

## 300mA Current Limited Power Switch

Check for Samples: [LM34902](#)

### FEATURES

- Input Voltage of 2.8V to 5.3V
- 0.3A Maximum Switch Current
- 0.64Ω Typical Total On-Resistance
- Load Detection
- Enable/Disable
- Switch On Indicator
- Peak Current Limit
- Thermal Shutdown
- 6-Bump Thin DSBGA Package

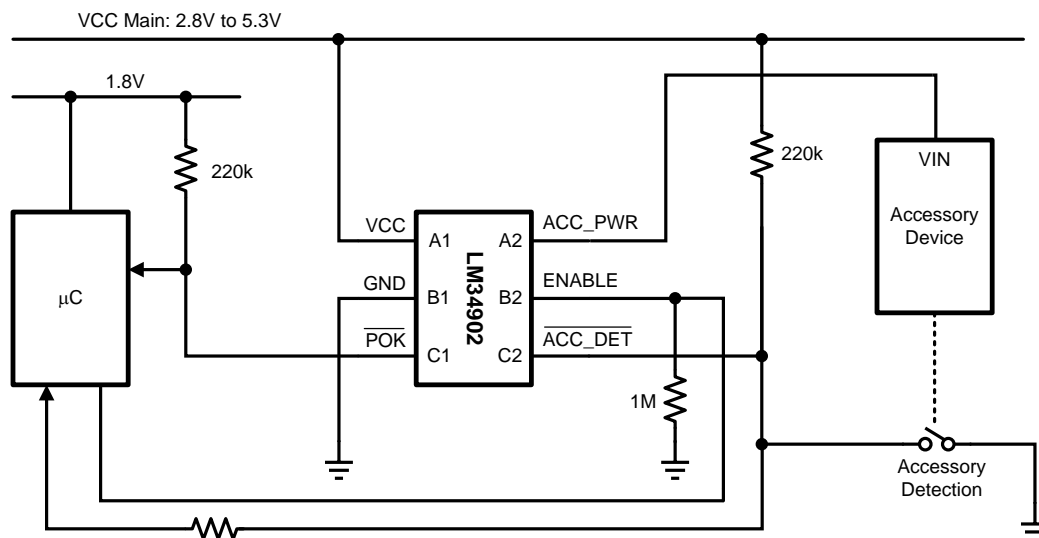
### DESCRIPTION

The LM34902 is a 0.3A PFET switch used to control the input voltage of electronic devices. It is easily integrated into system designs that have a 2.8V to 5.3V voltage rail. Besides the 0.45Ω PFET switch, the LM34902 can be enabled or disabled by a logic signal. The IC monitors the presence of a downstream electronic device via a dedicated pin to decide whether to turn on the PFET switch. A power good signal generated by the IC can be used by system control to determine the status of the switch. The LM34902 also provides over-current and over-temperature protection. The IC comes in a tiny 6-bump Thin DSBGA package.

### APPLICATIONS

- Handsets, Tablets, Notebooks
- Portable devices

### Typical Application Circuit



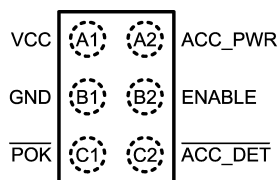
Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

All trademarks are the property of their respective owners.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of the Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

Copyright © 2012, Texas Instruments Incorporated

## Connection Diagram



**Figure 1. Top View  
6-Bump Thin DSBGA Package  
See Package Number YFQ**

### PIN DESCRIPTION

Name	Pin Number	Function
VCC	A1	Power input of the PFET switch. It also provides power to the entire IC. Connect to the voltage rail that the accessory device is expected to work off.
GND	B1	Common Ground (device substrate).
$\overline{\text{POK}}$	C1	Open-drain PFET status indicator. When the PFET is off, this pin floats. When PFET is on, it is grounded.
$\overline{\text{ACC\_DET}}$	C2	Pull this pin low to tell the IC that the downstream accessory device is plugged in.
ENABLE	B2	When this pin is low, the PFET will be turned off and $\overline{\text{POK}}$ will be open-drained. Current limit circuitry will also be disabled. The IC will be in a low-power state. This pin should be held low until VCC is established to ensure proper initial state of internal logic. When ENABLE is high, the PFET switch will be allowed to turn on.
ACC_PWR	A2	Power output terminal of the PFET switch. Connect to input rail of accessory device.

### TRUTH TABLE

Input					Output	
ENABLE	$\overline{\text{ACC\_DET}}$	Current Limit Detected	$T_J$ Limit Exceeded	$2.8\text{V} < \text{VCC} < 5.3\text{V}$	PFET Switch Status	$\overline{\text{POK}}$
0	x	No	No	Yes	Open	Open Drain
x	1	No	No	Yes	Open	Open Drain
0 to 1	0	No	No	Yes	On	Grounded
0 to 1	0	Yes	No	Yes	Current Limited	Grounded
x	x	x	Yes	$2.2\text{V} < \text{VCC} < 5.3\text{V}$	Open	Open Drain
0	x	x	No	$2.2\text{V} < \text{VCC} < 2.8\text{V}$	Open	Open Drain

Note: "x" stands for "don't care".



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 <sup>(1)</sup>

VCC	-0.3V to 6V
ENABLE, $\overline{\text{POK}}$ , $\overline{\text{ACC\_DET}}$ ,	
ACC_PWR <sup>(2)</sup>	-0.3V to 6V
Junction Temperature ( $T_J$ )	+150°C
Storage Temperature Range	-65°C to +150°C
ESD Susceptibility, Human Body Model <sup>(3)</sup>	2kV

(1) Absolute Maximum Ratings are limits beyond which damage to the device may occur. Operating Ratings are conditions under which operation of the device is guaranteed. Operating Ratings do not imply guaranteed performance limits. For guaranteed performance limits and associated test conditions, see the Electrical Characteristics table.

(2) The voltages on these pins should never exceed VCC+0.3V.

(3) The human body model is a 100pF capacitor discharged through a 1.5 kΩ resistor into each pin. Test method is per JESD-22-A114.

## Operating Ratings <sup>(1)</sup>

VCC Voltage <sup>(2)</sup>	2.8V to 5.3V
Junction Temperature (T <sub>J</sub> ), LM34902	-40°C to +85°C

- (1) Absolute Maximum Ratings are limits beyond which damage to the device may occur. Operating Ratings are conditions under which operation of the device is guaranteed. Operating Ratings do not imply guaranteed performance limits. For guaranteed performance limits and associated test conditions, see the Electrical Characteristics table.
- (2) For VCC between 2.2V and 2.8V, if ENABLE is a logic low, the LM34902 will not turn on the PFET switch.

## Electrical Characteristics

Unless otherwise stated, the following conditions apply: VCC = 3V. Limits in standard type are for T<sub>J</sub> = 25°C only; limits in **boldface type** apply over the operating junction temperature (T<sub>J</sub>) range. Minimum and Maximum limits are guaranteed through test, design, or statistical correlation. Typical values represent the most likely parametric norm at T<sub>J</sub> = 25°C and are provided for reference purposes only.

Symbol	Parameter	Conditions	Min	Typ	Max	Units
V <sub>IL</sub>	Input Low Voltage, $\overline{\text{ACC\_DET}}$ , ENABLE				<b>0.45</b>	V
V <sub>IH</sub>	Input High Voltage, $\overline{\text{ACC\_DET}}$ , ENABLE		<b>1.35</b>			V
V <sub>IHS</sub>	Input Hysteresis, $\overline{\text{ACC\_DET}}$ , ENABLE			55		mV
I <sub>LK</sub>	Input Current, $\overline{\text{ACC\_DET}}$ , ENABLE	$\overline{\text{ACC\_DET}}$ , ENABLE between 0V and VCC			1	μA
I <sub>SD</sub>	VCC Current in Shutdown Mode	V <sub>ENABLE</sub> = 0V V <sub>VCC</sub> = 5.3V			10	μA
I <sub>Q</sub>	VCC Quiescent Current	V <sub>ENABLE</sub> = 1.8V V <sub>VCC</sub> = 5.3V, I <sub>ACC_PWR</sub> = 0A		47	<b>100</b>	μA
R <sub>ON</sub>	Total On Resistance Between VCC and ACC_PWR Pins	V <sub>VCC</sub> = 3V I <sub>ACC_PWR</sub> = 0.3A		0.64	<b>1</b>	Ω
I <sub>LK_ACC</sub>	ACC_PWR Leakage Current When PFET is Off	V <sub>ACC_PWR</sub> = 0V to VCC V <sub>VCC</sub> = 5.3V V <sub>ENABLE</sub> = 0V			1	μA
I <sub>LIMIT</sub>	PFET Switch Current Limit	V <sub>VCC</sub> = 2.8V to 5.3V V <sub>ACC_PWR</sub> = 0V	<b>0.3</b>	0.45	<b>0.65</b>	A
V <sub>POK</sub>	$\overline{\text{POK}}$ Current Sink Capability	$\overline{\text{POK}}$ asserted. 1mA sink current.			0.4	V
I <sub>POK</sub>	$\overline{\text{POK}}$ Leakage Current	$\overline{\text{POK}}$ de-asserted. V <sub>POK</sub> = 3.3V			1	μA
T <sub>1</sub>	$\overline{\text{ACC\_DET}}$ Response Time	$\overline{\text{ACC\_DET}}$ rising to either PFET or $\overline{\text{POK}}$ FET turn-off		40		ns
T <sub>2</sub>	ENABLE Response Time	ENABLE rising to either PFET or $\overline{\text{POK}}$ FET turn-on		10		μs
T <sub>3</sub>	Minimum ENABLE Cycle Time <sup>(1)</sup>	$\overline{\text{ACC\_DET}}$ tied to ground. ENABLE logic high = 1.8V. VCC = 2.8V to 5.3V.		300		ns

- (1) If ENABLE toggles low from a high state, it needs to stay low for at least T<sub>3</sub> long before toggling back to high. Otherwise the internal flip-flop may not be set and the PFET switch may not turn on.

## Thermal Characteristics

Symbol	Description	Conditions	Typical Value	Unit
θ <sub>JA1</sub>	Junction-to-Ambient Thermal Resistance	Mount device on a standard 4-layer 4" x 3" JEDEC board. Apply known amount of power to the package. Measure junction temperature and surrounding air temperature. No air flow. Refer to JESD51-7 for more information.	104	°C/W
θ <sub>JA2</sub>	Junction-to-Ambient Thermal Resistance	Mount device on a 2-layer 2.19" x 2.9" board. Copper thickness is 1 oz per layer. No airflow. Power dissipation is 0.5W.	136	°C/W
T <sub>SD</sub>	Thermal Shutdown Threshold	Raise T <sub>J</sub> from below 150°C until $\overline{\text{POK}}$ is de-asserted. No load is connected at ACC_PWR.	170	°C

## Typical Performance Characteristics

Unless indicated otherwise,  $V_{CC} = 3V$  and  $T_J = 25^\circ C$ .

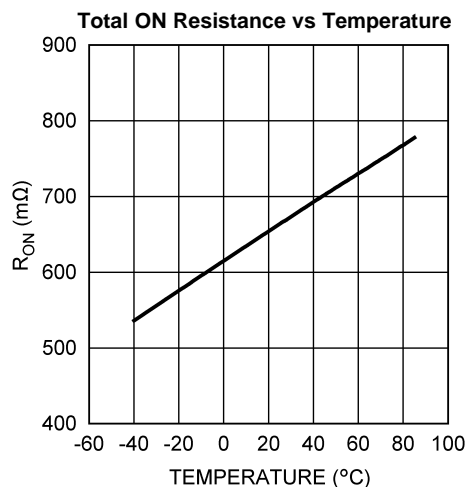


Figure 2.

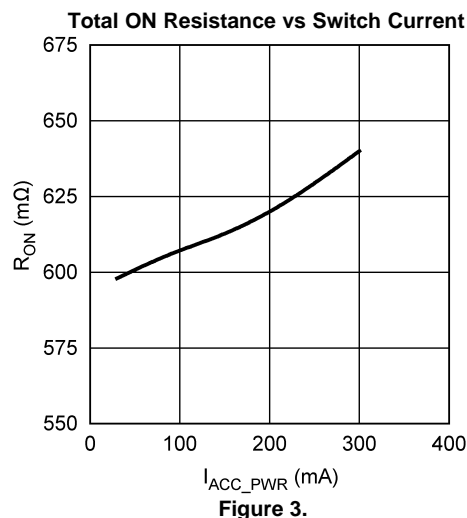


Figure 3.

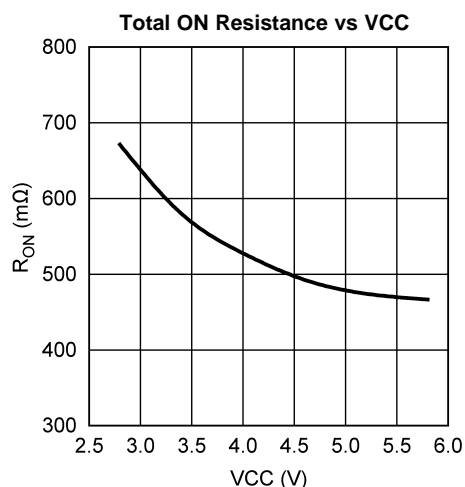


Figure 4.

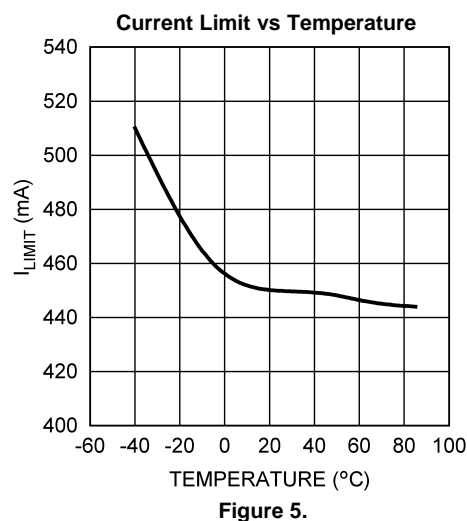


Figure 5.

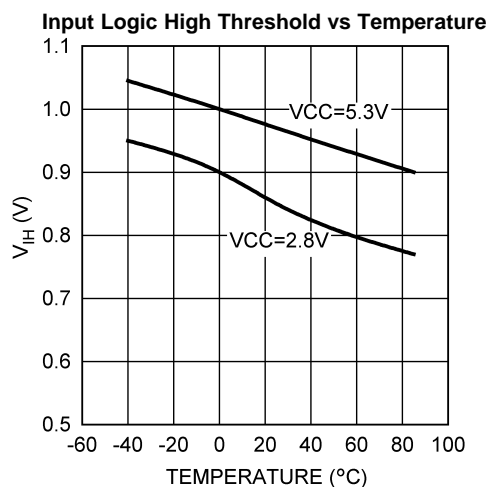


Figure 6.

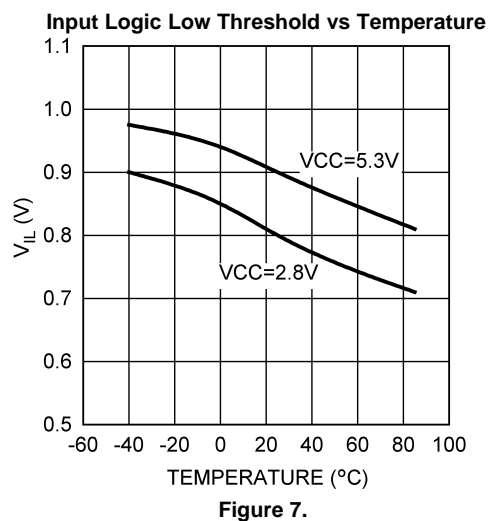
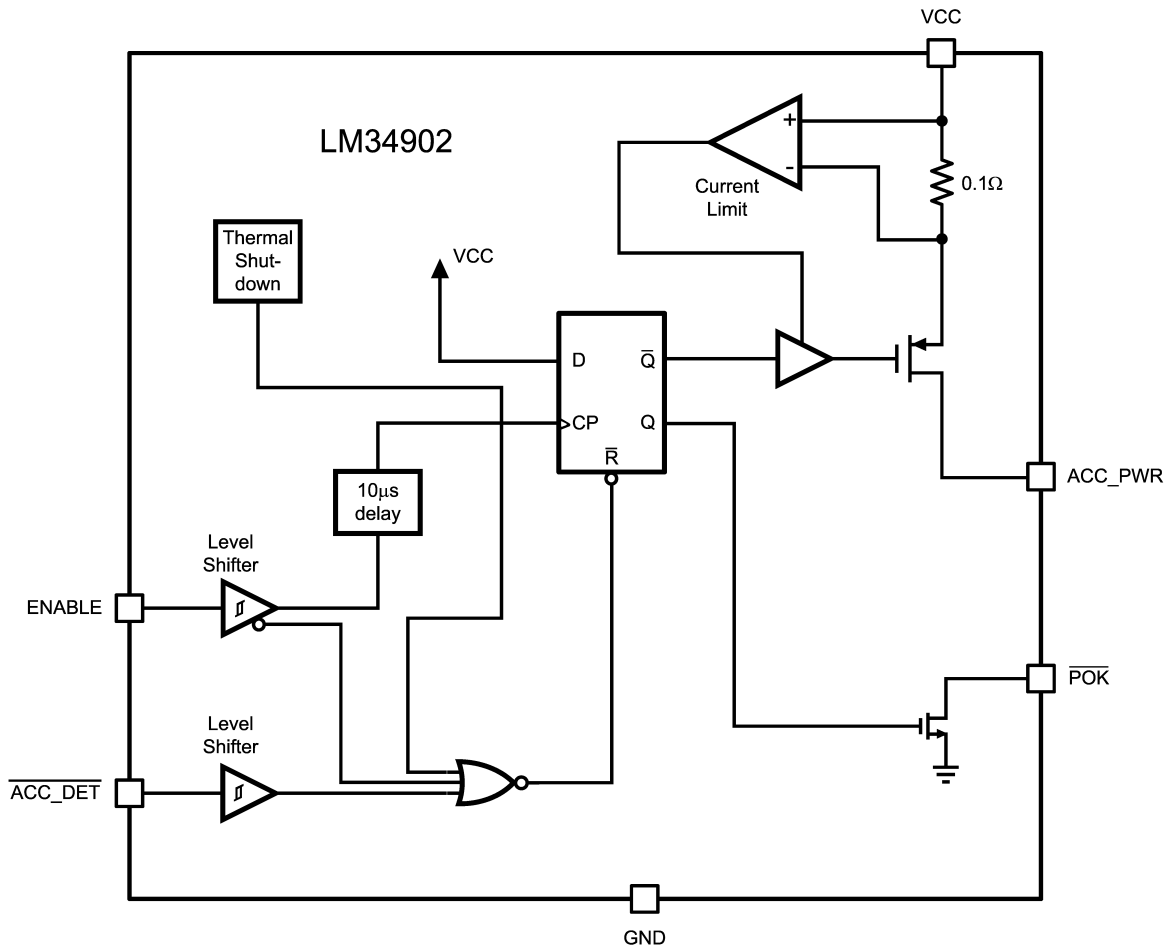


Figure 7.

## BLOCK DIAGRAM



## APPLICATION HINTS

To turn on the PFET switch, both the ENABLE and the  $\overline{\text{ACC\_DET}}$  pins need to be asserted. In addition,  $\overline{\text{ACC\_DET}}$  needs to be asserted no later than the rising edge of the ENABLE signal. De-assertion of either the ENABLE or the  $\overline{\text{ACC\_DET}}$  will result in turned-off PFET switch and de-asserted POK signal.

To prevent a glitch in the otherwise asserted  $\overline{\text{ACC\_DET}}$  from keeping the FETs turned off, it is a good practice to cycle the ENABLE following every falling edge in the  $\overline{\text{ACC\_DET}}$  signal. When cycling the ENABLE, make sure it stays low for at least  $T_3$  long before toggling back high. If ENABLE logic high level is not 1.8V, make sure ENABLE stays low for at least 1µs.

When laying out the PCB, try to keep the ENABLE and  $\overline{\text{ACC\_DET}}$  traces as short as possible and away from noisy traces.

**PACKAGING INFORMATION**

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Top-Side Markings (4)	Samples
LM34902ITM/NOPB	ACTIVE	DSBGA	YFQ	6	250	Green (RoHS & no Sb/Br)	SNAGCU	Level-1-260C-UNLIM	-40 to 85	K	<a href="#">Samples</a>
LM34902ITMX/NOPB	ACTIVE	DSBGA	YFQ	6	3000	Green (RoHS & no Sb/Br)	SNAGCU	Level-1-260C-UNLIM	-40 to 85	K	<a href="#">Samples</a>
LM34902ITMZ/NOPB	ACTIVE	DSBGA	YFQ	6		TBD	Call TI	Call TI	-40 to 85		<a href="#">Samples</a>

(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)

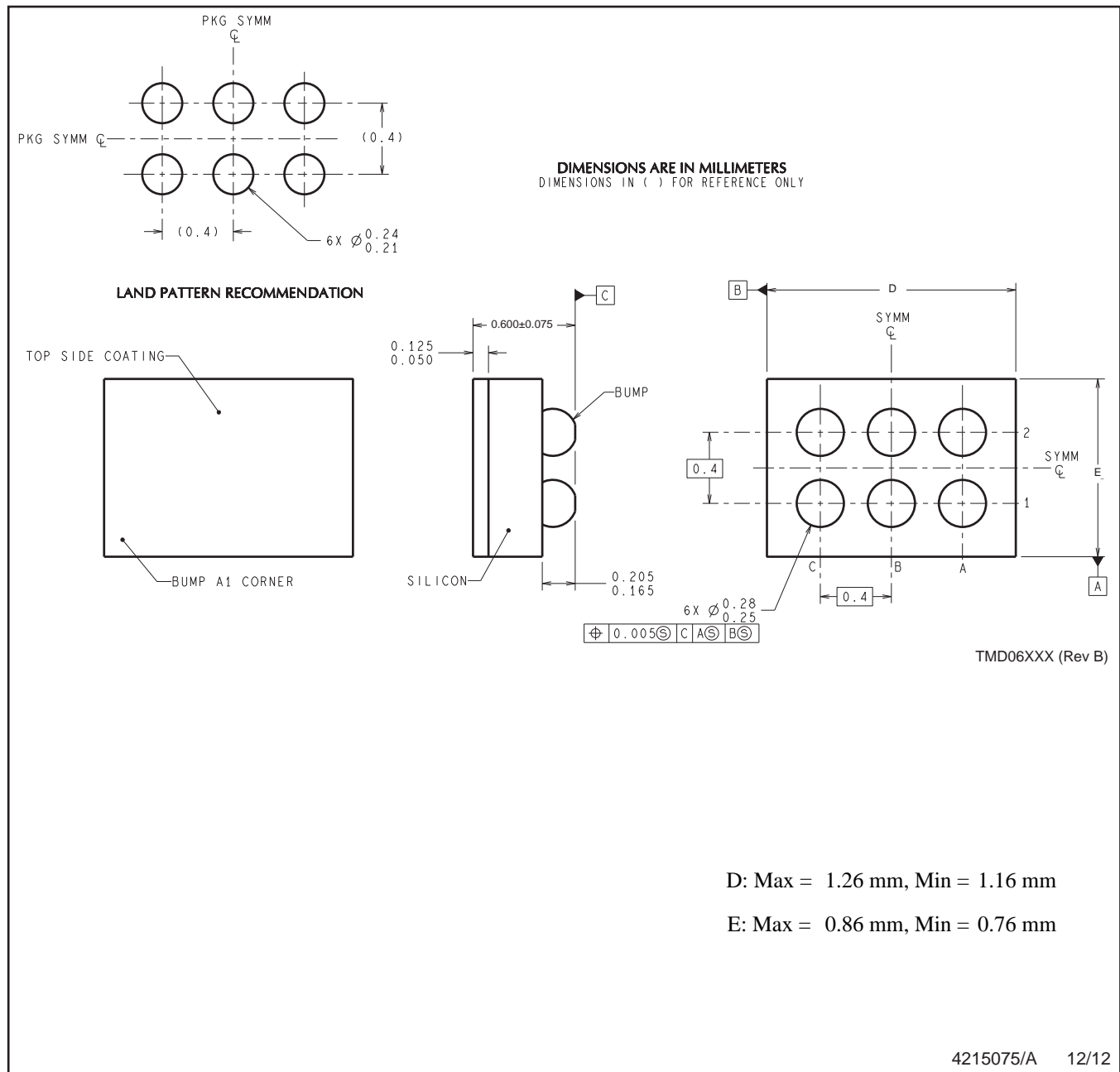
(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) Only one of markings shown within the brackets will appear on the physical device.

**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.

YFQ0006



NOTES: A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.  
B. This drawing is subject to change without notice.

## IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

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

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

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license 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 significant portions 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. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

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

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

### Products

Audio	<a href="http://www.ti.com/audio">www.ti.com/audio</a>
Amplifiers	<a href="http://amplifier.ti.com">amplifier.ti.com</a>
Data Converters	<a href="http://dataconverter.ti.com">dataconverter.ti.com</a>
DLP® Products	<a href="http://www.dlp.com">www.dlp.com</a>
DSP	<a href="http://dsp.ti.com">dsp.ti.com</a>
Clocks and Timers	<a href="http://www.ti.com/clocks">www.ti.com/clocks</a>
Interface	<a href="http://interface.ti.com">interface.ti.com</a>
Logic	<a href="http://logic.ti.com">logic.ti.com</a>
Power Mgmt	<a href="http://power.ti.com">power.ti.com</a>
Microcontrollers	<a href="http://microcontroller.ti.com">microcontroller.ti.com</a>
RFID	<a href="http://www.ti-rfid.com">www.ti-rfid.com</a>
OMAP Applications Processors	<a href="http://www.ti.com/omap">www.ti.com/omap</a>
Wireless Connectivity	<a href="http://www.ti.com/wirelessconnectivity">www.ti.com/wirelessconnectivity</a>

### Applications

Automotive and Transportation	<a href="http://www.ti.com/automotive">www.ti.com/automotive</a>
Communications and Telecom	<a href="http://www.ti.com/communications">www.ti.com/communications</a>
Computers and Peripherals	<a href="http://www.ti.com/computers">www.ti.com/computers</a>
Consumer Electronics	<a href="http://www.ti.com/consumer-apps">www.ti.com/consumer-apps</a>
Energy and Lighting	<a href="http://www.ti.com/energy">www.ti.com/energy</a>
Industrial	<a href="http://www.ti.com/industrial">www.ti.com/industrial</a>
Medical	<a href="http://www.ti.com/medical">www.ti.com/medical</a>
Security	<a href="http://www.ti.com/security">www.ti.com/security</a>
Space, Avionics and Defense	<a href="http://www.ti.com/space-avionics-defense">www.ti.com/space-avionics-defense</a>
Video and Imaging	<a href="http://www.ti.com/video">www.ti.com/video</a>

### TI E2E Community

[e2e.ti.com](http://e2e.ti.com)