

Micropower Precision Triple Supply Monitor with Push-Pull Reset Output in a 5-Lead SOT-23 Package

FEATURES

- **Monitors Three Inputs Simultaneously: 3V, 1.8V and Adjustable**
- **±1.5% Threshold Accuracy Over Temperature**
- **Very Low Supply Current: 10 μ A Typ**
- 200ms Reset Time Delay
- Power Supply Glitch Immunity
- Guaranteed $\overline{\text{RESET}}$ for $V_{\text{CC3}} \geq 1\text{V}$ or $V_{\text{CC18}} \geq 1\text{V}$
- **3V Active-Low Push-Pull Reset Output**
- 5-Lead SOT-23 Package

APPLICATIONS

- Desktop Computers
- Notebook Computers
- Intelligent Instruments
- Portable Battery-Powered Equipment
- Network Servers

DESCRIPTION

The LTC[®]1985-1.8 is a triple supply monitor intended for systems with multiple supply voltages. The reset output remains low until all three supplies have been in compliance for 200ms. Tight 1.5% accuracy specifications and glitch immunity ensure reliable reset operation without false triggering.

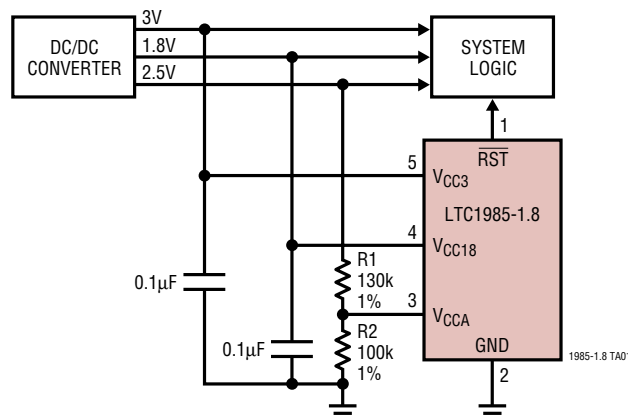
The $\overline{\text{RST}}$ output is guaranteed to be in the correct state for V_{CC18} or V_{CC3} down to 1V. The LTC1985 may also be configured to monitor any one or two V_{CC} inputs instead of three, depending on system requirements.

Very low (10 μ A typical) supply current makes the LTC1985 ideal for power conscious systems.

The LTC1985 is available in a 5-lead SOT-23 package.

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TYPICAL APPLICATION



ABSOLUTE MAXIMUM RATINGS

(Notes 1, 2)

$V_{CC3}, V_{CC18}, V_{CCA}$	-0.3V to 7V
\overline{RST}	-0.3V to ($V_{CC3} + 0.3V$)
Operating Temperature Range (Note 3)	-40°C to 85°C
Storage Temperature Range	-65°C to 150°C
Lead Temperature (Soldering, 10 sec)	300°C

PACKAGE/ORDER INFORMATION

<p>TOP VIEW</p> <p>\overline{RST} 1 5 V_{CC3}</p> <p>GND 2</p> <p>V_{CCA} 3 4 V_{CC18}</p> <p>S5 PACKAGE 5-LEAD PLASTIC SOT-23 $T_{JMAX} = 125^{\circ}C, \theta_{JA} = 250^{\circ}C/W$</p>	ORDER PART NUMBER
	LTC1985ES5-1.8
	S5 PART MARKING
	LTNM

Consult factory for Industrial and Military grade parts.

ELECTRICAL CHARACTERISTICS

The ● denotes specifications which apply over the full operating temperature range, otherwise specifications are at $T_A = 25^{\circ}C$. $V_{CC3} = 3V, V_{CC18} = 1.8V, V_{CCA} = V_{CC3}$ unless otherwise noted.

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_{RT3}	Reset Threshold V_{CC3}	V_{CC3} Input Threshold	● 2.760	2.805	2.850	V
V_{RT18}	Reset Threshold V_{CC18}	V_{CC18} Input Threshold	● 1.656	1.683	1.710	V
V_{RTA}	Reset Threshold V_{CCA}	V_{CCA} Input Threshold	● 0.985	1.000	1.015	V
V_{CCOP}	V_{CC3}, V_{CC18} Operating Voltage	\overline{RST} in Correct Logic State	● 1		7	V
I_{VCC3}	V_{CC3} Supply Current	$V_{CC18} > V_{CC3}$ $V_{CC18} < V_{CC3}, V_{CC3} = 3V$ (Note 4)	●	1 10	2 20	μA μA
I_{VCC18}	V_{CC18} Supply Current	$V_{CC18} < V_{CC3}, V_{CC18} = 1.8V$ (Note 4)	●	1	2	μA
I_{VCCA}	V_{CCA} Input Current	$V_{CCA} = 1V$	● -15	0	15	nA
t_{RST}	Reset Pulse Width	\overline{RST} Low (Note 5)	● 140	200	280	ms
t_{UV}	V_{CC} Undervoltage Detect to \overline{RST}	V_{CC18}, V_{CC3} or V_{CCA} Less Than Reset (Note 5) Threshold V_{RT} by More Than 1%		110		μs
V_{OL}	Output Voltage Low, \overline{RST}	$I_{SINK} = 2.5mA, V_{CC3} = 3V, V_{CC18} = 0V$	●	0.15	0.4	V
		$I_{SINK} = 100\mu A, V_{CC3} = 1V, V_{CC18} = 0V$	●	0.05	0.3	V
		$I_{SINK} = 100\mu A, V_{CC3} = 0V, V_{CC18} = 1V$	●	0.05	0.3	V
		$I_{SINK} = 100\mu A, V_{CC3} = 1V, V_{CC18} = 1V$	●	0.05	0.3	V
V_{OH}	Output Voltage High, \overline{RST}	$I_{SOURCE} = 200\mu A$	● 0.8	V_{CC3}		V

Note 1: Absolute Maximum Ratings are those values beyond which the life of the device may be impaired.

Note 2: All voltage values are with respect to GND.

Note 3: The LTC1985E is guaranteed to meet specified performance from 0°C to 70°C and is designed, characterized and assured to meet the

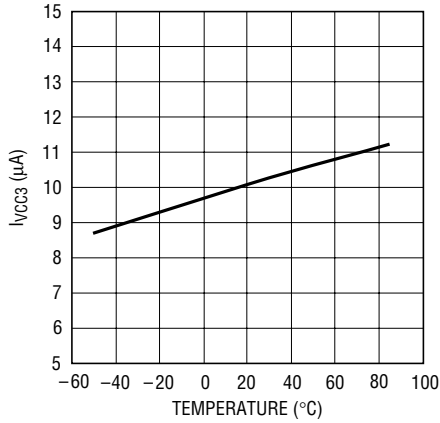
extended temperature limits of -40°C to 85°C but are not tested at these temperatures.

Note 4: Both V_{CC3} and V_{CC18} can act as the supply depending on which pin has the greatest potential.

Note 5: Measured from when input passes through the input threshold voltage (V_{RTX}) until \overline{RST} passes through 1.5V.

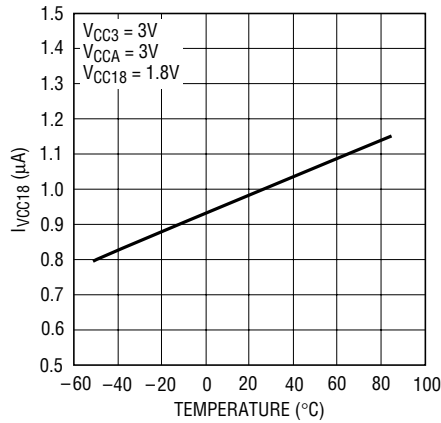
TYPICAL PERFORMANCE CHARACTERISTICS

I_{VCC3} vs Temperature



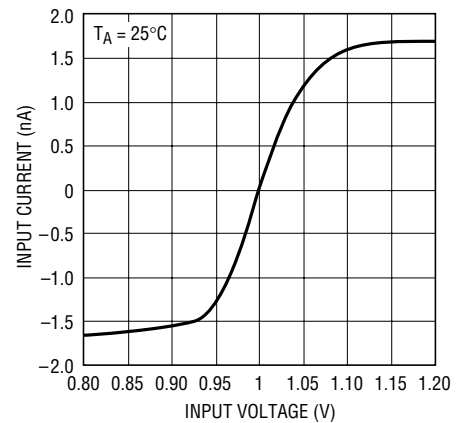
1985-18 G01

I_{VCC18} vs Temperature



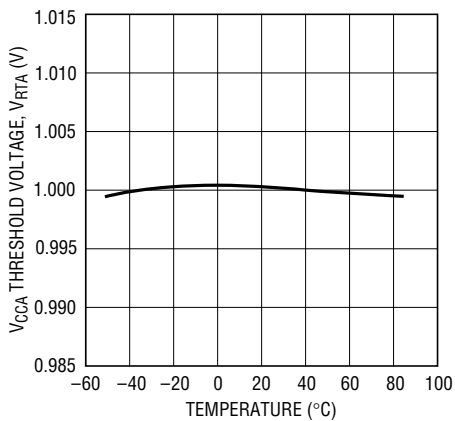
1985-18 G02

V_{CCA} Input Current vs Input Voltage



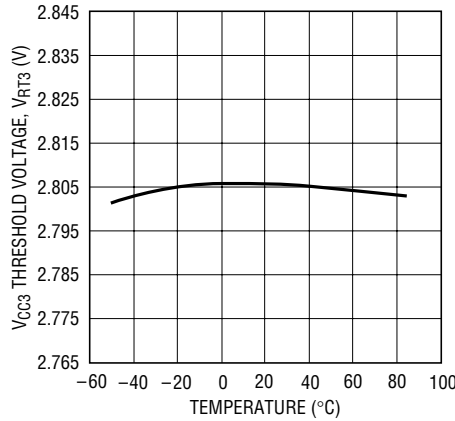
1985-18 G03

V_{CCA} Threshold Voltage vs Temperature



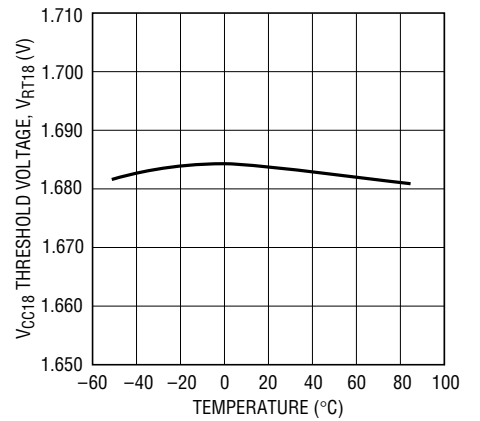
1985-18 G04

V_{CC3} Threshold Voltage vs Temperature



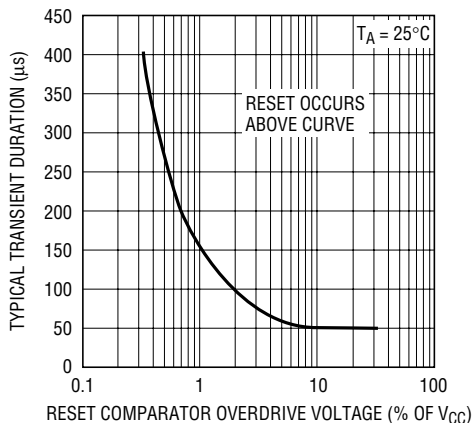
1985-18 G05

V_{CC18} Threshold Voltage vs Temperature



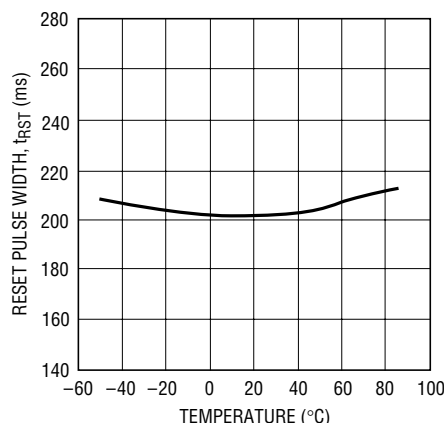
1985-18 G06

Typical Transient Duration vs Comparator Overdrive



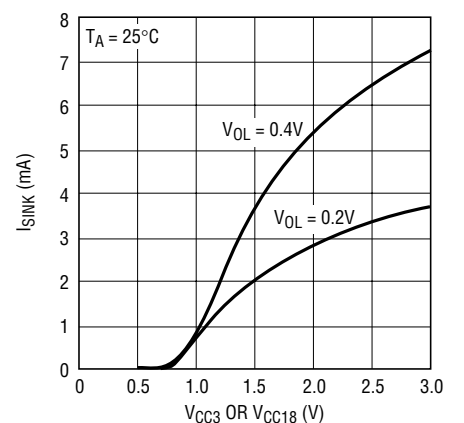
1985-18 G07

Reset Pulse Width vs Temperature



1985-18 G08

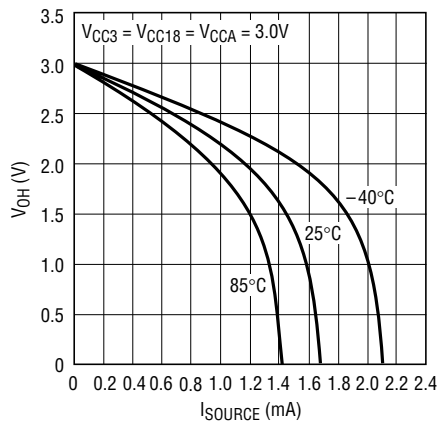
I_{SINK} vs Supply Voltage



1985-18 • G09

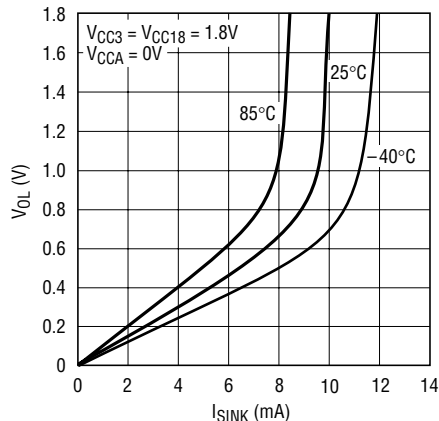
TYPICAL PERFORMANCE CHARACTERISTICS

RST High Level Output Voltage vs Output Source Current



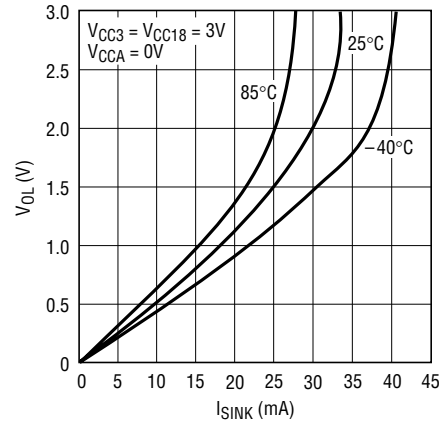
1985-81 G10

RST Voltage Output Low vs Output Sink Current



1985-81 G11

RST Voltage Output Low vs Output Sink Current



1985-81 G12

PIN FUNCTIONS

RST (Pin 1): Reset Logic Output. Active low, 3V push-pull output. Asserted when one or all of the supplies are below trip thresholds and held for 200ms after all supplies become valid.

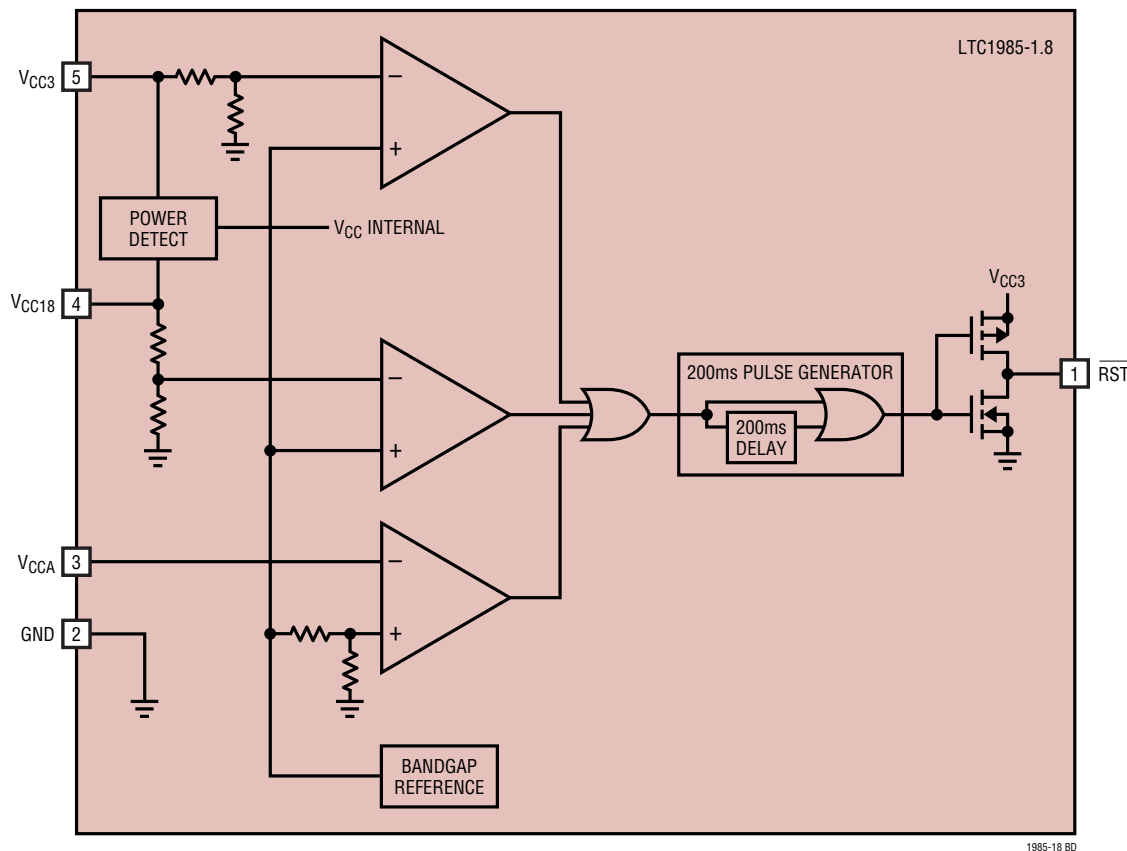
GND (Pin 2): Ground.

V_{CCA} (Pin 3): 1V Sense, High Impedance Input. If unused it can be tied to either V_{CC3} or V_{CC18} .

V_{CC18} (Pin 4): 1.8V Sense Input and Power Supply Pin. This pin is used on the LTC1985 to provide power to the part when the voltage on V_{CC18} is greater than the voltage on V_{CC3} . Bypass to ground with a $\geq 0.1\mu F$ ceramic capacitor.

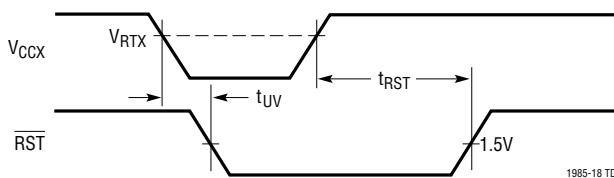
V_{CC3} (Pin 5): 3V Sense Input and Power Supply Pin. This pin provides power to the part when the voltage on V_{CC3} is greater than the voltage on V_{CC18} . Bypass to ground with a $\geq 0.1\mu F$ ceramic capacitor.

BLOCK DIAGRAM



TIMING DIAGRAM

V_{CC} Monitor Timing



APPLICATIONS INFORMATION

Supply Monitoring

The LTC1985 is a low power, high accuracy triple supply monitoring circuit with a single 200ms microprocessor reset output.

All three V_{CC} inputs must be above predetermined thresholds for reset not to be invoked. The LTC1985 will assert reset during power-up, power-down and brownout conditions on any one or all of the V_{CC} inputs.

3V or 1.8V Power Detect

The LTC1985 is powered from the 3V input pin (V_{CC3}) or the 1.8V input pin (V_{CC18}), whichever pin has the highest potential. This ensures the part pulls the \overline{RST} pin low as soon as either input pin is $\geq 1V$.

Power-Up

Upon power-up, either the V_{CC18} or V_{CC3} pin, can power the part. This ensures that \overline{RST} will be low when either V_{CC18} or V_{CC3} reaches 1V. As long as any one of the V_{CC} inputs is below its predetermined threshold, \overline{RST} will stay a logic low. Once all of the V_{CC} inputs rise above their thresholds, an internal timer is started and \overline{RST} is driven high after 200ms.

\overline{RST} is reasserted whenever any one of the V_{CC} inputs drops below its predetermined threshold and remains asserted until 200ms after all of the V_{CC} inputs are above their thresholds.

Power-Down

On power-down, once any of the V_{CC} inputs drop below its threshold, \overline{RST} is held at a logic low. A logic low of 0.3V is guaranteed until both V_{CC3} and V_{CC18} drop below 1V.

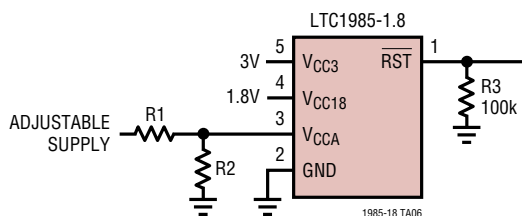


Figure 1. Typical Application Showing Resistor on \overline{RST} Output to Ground

Override Functions

The V_{CCA} pin, if unused, can be tied to either V_{CC3} or V_{CC18} . This is an obvious solution since the trip points for V_{CC3} and V_{CC18} will always be greater than the trip point for V_{CCA} . Likewise, the V_{CC18} , if unused, can be tied to V_{CC3} . V_{CC3} must always be used. Tying V_{CC3} to V_{CC18} and operating off of a 1.8V supply will result in the continuous assertion of \overline{RST} .

Ensuring \overline{RST} Valid for Supply Voltages Under 1V

When the supplies drops below 1V the \overline{RST} output current sink capability is drastically reduced. The combination of stray currents and stray capacitance to signals other than ground can cause the \overline{RST} output pin to float around. In a lot of applications this is not a problem since most microprocessors and other circuits do not operate with the supply voltage less than 1V. In applications where the \overline{RST} output must be valid down to 0V the addition of a pull-down resistor from \overline{RST} to ground will ensure \overline{RST} is held low. The circuit in Figure 1 shows an application employing this technique. The value chosen for the pull-down resistor ($R3$) is a trade-off between pull-down strength and loading of the \overline{RST} pin. If the value of the resistor is too large the pin may still float and if the resistor value is too low it may load down the \overline{RST} as well as burn excess supply current, a value of 100k is a good compromise.

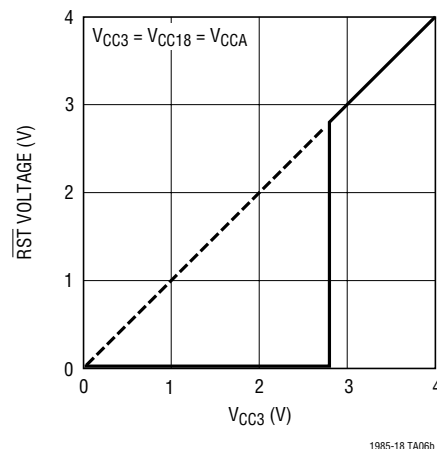
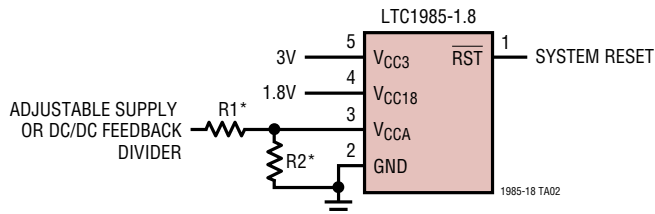


Figure 2. \overline{RST} Voltage vs V_{CC3} with a 100k Resistor on \overline{RST} to Ground

Resistor on \overline{RST} Output to Ground Ensures \overline{RST} Valid to $V_{CC} = 0V$

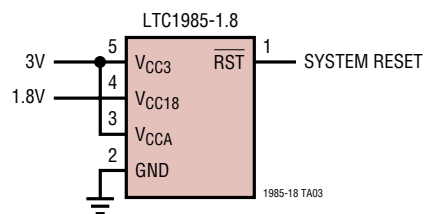
TYPICAL APPLICATIONS

Triple Supply Monitor (3V, 1.8V and Adjustable)

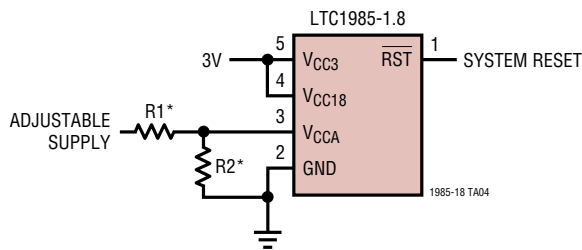


*TO PRESERVE THRESHOLD ACCURACY, SET PARALLEL COMBINATION OF R1 AND R2 $\leq 66.5k$

Dual Supply Monitor (3V and 1.8V, Defeat VCCA Input)

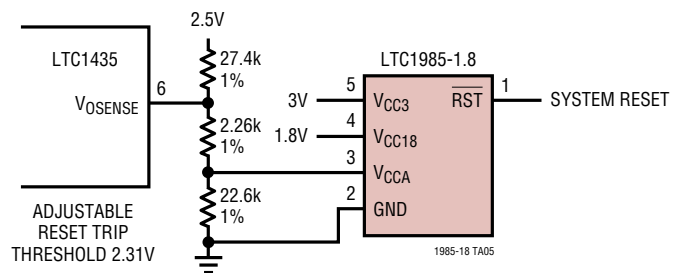


Dual Supply Monitor (3V Plus Adjustable)



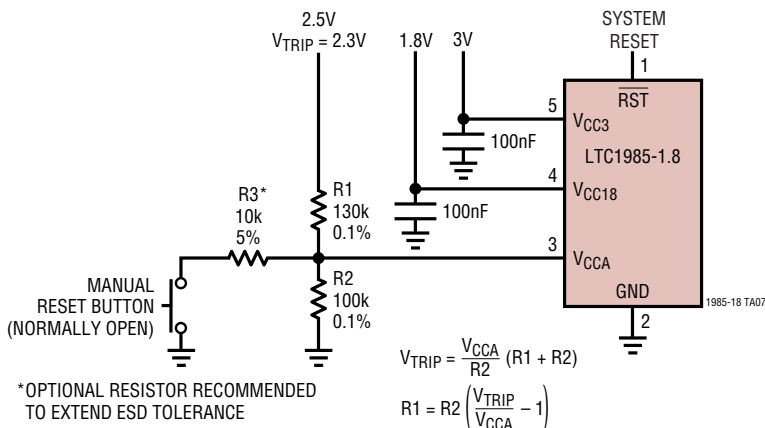
*TO PRESERVE THRESHOLD ACCURACY, SET PARALLEL COMBINATION OF R1 AND R2 $\leq 66.5k$

Using VCCA Tied to DC/DC Feedback Divider



TYPICAL APPLICATION

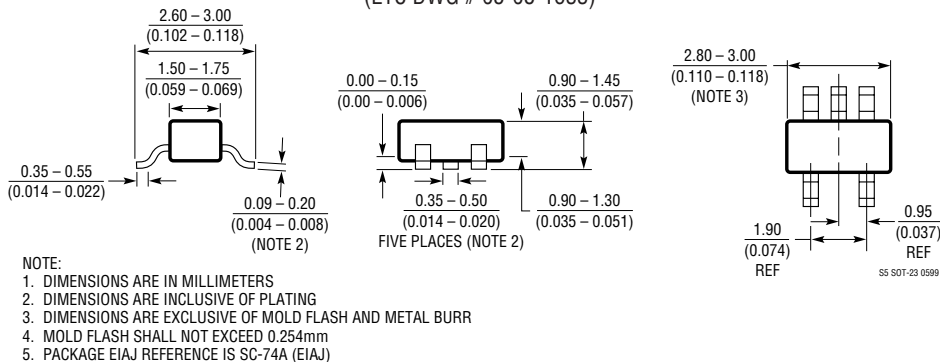
Triple Supply Monitor with Manual Reset Button



PACKAGE DESCRIPTION

Dimensions in inches (millimeters) unless otherwise noted.

S5 Package 5-Lead Plastic SOT-23 (LTC DWG # 05-08-1633)



RELATED PARTS

PART NUMBER	DESCRIPTION	COMMENTS
LTC690	5V Supply Monitor, Watchdog Timer and Battery Backup	4.65V Threshold
LTC694-3.3	3.3V Supply Monitor, Watchdog Timer and Battery Backup	2.9V Threshold
LTC699	5V Supply Monitor and Watchdog Timer	4.65V Threshold
LTC1232	5V Supply Monitor, Watchdog Timer and Push-Button Reset	4.37V/4.62V Threshold
LTC1326	Micropower Precision Triple Supply Monitor for 5V, 3.3V and ADJ	4.725V, 3.118V, 1V Thresholds ($\pm 0.75\%$)
LTC1326-2.5	Micropower Precision Triple Supply Monitor for 2.5V, 3.3V and ADJ	2.363V, 3.118V, 1V Thresholds ($\pm 0.75\%$)
LTC1536	Precision Triple Supply Monitor for PCI Applications	Meets PCI t_{FAIL} Timing Specifications
LTC1726-2.5	Micropower Triple Supply Monitor for 2.5V, 3.3V and ADJ	Adjustable \overline{RESET} and Watchdog Time Outs
LTC1726-5	Micropower Triple Supply Monitor for 5V, 3.3V and ADJ	Adjustable \overline{RESET} and Watchdog Time Outs
LTC1727-2.5/1727-5	Micropower Triple Supply Monitor with Open-Drain Reset	Individual Monitor Outputs in MSOP
LTC1728-1.8	Micropower Triple Supply Monitor with Open-Drain Reset	5-Lead SOT-23 Package
LTC1728-2.5/1728-5	Micropower Triple Supply Monitor with Open-Drain Reset	5-Lead SOT-23 Package