

HIGH-CURRENT HALF-BRIDGE MOTOR DRIVER

Designed for use as a general-purpose motor driver, the UDN2943Z half-bridge driver combines high-current sink and source drivers with logic stages, level shifting, diode transient protection, and a voltage regulator for single-supply operation. Capable of operating in extremely harsh environments, this device can withstand high ambient temperatures, output overloads, and repeated power supply transient voltages without damage. The driver can be used in pairs for full-bridge operation, or as triplets in three-phase brushless dc motor-drive applications.

The input circuitry is compatible with TTL, low-voltage CMOS, and NMOS logic. Logic lockout prevents both source and sink drivers from turning ON simultaneously. Each driver is turned ON by an active-low input, making the UDN2943Z especially desirable in many micro-processor applications. An accidental input open circuit will turn OFF the corresponding output. The device also provides an internally-generated dead time to prevent crossover currents during output switching. Monolithic, space-saving construction offers reliability unobtainable with discrete components.

Saturated output drivers provide for low saturation voltage at the maximum rated current. Internal short-circuit protection, activated at load currents above 1 A, protects the source driver from accidental short-circuits between the output and ground.

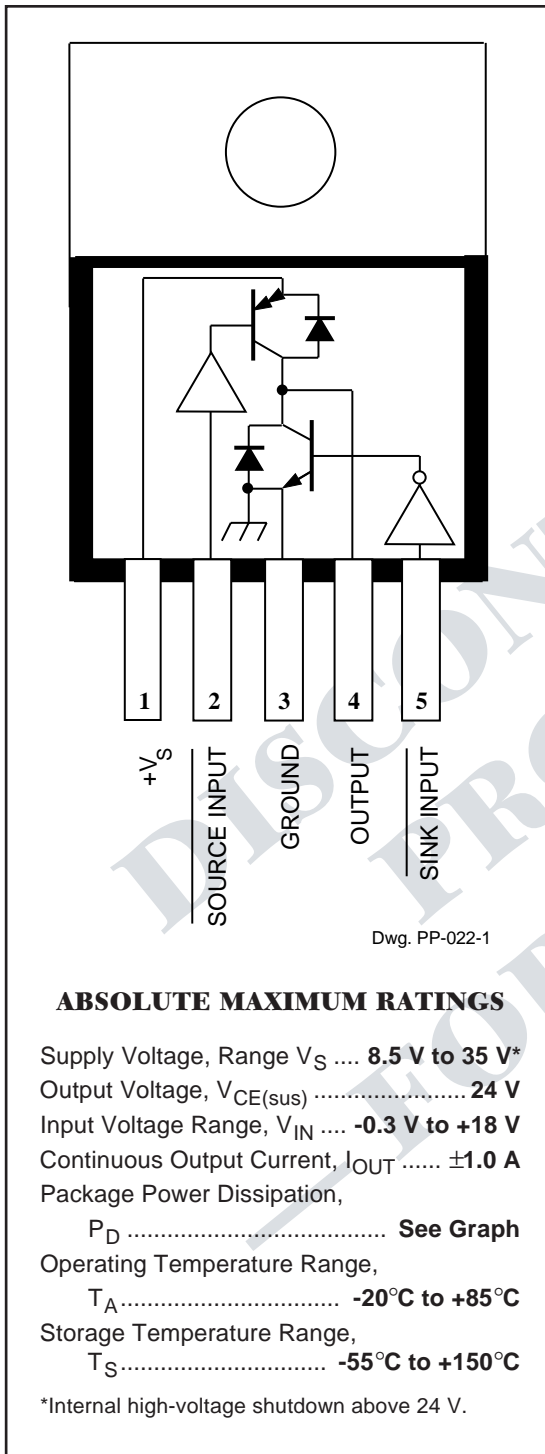
The UDN2943Z driver is rated for continuous operation with inductive loads at supply voltages of up to 24 V. With supply voltage transients (to 35 V maximum), a high-voltage protection circuit becomes operative, shutting OFF both output drivers. The internal thermal shutdown is triggered by a nominal junction temperature of 160°C.

Single-chip construction and a 5-lead power-tab TS-001 plastic package provide cost-effective and reliable systems designs. It also features excellent power dissipation ratings, minimum size, and ease of installation. The heat-sink tab is at ground potential and does not require insulation.

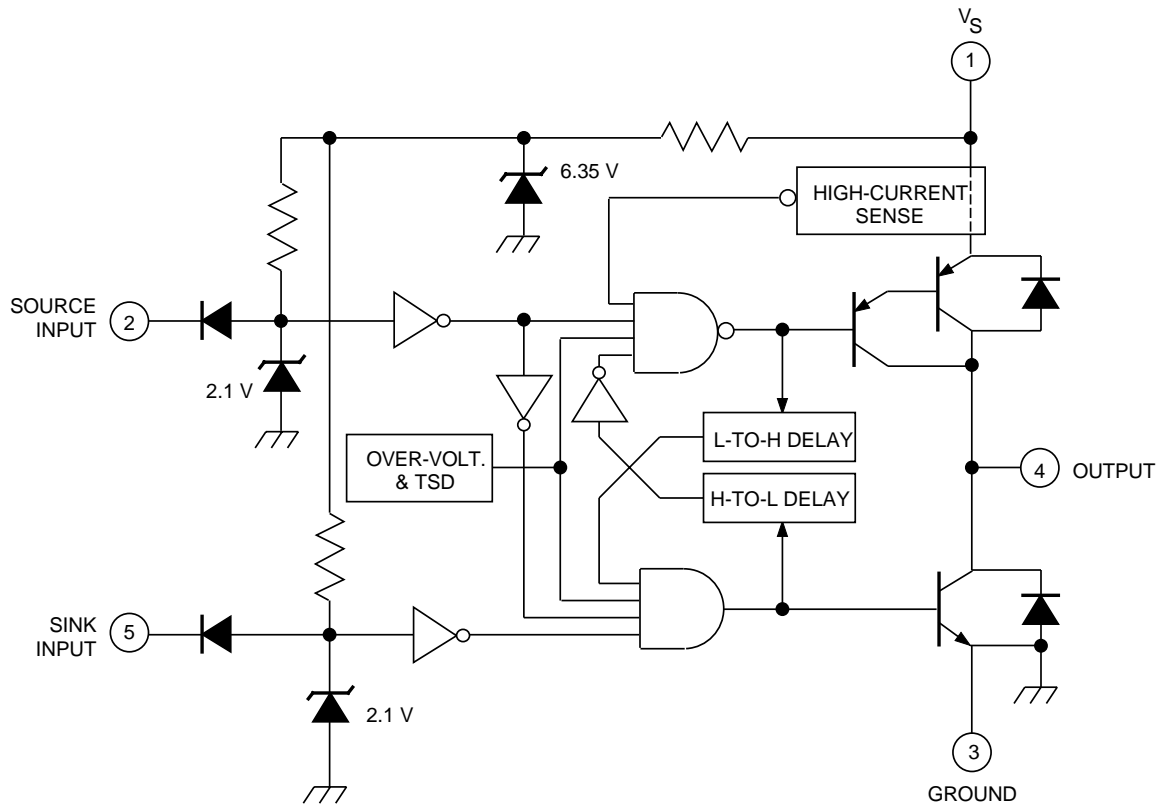
FEATURES

- ±1 A Output Current
- Saturated Output Drivers
- Logic-Compatible Inputs
- Output-Transient Protection
- Tri-State Output
- 8.5 V to 24 V Operating Range
- Crossover-Current Protected
- Withstands 35 V Supply Transients
- Internal Over-Voltage Protection
- Internal Short-Circuit Protection

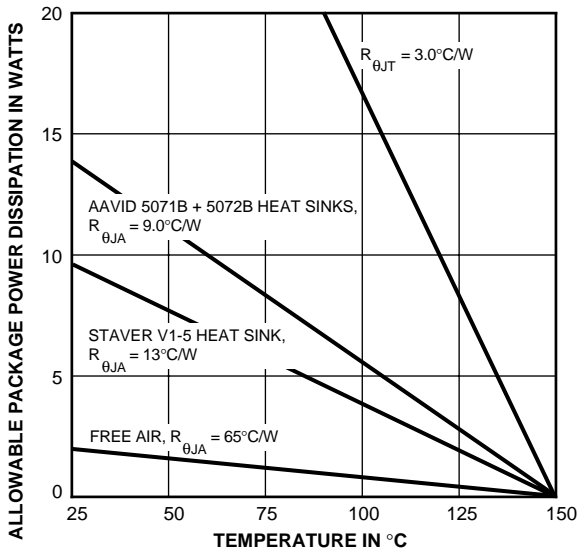
Always order by complete part number: **UDQ2943Z** .



FUNCTIONAL BLOCK DIAGRAM



Dwg. FP-038



Dwg. GP-014A

LOGIC TRUTH TABLE

| Source Driver Pin 2 | Sink Driver Pin 5 | Output Pin 4 |
|------------------------|----------------------|-----------------|
| Low | Low | High |
| Low | High | High |
| High | Low | Low |
| High | High | High Z |



ELECTRICAL CHARACTERISTICS at $T_A = +25^\circ\text{C}$, $V_S = +24\text{ V}$ (unless otherwise noted).

| Characteristic | Symbol | Source Driver Input, Pin 2 | Sink Driver Input, Pin 5 | Output Pin 4 | Other | Limits | | | Units |
|--|---------------|----------------------------|--------------------------|--------------|---------|--------|------|------|------------------|
| | | | | | | Min. | Typ. | Max. | |
| Output Leakage Current ($V_S = +35\text{ V}$) | I_{CEX} | 2.4 V | 2.4 V | 0 V | — | — | -10 | -100 | μA |
| | | 2.4 V | 2.4 V | 35 V | — | — | 10 | 100 | μA |
| Output Sustaining Voltage | $V_{CE(sus)}$ | 2.4 V | 0.8 to 2.4 V | 1.0 A | Fig. 1A | 24 | — | — | V |
| | | 0.8 to 2.4 V | 2.4 V | -1.0 A | Fig. 1B | 24 | — | — | V |
| Output Saturation Voltage | $V_{CE(SAT)}$ | 0.8 V | 2.4 V | -1.0 A | — | — | 1.2 | 1.8 | V |
| | | 2.4 V | 0.8 V | 1.0 A | — | — | 0.6 | 1.0 | V |
| Short-Circuit Source Current | I_{SC} | 0.8 V | 2.4 V | 0 V | — | 1.0 | — | 1.8 | A |
| Logic Input Voltage | $V_{IN(1)}$ | — | — | — | — | 2.0 | — | — | V |
| | $V_{IN(0)}$ | — | — | — | — | — | — | 0.8 | V |
| Input Current | $I_{IN(1)}$ | 2.4 V | 2.4 V | NC | — | — | 10 | 100 | μA |
| | $I_{IN(0)}$ | 0.8 V | 0.8 V | NC | — | — | -50 | -200 | μA |
| Clamp Diode Forward Voltage | V_F | NC | NC | 1.0 A | Fig. 2 | — | 1.5 | 2.0 | V |
| Logic Supply Current | I_S | 2.4 V | 2.4 V | NC | — | — | 15 | 30 | mA |
| | | 2.4 V | 0.8 V | NC | — | — | 55 | 75 | mA |
| | | 0.8 V | 2.4 V | NC | — | — | 30 | 40 | mA |
| Thermal Shutdown Temperature | T_J | — | — | — | — | — | 160 | — | $^\circ\text{C}$ |
| Over-Voltage Shutdown | V_S | — | — | — | — | 24 | — | 35 | V |
| Propagation Delay | t_{PD} | 2.4 V | 2.4 V to 0.8 V | 0.4 A | Fig. 3 | — | 0.6 | — | μs |
| | | 0.8 to 2.4 V | 2.4 V | -0.4 A | Fig. 4 | — | 1.0 | — | μs |
| | | 2.4 V | 0.8 to 2.4 V | 0.4 A | Fig. 3 | — | 1.1 | — | μs |
| | | 2.4 to 0.8 V | 2.4 V | -0.4 A | Fig. 4 | — | 0.6 | — | μs |

Notes: Negative current is defined as coming out of (sourcing) the specified device pin.

Typical Data is for design information only.

SOURCE INPUT
VOLTAGE

SINK INPUT
VOLTAGE

+
OUTPUT
CURRENT
0
-

— SINKING CURRENT

- - - OPEN CIRCUIT. -

— SOURCING CURRENT

2943 HIGH-CURRENT HALF-BRIDGE MOTOR DRIVER

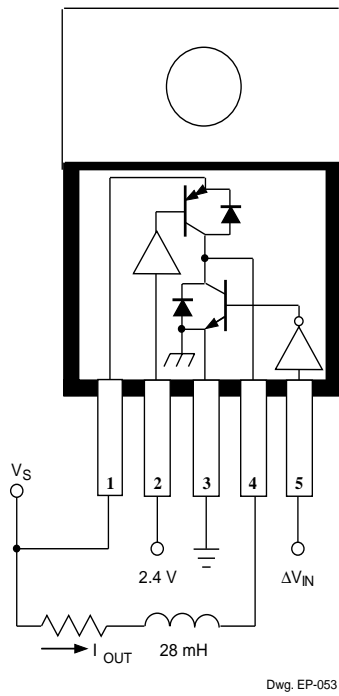


Figure 1A

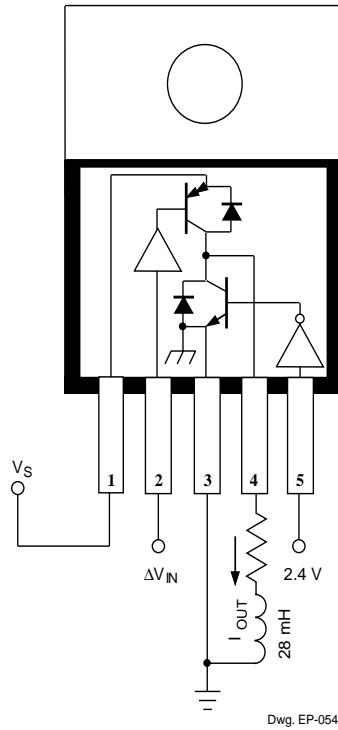


Figure 1B

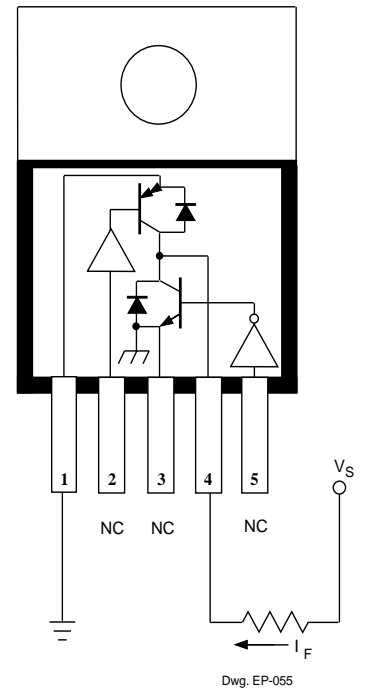


Figure 2

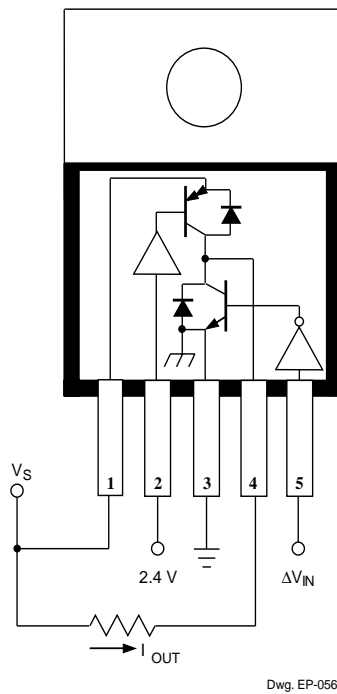


Figure 3

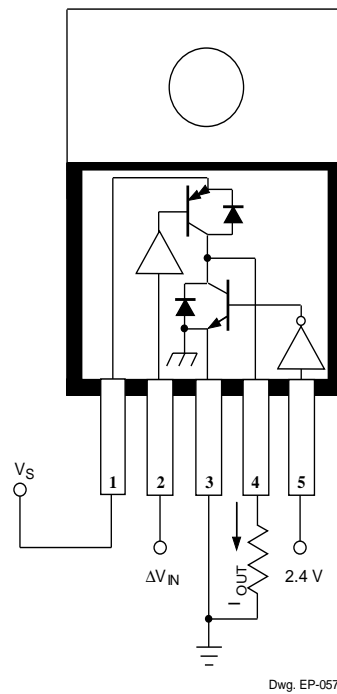
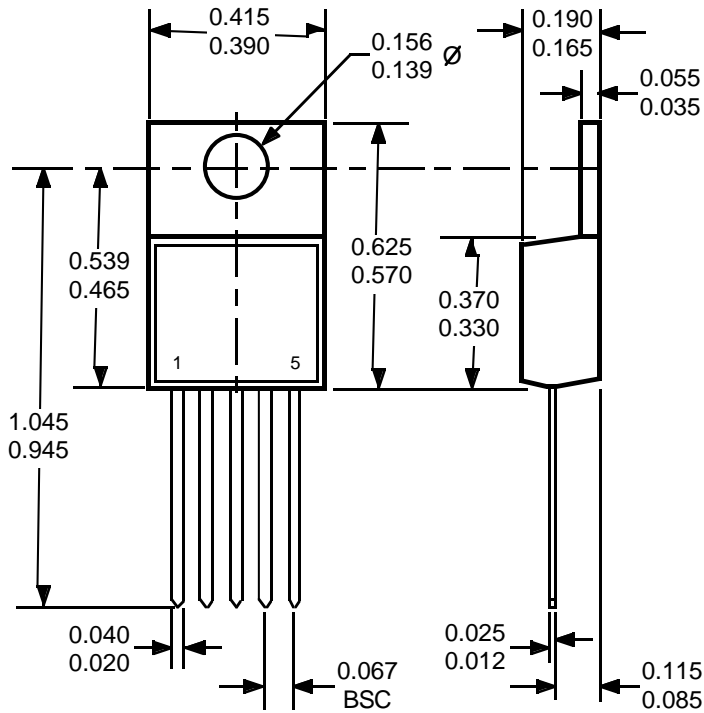


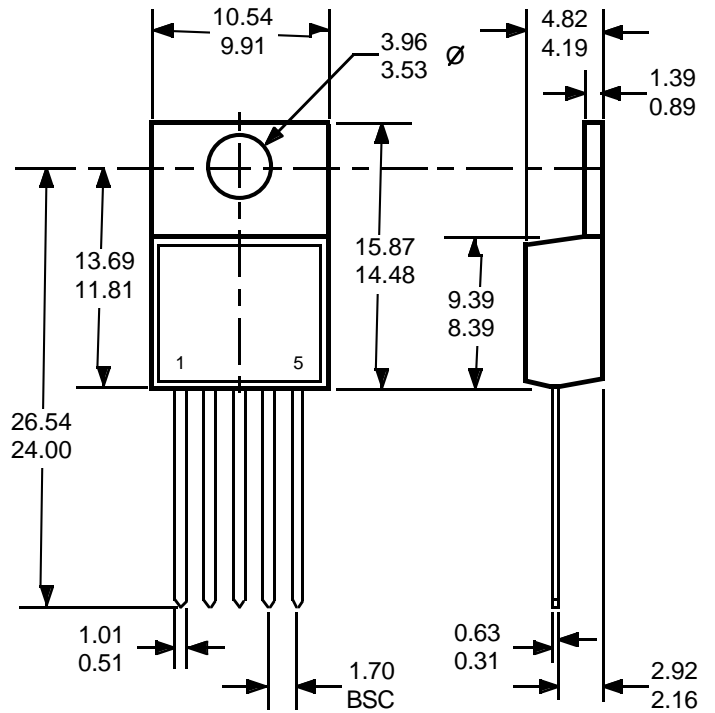
Figure 4

Dimensions in Inches



Dwg. MP-005 in

**Dimensions in Millimeters
(Based on 1" = 25.40 mm)**



Dwg. MP-005 mm

MOTOR DRIVERS SELECTION GUIDE

| Function | Output Ratings * | | Part Number † |
|---|------------------|------|-------------------|
| INTEGRATED CIRCUITS FOR BRUSHLESS DC MOTORS | | | |
| 3-Phase Controller/Drivers | ±2.0 A | 45 V | 2936 and 2936-120 |
| Hall-Effect Latched Sensors | 10 mA | 24 V | 3175 and 3177 |
| 2-Phase Hall-Effect Sensor/Controller | 20 mA | 25 V | 3235 |
| Hall-Effect Complementary Output Sensor | 20 mA | 25 V | 3275 |
| 2-Phase Hall-Effect Sensor/Driver | 900 mA | 14 V | 3625 |
| 2-Phase Hall-Effect Sensor/Driver | 400 mA | 26 V | 3626 |
| Hall-Effect Comp. Output Sensor/Driver | 300 mA | 60 V | 5275 |
| 3-Phase Back-EMF Controller/Driver | ±900 mA | 14 V | 8902-A |
| 3-Phase Controller/DMOS Driver | ±4.0 A | 14 V | 8925 |
| 3-Phase Back-EMF Controller/Driver | ±1.0 A | 7 V | 8980 and 8983 |
| INTEGRATED BRIDGE DRIVERS FOR DC AND BIPOLAR STEPPER MOTORS | | | |
| PWM Current Controlled Dual Full Bridge | ±750 mA | 45 V | 2916 |
| PWM Current Controlled Dual Full Bridge | ±1.5 A | 45 V | 2917 |
| PWM Current Controlled Dual Full Bridge | ±1.5 A | 45 V | 2918 |
| PWM Current Controlled Dual Full Bridge | ±750 mA | 45 V | 2919 |
| Half-Bridge Driver | ±1.0 A | 24 V | 2943 |
| Dual Full Bridge Driver | ±2.0 A | 50 V | 2998 |
| PWM Current Controlled Full Bridge | ±2.0 A | 50 V | 3952 |
| PWM Current Controlled Full Bridge | ±1.3 A | 50 V | 3953 |
| PWM Current Controlled Dual Full Bridge | ±800 mA | 45 V | 3961 |
| PWM Current Controlled Dual Full Bridge | ±800 mA | 30 V | 3962 |
| OTHER INTEGRATED CIRCUIT MOTOR DRIVERS | | | |
| Unipolar Stepper Motor Quad Driver | 1.8 A | 50 V | 2544 |
| Unipolar Stepper-Motor Translator/Driver | 1.25 A | 50 V | 5804 |
| Unipolar Stepper-Motor Quad Driver | 1 A | 46 V | 7024 and 7029 |
| Unipolar Microstepper-Motor Quad Driver | 1.2 A | 46 V | 7042 |
| Voice-Coil Motor Driver | ±500 mA | 6 V | 8932-A |
| Voice-Coil Motor Driver | ±800 mA | 16 V | 8958 |
| Voice-Coil (and spindle) Motor Driver | ±350 mA | 7 V | 8980 and 8983 |

* Current is maximum specified test condition, voltage is maximum rating. See specification for sustaining voltage limits or over-current protection voltage limits.

Negative current is defined as coming out of (sourcing) the output.

† Complete part number includes additional characters to indicate operating temperature range and package style.

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