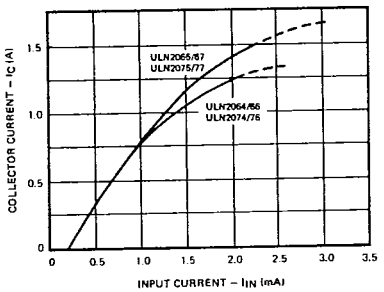
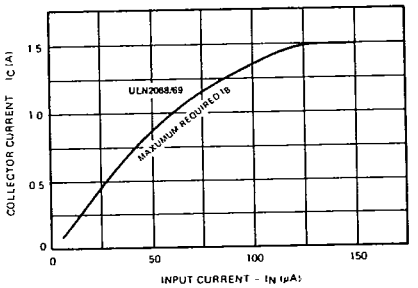
Typical Performance Characteristics

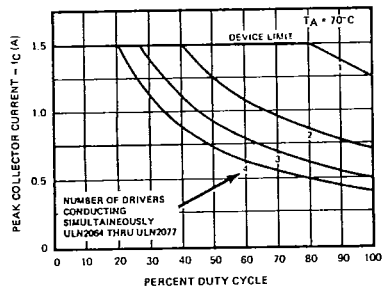
Collector Current vs. Input Current



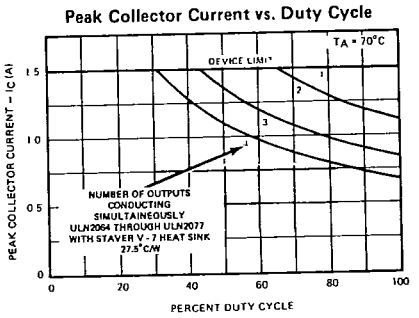
Collector Current vs. Input Current



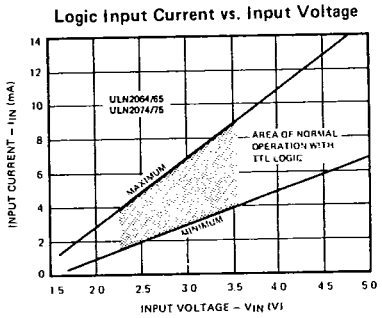
Peak Collector Current vs. Duty Cycle



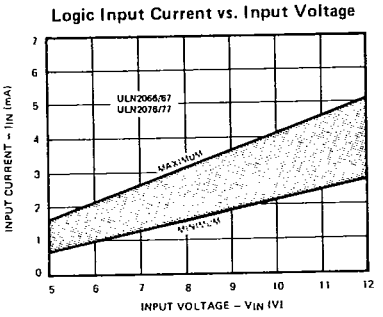
Peak Collector Current vs. Duty Cycle



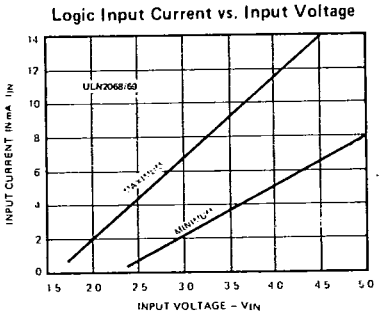
Logic Input Current vs. Input Voltage



Logic Input Current vs. Input Voltage



Logic Input Current vs. Input Voltage



Order Information

Input Conditions	V_{IN} MAX	V_{CE} = 50V I_C = 1.5A	V_{CE} = 80 I_C = 1.5A
TTL, DTL, Schottky TTL, 5V CMOS and NMOS	15V	ULN2064N	ULN2065N
6 to 15V CMOS and PMOS	30V	ULN2066N	ULN2067N
TTL, DTL, Schottky TTL, 5V CMOS and NMOS	15V	ULN2068N	ULN2069N
6 to 15V CMOS and PMOS	30V	ULN2070N	ULN2071N
General Purpose	30V	ULN2074N	—
General Purpose	60V	—	ULN2075N
6 to 15V CMOS and PMOS	30V	ULN2076N	—
6 to 15V CMOS and PMOS	60V	—	ULN2077N

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