National Semiconductor

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DS3656 Quad Peripheral Driver

General Description

The DS3656 is a quad peripheral driver designed for use in automotive applications. Logically it is an open collector NAND function with all inputs compatible with 74LS and CMOS series products. An enable input is provided that is common to each driver. When taken to a logic zero level all outputs will turn off. Also, overvoltage is detected.

The DS3656 has features associated with the output structure that make it highly versatile to many applications. Each output is capable of 600 mA sink currents and offers 65V standoff voltage in non-inductive applications. A clamp network capable of handling 800 mA is incorporated in each output which eliminates the need of an external network to quench the high voltage backswing caused when switching inductive loads up to 30V (reference AN-213).

The DS3656 is intended to operate from a 12V automotive battery. Internal to the device is its own voltage regulator which permits the device to operate during the wide voltage variation seen in many automotive applications. An overvoltage-protection circuit is incorporated that will cause the outputs to turn off when the supply exceeds 30V. The circuit is designed to withstand worst case fault conditions that occur in automotive applications, such as high voltage transients and reverse battery connection. In this type of environment an external 100Ω resistor must be connected in series with the V_{CC} line.

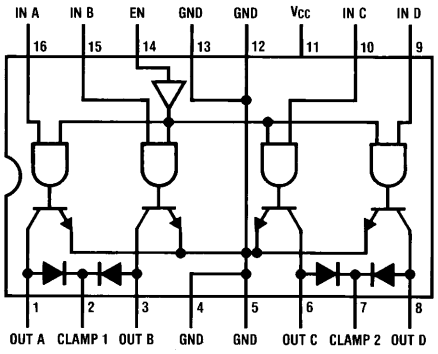
The molded package is specifically constructed to allow increased power dissipation over conventional packages. The four ground pins are directly connected to the device chip with a special copper lead frame. When the quad driver is soldered into a copper PC board the power rating of the device will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

Features

- Quad automotive peripheral driver
- 600 mA output current capability
- High voltage outputs—65V
- Clamp diode provided for inductive loads
- Built in regulator
- Overvoltage failsafe
- TTL/LS/CMOS compatible diode clamped inputs
- High power dissipation package
- Guaranteed to withstand worst case fault conditions

Connection Diagram

Dual-In-Line Package



TL/F/5818–1

Top View

Order Number DS3656N
See NS Package Number N16A

Truth Table

Enable	In X	Out X
H	H	L
H	L	Z
L	X	Z

H = High level L = Low level X = Irrelevant
Z = High impedance state

RRD-B30M105/Printed in U. S. A.

Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage, V_{CC} (Note 2)	65V
Input Voltage	7V
Output Voltage	65V
Continuous Output Current	1.2A
Junction Temperature	150°C
Thermal Resistance (Junction to Ambient)	
DS3656N Plugged in a Socket	60°C/W
DS3656N Soldered in a PC Board	35°C/W
DS3656N Soldered in a PC Board with 6 in^2 Cn Foil	20°C/W
Lead Temperature (Soldering, 4 seconds)	260°C

Operating Conditions

	Min	Max	Units
Supply Voltage, V_{CC}	10.5	17.0	V
Temperature	−40	105	°C

Electrical Characteristics (Notes 2 and 3)

Symbol	Parameter	Conditions	Min	Max	Units
V_{CC}	Power Supply Voltage		10.5	17	V
I_{CC}	Power Supply Current			65	mA
V_{IH}	High Level Input Voltage		2.0		V
V_{IL}	Low Level Input Voltage			0.8	V
I_{IH}	High Level Input Current	$V_{IN} = 2.7V$		20	μA
I_{IL}	Low Level Input Current	$V_{IN} = 0.4V$		−360	μA
V_{ICL}	Input Clamp Voltage	$I_{IN} = -10$ mA		−1.5	V
V_{OL}	Low Level Output Voltage	$I_L = 600$ mA, $V_{CC} = 10.5V$		1.5	V
I_{OH}	High Level Leakage Current	$V_{OH} = 65V$		1.0	mA
V_F	Output Diode Forward Voltage	$I_F = 800$ mA		2.5	V
I_R	Output Diode Reverse Leakage	$V_R = 65V$		1.0	mA
B_{VCER}	V_{OH1} Switching Capacitive or Resistive Load			65	V
L_{VCEO}	V_{OH2} Switching Inductive Clamped Load			30	V

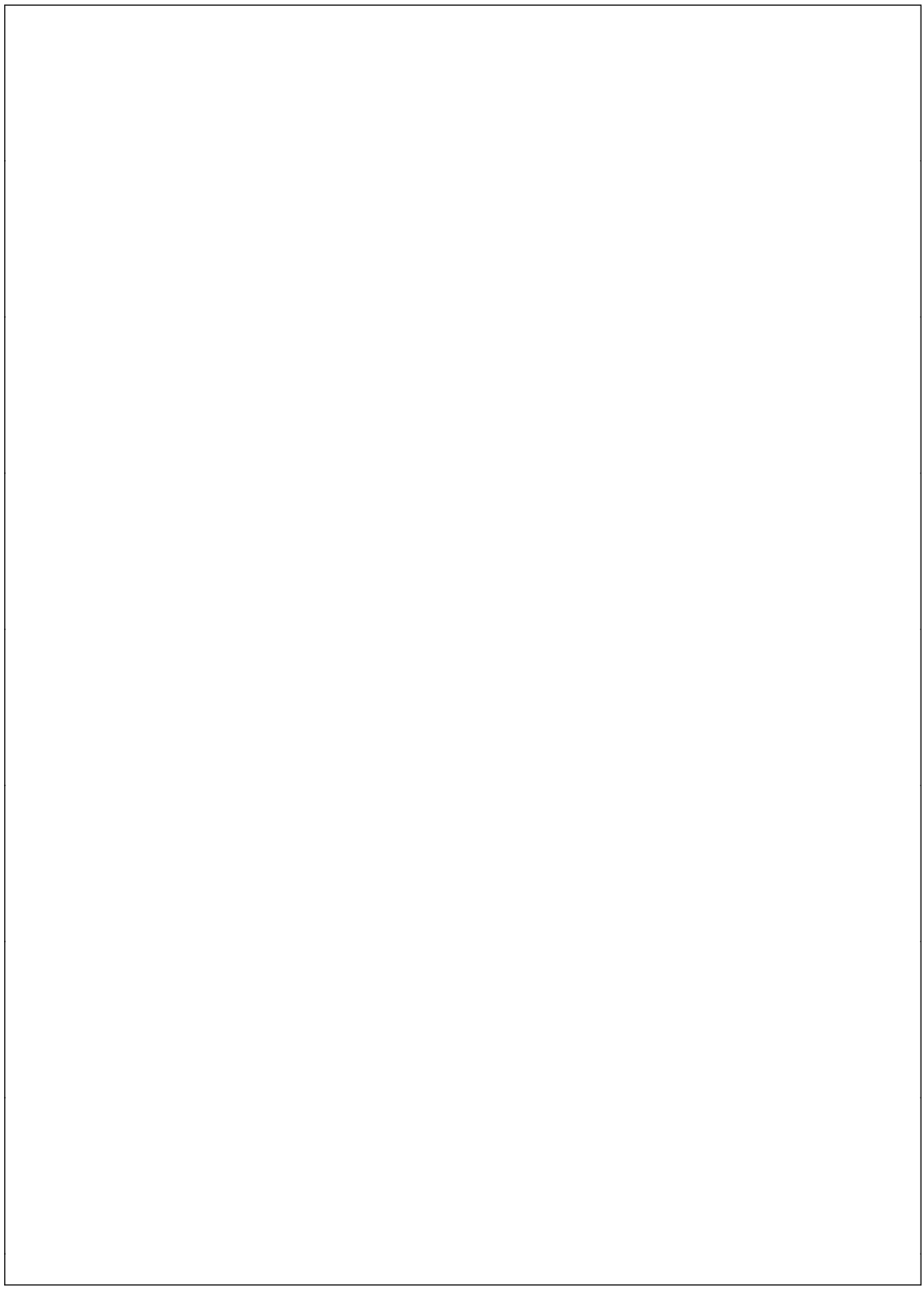
Switching Characteristics $V_{CC} = 13.2V$, $T_A = 25°C$

Symbol	Parameter	Conditions	Min	Max	Units
t_{PLH}	Propagation Delay Time Low to High Level Output	$V_{CC} = 13.2V$, $R_L = 30\Omega$, $C_L = 15$ pF		10	μs
t_{PHL}	Propagation Delay Time High to Low Level Output	$V_{CC} = 13.2V$, $R_L = 30\Omega$, $C_L = 15$ pF		10	μs
t_{TLH}	Transition Time Low to High Level Output	$V_{CC} = 13.2V$, $R_L = 30\Omega$, $C_L = 15$ pF		500	ns
t_{THL}	Transition Time High to Low Level Output	$V_{CC} = 13.2V$, $R_L = 30\Omega$, $C_L = 15$ pF		500	ns
t_{PLH}	Enable to Output	$V_{CC} = 13.2V$, $R_L = 30\Omega$, $C_L = 15$ pF		10	μs
t_{PHL}	Enable to Output	$V_{CC} = 13.2V$, $R_L = 30\Omega$, $C_L = 15$ pF		10	μs

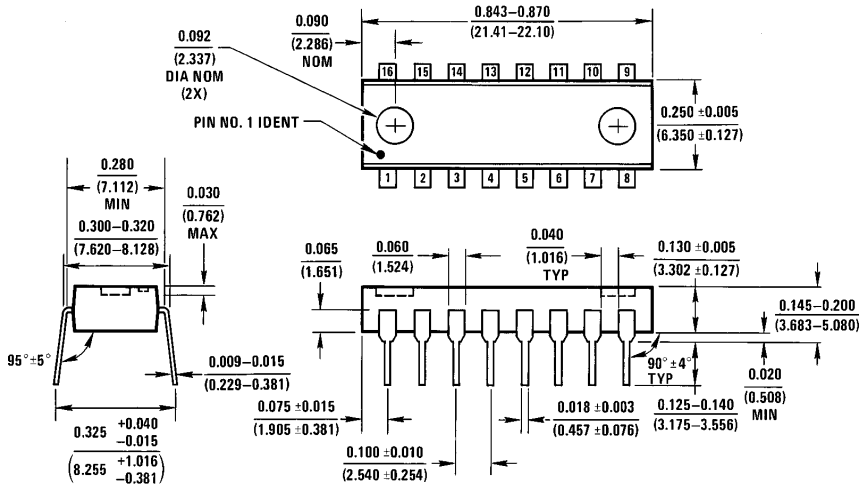
Note 1: "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. Except for "Operating Temperature Range" they are not meant to imply that the devices should be operated at these limits. The table of "Electrical Characteristics" provides conditions for actual device operation.

Note 2: Voltage values are with respect to network ground terminal unless otherwise specified.

Note 3: Unless otherwise specified min/max limits apply across the −40°C to +105°C temperature range.



Physical Dimensions inches (millimeters)



N16A (REV E)

Molded Dual-In-Line Package (N)
Order Number DS3656N
NS Package Number N16A

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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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