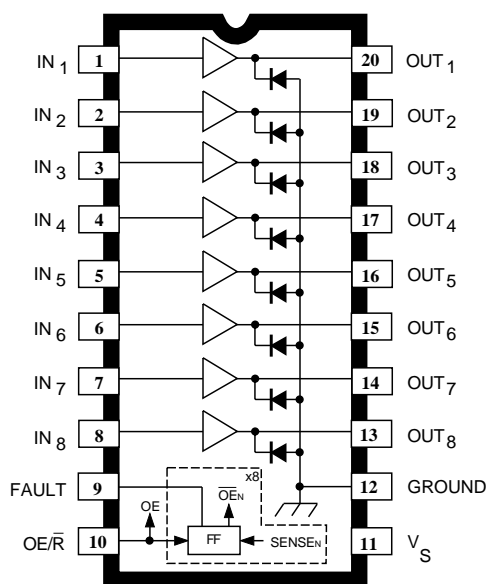


8-CHANNEL SOURCE DRIVER WITH OVER-CURRENT PROTECTION



Dwg. PP-067

Note that the UDN2987A (DIP) and the UDN2987LW (SOIC) are electrically identical and share a common terminal number assignment.

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} | 35 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.

Providing over-current protection for each of its eight sourcing outputs, the UDN2987A and UDN2987LW drivers are 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 these drivers, 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.

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.

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. The UDN2987A is supplied in a 20-pin dual in-line plastic package; the UDN2987LW is supplied in a 20-lead small-outline plastic package.

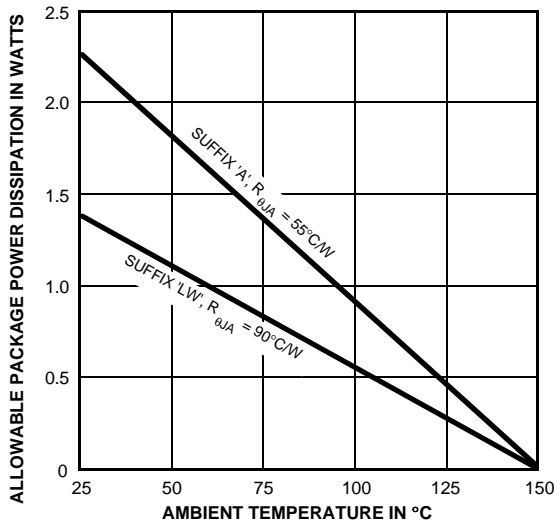
FEATURES

- 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
- Automotive Capable

Always order by complete part number:

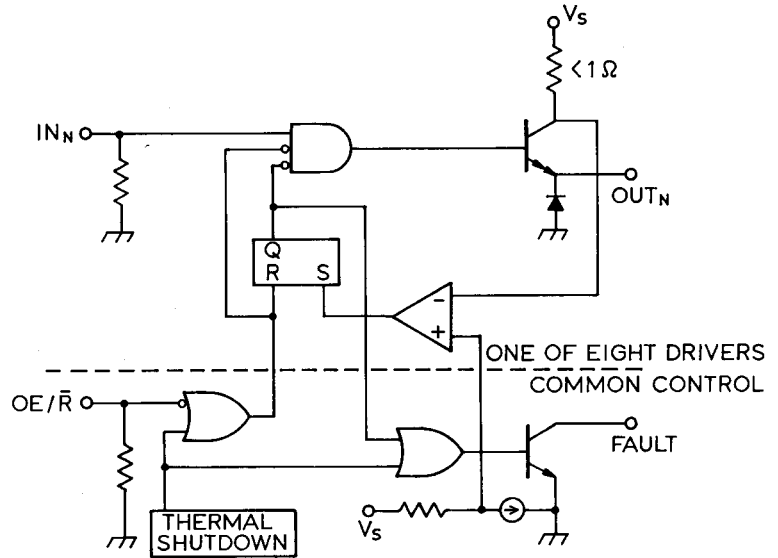
| Part Number | Package |
|-------------|------------------------|
| UDN2987A | 20-Pin DIP |
| UDN2987LW | 20-Lead Wide-Body SOIC |

2987 8-CHANNEL SOURCE DRIVER



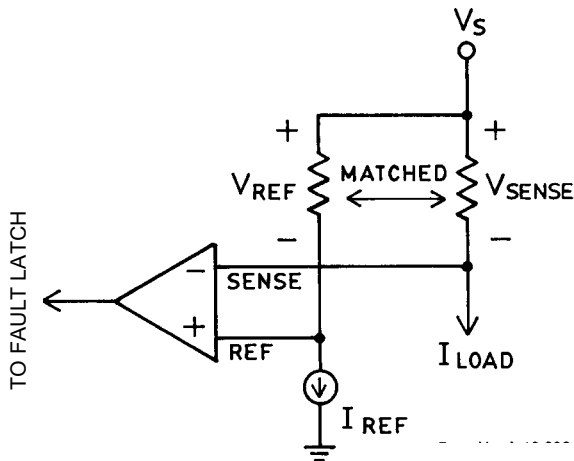
Dwg. GS-004B

FUNCTIONAL BLOCK DIAGRAM



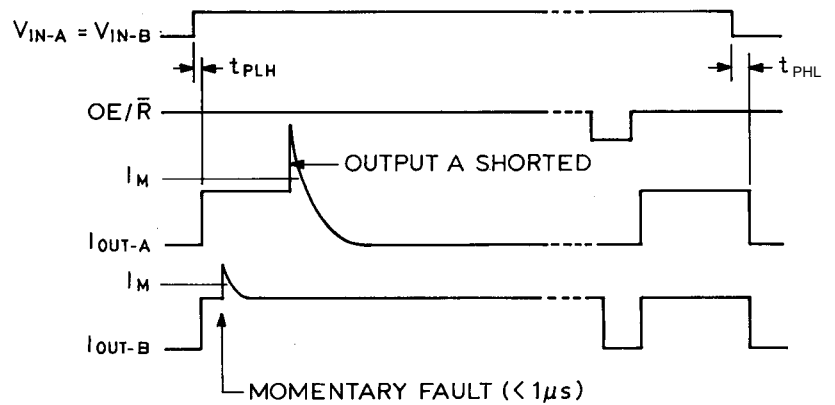
Dwg. No. A-13,286

OVER-CURRENT FAULT SENSE



Dwg. No. A-13,292

OUTPUT CURRENT WAVESHAPES



Dwg. No. A-13,293

2987
8-CHANNEL
SOURCE DRIVER

**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 | | | Units |
|-----------------------------|----------------|--|--------|-------|------|------------------|
| | | | Min. | Typ. | Max. | |
| Functional Supply Range | V_S | | 7.0 | — | 35 | V |
| Output Leakage Current | I_{CEX} | $V_{IN} = 0.4\text{ V}^*$ | — | <-5.0 | -200 | μA |
| Output Sustaining Voltage | $V_{OUT(SUS)}$ | $I_{OUT} = -350\text{ mA}$, $L = 2.0\text{ mH}$ | 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 | $V_{IN} = 2.4\text{ V}$ | -370 | -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 | ΔT_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.

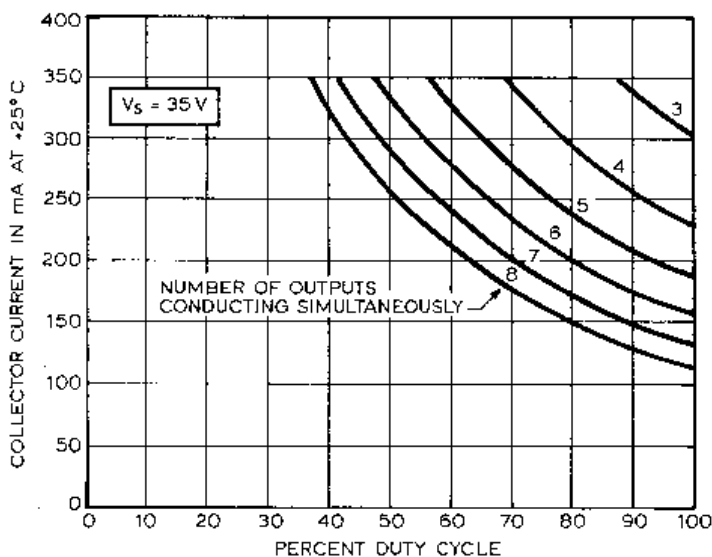
2987

8-CHANNEL SOURCE DRIVER

ALLOWABLE OUTPUT CURRENT AS A FUNCTION OF DUTY CYCLE

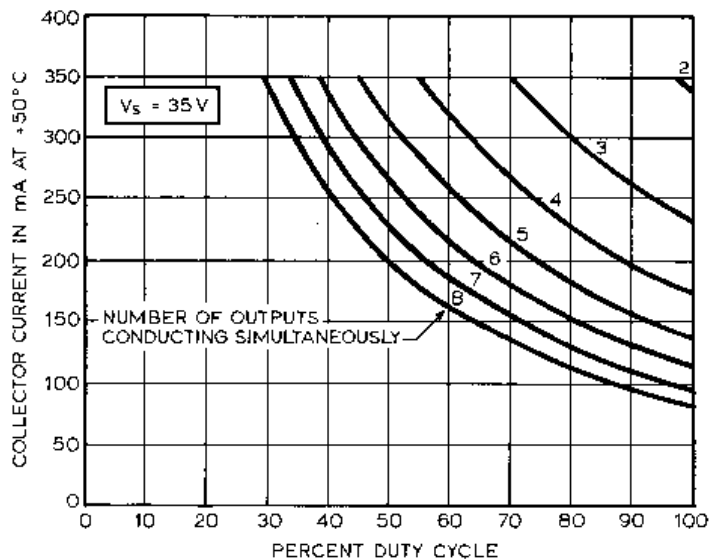
(UDN2987A shown, multiply by 78% for UDN2987LW)

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 UDN2987A and UDN2987LW have 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 -370 mA, minimum; therefore, attempted operation at current levels greater than -370 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. Note that the RESET pulse duration (OE/R low) should be at least 1 μs . This will ensure safe operation under attempted RESET conditions with a shorted load. 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 ($V_{\text{SENSE}} > V_{\text{REF}}$) will set the affected latch and shut down only that channel. All other channels will continue to operate normally. The latch includes a 1 μs 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.

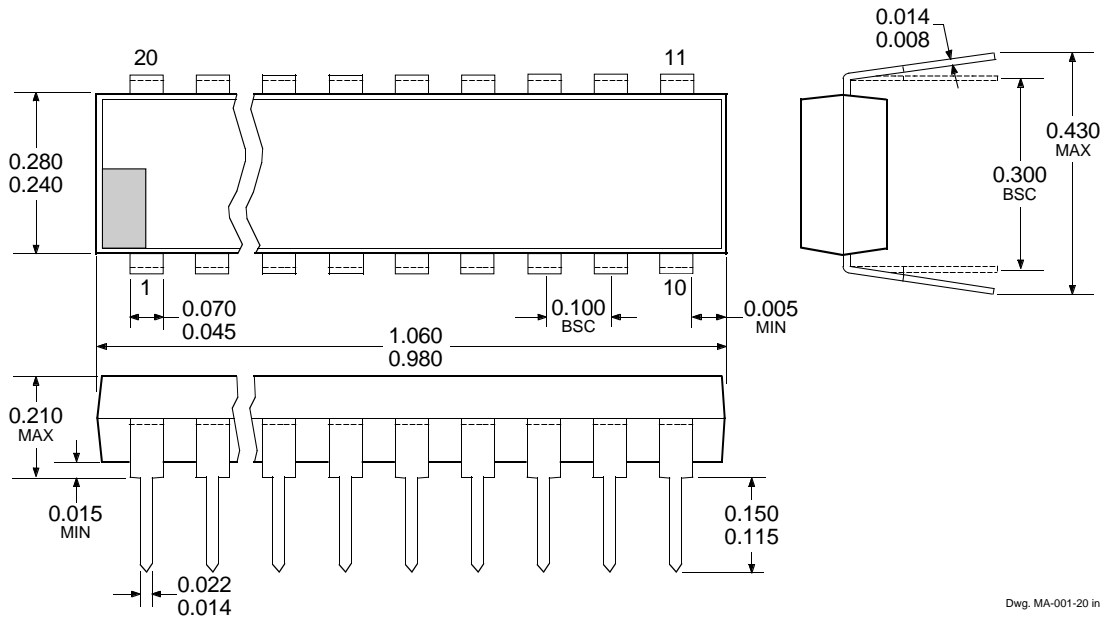
A common thermal shutdown disables all outputs if the chip temperature exceeds +165°C. At thermal shutdown, all latches are reset. The outputs are disabled until the chip cools down to about +150°C (thermal hysteresis).

In the event of any channel over-current condition or chip thermal shutdown, the FAULT open-collector output is pulled low (turned ON).

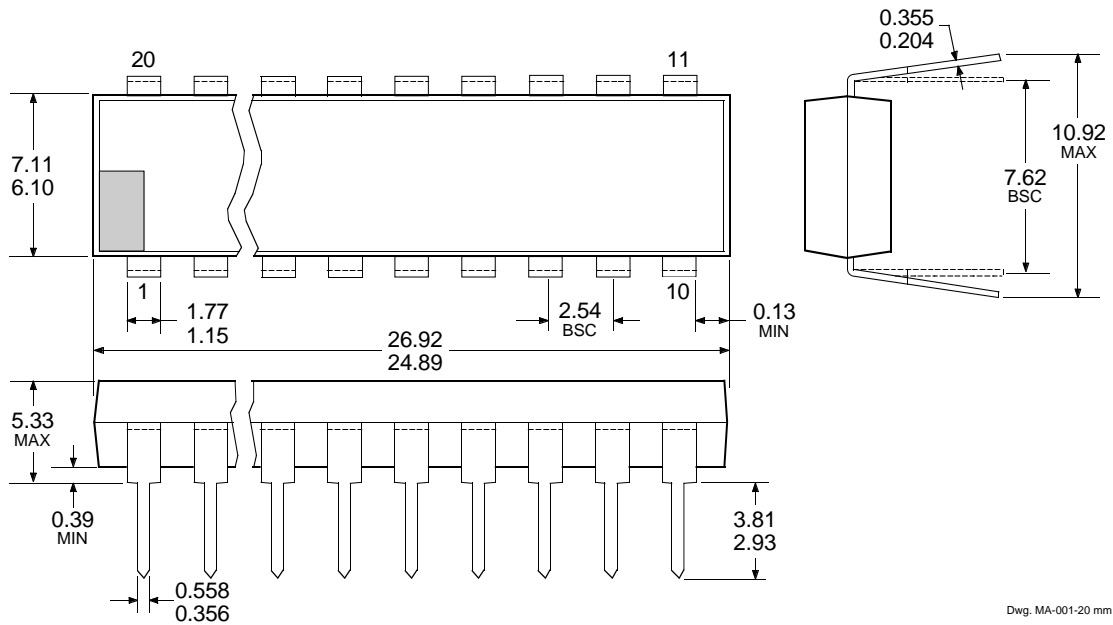
2987 8-CHANNEL SOURCE DRIVER

UDN2987A

Dimensions in Inches
(controlling dimensions)



Dimensions in Millimeters
(for reference only)

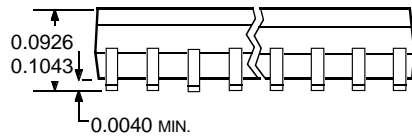
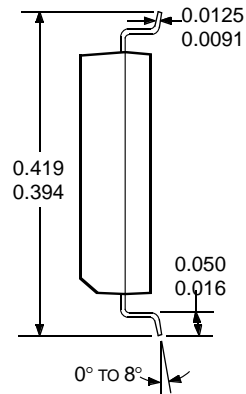
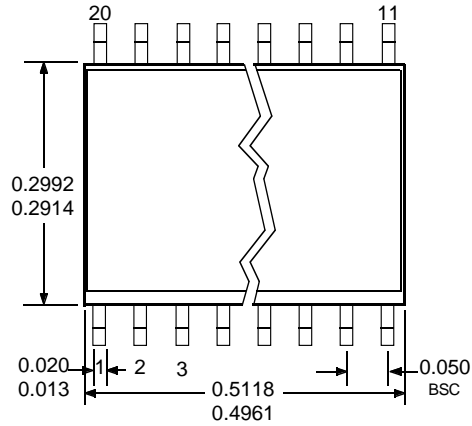


- NOTES: 1. Exact body and lead configuration at vendor's option within limits shown.
 2. Lead spacing tolerance is non-cumulative.
 3. Lead thickness is measured at seating plane or below.
 4. Shipped in sticks/tubes of 18 devices.

2987 8-CHANNEL SOURCE DRIVER

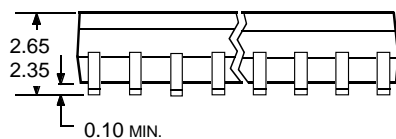
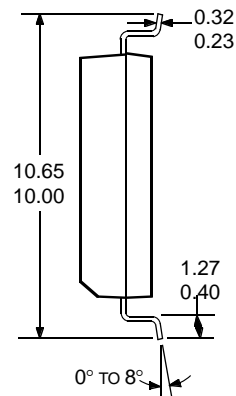
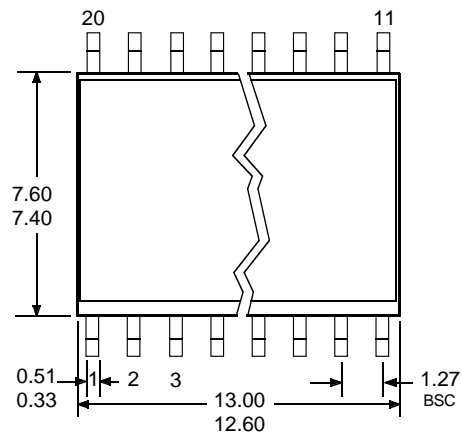
UDN2987LW

Dimensions in Inches
(for reference only)



Dwg. MA-008-20 in

Dimensions in Millimeters
(controlling dimensions)



Dwg. MA-008-20 mm

- NOTES: 1. Exact body and lead configuration at vendor's option within limits shown.
2. Lead spacing tolerance is non-cumulative.
3. Shipped in sticks/tubes of 37 devices or add "TR" to part number for tape and reel.

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2987
8-CHANNEL
SOURCE DRIVER

POWER SOURCE DRIVERS

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 | |
| -25 | 60 | 8 | – | X | – | – | – | 5815 |
| | 60 | 10 | X | X | active pull-down | – | – | 6810 |
| | 60 | 12 | X | X | active pull-down | – | – | 5811 |
| | 60 | 20 | X | X | active pull-down | – | – | 6812 |
| | 60 | 32 | X | X | active pull-down | – | – | 6818 |
| | 85 | 8 | – | – | – | – | – | 6118 |
| -120 | -25 | 8 | – | – | X | X | – | 2585 |
| | 30 | 8 | – | – | X | X | – | 2985 |
| | 50 | 8 | X | X | X | X | – | 5895 |
| -350 | 35 | 8 | – | – | X | – | X | 2987 |
| | 50 | 8 | – | – | X | – | – | 2981 and 2982 |
| | 50 | 8 | X | X | X | – | – | 5891 |
| | 80 | 8 | – | – | X | – | – | 2983 |
| | 80 | 8 | X | X | X | – | – | 5890 |
| -500 | 6 | 1 | – | – | – | MOSFET | X | 2525 and 2535 |
| | 6 | 2 | – | – | – | MOSFET | X | 2535 and 2536 |

* 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.

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