



MB3761

Voltage Detector Datasheet

Designed for voltage detector applications, the Cypress MB3761 is a dual comparator with a built-in high precision reference voltage generator. Outputs are open-collector outputs and enable use of the OR-connection between both channels. Both channels have hysteresis control outputs. Because of a wide power supply voltage range and a low power supply current, the MB3761 is suitable for power supply monitors and battery backup systems.

Features

- Wide power supply voltage range: 2.5 V to 40 V
- Low power and small voltage dependency supply current: 250 μ A Typ
- Built-in stable low voltage generator: 1.20 V Typ
- Easy-to-add hysteresis characteristics.
- One type of package (SOP-8pin : 1 type)

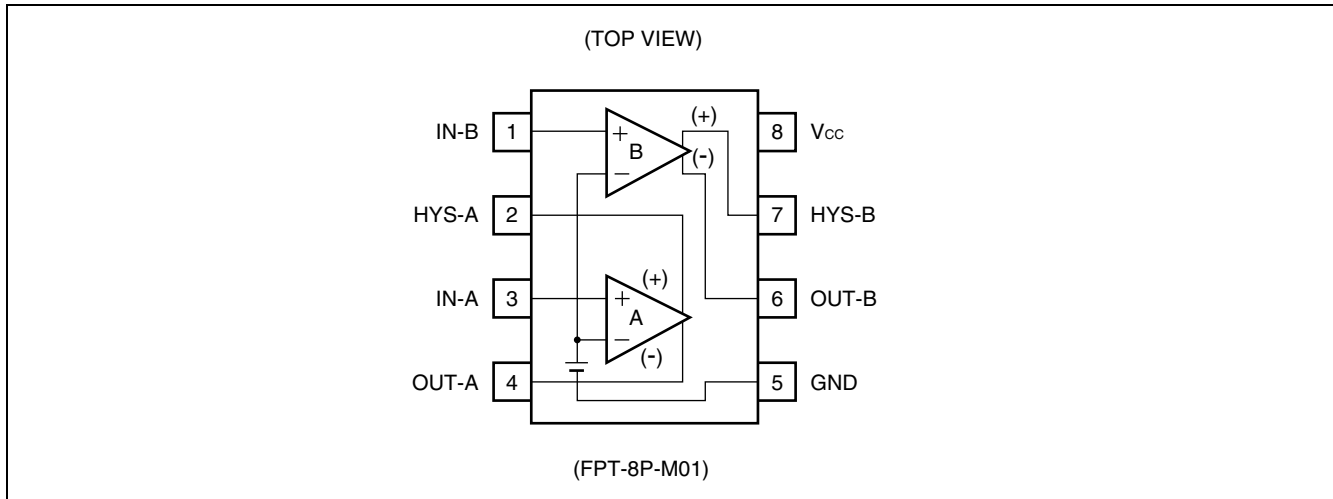
Applications

Industrial Equipment, Arcade Amusement, and so on.

Contents

Pin Assignment	3	Ordering Information	11
Absolute Maximum Ratings	3	RoHS Compliance Information	
Recommended Operating Conditions	3	of Lead (Pb) Free version	11
Electrical Characteristics	4	Marking Format (Lead Free version)	11
Equivalent Circuit	5	Labeling Sample (Lead Free version)	11
Operational Definitions	6	MB3761PF-□□□E1 Recommended Conditions	
Typical Performance Characteristics	7	of Moisture Sensitivity Level	12
Application Examples	8	Package Dimension	13
Addition of Hysteresis	8	Document History	14
Voltage Detection for Alarm	8	Sales, Solutions, and Legal Information	15
Voltage Detection for Alarm	9	Worldwide Sales and Design Support	15
Programmable Zener	9	Products	15
Recovery Reset Circuit	9	PSoC® Solutions	15
Typical Characteristics	10	Cypress Developer Community	15
Notes on Use	10	Technical Support	15

1. Pin Assignment



2. Absolute Maximum Ratings

Parameter	Symbol	Rating		Unit
		Min	Max	
Power Supply Voltage	V_{CC}	–	41	V
Output Voltage	V_O	–	41	V
Output Current	I_O	–	50	mA
Input Voltage	V_{IN}	– 0.3	+ 6.5	V
Power Dissipation	P_D	–	350 ($T_A \leq +70\text{ }^\circ\text{C}$)	mW
Storage Temperature	T_{STG}	– 55	+ 125	$^\circ\text{C}$

WARNING: Semiconductor devices can be permanently damaged by application of stress (voltage, current, temperature, etc.) in excess of absolute maximum ratings. Do not exceed these ratings.

3. Recommended Operating Conditions

Parameter	Symbol	Value		Unit
		Min	Max	
Power Supply Voltage	V_{CC}	2.5	40	V
Operating Ambient Temperature	T_A	– 20	+ 75	$^\circ\text{C}$
Output Current at pin 4	I_{O4}	–	4.5	mA
Output Current at pin 6	I_{O6}	–	3.0	mA

WARNING: The recommended operating conditions are required in order to ensure the normal operation of the semiconductor device. All of the device's electrical characteristics are warranted when the device is operated within these ranges.

Always use semiconductor devices within their recommended operating condition ranges. Operation outside these ranges may adversely affect reliability and could result in device failure.

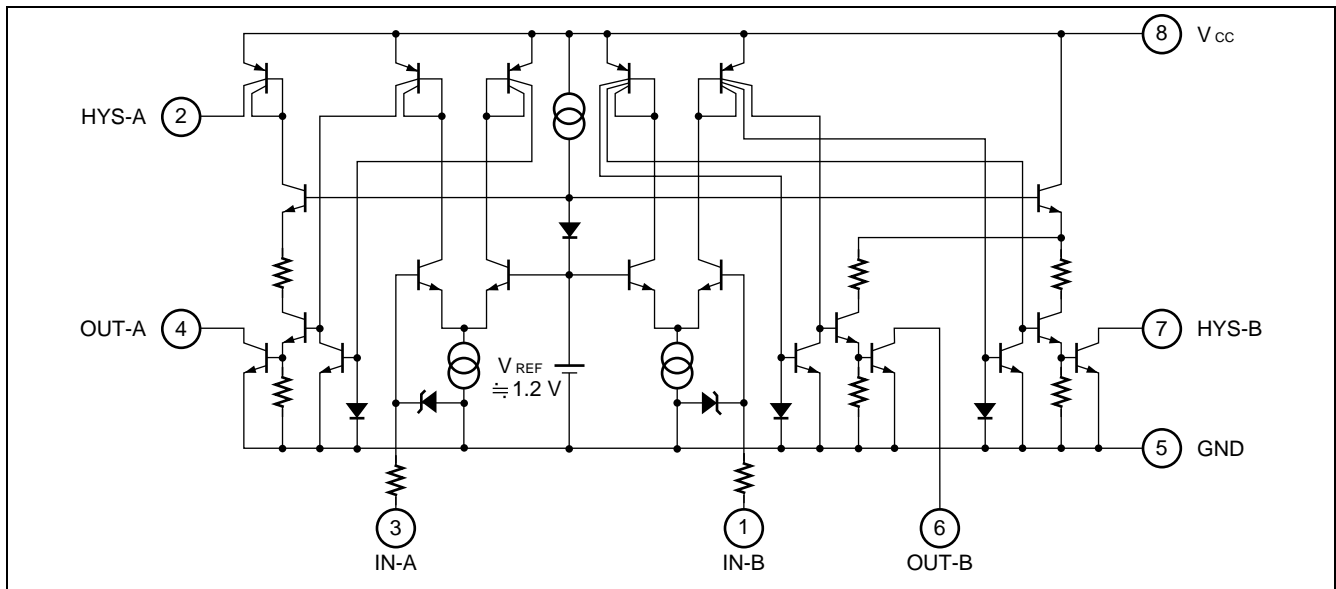
No warranty is made with respect to uses, operating conditions, or combinations not represented on the data sheet. Users considering application outside the listed conditions are advised to contact their Cypress representatives beforehand.

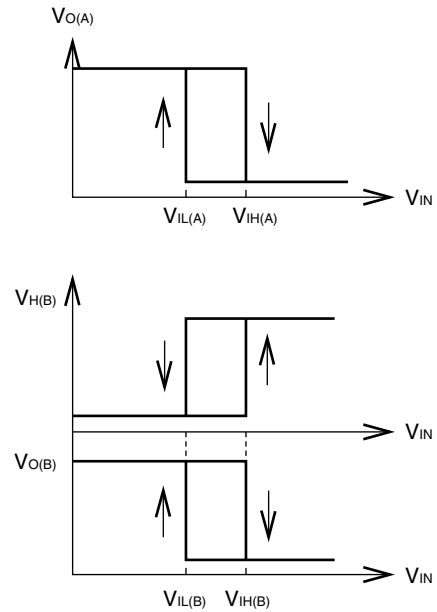
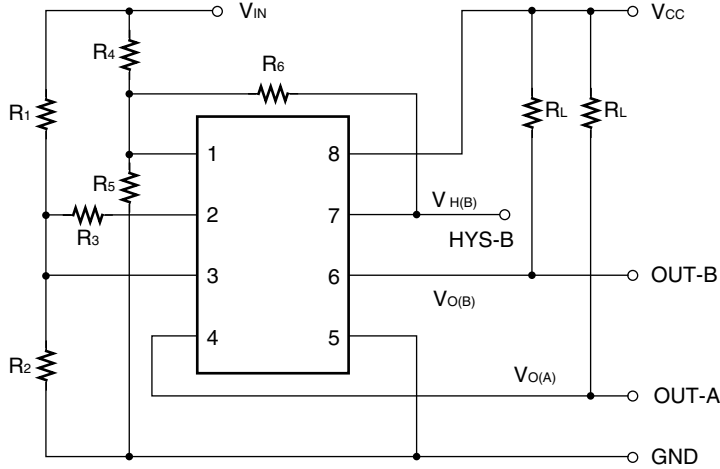
4. Electrical Characteristics

 (T_A = +25 °C, V_{CC} = 5 V)

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Power Supply Voltage	I _{CCL}	V _{CC} = 40 V, V _{IL} = 1.0 V	–	250	400	μA
	I _{CCH}	V _{CC} = 40 V, V _{IH} = 1.5 V	–	400	600	μA
Threshold Voltage	V _{TH}	I _O = 2 mA, V _O = 1 V	1.15	1.20	1.25	V
Deviation of Threshold Voltage	ΔV _{TH1}	2.5 V ≤ V _{CC} ≤ 5.5 V	–	3	12	mV
	ΔV _{TH2}	4.5 V ≤ V _{CC} ≤ 40 V	–	10	40	mV
Offset Voltage between Outputs	V _{OOSA}	I _{OA} = 4.5 mA, V _{OA} = 2 V, I _{HA} = 20 μA, V _{HA} = 3 V	–	2.0	–	mV
	V _{OSSB}	I _{OB} = 3 mA, V _{OB} = 2 V, I _{HB} = 3 mA, V _{HB} = 2 V	–	2.0	–	mV
Temperature Coefficient of Threshold Voltage	α	-20°C ≤ T _A ≤ +70°C	–	±0.05	–	mV/°C
Difference Voltage on Threshold Voltage between Channel	ΔV _{THAB}	–	-10	–	+10	mV
Input Current	I _{IL}	V _{IL} = 1.0 V	–	5	–	nA
	I _{IH}	V _{IH} = 1.5 V	–	100	500	nA
Output Leakage Current	I _{OH}	V _O = 40 V, V _{IL} = 1.0 V	–	–	1	μA
Hysteresis Output Leakage Current	I _{HLA}	V _{CC} = 40 V, V _{HA} = 0 V, V _{IL} = 1.0 V	–	–	0.1	μA
	I _{HHB}	V _{HB} = 40 V, V _{IH} = 1.5 V	–	–	1	μA
Output Sink Current	I _{OLA}	V _O = 1.0 V, V _{IH} = 1.5 V	6	12	–	mA
	I _{OLB}	V _O = 1.0 V, V _{IH} = 1.5 V	4	10	–	mA
Hysteresis Current	I _{HHA}	V _H = 0 V, V _{IH} = 1.5 V	40	80	–	μA
	I _{HLB}	V _H = 1.0 V, V _{IL} = 1.0 V	4	10	–	mA
Output Saturation Voltage	V _{OLA}	I _O = 4.5 mA, V _{IH} = 1.5 V	–	120	400	mV
	V _{OLB}	I _O = 3.0 mA, V _{IH} = 1.5 V	–	120	400	mV
Hysteresis Saturation	V _{HHA}	I _H = 20 μA, V _{IH} = 1.5 V	–	50	200	mV
	V _{HLB}	I _H = 3.0 mA, V _{IL} = 1.0 V	–	120	400	mV
Output Delay Time	t _{PHL}	R _L = 5 kΩ	–	2	–	μs
	t _{PLH}	R _L = 5 kΩ	–	3	–	μs

5. Equivalent Circuit



6. Operational Definitions


$$V_{IH(A)} = \left(1 + \frac{R_1}{R_2}\right) V_R$$

$$V_{IH(B)} = \left(1 + \frac{R_4}{R_5 // R_6}\right) V_R$$

$$V_R \cong V_{TH} (\cong 1.20 \text{ V})$$

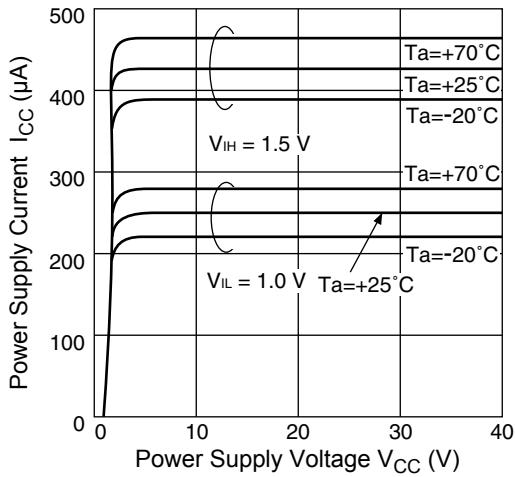
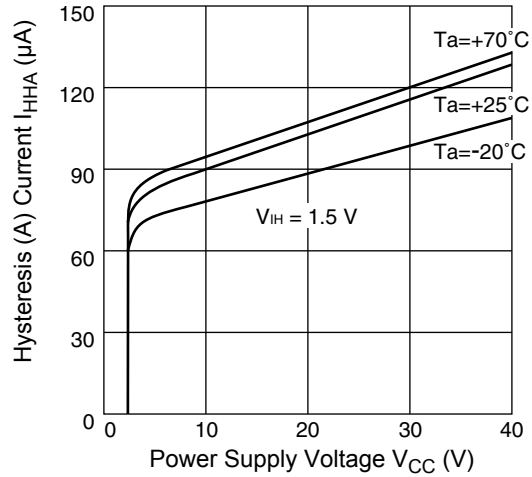
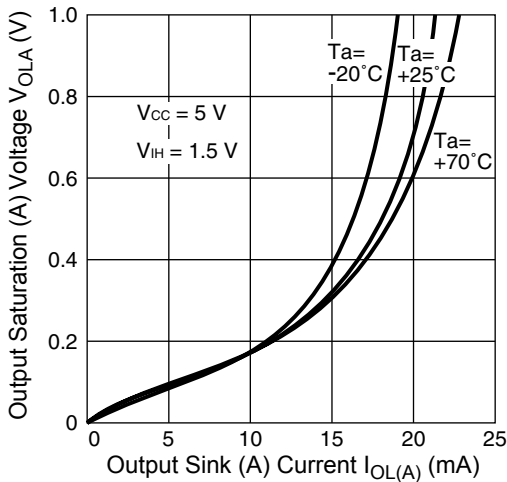
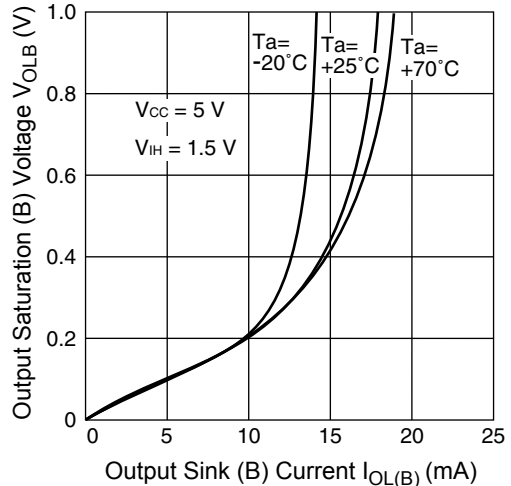
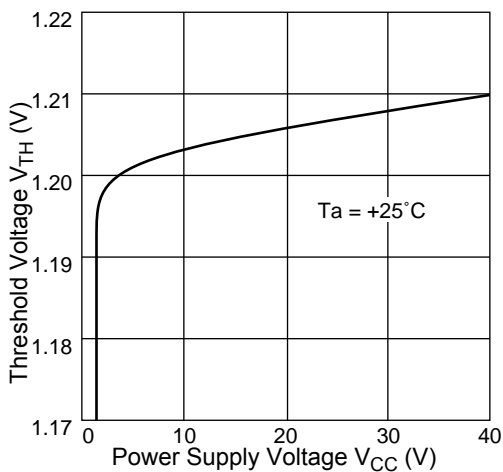
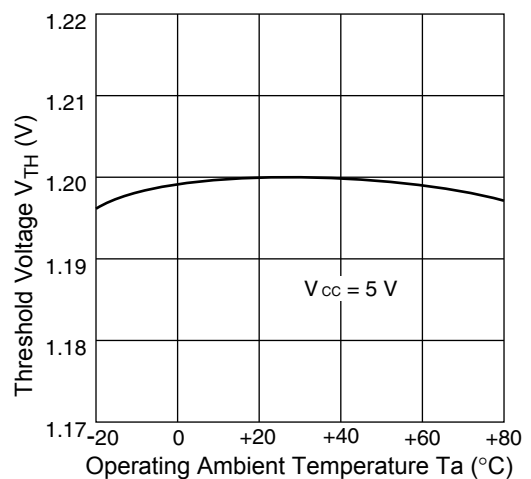
$$V_{IL(A)} = \left(1 + \frac{R_1}{R_2 // R_3}\right) V_R - \frac{R_1}{R_3} V_{CC}$$

$$V_{IL(B)} = \left(1 + \frac{R_4}{R_5}\right) V_R$$

$$R_2 // R_3 = \frac{R_2 R_3}{R_2 + R_3}$$

$$R_5 // R_6 = \frac{R_5 R_6}{R_5 + R_6}$$

Note :

7. Typical Performance Characteristics
Power Supply Current vs. Power Supply Voltage

Hysteresis (A) Current vs. Power Supply Voltage

Output Saturation (A) Voltage vs. Output Sink (A) Current

Output Saturation (B) Voltage vs. Output Sink (B) Current

Threshold Voltage vs. Power Supply Voltage

Threshold Voltage vs. Operating Ambient Temperature


8. Application Examples

8.1 Addition of Hysteresis

$$V_{IH(A)} \cong \left(1 + \frac{R_1 + R_2}{R_3}\right) V_R$$

$$V_{IL(A)} \cong \left(1 + \frac{R_2}{R_3}\right) V_R$$

$$V_{IH(B)} \cong \left(1 + \frac{R_1}{R_2}\right) V_R$$

$$V_{IL(B)} \cong \left(1 + \frac{R_1}{R_2 + R_3}\right) V_R$$

Note: All calculations occur with the output voltage at 0. The hysteresis values are adjusted for load condition and saturation voltage.

8.2 Voltage Detection for Alarm

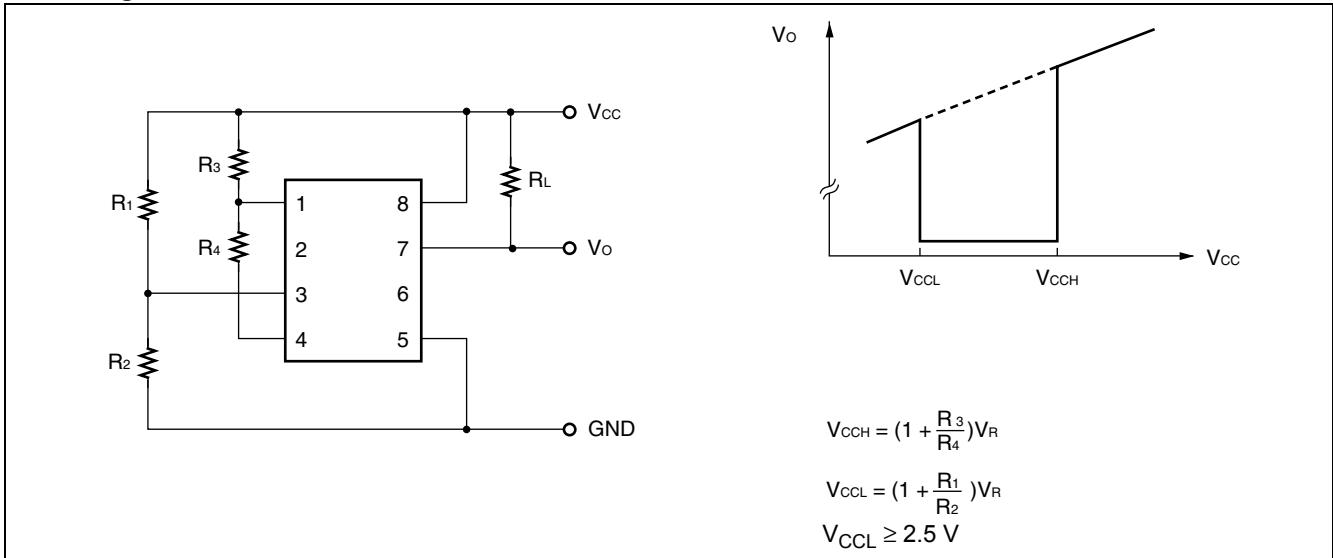
$$V_{CCH} = \left(1 + \frac{R_1}{R_2}\right) V_R$$

$$V_{CCL} = \left(1 + \frac{R_3}{R_4}\right) V_R$$

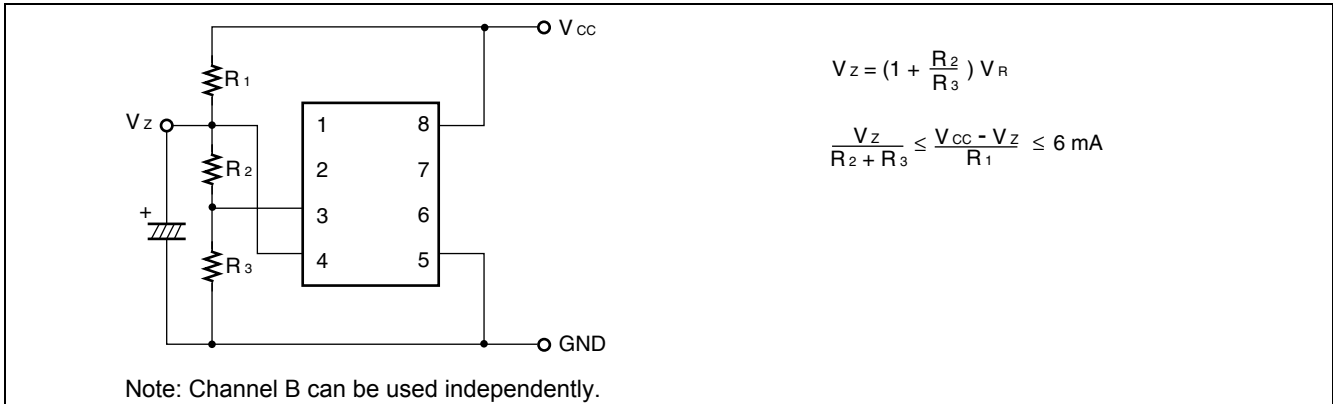
$$V_{CCL} \geq 2.5 \text{ V}$$

For hysteresis, a positive feedback from pin 2 or 7 is required.

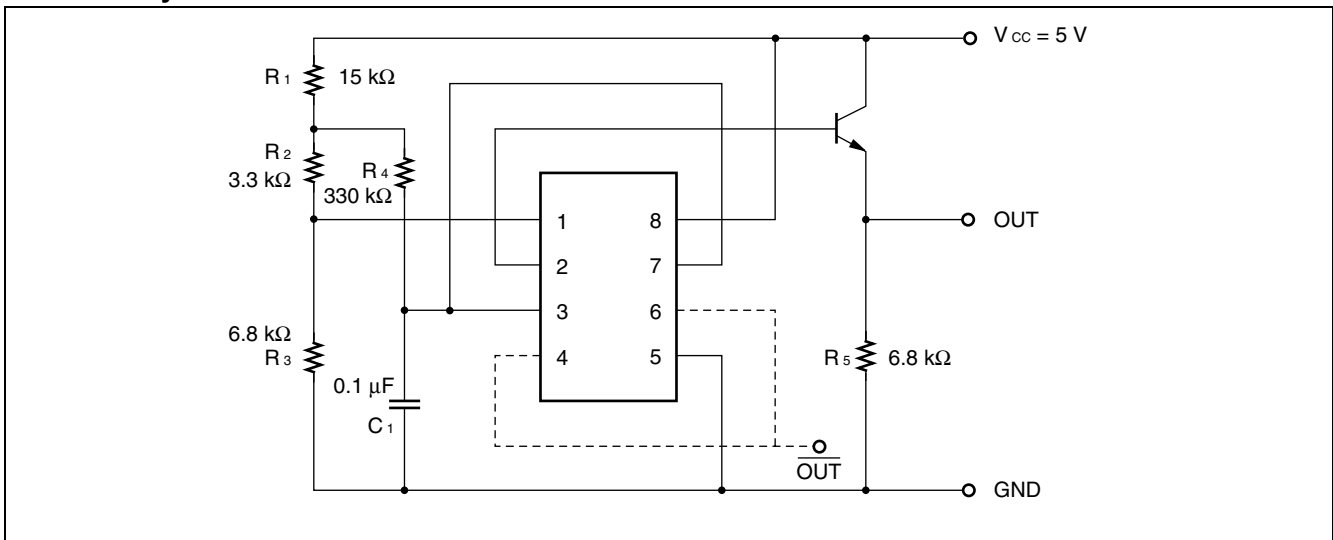
8.3 Voltage Detection for Alarm



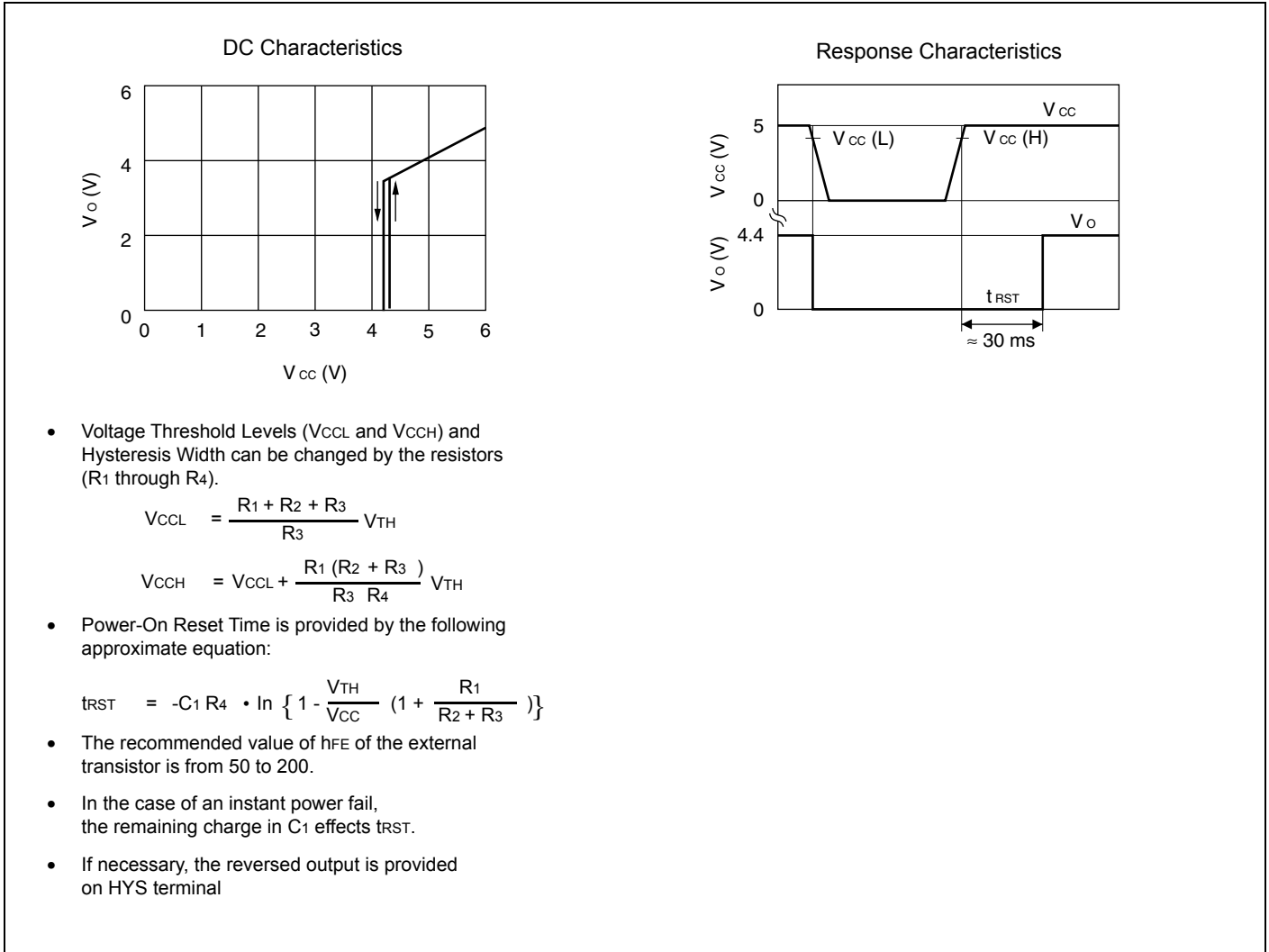
8.4 Programmable Zener



8.5 Recovery Reset Circuit



9. Typical Characteristics



10. Notes on Use

- Take account of common impedance when designing the earth line on a printed wiring board.
- Take measures against static electricity.
 - For semiconductors, use antistatic or conductive containers.
 - When storing or carrying a printed circuit board after chip mounting, put it in a conductive bag or container.
 - The work table, tools and measuring instruments must be grounded.
 - The worker must put on a grounding device containing 250 kΩ to 1 MΩ resistors in series.
- Do not apply a negative voltage
 - Applying a negative voltage of -0.3 V or less to an LSI may generate a parasitic transistor, resulting in malfunction.

11. Ordering Information

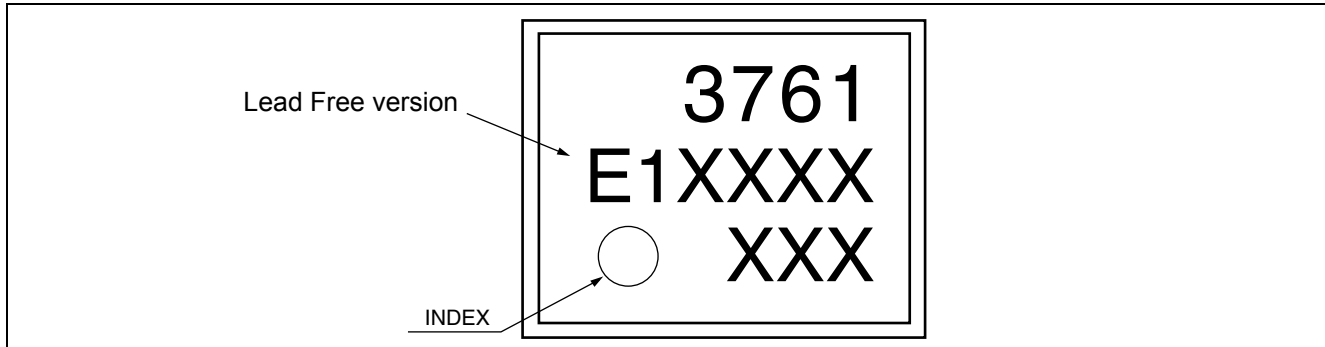
Part number	Package	Remarks
MB3761PF-□□□	8-pin plastic SOP (FPT-8P-M01)	Conventional version
MB3761PF-□□□E1	8-pin plastic SOP (FPT-8P-M01)	Lead Free version

12. RoHS Compliance Information of Lead (Pb) Free version

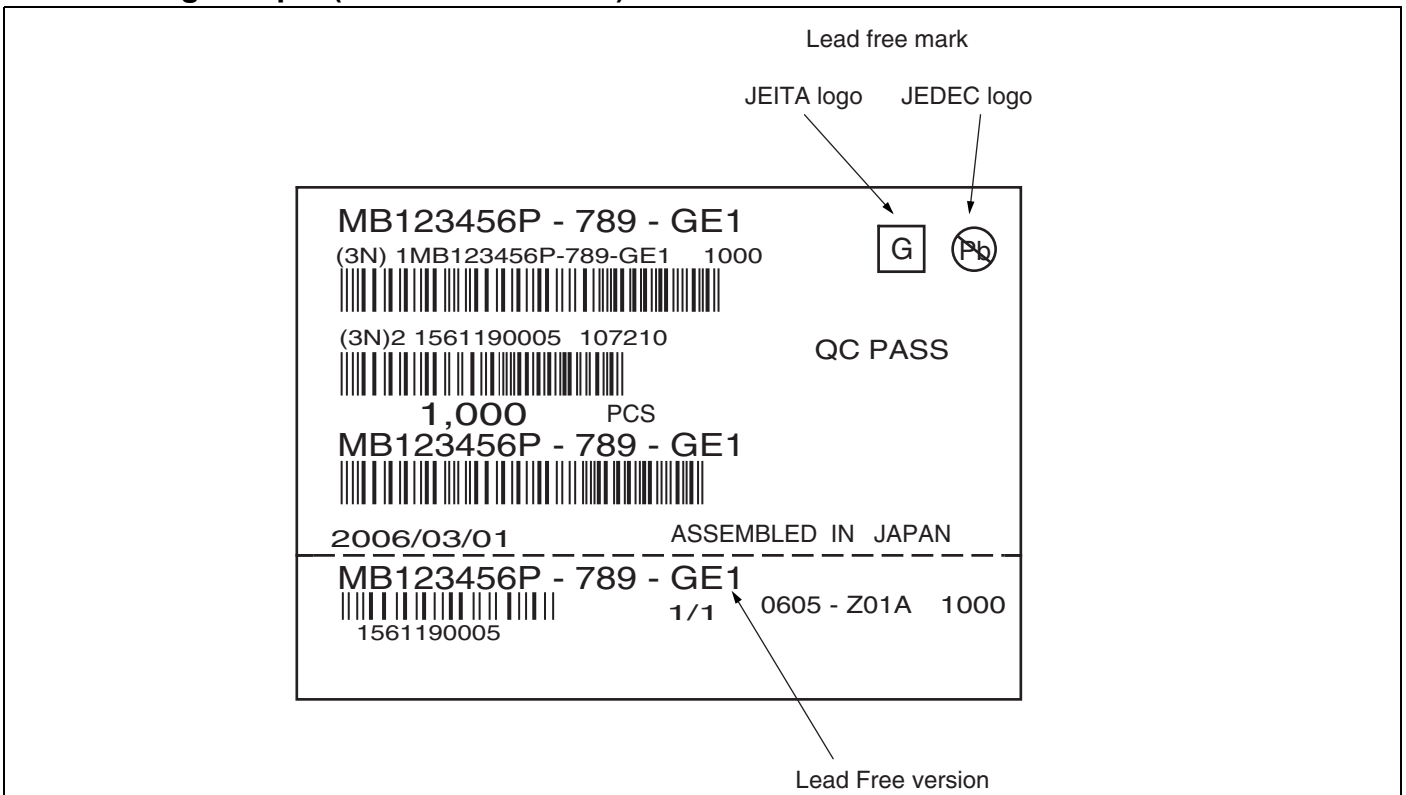
The LSI products of Cypress with “E1” are compliant with RoHS Directive , and has observed the standard of lead, cadmium, mercury, Hexavalent chromium, polybrominated biphenyls (PBB) , and polybrominated diphenyl ethers (PBDE) .

The product that conforms to this standard is added “E1” at the end of the part number.

13. Marking Format (Lead Free version)



14. Labeling Sample (Lead Free version)

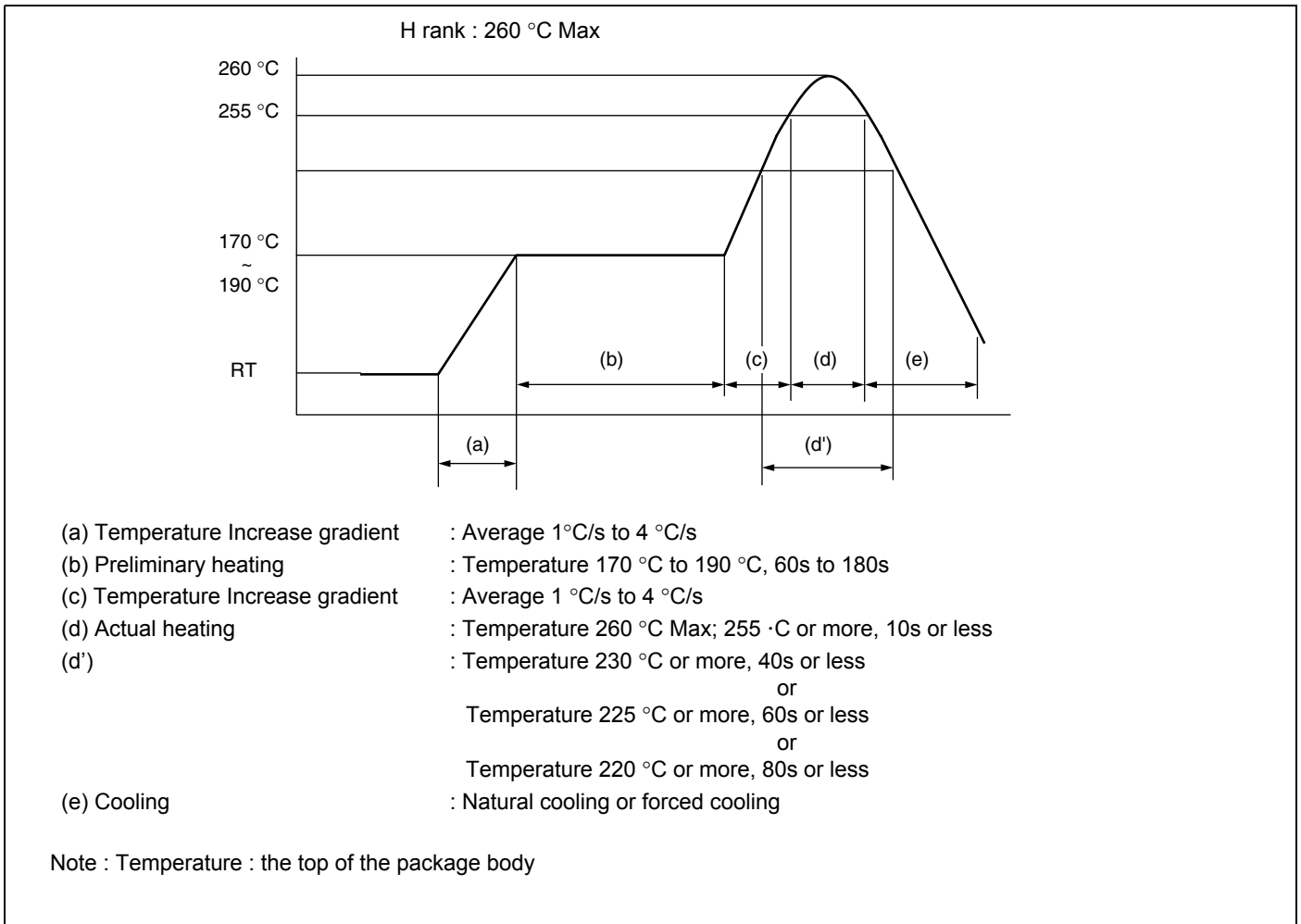


15. MB3761PF-□□□E1 Recommended Conditions of Moisture Sensitivity Level

Item	Condition	
Mounting Method	IR (infrared reflow) , Manual soldering (partial heating method)	
Mounting times	2 times	
Storage period	Before opening	Please use it within two years after Manufacture.
	From opening to the 2nd reflow	Less than 8 days
	When the storage period after opening was exceeded	Please processes within 8 days after baking (125 °C, 24H)
Storage conditions	5 °C to 30 °C, 70%RH or less (the lowest possible humidity)	

[Temperature Profile for Cypress Standard IR Reflow]

1. IR (infrared reflow)

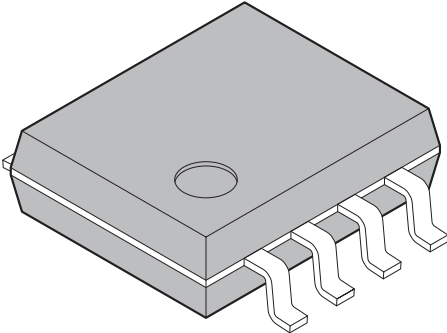


2. Manual soldering (partial heating method)

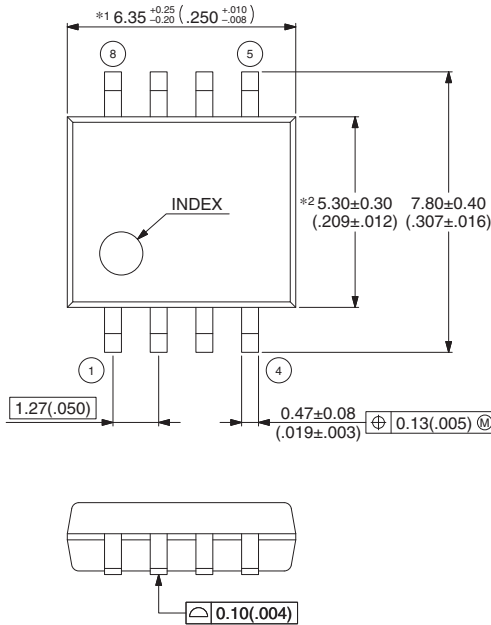
Conditions : Temperature 400 °C Max

Times : 5 s max/pin

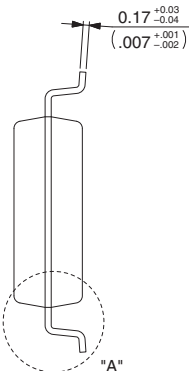
16. Package Dimension

<p style="text-align: center;">8-pin plastic SOP</p>  <p style="text-align: center;">(FPT-8P-M01)</p>	Lead pitch	1.27 mm
	Package width × package length	5.3 × 6.35 mm
	Lead shape	Gullwing
	Sealing method	Plastic mold
	Mounting height	2.25 mm MAX
	Weight	0.10 g
	Code (Reference)	P-SOP8-5.3×6.35-1.27

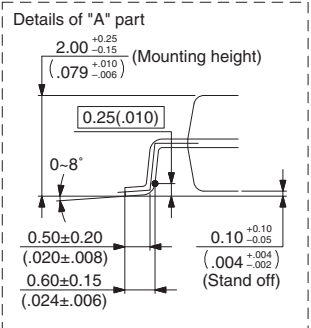
8-pin plastic SOP
(FPT-8P-M01)



Note 1) *1 : These dimensions include resin protrusion.
 Note 2) *2 : These dimensions do not include resin protrusion.
 Note 3) Pins width and pins thickness include plating thickness.
 Note 4) Pins width do not include tie bar cutting remainder.



Details of "A" part



© 2002 FUJITSU LIMITED F08002S-c-6-7

Dimensions in mm (inches).
Note: The values in parentheses are reference values.

Document History

Spansion Publication Number: DS04-27300-4E

Document Title: MB3761, Voltage Detector Datasheet Document Number: 002-08509				
Revision	ECN	Orig. of Change	Submission Date	Description of Change
**	—	TAOA	05/11/2006	Migrated to Cypress and assigned document number 002-08509. No change to document contents or format.
*A	5544222	TAOA	12/07/2016	Migrated to Cypress template format.
*B	5841630	MASG	08/02/2017	Adapted Cypress new logo.

Sales, Solutions, and Legal Information

Worldwide Sales and Design Support

Cypress maintains a worldwide network of offices, solution centers, manufacturer's representatives, and distributors. To find the office closest to you, visit us at [Cypress Locations](#).

Products

ARM [®] Cortex [®] Microcontrollers	cypress.com/arm
Automotive	cypress.com/automotive
Clocks & Buffers	cypress.com/clocks
Interface	cypress.com/interface
Internet of Things	cypress.com/iot
Memory	cypress.com/memory
Microcontrollers	cypress.com/mcu
PSoC	cypress.com/psoc
Power Management ICs	cypress.com/pmic
Touch Sensing	cypress.com/touch
USB Controllers	cypress.com/usb
Wireless/Rf	cypress.com/wireless

PSoC[®] Solutions

[PSoC 1](#) | [PSoC 3](#) | [PSoC 4](#) | [PSoC 5LP](#) | [PSoC 6](#)

Cypress Developer Community

[Forums](#) | [WICED IOT Forums](#) | [Projects](#) | [Video](#) | [Blogs](#) | [Training](#) | [Components](#)

Technical Support

cypress.com/support

© Cypress Semiconductor Corporation, 1994-2017. This document is the property of Cypress Semiconductor Corporation and its subsidiaries, including Spansion LLC ("Cypress"). This document, including any software or firmware included or referenced in this document ("Software"), is owned by Cypress under the intellectual property laws and treaties of the United States and other countries worldwide. Cypress reserves all rights under such laws and treaties and does not, except as specifically stated in this paragraph, grant any license under its patents, copyrights, trademarks, or other intellectual property rights. If the Software is not accompanied by a license agreement and you do not otherwise have a written agreement with Cypress governing the use of the Software, then Cypress hereby grants you a personal, non-exclusive, nontransferable license (without the right to sublicense) (1) under its copyright rights in the Software (a) for Software provided in source code form, to modify and reproduce the Software solely for use with Cypress hardware products, only internally within your organization, and (b) to distribute the Software in binary code form externally to end users (either directly or indirectly through resellers and distributors), solely for use on Cypress hardware product units, and (2) under those claims of Cypress's patents that are infringed by the Software (as provided by Cypress, unmodified) to make, use, distribute, and import the Software solely for use with Cypress hardware products. Any other use, reproduction, modification, translation, or compilation of the Software is prohibited.

TO THE EXTENT PERMITTED BY APPLICABLE LAW, CYPRESS MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARD TO THIS DOCUMENT OR ANY SOFTWARE OR ACCOMPANYING HARDWARE, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. To the extent permitted by applicable law, Cypress reserves the right to make changes to this document without further notice. Cypress does not assume any liability arising out of the application or use of any product or circuit described in this document. Any information provided in this document, including any sample design information or programming code, is provided only for reference purposes. It is the responsibility of the user of this document to properly design, program, and test the functionality and safety of any application made of this information and any resulting product. Cypress products are not designed, intended, or authorized for use as critical components in systems designed or intended for the operation of weapons, weapons systems, nuclear installations, life-support devices or systems, other medical devices or systems (including resuscitation equipment and surgical implants), pollution control or hazardous substances management, or other uses where the failure of the device or system could cause personal injury, death, or property damage ("Unintended Uses"). A critical component is any component of a device or system whose failure to perform can be reasonably expected to cause the failure of the device or system, or to affect its safety or effectiveness. Cypress is not liable, in whole or in part, and you shall and hereby do release Cypress from any claim, damage, or other liability arising from or related to all Unintended Uses of Cypress products. You shall indemnify and hold Cypress harmless from and against all claims, costs, damages, and other liabilities, including claims for personal injury or death, arising from or related to any Unintended Uses of Cypress products.

Cypress, the Cypress logo, Spansion, the Spansion logo, and combinations thereof, WICED, PSoC, CapSense, EZ-USB, F-RAM, and Traveo are trademarks or registered trademarks of Cypress in the United States and other countries. For a more complete list of Cypress trademarks, visit cypress.com. Other names and brands may be claimed as property of their respective owners.