SERIES UDN-2580A
8-CHANNEL SOURCE DRIVERS

FEATURES

- TTL, CMOS, PMOS, NMOS Compatible
- High Output Current Ratings
- Internal Transient Suppression
- Efficient Input/Output Pin Structure

THIS versatile family of integrated circuits, originally designed to link NMOS logic with high-current inductive loads, will work with many combinations of logic- and load-voltage levels, meeting interface requirements beyond the capabilities of standard logic buffers.

Series UDN-2580A source drivers can drive incandescent, LED, or vacuum fluorescent displays. Internal transient-suppression diodes permit the drivers to be used with inductive loads.

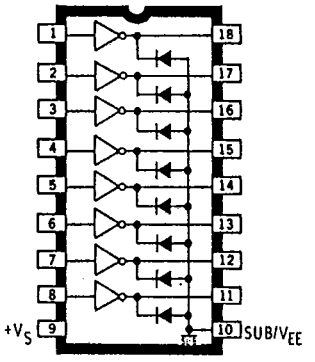
Type UDN-2580A is a high-current source driver used to switch the ground ends of loads that are directly connected to a negative supply. Typical loads are telephone relays, PIN diodes, and LEDs.

Type UDN-2585A is a driver designed for applications requiring low output saturation voltages. Typical loads are low-voltage LEDs and incandescent displays. The eight non-Darlington outputs will simultaneously sustain continuous load currents of −120 mA at ambient temperatures to +70°C.

Type UDN-2588A, a high-current source driver similar to Type UDN-2580A, has separate logic and driver supply lines. Its eight drivers can serve as an interface between positive logic (TTL, CMOS, PMOS) or negative logic (NMOS) and either negative or split-load supplies.

Types UDN-2580A and UDN-2588A are rated for operation with output voltages of up to 50 V. Selected devices, carrying the suffix "-1" on the Sprague part number, have maximum ratings of 80 V.

Types UDN-2580A and UDN-2585A are furnished in 18-pin dual in-line plastic packages; Type UDN-2588A is supplied in a 20-pin dual in-line plastic package. All input connections are on one side of the packages, output pins on the other, to simplify printed wiring board layout.



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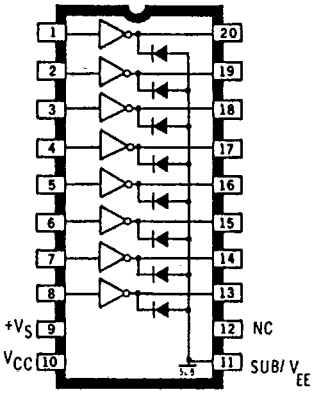
UDN-2580A
UDN-2585A



DWG.NO. A-11,357

UDN-2588A

SERIES UDN-2580A
8-CHANNEL HIGH-CURRENT SOURCE DRIVERS

T-52-13-07

ABSOLUTE MAXIMUM RATINGS
at 25°C Free-Air Temperature for Any One Driver (unless otherwise noted)

	UDN-2580A	UDN-2580A-1	UDN-2585A	UDN-2588A	UDN-2588A-1
Output Voltage, V_{CE}	50 V	80 V	25 V	50 V	80 V
Supply Voltage, V_S (ref. sub.)	50 V	80 V	25 V	50 V	80 V
Supply Voltage, V_{CC} (ref. sub.)	—	—	—	50 V	80 V
Input Voltage, V_{IN} (ref. V_S)	−30 V	−30 V	−20 V	−30 V	−30 V
Total Current, $I_{CC} + I_S$	−500 mA	−500 mA	−250 mA	−500 mA	−500 mA
Substrate Current, I_{SUB}	3.0 A	3.0 A	2.0 A	3.0 A	3.0 A

Allowable Power Dissipation, P_D (single output) ..... 1.0 W
(total package) ..... 2.2 W*
Operating Temperature Range, T_A ..... −20°C to +85°C
Storage Temperature Range, T_S ..... −55°C to +150°C

*Derate at the rate of 18 mW/°C above 25°C

For simplification, these devices are characterized on the following pages with specific voltages for inputs, logic supply (V_S), load supply (V_{EE}), and collector supply (V_{CC}). Typical use of the UDN-2580A and UDN-2580A-1 is with negative referenced logic. The more common application of the UDN-2585A, UDN-2588A, and UDN-2588A-1 is with positive referenced logic supplies. In application, the devices are capable of operation over a wide range of logic and supply voltage levels:

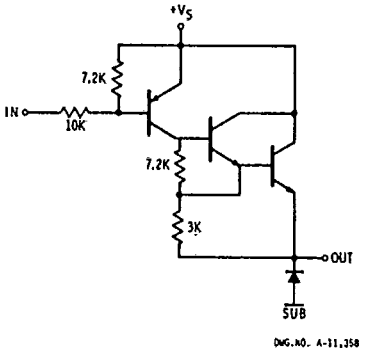
TYPICAL OPERATING VOLTAGES

V_S	$V_{IN(ON)}$	$V_{IN(OFF)}$	V_{CC}	$V_{EE(MAX)}$	Device Type
0 V	−15 V to −3.6 V	−0.5 V to 0 V	NA	−25 V	UDN-2585A
				−50 V	UDN-2580A
				−80 V	UDN-2580A-1
+5 V	0 V to +1.4 V	+4.5 V to +5 V	NA	−20 V	UDN-2585A
				−45 V	UDN-2580A
				−75 V	UDN-2580A-1
			≤5 V	−45 V	UDN-2588A
				−75 V	UDN-2588A-1
+12 V	0 V to +8.4 V	+11.5 V to +12 V	NA	−13 V	UDN-2585A
				−38 V	UDN-2580A
				−68 V	UDN-2580A-1
			≤12 V	−38 V	UDN-2588A
				−68 V	UDN-2588A-1
+15 V	0 V to +11.4 V	+14.5 V to +15 V	NA	−10 V	UDN-2585A
				−35 V	UDN-2580A
				−65 V	UDN-2580A-1
			≤15 V	−35 V	UDN2588A
				−65 V	UDN-2588A-1

NOTE: The substrate must be tied to the most negative point in the external circuit to maintain isolation between drivers and to provide for normal circuit operation.

UDN-2580A
UDN-2580A-1

PARTIAL SCHEMATIC



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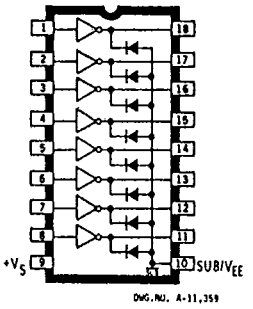

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3

ELECTRICAL CHARACTERISTICS at T_A = +25°C, V_S = 0 V, V_{EE} = −45 V (unless otherwise noted)

Characteristic	Symbol	Applicable Devices	Test Conditions	Limits Min.	Limits Max.	Units
Output Leakage Current	I_{CEX}	UDN-2580A	V_{IN} = −0.5 V, V_{OUT} = V_{EE} = −50 V	—	50	µA
			V_{IN} = −0.4 V, V_{OUT} = V_{EE} = −50 V, T_A = 70°C	—	100	µA
		UDN-2580A-1	V_{IN} = −0.5 V, V_{OUT} = V_{EE} = −80 V	—	50	µA
			V_{IN} = −0.4 V, V_{OUT} = V_{EE} = −80 V, T_A = 70°C	—	100	µA
Output Sustaining Voltage	$V_{CE(SUS)}$	UDN-2580A	V_{IN} = −0.4 V, I_{OUT} = −25 mA, Note 1	35	—	V
		UDN-2580A-1	V_{IN} = −0.4 V, V_{EE} = −75 V, I_{OUT} = −25 mA, Note 1	50	—	V
Output Saturation Voltage	$V_{CE(SAT)}$	Both	V_{IN} = −2.4 V, I_{OUT} = −100 mA	—	1.8	V
			V_{IN} = −3.0 V, I_{OUT} = −225 mA	—	1.9	V
			V_{IN} = −3.6 V, I_{OUT} = −350 mA	—	2.0	V
Input Current	$I_{IN(ON)}$	Both	V_{IN} = −3.6 V, I_{OUT} = −350 mA	—	−500	µA
			V_{IN} = −15 V, I_{OUT} = −350 mA	—	−2.1	mA
	$I_{IN(OFF)}$	Both	I_{OUT} = −500 µA, T_A = 70°C, Note 3	−50	—	µA
Input Voltage	$V_{IN(ON)}$	Both	I_{OUT} = −100 mA, V_{CE} ≤1.8 V, Note 4	—	−2.4	V
			I_{OUT} = −225 mA, V_{CE} ≤1.9 V, Note 4	—	−3.0	V
			I_{OUT} = −350 mA, V_{CE} ≤2.0 V, Note 4	—	−3.6	V
	$V_{IN(OFF)}$	Both	I_{OUT} = −500 µA, T_A = 70°C	−0.2	—	V
Clamp Diode Leakage Current	I_R	UDN-2580A	V_R = 50 V, T_A = 70°C	—	50	µA
		UDN-2580A-1	V_R = 80 V, T_A = 70°C	—	50	µA
Clamp Diode Forward Voltage	V_F	Both	I_F = 350 mA	—	2.0	V
Input Capacitance	C_{IN}	Both		—	25	pF
Turn-On Delay	t_{PHL}	Both	0.5 E_{IN} to 0.5 E_{OUT}	—	5.0	µs
Turn-Off Delay	t_{PLH}	Both	0.5 E_{IN} to 0.5 E_{OUT}	—	5.0	µs

NOTES: 1. Pulsed test, t_p ≤300 µs, duty cycle ≤2%.
2. Negative current is defined as coming out of the specified device pin.
3. The $I_{IN(OFF)}$ current limit guarantees against partial turn-on of the output.
4. The $V_{IN(ON)}$ voltage limit guarantees a minimum output source current per the specified conditions.
5. The substrate must always be tied to the most negative point and must be at least 4.0 V below V_S.

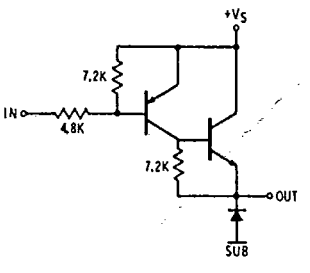
UDN-2585A

ELECTRICAL CHARACTERISTICS at T_A = +25°C, V_S = 0 V, V_{EE} = −20 V (unless otherwise noted)

Characteristic	Symbol	Test Conditions	Limits		
			Min.	Max.	Units
Output Leakage Current	I_{CEX}	V_{IN} = −0.5 V, V_{OUT} = V_{EE} = −25 V	—	50	µA
		V_{IN} = −0.4 V, V_{OUT} = V_{EE} = −25 V, T_A = 70°C	—	100	µA
Output Sustaining Voltage	$V_{CE(SUS)}$	V_{IN} = −0.4 V, I_{OUT} = −25 mA, Note 1	15	—	V
Output Saturation Voltage	$V_{CE(SAT)}$	V_{IN} = −4.6 V, I_{OUT} = −60 mA	—	1.1	V
		V_{IN} = −4.6 V, I_{OUT} = −120 mA	—	1.2	V
Input Current	$I_{IN(ON)}$	V_{IN} = −4.6 V, I_{OUT} = −120 mA	—	−1.6	mA
		V_{IN} = −14.6 V, I_{OUT} = −120 mA	—	−5.0	mA
Input Voltage	$V_{IN(ON)}$	I_{OUT} = −120 mA, V_{CE} ≤1.2 V, Note 3	—	−4.6	V
	$V_{IN(OFF)}$	I_{OUT} = −100 µA, T_A = 70°C	−0.4	—	V
Clamp Diode Leakage Current	I_R	V_R = 25 V, T_A = 70°C	—	50	µA
Clamp Diode Forward Voltage	V_F	I_F = 120 mA	—	2.0	V
Input Capacitance	C_{IN}		—	25	pF
Turn-On Delay	t_{PHL}	0.5 E_{IN} to 0.5 E_{OUT}	—	5.0	µs
Turn-Off Delay	t_{PLH}	0.5 E_{IN} to 0.5 E_{OUT}	—	5.0	µs

NOTES: 1. Pulsed test, t_p ≤300 µs, duty cycle ≤2%.
2. Negative current is defined as coming out of the specified device pin.
3. The $V_{IN(ON)}$ voltage limit guarantees a minimum output source current per the specified conditions.
4. The substrate must always be tied to the most negative point and must be at least 4.0 V below V_S.

PARTIAL SCHEMATIC



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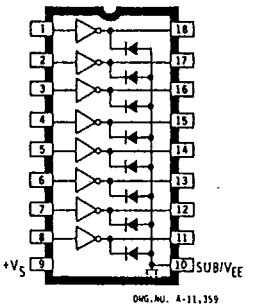

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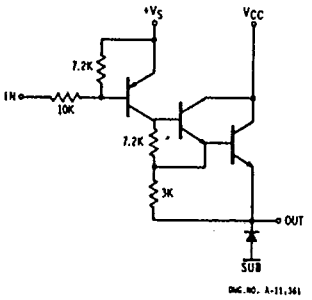
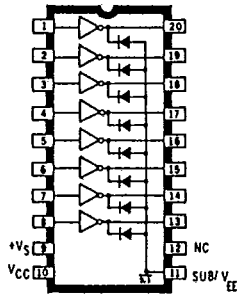
UDN-2588A
UDN-2588A-1

T-52-13-07

PARTIAL SCHEMATIC



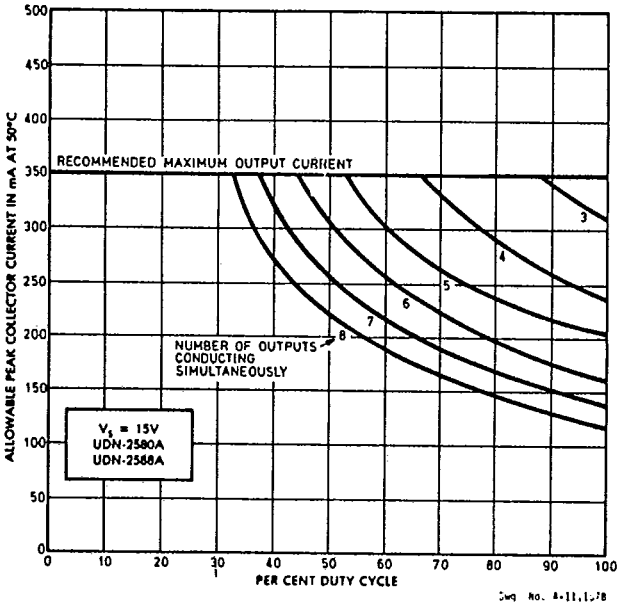


ELECTRICAL CHARACTERISTICS at T_A = +25°C, V_S = 5.0 V, V_{CC} = 5.0 V, V_{EE} = −40 V (unless otherwise noted)

Characteristic	Symbol	Applicable Devices	Test Conditions	Limits Min.	Limits Max.	Units
Output Leakage Current	I_{CEX}	UDN-2588A	V_{IN} ≥4.5 V, V_{OUT} = V_{EE} = −45 V	—	50	µA
			V_{IN} ≥4.6 V, V_{OUT} = V_{EE} = −45 V, T_A = 70°C	—	100	µA
		UDN-2588A-1	V_{IN} ≥4.5 V, V_{OUT} = V_{EE} = −75 V	—	50	µA
			V_{IN} ≥4.6 V, V_{OUT} = V_{EE} = −75 V, T_A = 70°C	—	100	µA
Output Sustaining Voltage	$V_{CE(SUS)}$	UDN-2588A	V_{IN} ≥4.6 V, I_{OUT} = −25 mA, Note 1	35	—	V
		UDN-2588A-1	V_{IN} ≥4.6 V, V_{EE} = −70 V, I_{OUT} = −25 mA, Note 1	50	—	V
Output Saturation Voltage	$V_{CE(SAT)}$	Both	V_{IN} = 2.6 V, I_{OUT} = −100 mA, Ref. V_{CC}	—	1.8	V
			V_{IN} = 2.0 V, I_{OUT} = −225 mA, Ref. V_{CC}	—	1.9	V
			V_{IN} = 1.4 V, I_{OUT} = −350 mA, Ref. V_{CC}	—	2.0	V
Input Current	$I_{IN(ON)}$	Both	V_{IN} = 1.4 V, I_{OUT} = −350 mA	—	−500	µA
			V_S = 15 V, V_{EE} = −30 V, V_{IN} = 0 V, I_{OUT} = −350 mA	—	−2.1	mA
	$I_{IN(OFF)}$	Both	I_{OUT} = −500 A, T_A = 70°C, Note 3	−50	—	µA
Input Voltage	$V_{IN(ON)}$	Both	I_{OUT} = −100 mA, V_{CE} ≤1.8 V, Note 4	—	2.6	V
			I_{OUT} = −225 mA, V_{CE} ≤1.9 V, Note 4	—	2.0	V
			I_{OUT} = −350 mA, V_{CE} ≤2.0 V, Note 4	—	1.4	V
	$V_{IN(OFF)}$	Both	I_{OUT} = −500 µA, T_A = 70°C	4.8	—	V
Clamp Diode Leakage Current	I_R	UDN-2588A	V_R = 50 V, T_A = 70°C	—	50	µA
		UDN-2588A-1	V_R = 80 V, T_A = 70°C	—	50	µA
Clamp Diode Forward Voltage	V_F	Both	I_F = 350 mA	—	2.0	V
Input Capacitance	C_{IN}	Both		—	25	pF
Turn-On Delay	t_{PHL}	Both	0.5 E_{IN} to 0.5 E_{OUT}	—	5.0	µs
Turn-Off Delay	t_{PLH}	Both	0.5 E_{IN} to 0.5 E_{OUT}	—	5.0	µs

NOTES: 1. Pulsed test, t_p ≤300 µs, duty cycle ≤2%.
2. Negative current is defined as coming out of the specified device pin.
3. The $I_{IN(OFF)}$ current limit guarantees against partial turn-on of the output.
4. The $V_{IN(ON)}$ voltage limit guarantees a minimum output source current per the specified conditions.
5. The substrate must always be tied to the most negative point and must be at least 4.0 V below V_S.
6. V_{CC} must never be more positive than V_S.

ALLOWABLE PEAK COLLECTOR CURRENT AT 50°C AS A FUNCTION OF DUTY CYCLE



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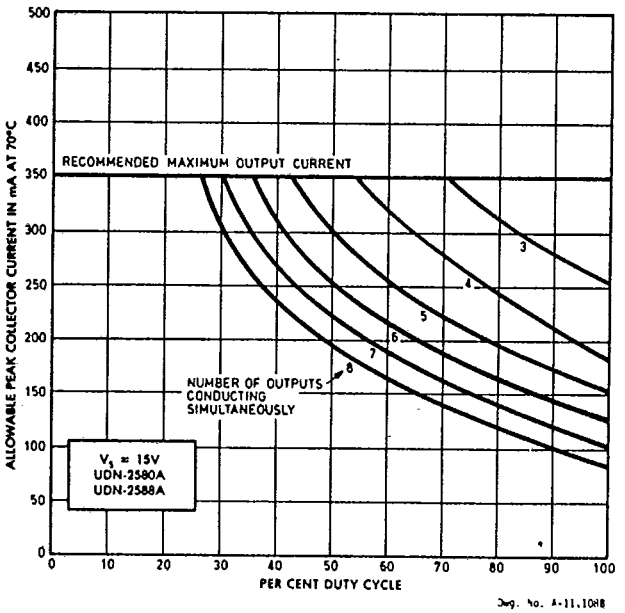
ALLOWABLE PEAK COLLECTOR CURRENT AT 70°C AS A FUNCTION OF DUTY CYCLE



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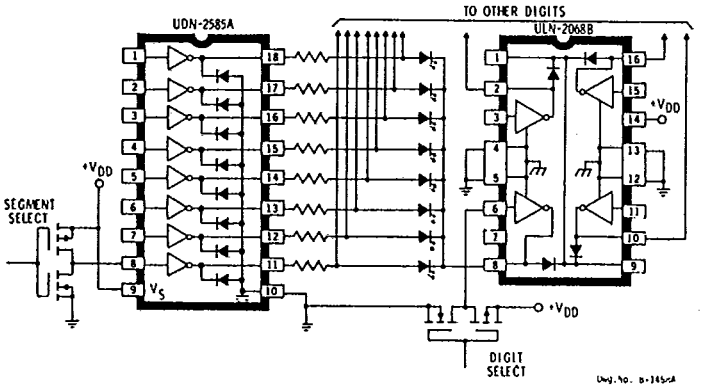
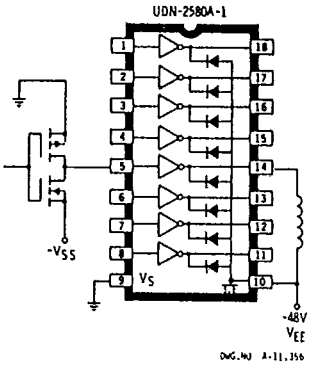
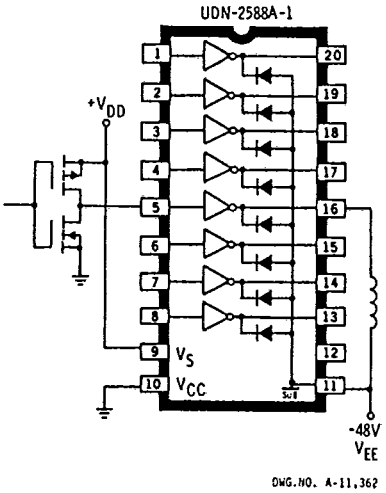
TYPICAL APPLICATIONS



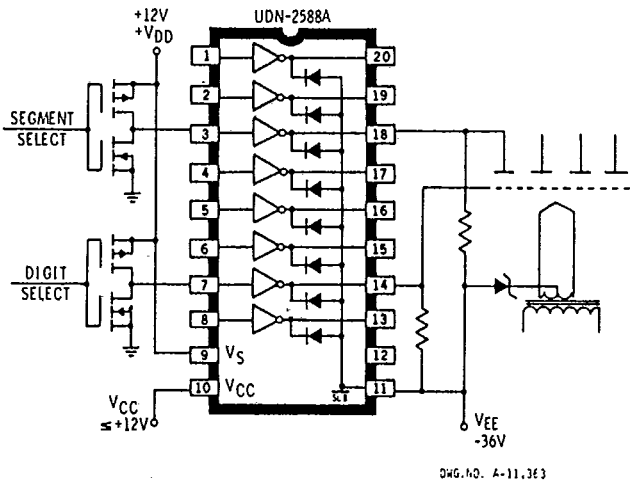
COMMON-CATHODE LED DRIVER



TELECOMMUNICATIONS RELAY DRIVER (Negative Logic)



TELECOMMUNICATIONS RELAY DRIVER (Positive Logic)



VACUUM FLUORESCENT DISPLAY DRIVER (Split Supply)