DS3658 Quad High Current Peripheral Driver

Check for Samples: DS3658

FEATURES

- **Single Saturated Transistor Outputs**
- **Low Standby Power, 10 mW Typical**
- **High Impedance TTL Compatible Inputs**
- **Outputs May Be Tied Together for Increased Current Capacity**
- **High Output Current**
  - **600 mA Per Output**
  - **2.4A Per Package**
- **No Output Latch-up at 35V**
- **Low Output ON Voltage (350 mV typ @ 600 mA)**
- **High Breakdown Voltage (70V)**
- **Open Collector Outputs**
- **Output Clamp Diodes for Inductive Fly Back Protection**
- **NPN Inputs for Minimal Input Currents (1 µA Typical)**
- **Low Operating Power**
- **Standard 5V Power Supply**
- **Power Up/Down Protection**
- **Fail Safe Operation**
- **2W Power Package**
- **Pin-for-Pin Compatible with SN75437**

APPLICATIONS

- **Relay Drivers**
- **Lamp Drivers**
- **Solenoid Drivers**
- **Hammer Drivers**
- **Stepping Motor Drivers**
- **Triac Drivers**
- **LED Drivers**
- **High Current, High Voltage Drivers**
- **Level Translators**
- **Fiber Optic LED Drivers**

DESCRIPTION

The DS3658 quad peripheral driver is designed for those applications where low operating power, high breakdown voltage, high output current and low output ON voltage are required. A unique input circuit combines TTL compatibility with high impedance. In fact, its extreme low input current allows it to be driven directly by a CMOS device.

The outputs are capable of sinking 600 mA each and offer a 70V breakdown. However, for inductive loads the output should be clamped to 35V or less to avoid latch-up during turn off (inductive fly back protection—refer to AN-213 'SNOA610'). An on-chip clamp diode capable of handling 800 mA is provided at each output for this purpose. In addition, the DS3658 incorporates circuitry that specifies glitch-free power up or down operation and a fail-safe feature which puts the output in a high impedance state when the input is open.

The PDIP package is specifically constructed to allow increased power dissipation over conventional packages. The four ground pins are directly connected to the device chip with a special cooper lead frame. When the quad driver is soldered into a PC board, the power rating of the device improves significantly.

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Connection Diagram

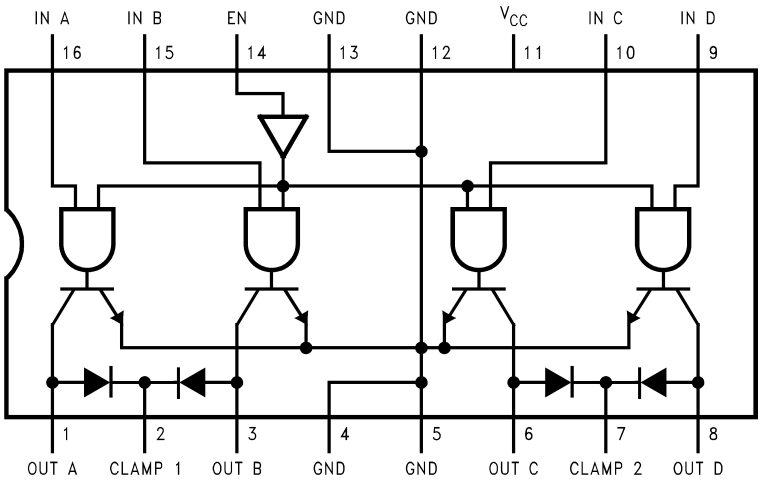


Figure 1. PDIP- Top View
See Package Number NFG0016E

These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

Absolute Maximum Ratings (1)(2)

Supply Voltage	7V
Input Voltage	15V
Output Voltage	70V
Output Current	1.5A
Continuous Power Dissipation @ 25°C Free-Air (3)	2075 mW
Storage Temperature Range	−65°C to +150°C
Lead Temperature (Soldering, 4 sec.)	260°C

(1) "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be specified. They are not meant to imply that the device should be operated at these limits. Electrical Characteristics provides conditions for actual device operation.
(2) If Military/Aerospace specified devices are required, please contact the Texas Instruments Sales Office/ Distributors for availability and specifications.
(3) For operation over 25° free-air temperature, derate linearly to 1328 mW @ 70°C @ the rate of 16.6 mW/°C.

Operating Conditions

	Min	Max	Units
Supply Voltage	4.75	5.25	V
Ambient Temperature	0	70	°C

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Electrical Characteristics[1][2]

Symbol	Parameter	Conditions	Min	Typ	Max	Units
V_{IH}	Input High Voltage		2.0			V
V_{IL}	Input Low Voltage				0.8	V
I_{IH}	Input High Current	V_{IN} = 5.25V, V_{CC} = 5.25V		1.0	1.0	µA
I_{IL}	Input Low Current	V_{IN} = 0.4V			±10	µA
V_{IK}	Input Clamp Voltage	I_I = −12 mA		−0.8	−1.5	V
V_{OL}	Output Low Voltage	I_L = 300 mA		0.2	0.4	V
		I_L = 600 mA [3]		0.35	0.7	V
I_{CEX}	Output Leakage Current	V_{CE} = 70V, V_{IN} = 0.8V			100	µA
V_F	Diode Forward Voltage	I_F = 800 mA		1.0	1.6	V
I_R	Diode Leakage Current	V_R = 70V			100	µA
I_{CC}	Supply Current	All Inputs High		60	85	mA
		All Inputs Low		2	4	mA

(1) Unless otherwise specified, min/max limits apply across the 0°C to +70°C temperature range and the 4.75V to 5.25V power supply range. All typical values are for T_A = 25°C and V_{CC} = 5.0V.
(2) All currents into device pins are shown as positive, all currents out of device pins are shown as negative, all voltages are referenced to ground, unless otherwise specified. All values shown as max or min are so classified on absolute value basis.
(3) All sections of this quad circuit may conduct rated current simultaneously, however, power dissipation averaged over a short interval of time must fall within specified continuous dissipation ratings.

Switching Characteristics[1]

Symbol	Parameter	Conditions	Min	Typ	Max	Units
t_{PHL}	Turn On Delay	R_L = 60Ω, V_L = 30V		226	500	ns
t_{PLH}	Turn Off Delay	R_L = 60Ω, V_L = 30V		2430	8000	ns

(1) Unless otherwise specified, min/max limits apply across the 0°C to +70°C temperature range and the 4.75V to 5.25V power supply range. All typical values are for T_A = 25°C and V_{CC} = 5.0V.

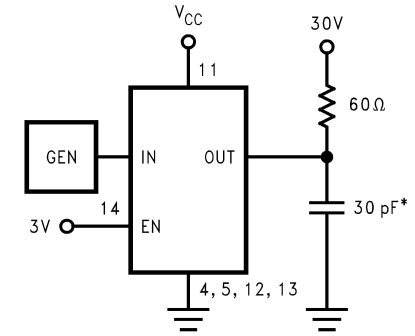
Truth Table[1]

IN	EN	OUT
H	H	L
L	H	Z
H	L	Z
L	L	Z

(1) H = High state
L = Low state
Z = High impedance state

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AC Test Circuit



*Includes probe and jig capacitance.

Figure 2.

Switching Waveforms

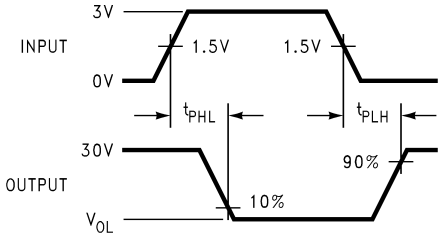
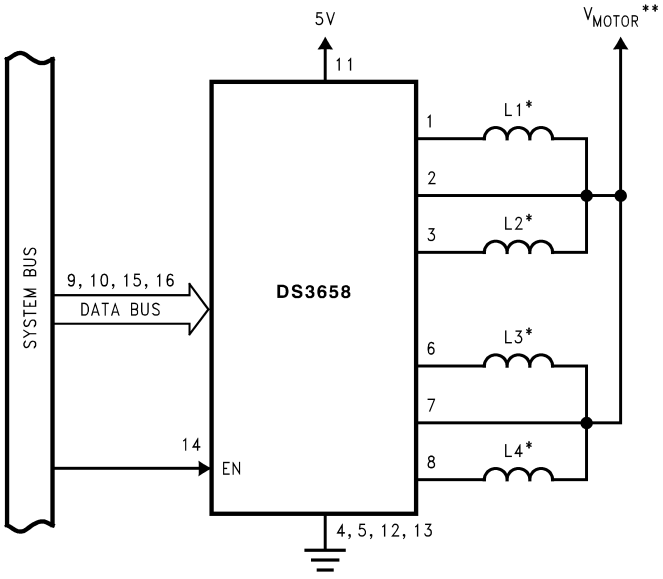


Figure 3.

Typical Applications



*L1, L2, L3, L4 are the windings of a bifilar stepping motor.
**V_{MOTOR} is the supply voltage of the motor.

Figure 4. Stepping Motor Driver

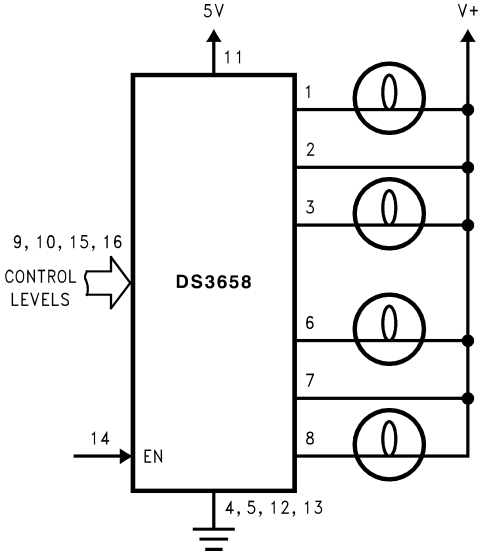


Figure 5. Lamp Driver

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REVISION HISTORY

Changes from Revision A (April 2013) to Revision B	Page
• Changed layout of National Data Sheet to TI format	4

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PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
DS3658N	NRND	PDIP	NFG	16	25	TBD	Call TI	Call TI	0 to 70	DS3658N	
DS3658N/NOPB	ACTIVE	PDIP	NFG	16	25	Green (RoHS & no Sb/Br)	CU SN	Level-1-NA-UNLIM	0 to 70	DS3658N	Samples

(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
TBD: The Pb-Free/Green conversion plan has not been defined.
Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.
Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

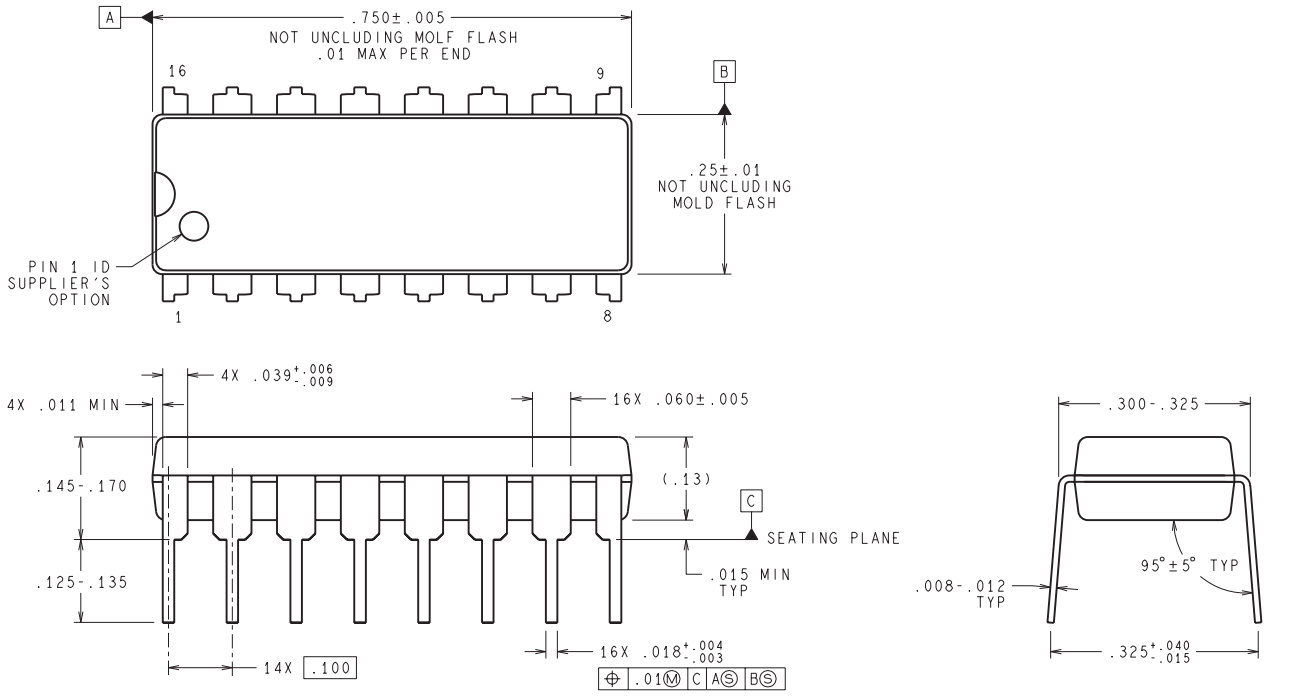
(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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