

Microcontroller Supervisory Circuit with Push-Pull Output

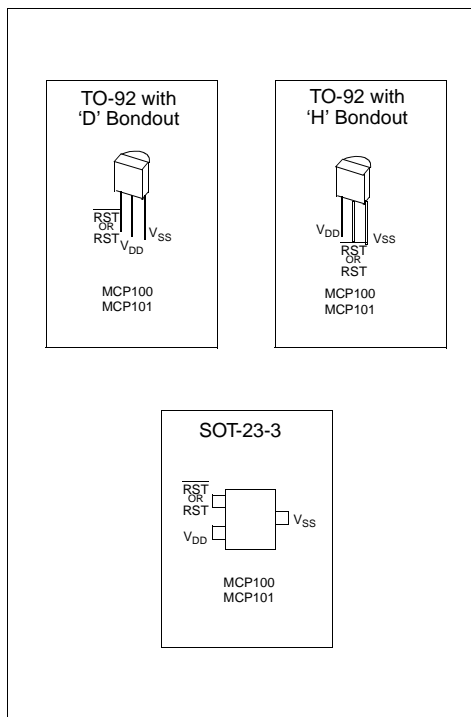
FEATURES

- Holds microcontroller in reset until supply voltage reaches stable operating level
- Resets microcontroller during power loss
- Precision monitoring of 3V, 3.3V, and 5V systems
- 7 voltage trip points available
- Active low $\overline{\text{RESET}}$ pin (MCP100) or active high RESET (MCP101)
- Push-pull output
- Holds $\overline{\text{RESET}}$ /RESET for 350 ms (typical)
- Guaranteed $\overline{\text{RESET}}$ /RESET to $V_{DD} = 1.0V$
- Accuracy of $\pm 125mV$ for 5V systems and $\pm 75mV$ for 3V systems over temperature
- 45 μA typical operating current
- Temperature range:
 - Industrial (I): $-40^{\circ}C$ to $+85^{\circ}C$

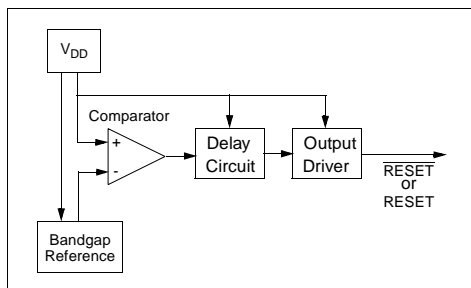
DESCRIPTION

The Microchip Technology Inc. MCP100/101 is a voltage supervisory device designed to keep a microcontroller in reset until the system voltage has reached the proper level and stabilized. It also operates as protection from brown-out conditions when the supply voltage drops below a safe operating level. Both devices are available with a choice of seven different trip voltages and both have push-pull outputs. The MCP100 has a low active $\overline{\text{RESET}}$ pin and the MCP101 has a high active RESET pin. The MCP100/101 will assert the $\overline{\text{RESET}}$ /RESET signal whenever the voltage on the V_{DD} pin is below the trip-point voltage.

PACKAGES



BLOCK DIAGRAM



MCP100/101

1.0 ELECTRICAL CHARACTERISTICS

1.1 Maximum Ratings*

V_{DD} 7.0V
 All inputs and outputs w.r.t. V_{SS} -0.6V to $V_{DD} + 1.0V$
 Storage temperature-65°C to +150°C
 Ambient temp. with power applied-65°C to +125°C
 Soldering temperature of leads (10 seconds)+300°C
 ESD protection on all pins≥ 2 kV

***Notice:** Stresses above those listed under "Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at those or any other conditions above those indicated in the operational listings of this specification is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

DC AND AC CHARACTERISTICS

| All parameters apply at the specified temp and voltage ranges unless otherwise noted. | | V _{DD} = 1.0 - 5.5V Industrial (I):-40°C to +85°C | | | | | |
|---|--|---|----------------------|-------|------|-------|---|
| PARAMETER | | SYMBOL | MIN | TYP | MAX | UNITS | TEST CONDITIONS |
| Operating Voltage Range | | V _{DD} | 1.0 | | 5.5 | V | |
| V _{DD} Value to Guarantee RESET/ RESET | | V _{DDMIN} | 1.0 | | | V | |
| Operating current | | I _{DD} | | 45 | 60 | μA | V _{DD} = 5.5V (no load) |
| V _{DD} Trip Point | MCP10X-270 | V _{TRIP} | 2.55 | 2.625 | 2.7 | V | |
| | MCP10X-300 | | 2.85 | 2.925 | 3.0 | | |
| | MCP10X-315 | | 3.0 | 3.075 | 3.15 | | |
| | MCP10X-450 | | 4.25 | 4.375 | 4.50 | | |
| | MCP10X-460 | | 4.35 | 4.475 | 4.60 | | |
| | MCP10X-475 | | 4.50 | 4.625 | 4.75 | | |
| | MCP10X-485 | | 4.60 | 4.725 | 4.85 | | |
| RESET Low Level Output Voltage (MCP100) | MCP100-270 MCP100-300 MCP100-315 | V _{OL} | | | 0.4 | V | I _{OL} = 3.2mA, V _{DD} = V _{TRIPMIN} |
| | MCP100-450 MCP100-460 MCP100-475 MCP100-485 | | | | 0.6 | | I _{OL} = 8.5mA, V _{DD} = V _{TRIPMIN} |
| RESET High Level Output Voltage (MCP100) | MCP100-XXX (All V _{TRIP} Points) | V _{OH} | V _{DD} -0.7 | | | V | I _{OH} = 3mA, V _{DD} > V _{TRIPMAX} |
| RESET Low Level Output Voltage (MCP101) | MCP101-270 MCP101-300 MCP101-315 | V _{OL} | | | 0.4 | V | I _{OL} = 3.2mA, V _{DD} > V _{TRIPMAX} |
| | MCP101-450 MCP101-460 MCP101-475 MCP101-485 | | | | 0.6 | | I _{OL} = 8.5mA, V _{DD} > V _{TRIPMAX} |
| RESET High level Output Voltage (MCP101) | MCP101-XXX (All V _{TRIP} Points) | V _{OH} | V _{DD} -0.7 | | | V | I _{OH} = 3mA, V _{DD} = V _{TRIPMIN} |
| Threshold Hysteresis | | V _{HYS} | | 50 | | mV | |
| V _{DD} Detect to RESET/RESET Inactive | | t _{RPU} | 150 | 350 | 700 | ms | |
| V _{DD} Detect to RESET/RESET | | t _{RPD} | | 10 | | μs | V _{DD} ramped from V _{TRIPMAX} + 250mV down to V _{TRIPMIN} - 250mV |

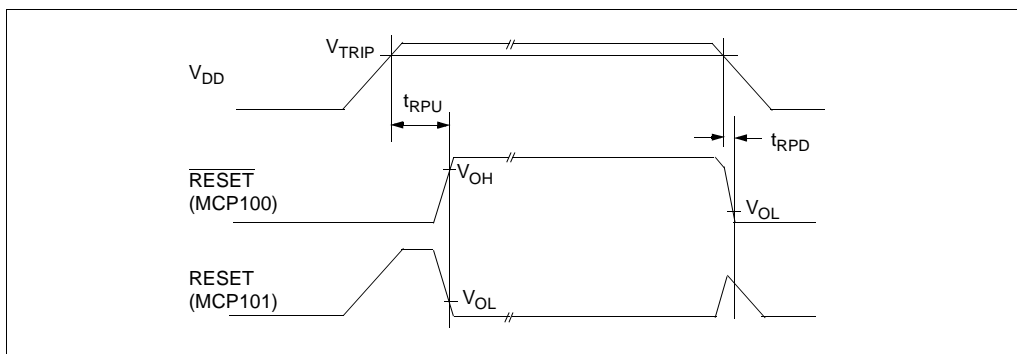


FIGURE 1-1: MCP100/101 Timing Diagram

2.0 APPLICATIONS INFORMATION

2.1 The Need for Supervisory Circuits

For many of today's microcontroller applications, care must be taken to prevent low power conditions that can cause many different system problems. The most common causes are brown-out conditions where the system supply drops below the operating level momentarily, and the second, is when a slowly decaying power supply causes the microcontroller to begin executing instructions without enough voltage to sustain SRAM and producing indeterminate results.

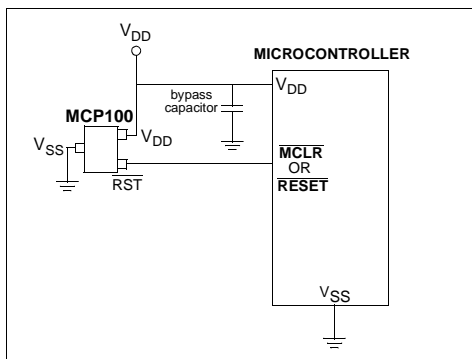


FIGURE 2-1: Typical Application

2.2 Negative Going V_{DD} Transients

Many system designers implementing POR circuits are concerned about the minimum pulse width required to cause a reset. Figure 2-2 shows typical transient duration vs. reset comparator overdrive for which the MCP100/101 will not generate a reset pulse. It shows that the farther below the trip point the transient pulse goes, the duration of the pulse required to cause a reset gets shorter. A 0.1 μF bypass cap mounted as close as possible to the V_{DD} pin provides additional transient immunity.

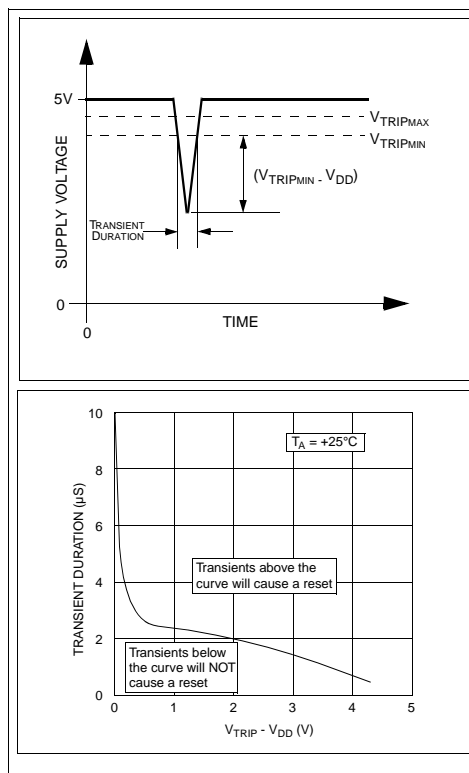


FIGURE 2-2: Typical Transient Response

2.3 Effect of Temperature on Timeout Period (t_{RPU})

The timeout period (t_{RPU}) determines how long the device remains in the reset condition. This is controlled by an internal RC timer and is effected by both V_{DD} and temperature. The graph shown in Figure 2-3 shows typical response for different V_{DD} values and temperatures.

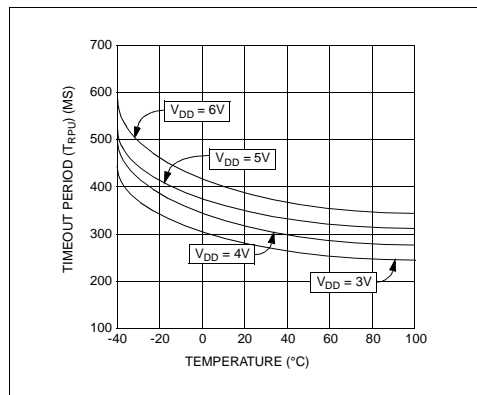


FIGURE 2-3: Typical t_{RPU} vs. Temperature

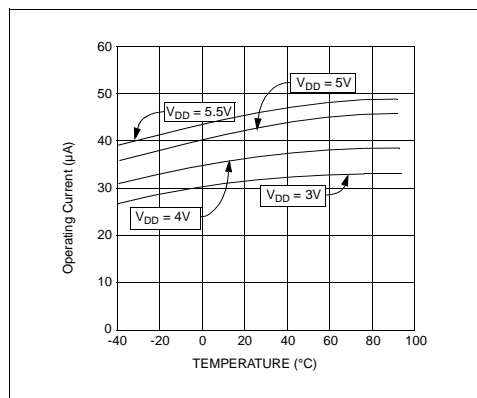


FIGURE 2-4: I_{DD} vs. Temperature

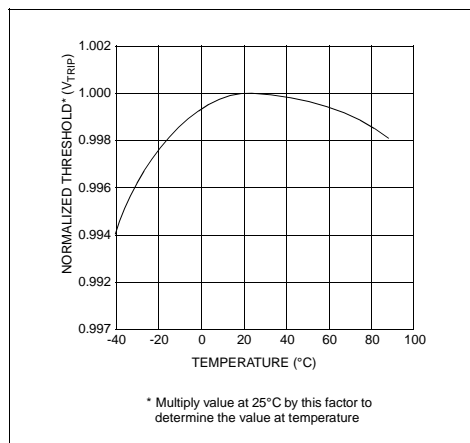


FIGURE 2-5: Normalized V_{TRIP} vs. Temperature

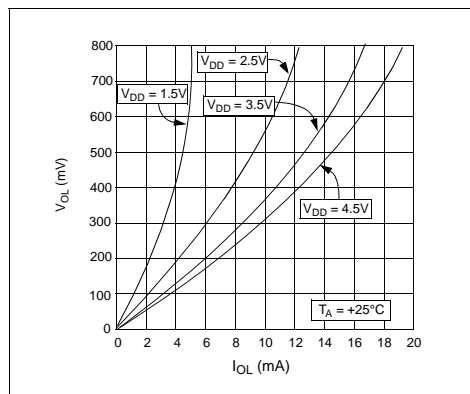


FIGURE 2-6: V_{OL} vs. I_{OL}

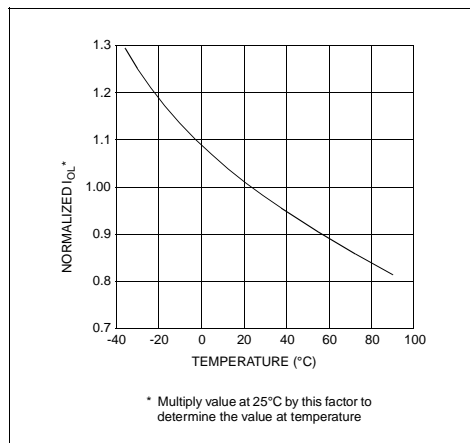


FIGURE 2-7: Normalized I_{OL} vs. Temperature

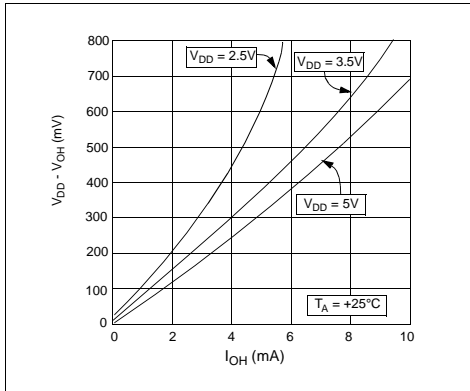


FIGURE 2-8: $V_{DD} - V_{OH}$ vs. I_{OH}

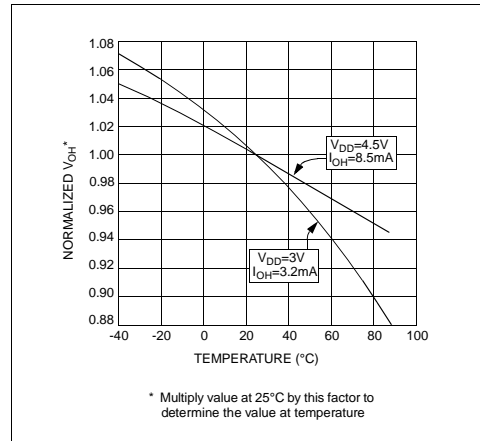


FIGURE 2-9: Normalized V_{OH} vs. Temperature

NOTES:

MCP100/101 PRODUCT IDENTIFICATION SYSTEM

MCP100/101—xxx b I /pp

Package:

TO = TO-92 (3-lead) [offered in bags only]

TT = SOT-23 (3-lead) [offered in tape & reel only]

Temperature Range

I = -40°C to +85°C (only offered in I)

Bondout Option
(TO-92 only)

D = D Bond Option (see bond option chart below)

H = H Bond Option

RESET/RESET
V_{TRIP} Voltage

270 = $2.55 \leq V_{TRIP} \leq 2.70$

300 = $2.85 \leq V_{TRIP} \leq 3.00$

315 = $3.00 \leq V_{TRIP} \leq 3.15$

450 = $4.25 \leq V_{TRIP} \leq 4.50$

460 = $4.35 \leq V_{TRIP} \leq 4.60$

475 = $4.50 \leq V_{TRIP} \leq 4.75$

485 = $4.60 \leq V_{TRIP} \leq 4.85$

Device:

MCP100 = Supervisor circuit with active low $\overline{\text{RESET}}$ output

MCP100T = Supervisor circuit with active low $\overline{\text{RESET}}$ output
(tape & reel)

MCP101 = Supervisor circuit with active high RESET output

MCP101T = Supervisor circuit with active high RESET output
(tape & reel)

Product Identification Options for MCP100/101

TO-92 with
'D' Bondout



MCP100-xxxD I/TO
MCP101-xxxD I/TO

TO-92 with
'H' Bondout



MCP100-xxxH I/TO
MCP101-xxxH I/TO

SOT-23-3



MCP100-xxx I/TT
MCP101-xxx I/TT

Example of Product Identification:

For the MCP100 (active low $\overline{\text{RESET}}$ pin) with V_{TRIP} range of 2.55V - 2.70V in TO-92 package with 'H' bond option in industrial temp range, the part number would be: MCP100-270H I/TO.

Sales and Support

Data Sheets

Products supported by a preliminary Data Sheet may have an errata sheet describing minor operational differences and recommended workarounds. To determine if an errata sheet exists for a particular device, please contact one of the following:

1. Your local Microchip sales office
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