National Semiconductor

October 1996

LMC6953
PCI Local Bus Power Supervisor

General Description

The LMC6953 is a voltage supervisory chip designed to meet PCI (Peripheral Component Interconnect) Specifications Revision 2.1. It monitors 5V and 3.3V power supplies. In cases of power-up, power-down, brown-out, power failure and manual reset interrupt, the LMC6953 provides an active low reset. $\overline{\text{RESET}}$ holds low for 100 ms after both 5V and 3.3V powers recover, or after manual reset signal returns to high state. The external capacitor on pin 8 adjusts the reset delay.

This part is ideal on PCI motherboards or add-in cards to ensure the integrity of the entire system when there is a fault condition. The active low reset sets the microprocessor or local device in a known state.

The LMC6953 has a built-in bandgap reference that accurately determines all the threshold voltages. The internal reset delay circuitry eliminates additional discrete components.

Features

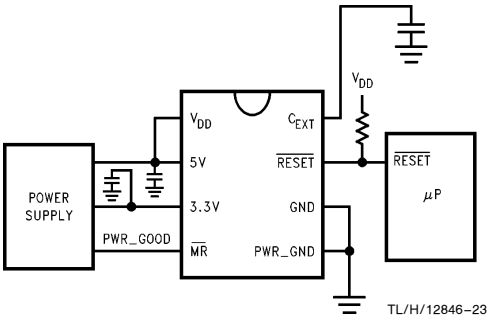
- Compliant to PCI specifications revision 2.1.
- Under and over voltage detectors for 5V and 3.3V
- Power failure detection (5V falling under 3.3V by 300 mV max)
- Manual reset input pin
- Guaranteed $\overline{\text{RESET}}$ assertion at V_{DD} = 1.5V
- Integrated reset delay circuitry
- Open drain output
- Adjustable reset delay
- Response time for over and under voltage detection 490 ns Max
- Power failure response time 90 ns Max
- Requires minimal external components

Applications

- Desktop PCs
- PCI-Based Systems
- Network servers

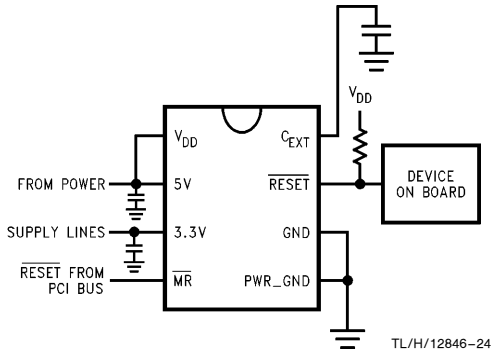
Typical Application Circuits

On Mother Board



TL/H/12846–23

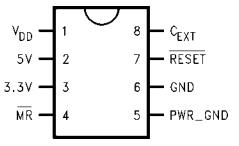
On Add-in Cards



TL/H/12846–24

Connection Diagram

8-Pin SO



TL/H/12846–2

Top View

Ordering Information

Package	Commercial Temp Range 0°C to +70°C	NSC Drawing	Supplied As
8-Pin Small Outline	LMC6953CM	M08A	Rails
	LMC6953CMX		2.5k Tape and Reel

Absolute Maximum Ratings (Note 1)

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

ESD Tolerance (Note 2)	
Human Body Model	2 kV
Machine Model	200V
Voltage at Input Pin	7V
Supply Voltage	7V
Current at Output Pin	15 mA
Current at Power Supply Pin (Note 3)	10 mA
Lead Temp. (Soldering, 10 sec.)	260°C
Storage Temperature Range	−65°C to +150°C
Junction Temperature	150°C

Operating Ratings (Note 1)

Supply Voltage	1.5V to 6V
Junction Temperature Range	
LMC6953C	$0°C \leq T_J \leq 70°C$
Thermal Resistance (θ_{JA})	
M Package	165°C/W

DC Electrical Characteristics

Unless otherwise specified, all **boldface** limits guaranteed for $T_J = 0°C$ to 70°C, $V_{DD} = 5V$, $R_{PULL-UP} = 4.7\ k\Omega$ and $C_{EXT} = 0.01\ \mu F$. Typical numbers are room temperature (25°C) performance.

Symbol	Parameter	Conditions	Min	Typ	Max	Units
V_{H5}	V_{DD} Over-Voltage Threshold	(Note 4)	**5.45**	5.6	**5.75**	V
V_{L5}	V_{DD} Under-Voltage Threshold	(Note 4)	**4.25**	4.4	**4.55**	V
$V_{H3.3}$	3.3V Over-Voltage Threshold	(Note 5)	**3.8**	3.95	**4.1**	V
$V_{L3.3}$	3.3V Under-Voltage Threshold	(Note 5)	**2.5**	2.65	**2.8**	V
V_{MR}	Manual RESET Threshold			2.5	**2.8**	V
V_{PF}	Power Failure Differential Voltage (3.3V Pin−5V Pin)	(Note 6)		150	**300**	mV
R_{IN}	Input Resistance at 5V and 3.3V Pins			35		kΩ
V_{OL}	$\overline{\text{RESET}}$ Output Low	$V_{DD} = 1.5V$ to 6V		0.05	**0.1**	V
I_S	Supply Current	(Note 3)		0.8	**1.5**	mA

AC Electrical Characteristics

Unless otherwise specified, all **boldface** limits guaranteed for $T_J = 0°C$ to 70°C, $V_{DD} = 5V$, $R_{PULL-UP} = 4.7\ k\Omega$ and $C_{EXT} = 0.01\ \mu F$. Typical numbers are room temperature (25°C) performance.

Symbol	Parameter	Conditions	Typ	LMC6953 Limit	Units
t_D	Over or Under Voltage Response Time	(Note 7)	150	**490**	ns max
t_{PF}	Power Failure Response Time	(Note 8)	40	**90**	ns max
t_{RESET}	Reset Delay	$C_{EXT} = 0.01\ \mu F$	100		ms

Note 1: Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is intended to be functional, but specific performance is not guaranteed. For guaranteed specifications and the test conditions, see the Electrical Characteristics.

Note 2: Human body model, 1.5 kΩ in series with 100 pF. Machine model. 200Ω in series with 100 pF.

Note 3: Supply current measured at pins 1, 2, and 3. The 4.7 kΩ pull-up resistor on pin 7 is not tied to V_{DD} in this measurement.

Note 4: PCI Specifications Revision 2.1, Section 4.2.1.1 and Section 4.3.2.

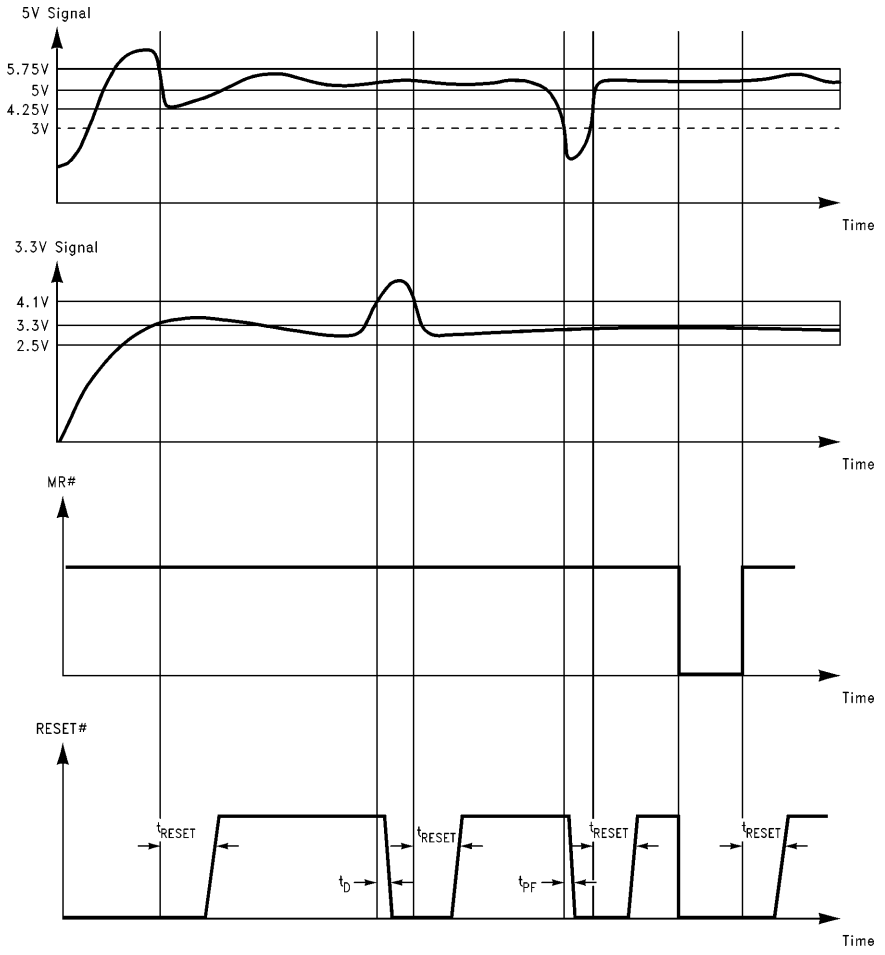
Note 5: PCI Specifications Revision 2.1, Section 4.2.2.1 and Section 4.3.2.

Note 6: PCI Specifications Revision 2.1 and Section 4.3.2.

Note 7: PCI Specifications Revision 2.1, Section 4.3.2. The response time is measured individually with ±750 mV of overdrive applied to pin 2 then ±600 mV of overdrive applied to pin 3 and taking the worst number of the four measurements.

Note 8: PCI Specifications Revision 2.1, Section 4.3.2. The power failure response time is measured with a signal changing from 5V to 3V applied to pin 2 and a 3.3V DC applied to pin 3.

LMC6953 Timing Diagram

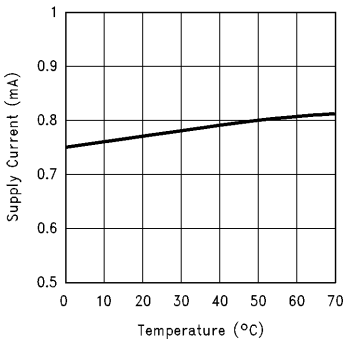


TL/H/12846–3

Note: t_{RESET}, t_D and t_{PF} are not to scale.

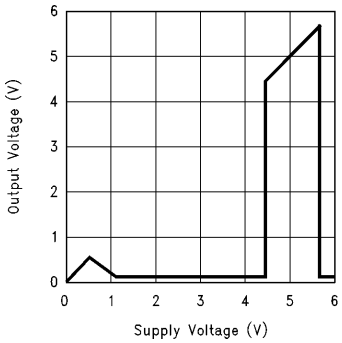
Typical Performance Characteristics Unless otherwise specified, $T_A = 25°C$

Supply Current vs Temperature



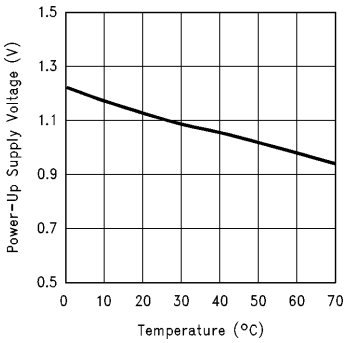
TL/H/12846–4

Output Voltage vs Supply Voltage



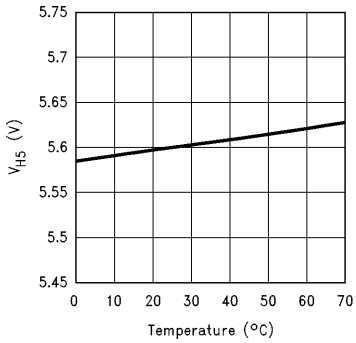
TL/H/12846–12

Power-Up Supply Voltage vs Temperature



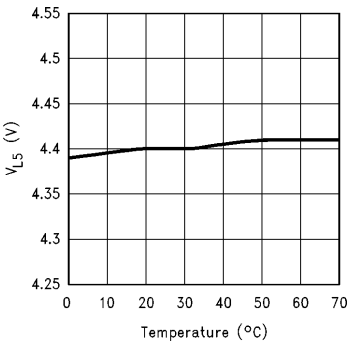
TL/H/12846–9

V_{H5} vs Temperature



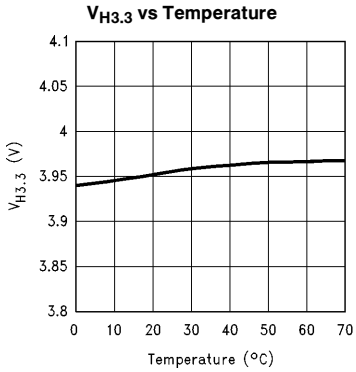
TL/H/12846–5

V_{L5} vs Temperature



TL/H/12846–6

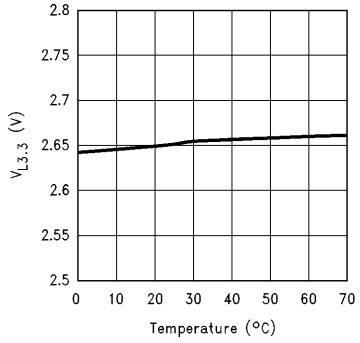
$V_{H3.3}$ vs Temperature



TL/H/12846–7

Typical Performance Characteristics Unless otherwise specified, T_A = 25°C (Continued)

$V_{L3.3}$ vs Temperature



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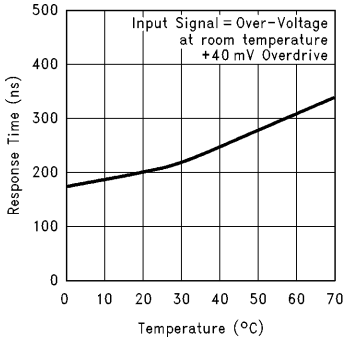
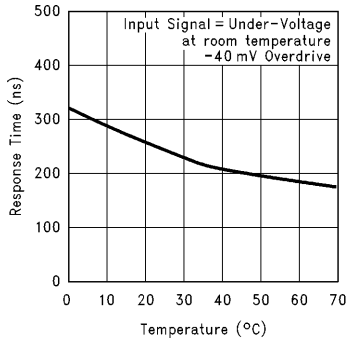
Over-Voltage Response Time vs Temperature



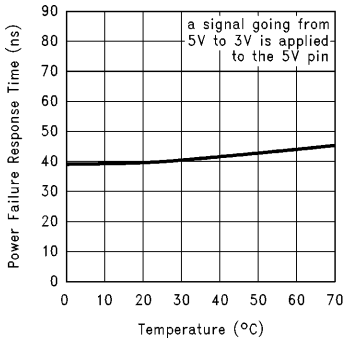
TL/H/12846–13

Under-Voltage Response Time vs Temperature



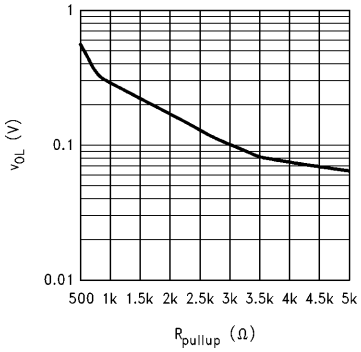
TL/H/12846–14

Power Failure Response Time vs Temperature



TL/H/12846–15

V_{OL} vs $R_{PULL-UP}$



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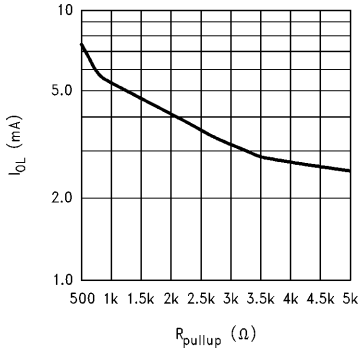
I_{OL} vs $R_{PULL-UP}$



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