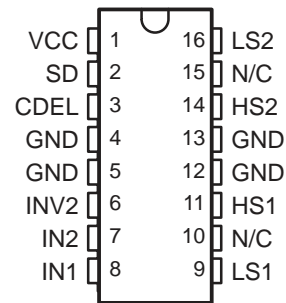


- 250-mA Continuous Total Output Drive
- Two Output Power Switches, 35-V Maximum Operation
- Low-Side or High-Side Switch Configuration
- User Programmable Phasing of Output Switch LS2/HS2
- Internal Output Voltage Clamp for Driving Inductive Loads
- 9 V to 35 V Supply Voltage Range
- Current Limit Protection
- Thermal Shutdown Protection
- UVLO With User Programmable Time Delay

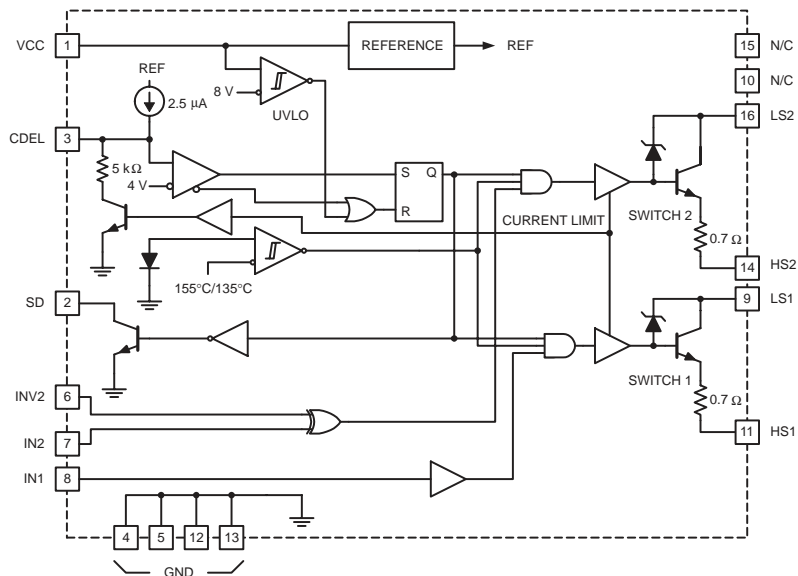
DP, M, OR NP PACKAGES (TOP VIEW)



description

The UCx7136 bipolar dual switch contains all the control and drive circuitry required to drive resistive, capacitive, and inductive loads as in industrial sensor applications. The output drivers are 250-mA NPN power switches that can switch a load between a voltage supply up to 35 V and GND with a continuous output current rating of 250 mA, combined or individually. Internal 46-V Zener clamps are provided to clamp collector-to-emitter NPN power switch voltages to safe levels when driving inductive loads. The two outputs can be configured in any combination of high side (load to GND) or low side (load to VCC). The output of switch 1 is fixed in phase with the CMOS compatible IN1 pin. The CMOS compatible exclusive OR gate inputs, IN2 and INV2, determine the output phase of switch 2. An under voltage lockout (UVLO) function is provided to disable both output NPN power switches until VCC is greater than 8 V. Both output NPN power switches can also be disabled past the UVLO enable trip point by an external user programmable time delay capacitor. An internal current limit function enables a low on/off duty cycle of the NPN power switches should the dc current go beyond 1 A. An internal thermal shutdown function disables the switches if the IC temperature reaches 155°C such as in an overcurrent condition.

schematic



UDG-99016



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

PRODUCT PREVIEW information concerns products in the formative or design phase of development. Characteristic data and other specifications are design goals. Texas Instruments reserves the right to change or discontinue these products without notice.



Copyright © 2000, Texas Instruments Incorporated

UC27136, UC37136 DUAL OUTPUT SWITCH

SLUS447 - FEBRUARY 2000 - REVISED JULY 2000

absolute maximum ratings over operating free-air temperature (unless otherwise noted)†

Supply Voltage, VCC	35 V
LS1, HS1, LS2, HS2	35 V
LS1-HS1, LS2-HS2 (clamped by internal circuitry)	46 V
Output Current, Continuous	250 mA (Total)
Output Current, Peak	1.3 A
Logic Input Voltage	18 V
Storage Temperature, T _J	-65°C to 150°C
Junction Temperature, T _{stg}	-55°C to 150°C
Lead Temperature (Soldering, 10 s)	300°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

‡ Currents are positive into, negative out of the specified terminal. Consult Packaging Section of Data Book for thermal limitations and considerations of packages.

AVAILABLE OPTIONS

T _A	PACKAGE DEVICES		
	SOIC Narrow Lead Frame (DP)	Plastic Batwing DIP (NP)	QSOP Lead Frame (M)
-40°C to +85°C	UC27136DP	UC27136NP	N/A
0°C to +70°C	UC37136DP	UC37136NP	UC37136M

electrical characteristics VCC = 25 V, IN1 = IN2 = INV2 = 0 V (for low), IN1 = IN2 = INV2 = 5 V (for high), T_A = T_J, CDEL = 10 nF, (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Overall Section					
VCC supply voltage		9		35	V
VCC supply current	VCC current with IN1, IN2, INV2 = 0 V		7.0		mA
Under Voltage Lockout (UVLO) Section					
UVLO threshold		7.5	8	8.5	V
UVLO hysteresis		0.4	0.5	0.6	V
Input Logic Section					
Digital input high level	IN1, IN2, INV2	3.5			V
Digital input low level	IN1, IN2, INV2			1.5	V
Input bias current, low level	IN1, IN2, INV2 = 0 V		-10		μA
Input bias current high level	IN1, IN2, INV2 = 5 V		5		μA
Logic input to output delay				3	μs
Output: High Side Configuration Section					
Rise time (off to on)	R _{LOAD} = 250 Ω, See Figure 1		100		ns
Fall time (on to off)	R _{LOAD} = 250 Ω, See Figure 1		200		ns
Saturation voltage	R _{LOAD} = 100 Ω, T _A = 25°C, See Figure 1			1.15	V
	R _{LOAD} = 100 Ω, T _A = -40°C, See Figure 1			1.3	V
Current limit	R _{LOAD} = 0.25 Ω, T _A = 25°C, See Figure 1		1.1		A
Leakage current	HS1, HS2 = GND, LS1, LS2 = VCC, IN1, IN2, INV2 = 0 V			5	μA
Voltage clamp	Measure (V _{LS1} - V _{HS1}) or (V _{LS2} - V _{HS2})		46		V



electrical characteristics VCC = 25 V, IN1 = IN2 = INV2 = 0 V (for low), IN1 = IN2 = INV2 = 5 V (for high), TA = TJ, CDEL = 10 nF, (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Output: Low Side Configuration Section					
Rise time (on to off)	R _{LOAD} = 250 Ω, See Figure 2		300		ns
Fall Time (off to on)	R _{LOAD} = 250 Ω, See Figure 2		150		ns
Saturation voltage	R _{LOAD} = 100 Ω, TA = 25°C, See Figure 2			1.15	V
	R _{LOAD} = 100 Ω, TA = -40°C, See Figure 2			1.3	V
Current limit	R _{LOAD} = 0.25 Ω, TA = 25°C, See Figure 2		1.1		A
Leakage current	HS1, HS2 = GND, LS1, LS2 = VCC, IN1, IN2, INV2 = 0 V			5	μA
Voltage clamp	Measure (V _{LS1} - V _{HS1}) or (V _{LS2} - V _{HS2})		46		V
Turn On Delay					
CDEL maximum voltage			4.7		V
CDEL threshold			4		V
ICDEL			2.5		μA
Thermal Shutdown (see Note 1)					
Thermal shutdown threshold			155		°C
Hysteresis			20		°C

NOTE 1: Ensured by design. Not production tested.

pin descriptions

CDEL: A capacitor connected to this pin is used to program a turnon delay after the UVLO threshold has been reached. The UVLO function keeps the external capacitor connected to this pin discharged until VCC is greater than 8 V. After the UVLO upper trip point of 8 V has been exceeded, an internal 2.5-μA current source charges the capacitor from GND to 4.7 V. An internal voltage comparator enables the output NPN switches at 4 V, imparting a time delay after UVLO. As an added feature, an external switch can be connected in parallel with the user-programmable time-delay capacitor to disable the output NPN switches and reset the time delay capacitor by external means.

GND: The reference point for the internal reference, all thresholds, and the ground for the remainder of the device.

IN1: The digital-logic input pin that controls the state of the output NPN switch 1. When the IN1 pin is a logic low (0 V to 1.5 V), output switch 1 is off (non-conducting). When the IN1 pin is a logic high (3.5 V to 17.5 V), output switch 1 is on (conducting).

IN2, INV2: The digital logic input pins to the exclusive OR gate that controls the state of the output NPN switch 2. Refer to the truth table for description. A logic low is 0 V to 1.5 V; a logic high is 3.5 V to 17.5 V.

HS1: This pin is the emitter of output NPN switch 1.

HS2: This pin is the emitter of output NPN switch 2.

LS1: This pin is the collector of output NPN switch 1.

LS2: This pin is the collector of output NPN switch 2.

SD: This ground referenced open collector NPN output is asserted in the event of an overcurrent or during the start up delay due to the CDEL pin, non-conducting otherwise. The maximum SD current is 8 mA.

UC27136, UC37136 DUAL OUTPUT SWITCH

SLUS447 - FEBRUARY 2000 - REVISED JULY 2000

APPLICATION INFORMATION

TRUTHTABLE

INV2	IN2	Switch 2
Low	Low	Off
High	Low	On
Low	High	On
High	High	Off

turn on delay

The NPN output switches remains off until the external capacitor connected to CDEL charges up to the internal threshold voltage of 4 V with a charging current of 2.5 μ A. This off condition is independent of the state of the input logic pins IN1, IN2, and INV2. This capacitor charging imparts a delay time on the outputs that is equal to approximately 1.6 ms/nF. As an example, a 0.1- μ F capacitor connected to CDEL results in a 160 ms turnon delay after VCC crosses the 8-V UVLO threshold. If VCC drops below the 7.5-V hysteresis threshold, the CDEL capacitor is discharged immediately and both outputs turn off. The CDEL pin can also be externally driven low to restart the turnon delay sequence. The minimum acceptable value for the CDEL capacitor, when driving a capacitive load, is determined by:

$$C_{DEL(MIN)} = \left(\frac{C_{LOAD} \times V_{LOAD}}{2445} \right) \quad (1)$$

Where C_{LOAD} is equal to the output capacitive load and V_{LOAD} is equal to the voltage rail of the output load. The maximum switching frequency to drive a capacitive load, C_{LOAD} , is given by:

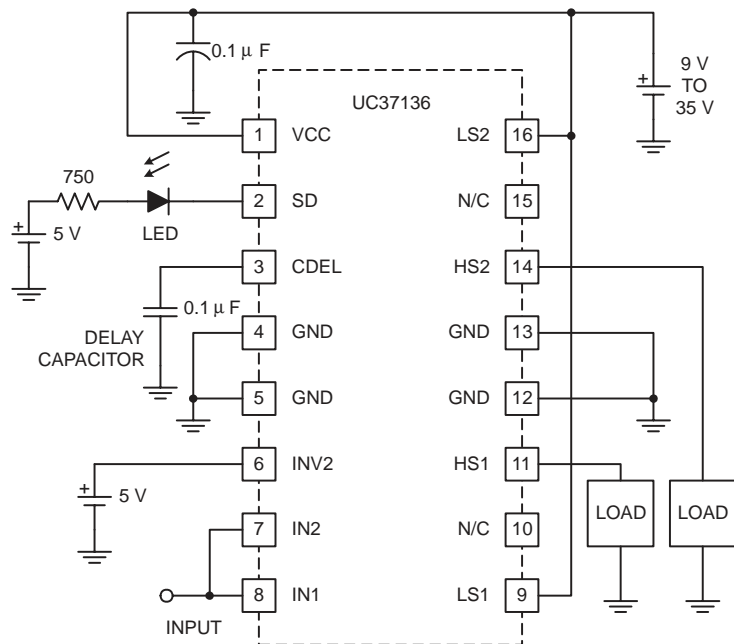
$$f_{(MAX)} = \frac{1}{9.4 \times C_{DEL} \times \left[1 - e \left(\frac{-C_{LOAD} \times V_{LOAD}}{5 \times 10^3 \times C_{DEL}} \right) \right] + C_{LOAD} \times V_{LOAD}} \quad (2)$$

overcurrent indication

The open collector output SD pin can be used to drive an LED to signal when an overload condition is present. The LED turns on, through an external pullup, when the outputs are shut down due to an overcurrent. The maximum SD current is 8 mA.

APPLICATION INFORMATION

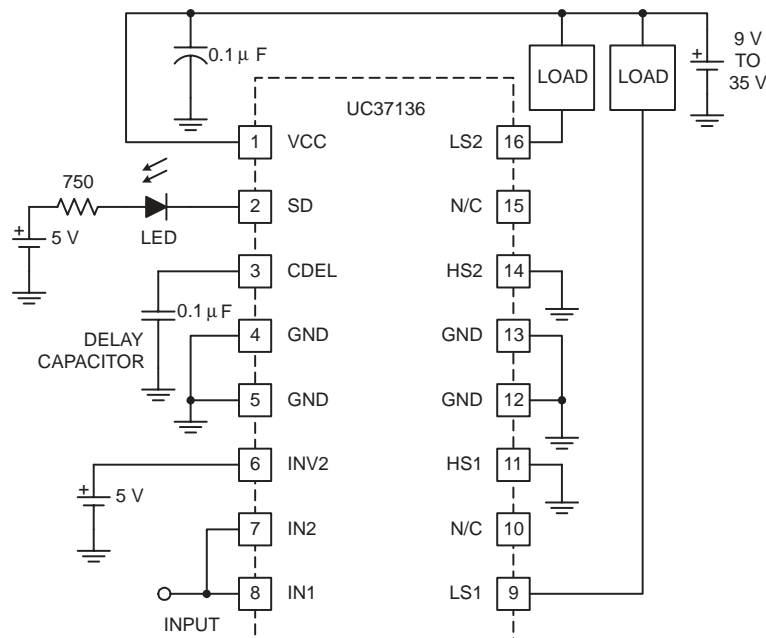
typical applications



UDG-99017

NOTE A: VCC, OUTPUT1 and OUTPUT2 can be connected to separate power supplies within the specified Absolute Maximum Ratings.

Figure 1. Both Switches Configured as High Side, Switch 2 Inverted with Respect to Switch 1



UDG-99019

NOTE A: VCC, OUTPUT1 and OUTPUT2 can be connected to separate power supplies within the specified Absolute Maximum Ratings.

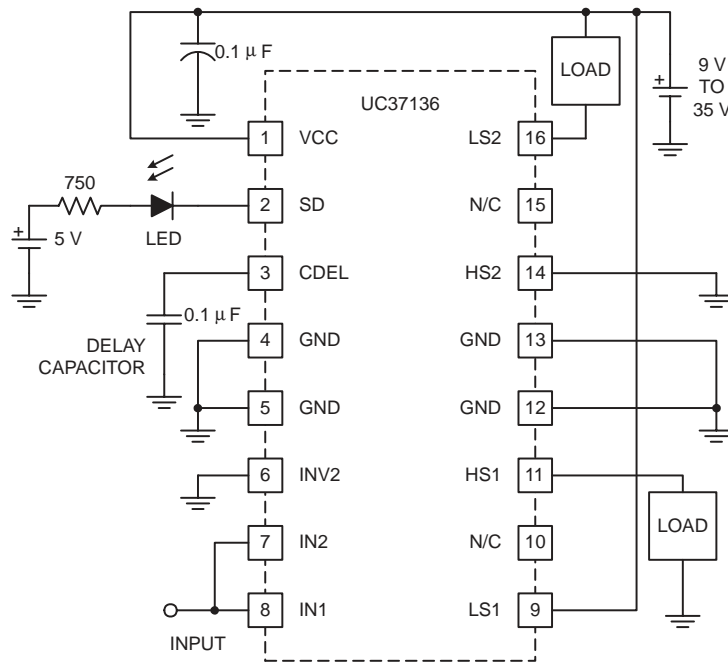
Figure 2. Both Switches Configured as Low Side, Switch 2 Inverted with Respect to Switch 1

UC27136, UC37136 DUAL OUTPUT SWITCH

SLUS447 - FEBRUARY 2000 - REVISED JULY 2000

APPLICATION INFORMATION

typical applications (continued)



UDG-99018

NOTE A: VCC, OUTPUT1 and OUTPUT2 can be connected to separate power supplies within the specified Absolute Maximum Ratings.

Figure 3. Switch 1 High Side, Switch 2 Low Side, in Phase with Each Other

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/ Ball Finish	MSL Peak Temp ⁽³⁾	Samples (Requires Login)
UC37136M	ACTIVE	SSOP/QSOP	DBQ	16		Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	Purchase Samples
UC37136MG4	ACTIVE	SSOP/QSOP	DBQ	16		Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	Purchase 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)

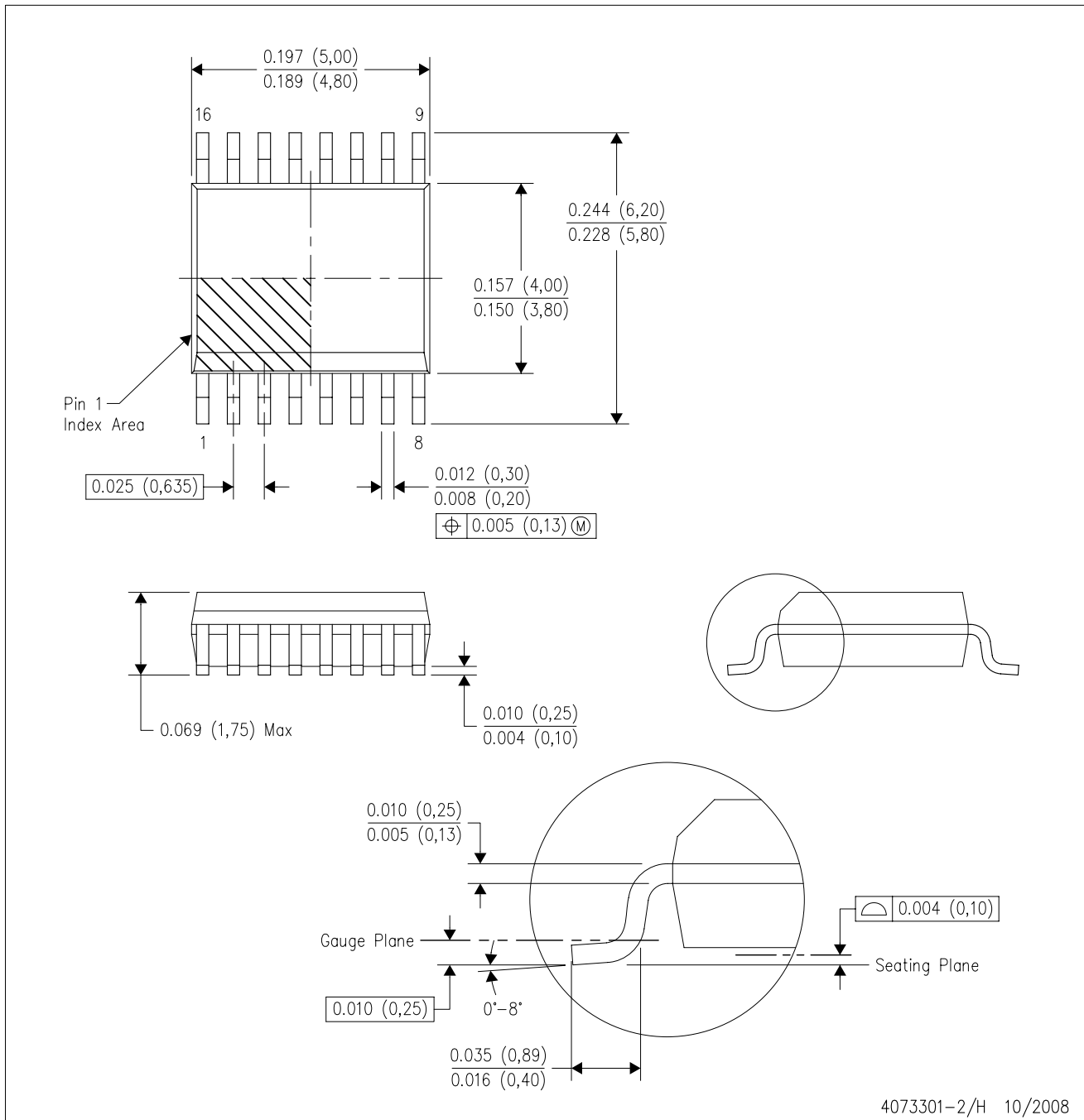
⁽³⁾ MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

DBQ (R-PDSO-G16)

PLASTIC SMALL-OUTLINE PACKAGE



- NOTES:
- All linear dimensions are in inches (millimeters).
 - This drawing is subject to change without notice.
 - Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15) per side.
 - Falls within JEDEC MO-137 variation AB.

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products		Applications	
Amplifiers	amplifier.ti.com	Audio	www.ti.com/audio
Data Converters	dataconverter.ti.com	Automotive	www.ti.com/automotive
DLP® Products	www.dlp.com	Communications and Telecom	www.ti.com/communications
DSP	dsp.ti.com	Computers and Peripherals	www.ti.com/computers
Clocks and Timers	www.ti.com/clocks	Consumer Electronics	www.ti.com/consumer-apps
Interface	interface.ti.com	Energy	www.ti.com/energy
Logic	logic.ti.com	Industrial	www.ti.com/industrial
Power Mgmt	power.ti.com	Medical	www.ti.com/medical
Microcontrollers	microcontroller.ti.com	Security	www.ti.com/security
RFID	www.ti-rfid.com	Space, Avionics & Defense	www.ti.com/space-avionics-defense
RF/IF and ZigBee® Solutions	www.ti.com/lprf	Video and Imaging	www.ti.com/video
		Wireless	www.ti.com/wireless-apps

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2010, Texas Instruments Incorporated