

UDN-2987A

8-CHANNEL SOURCE DRIVER

With Over-Current Protection

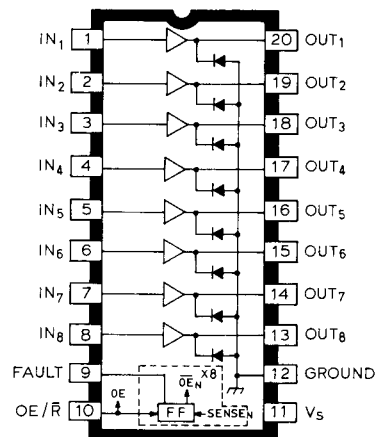
FEATURES

- 350 mA Output Source Current
- Over-Current Protected
- Internal Ground Clamp Diodes
- Output Breakdown Voltage 35 V, Minimum
- TTL, DTL, PMOS, or CMOS Compatible Inputs
- Internal Thermal Shutdown

Providing over-current protection for each of its eight sourcing outputs, the UDN-2987A driver is used as an interface between standard low-level logic and relays, motors, solenoids, LEDs and incandescent lamps. The device includes thermal shutdown and output transient protection/clamp diodes for use with sustaining voltages to 35 V.

In this driver, each channel includes a latch to turn OFF that channel if the maximum channel current is exceeded. All channels are disabled if the thermal shutdown is activated. A common FAULT output is used to indicate either chip thermal shutdown or any over-current condition. All outputs are enabled by pulling the common OE/R input high. When OE/R is low, all outputs are inhibited and the eight latches are reset. The UDN-2987A is supplied in a 20-lead dual in-line plastic package.

Under normal operating conditions each of eight outputs will source in excess of 100 mA continuously at an ambient temperature of 25°C and a supply of 35 V. The over-current fault circuit will protect the device from short-circuits to ground with supply voltages of up to 35 V.



Dwg No A-13.285

The inputs are compatible with 5 V and 12 V logic systems—TTL, Schottky TTL, DTL, PMOS, and CMOS. In all cases, the output is switched on by an active high input level.

ABSOLUTE MAXIMUM RATINGS

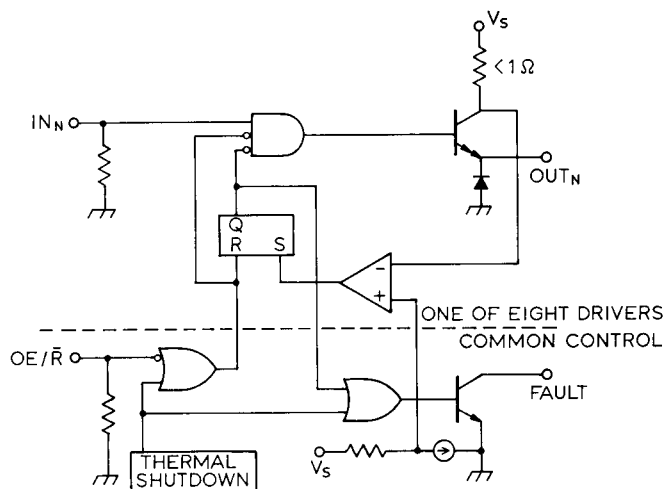
at $T_A = +25^\circ\text{C}$

Driver Supply Voltage, V_S	35 V
Output Sustaining Voltage, $V_{CE(SUS)}$	35 V
Continuous Output Current, I_{OUT}	— 500 mA*
FAULT Output Voltage, V_{CE}	50 V
FAULT Output Current, I_C	30 mA
Input Voltage, V_{IN}	15 V
Package Power Dissipation, P_D	See Graph
Operating Temperature Range, T_A	— 20°C to + 85°C
Storage Temperature Range, T_S	— 55°C to + 150°C

*Outputs are disabled at approximately — 500 mA per driver.

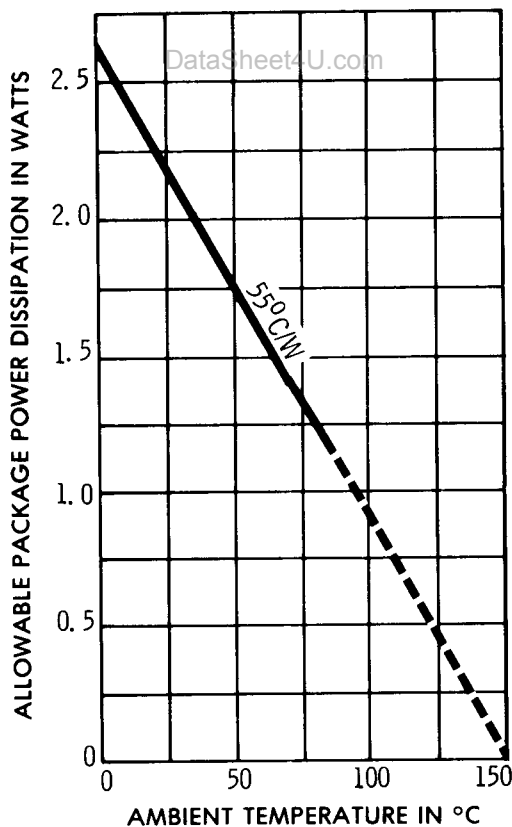
UDN-2987A 8-CHANNEL SOURCE DRIVER

FUNCTIONAL
BLOCK
DIAGRAM



Dwg. No. A-13.286

ALLOWABLE POWER DISSIPATION
AS A FUNCTION OF AMBIENT TEMPERATURE



Dwg. No. A-11.112A

ELECTRICAL CHARACTERISTICS at $T_A = 25^\circ\text{C}$, $V_{OE} = 2.4\text{ V}$, $V_S = 35\text{ V}$ unless otherwise noted.

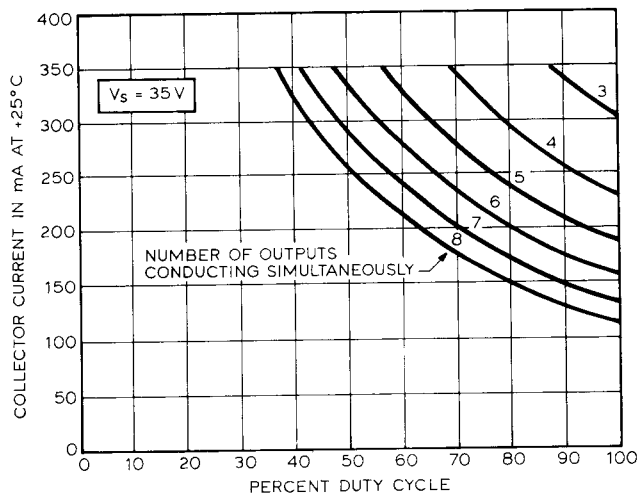
Characteristic	Symbol	Test Conditions	Limits			
			Min.	Typ.	Max.	Units
Functional Supply Range	V_S		7.0	—	35	V
Output Leakage Current	I_{CEX}	$V_{IN} = 0.4\text{ V}^*$	—	< -5	-200	μA
Output Sustaining Voltage	$V_{CE(SUS)}$	$I_{OUT} = -350\text{ mA}$, $L = 2.0\text{ mH}$	35	—	—	V
Output Saturation Voltage	$V_{OUT(SAT)}$	$V_{IN} = 2.4\text{ V}$, $I_{OUT} = -100\text{ mA}$	—	1.6	1.8	V
		$V_{IN} = 2.4\text{ V}$, $I_{OUT} = -225\text{ mA}$	—	1.7	1.9	V
		$V_{IN} = 2.4\text{ V}$, $I_{OUT} = -350\text{ mA}$	—	1.8	2.0	V
Channel Shutdown Threshold	I_M	$V_{IN} = 2.4\text{ V}$	-400	-500	—	mA
FAULT Leakage Current	I_{CEX}	$V_{CC} = 35\text{ V}$	—	<1.0	100	μA
FAULT Saturation Voltage	$V_{CE(SAT)}$	$I_C = 30\text{ mA}$	—	0.3	0.8	V
Input Voltage	$V_{IN(ON)}$		2.4	—	—	V
	$V_{IN(OFF)}$		—	—	0.4	V
Input Current	$I_{IN(ON)}$	$V_{IN} = 2.4\text{ V}$	—	125	170	μA
		$V_{IN} = 5.0\text{ V}$	—	840	1020	μA
		$V_{IN} = 12\text{ V}$	—	1500	1800	μA
	$I_{IN(OFF)}$	$V_{IN} = 0.4\text{ V}$	—	—	15	μA
Clamp Diode Leakage Current	I_R	$V_R = 35\text{ V}$, $T_A = 70^\circ\text{C}$	—	—	50	μA
Clamp Diode Forward Voltage	V_F	$I_F = 350\text{ mA}$	—	1.5	1.8	V
Supply Current	$I_{S(ON)}$	$V_{IN} = 2.4\text{ V}^*$, Outputs Open	—	13	18	mA
	$I_{S(OFF)}$	$V_{IN} = 0.4\text{ V}^*$	—	8.0	12	mA
Thermal Shutdown	T_J		—	165	—	$^\circ\text{C}$
Thermal Hysteresis	T_J		—	15	—	$^\circ\text{C}$
Propagation Delay Time	t_{PLH}	$R_L = 100\Omega$	—	0.3	0.6	μs
	t_{PHL}	$R_L = 100\Omega$	—	2.0	4.0	μs
Dead Time	t_d		—	1.0	—	μs

*All inputs simultaneously.

UDN-2987A
8-CHANNEL SOURCE DRIVER

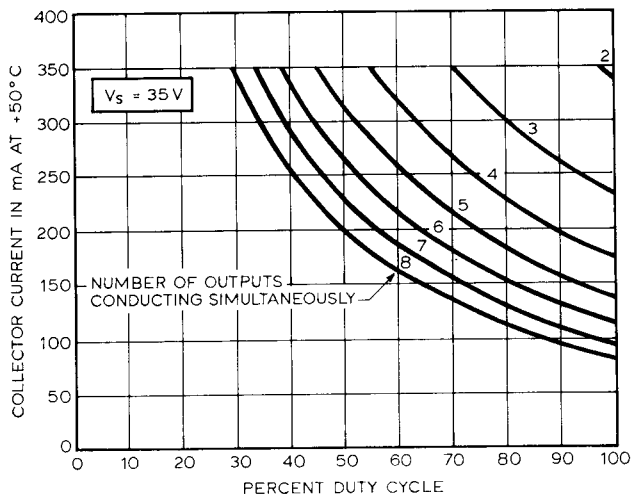
**ALLOWABLE OUTPUT CURRENT
AS A FUNCTION OF DUTY CYCLE**

AT +25°C



Dwg. No. A-13.288

AT +50°C



Dwg. No. A-13.289

APPLICATIONS INFORMATION AND CIRCUIT DESCRIPTION

As with all power integrated circuits, the UDN-2987A has a maximum allowable output current rating. The 500 mA rating does not imply that operation at that value is permitted or even obtainable. The channel output current trip point is specified as -400 mA, minimum; therefore, attempted operation at current levels greater than -400 mA may cause a fault indication and channel shutdown. The device is tested at a maximum of -350 mA and that is the recommended maximum output current per driver. It provides protection for current overloads or shorted loads up to 35 V.

All outputs are enabled by pulling the OE/R input high. When OE/R is low or allowed to float (internal pull-down), all outputs are inhibited and the latches are reset. The latches are also reset during power-up, regardless of the state of the OE/R input.

The load current causes a small voltage drop across the internal low-value sense resistor. This voltage is compared to the voltage drop across a reference resistor with a constant current. The two resistors are matched to eliminate errors due to manufacturing tolerances or temperature effects. Each channel includes a comparator and its own latch. An over-current fault ($V_{\text{SENSEI}} > V_{\text{REF}}$) will set the affected latch and shut down only that channel. All other channels will continue to operate normally. The latch includes a 1 μ s delay (t_d) to prevent unwanted triggering due to crossover currents generated when switching inductive loads. For an abrupt short circuit, the delay and output switching times will allow a brief, permissible current in excess of the trip current before the output driver is turned OFF.

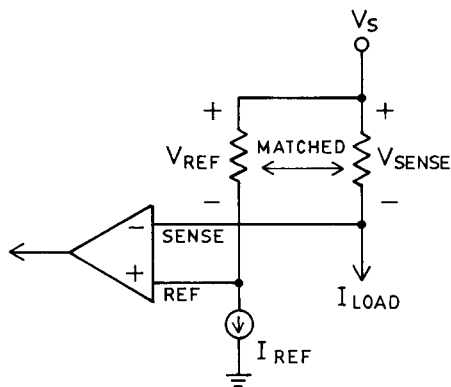
A common thermal shutdown disables all outputs if the chip temperature exceeds $+165^\circ\text{C}$. At thermal shutdown, all latches are reset. The outputs are disabled until the chip cools down to about $+150^\circ\text{C}$ (thermal hysteresis).

A common open-collector FAULT output is used to indicate any channel over-current condition or chip thermal shutdown.

UDN-2987A

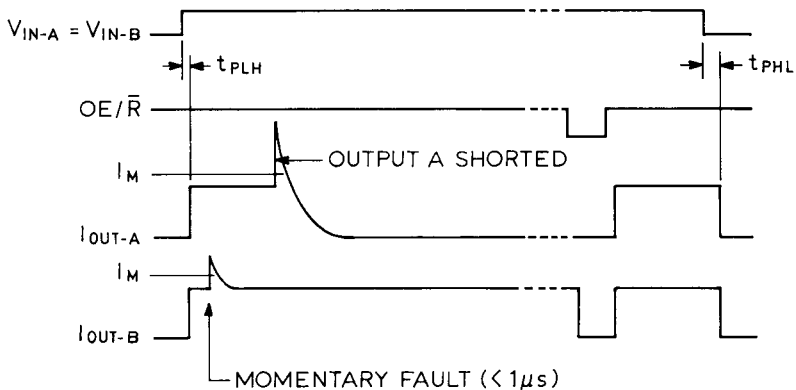
8-CHANNEL SOURCE DRIVERS

OVER-CURRENT FAULT SENSE



Dwg. No. A-13,292

OUTPUT CURRENT WAVESHAPES



Dwg. No. A-13,293