

## Microcontroller Supervisory Circuit with Push-Pull Output

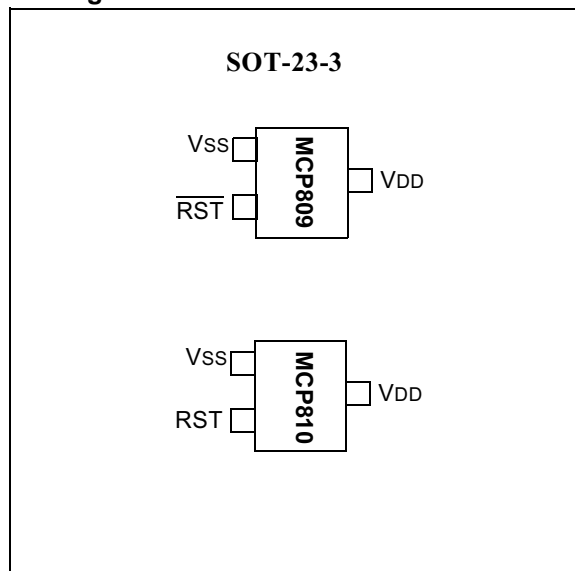
### Features

- 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 (MCP809) or active high RESET (MCP810)
- Push-pull output
- Holds  $\overline{\text{RESET}}$ /RESET for 350 ms (typical)
- $\overline{\text{RESET}}$ /RESET to  $V_{DD} = 1.0V$
- Accuracy of  $\pm 125$  mV for 5V systems and  $\pm 75$  mV for 3V systems over temperature
- 45  $\mu A$  typical operating current
- Temperature range:
  - Industrial (I):  $-40^{\circ}C$  to  $+85^{\circ}C$

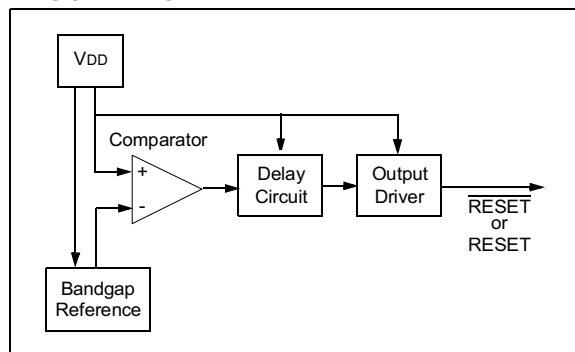
### DESCRIPTION

The Microchip Technology Inc. MCP809/810 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 MCP809 has a low active  $\overline{\text{RESET}}$  pin and the MCP810 has a high active RESET pin. The MCP809/810 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



# MCP809/810

## 1.0 ELECTRICAL CHARACTERISTICS

### 1.1 Maximum Ratings\*

V<sub>DD</sub> .....7.0V  
 All inputs and outputs w.r.t. V<sub>SS</sub> .....-0.6V to V<sub>DD</sub> +1.0V  
 Storage temperature ..... -65°C to +150°C  
 Ambient temp. with power applied ..... -65°C to +125°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 <sub>DD</sub> = 1.0 - 5.5V Industrial (I): -40°C to +85°C					
Parameter		Symbol	Min.	Typ.	Max.	Units	Test Conditions
Operating Voltage Range		V <sub>DD</sub>	1.0	—	5.5	V	
V <sub>DD</sub> Value to RESET/RESET		V <sub>DDMIN</sub>	1.0	—	—	V	
Operating Current		I <sub>DD</sub>	—	45	60	μA	V <sub>DD</sub> = 5.5V (no load)
V <sub>DD</sub> Trip Point	MCP8XX-270	V <sub>TRIP</sub>	2.55	2.625	2.7	V	
	MCP8XX-300		2.85	2.925	3.0		
	MCP8XX-315		3.0	3.075	3.15		
	MCP8XX-450		4.25	4.375	4.50		
	MCP8XX-460		4.35	4.475	4.60		
	MCP8XX-475		4.50	4.625	4.75		
	MCP8XX-485		4.60	4.725	4.85		
RESET Low Level Output Voltage (MCP809)	MCP809-270 MCP809-300 MCP809-315	V <sub>OL</sub>	—	—	0.4	V	I <sub>OL</sub> = 3.2 mA, V <sub>DD</sub> = V <sub>TRIPMIN</sub>
	MCP809-450 MCP809-460 MCP809-475 MCP809-485		—	—	0.6		I <sub>OL</sub> = 8.5 mA, V <sub>DD</sub> = V <sub>TRIPMIN</sub>
RESET High Level Output Voltage (MCP809)	MCP809-xxx (All V <sub>TRIP</sub> Points)	V <sub>OH</sub>	V <sub>DD</sub> -0.7	—	—	V	I <sub>OH</sub> = 3 mA, V <sub>DD</sub> > V <sub>TRIPMAX</sub>
RESET Low Level Output Voltage (MCP810)	MCP810-270 MCP810-300 MCP810-315	V <sub>OL</sub>	—	—	0.4	V	I <sub>OL</sub> = 3.2 mA, V <sub>DD</sub> > V <sub>TRIPMAX</sub>
	MCP810-450 MCP810-460 MCP810-475 MCP810-485		—	—	0.6		I <sub>OL</sub> = 8.5 mA, V <sub>DD</sub> > V <sub>TRIPMAX</sub>
RESET High Level Output Voltage (MCP810)	MCP810-xxx (All V <sub>TRIP</sub> Points)	V <sub>OH</sub>	V <sub>DD</sub> -0.7	—	—	V	I <sub>OH</sub> = 3 mA, V <sub>DD</sub> = V <sub>TRIPMIN</sub>
Threshold Hysteresis		V <sub>HYS</sub>	—	50	—	mV	
V <sub>DD</sub> Detect to RESET/RESET Inactive		t <sub>RPU</sub>	150	350	700	ms	
V <sub>DD</sub> Detect to RESET/RESET		t <sub>RPD</sub>	—	10	—	μs	V <sub>DD</sub> ramped from V <sub>TRIPMAX</sub> + 250 mV down to V <sub>TRIPMIN</sub> - 250 mV

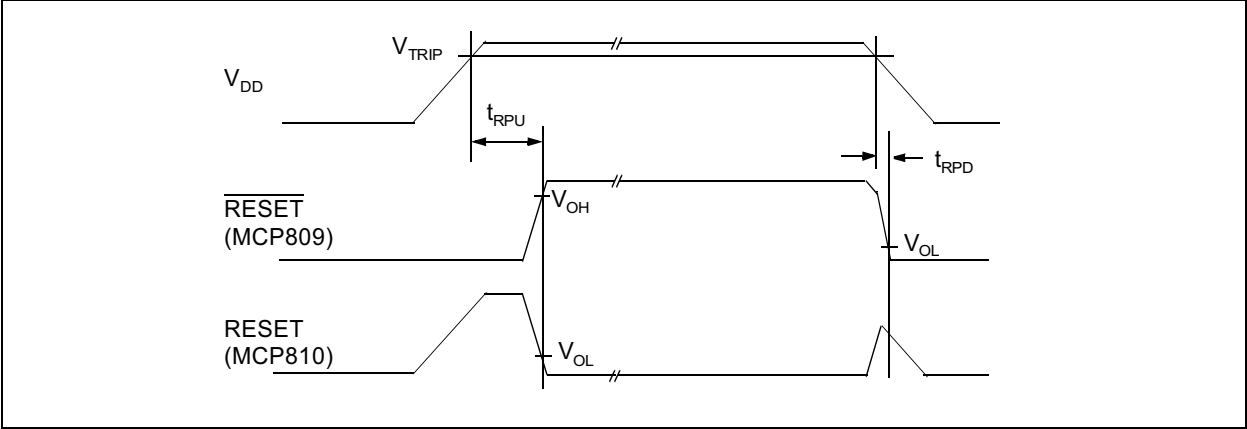


FIGURE 1-1: MCP809/810 TIMING DIAGRAM

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## 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.

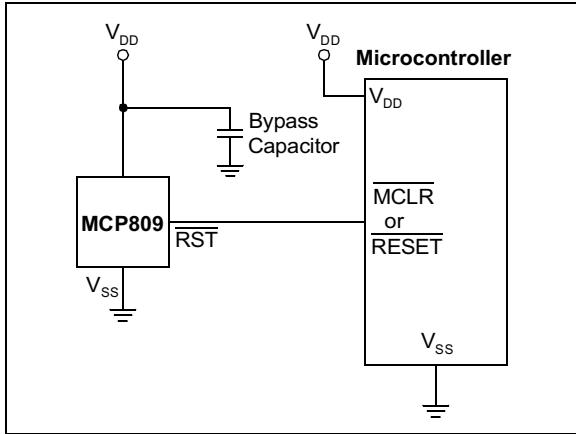


FIGURE 2-1: TYPICAL APPLICATION

### 2.2 Negative Going V<sub>DD</sub> Transients

Many system designers implementing POR circuits are concerned about the minimum pulse width required to cause a reset. Figure shows typical transient duration vs. reset comparator overdrive for which the MCP809/810 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  $\mu\text{F}$  bypass cap mounted as close as possible to the V<sub>DD</sub> pin provides additional transient immunity.

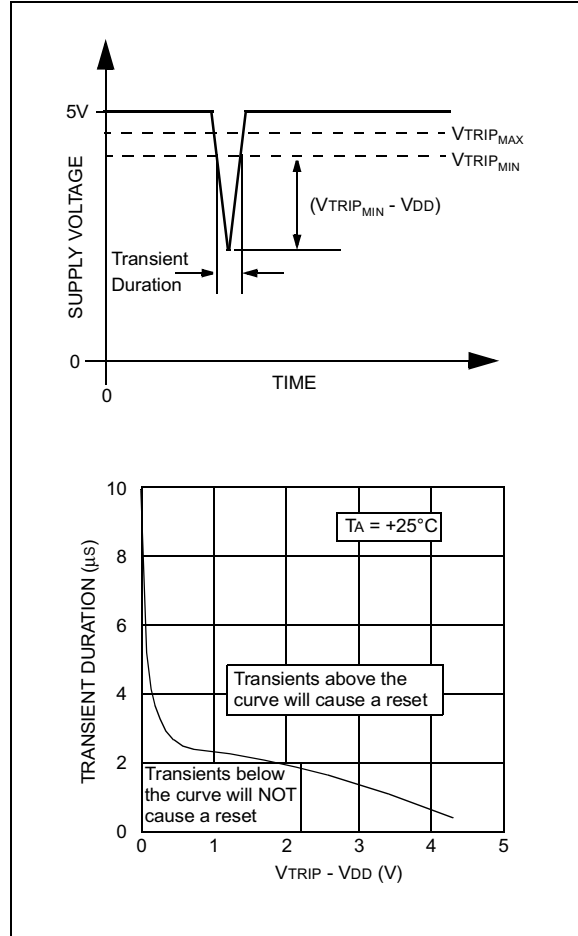
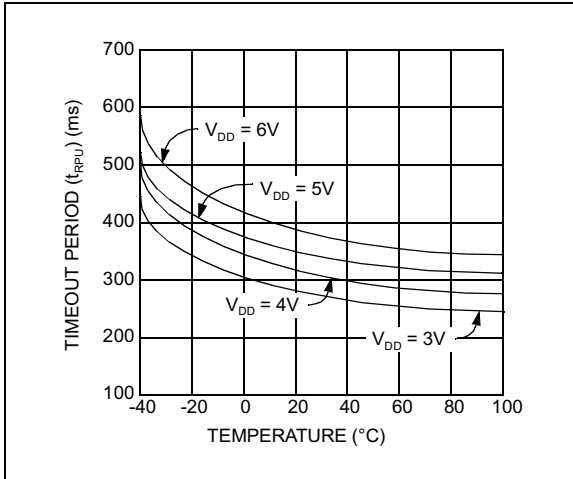


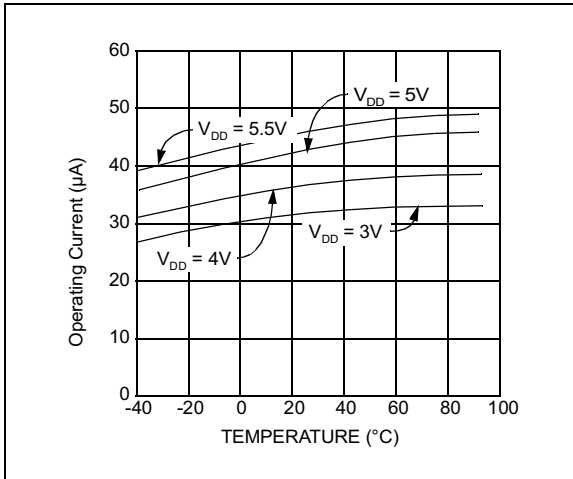
FIGURE 2-2: TYPICAL TRANSIENT RESPONSE

## Effect of Temperature on Timeout Period (t<sub>RPU</sub>)

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



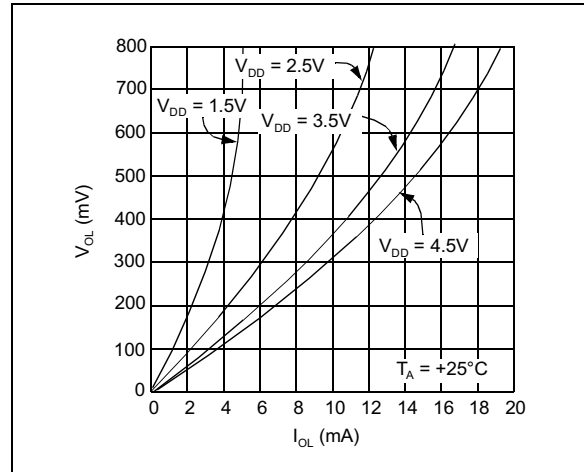
**FIGURE 2-3:** TYPICAL  $t_{RPU}$  VS. TEMPERATURE



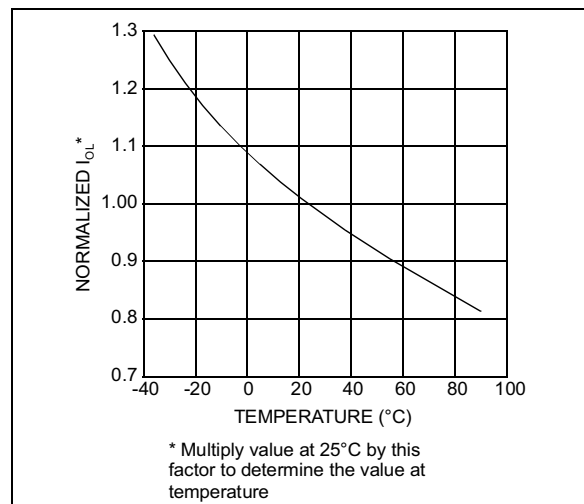
**FIGURE 2-4:**  $I_{DD}$  VS. TEMPERATURE



**FIGURE 2-5:** NORMALIZED  $V_{TRIP}$  VS. TEMPERATURE



**FIGURE 2-6:**  $V_{OL}$  VS.  $I_{OL}$



**FIGURE 2-7:** NORMALIZED  $I_{OL}$  vs. TEMPERATURE

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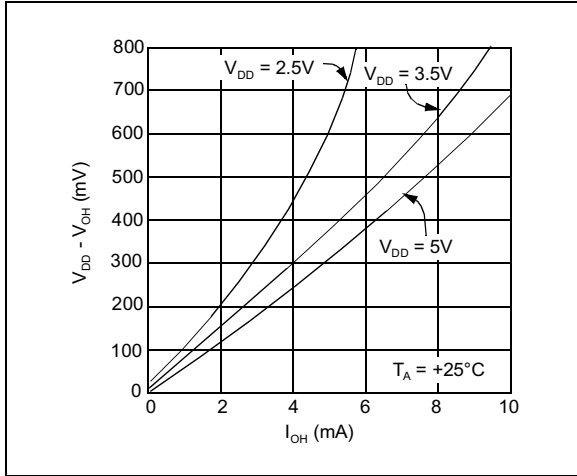


FIGURE 2-8:  $V_{DD} - V_{OH}$  vs.  $I_{OH}$

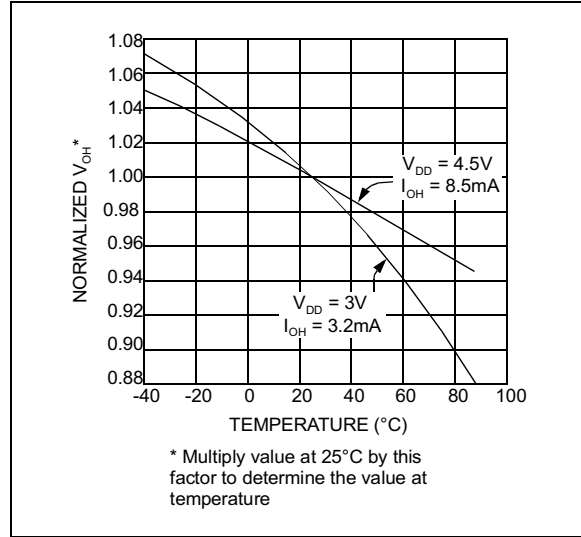


FIGURE 2-9: NORMALIZED  $V_{OH}^*$  vs. TEMPERATURE

## 3.0 PACKAGING INFORMATION

### 3.1 Package Marking Information

3-Lead Plastic Small Outline Transistor (SOT23)



Example:



#### SOT23 PARTS LABELING:

The table below identifies the first 2 characters (XX) in the 4-character field (XXNN) for marking of the 3-Lead SOT23 package.

Mark	Part Number	Mark	Part Number
QR	MCP809T-270I/TT	RR	MCP810T-270I/TT
QS	MCP809T-300I/TT	RS	MCP810T-300I/TT
QT	MCP809T-315I/TT	RT	MCP810T-315I/TT
QU	MCP809T-450I/TT	RU	MCP810T-450I/TT
QV	MCP809T-460I/TT	RV	MCP810T-460I/TT
QW	MCP809T-475I/TT	RW	MCP810T-475I/TT
QZ	MCP809T-485I/TT	RZ	MCP810T-485I/TT

<p><b>Legend:</b> XX...X Customer specific information*</p> <p>YY Year code (last 2 digits of calendar year)</p> <p>WW Week code (week of January 1 is week '01')</p> <p>NNN Alphanumeric traceability code</p>
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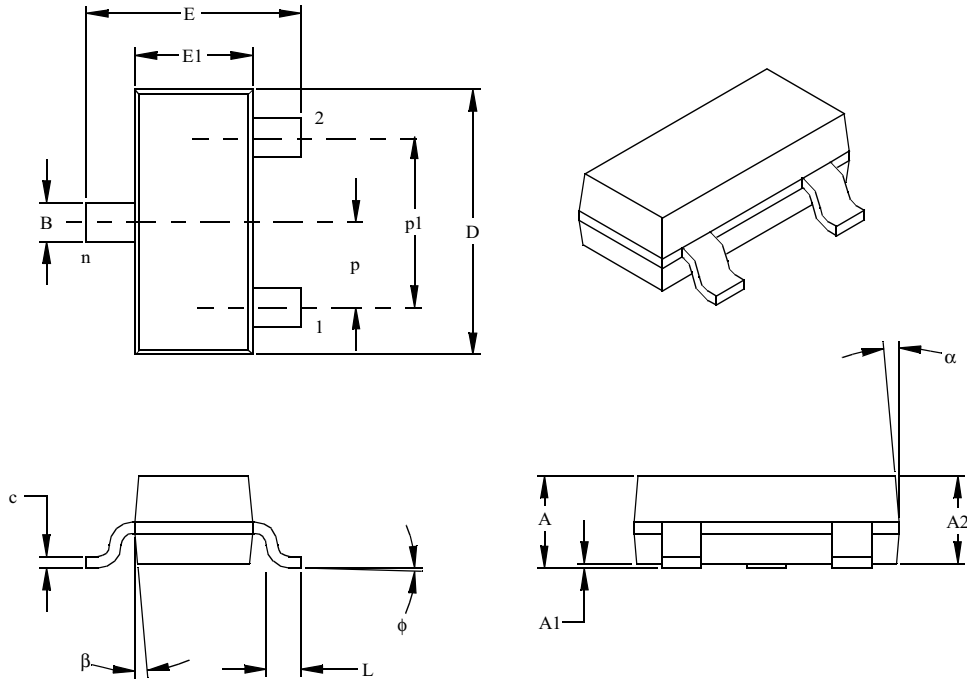
<p><b>Note:</b> In the event the full Microchip part number cannot be marked on one line, it will be carried over to the next line thus limiting the number of available characters for customer specific information.</p>
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- \* Standard OTP marking consists of Microchip part number, year code, week code, and traceability code. For OTP marking beyond this, certain price adders apply. Please check with your Microchip Sales Office. For QTP devices, any special marking adders are included in QTP price.

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## 3.2 Package Detail Information

### 3-Lead Plastic Small Outline Transistor (TT) (SOT23)



Dimension Limits	Units	INCHES*			MILLIMETERS		
		MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		3			3	
Pitch	p		.038			0.96	
Outside lead pitch (basic)	p1		.076			1.92	
Overall Height	A	.035	.040	.044	0.89	1.01	1.12
Molded Package Thickness	A2	.035	.037	.040	0.88	0.95	1.02
Standoff §	A1	.000	.002	.004	0.01	0.06	0.10
Overall Width	E	.083	.093	.104	2.10	2.37	2.64
Molded Package Width	E1	.047	.051	.055	1.20	1.30	1.40
Overall Length	D	.110	.115	.120	2.80	2.92	3.04
Foot Length	L	.014	.018	.022	0.35	0.45	0.55
Foot Angle	φ	0	5	10	0	5	10
Lead Thickness	c	.004	.006	.007	0.09	0.14	0.18
Lead Width	B	.015	.017	.020	0.37	0.44	0.51
Mold Draft Angle Top	α	0	5	10	0	5	10
Mold Draft Angle Bottom	β	0	5	10	0	5	10

\* Controlling Parameter  
 § Significant Characteristic

**Note:**

Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.  
 JEDEC Equivalent: TO-236  
 Drawing No. C04-104



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\_\_\_\_\_  
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<u>PART NO.</u>	<u>X</u>	<u>X</u>	<u>/XX</u>
Device	RESET/ RESET V <sub>TRIP</sub> Voltage	Temperature Range	Package
Device:	MCP809T: Supervisory circuit with active low <u>RESET</u> output (tape & reel)		
	MCP810T: Supervisory circuit with active high <u>RESET</u> output (tape & reel)		
<u>RESET/RESET</u> V <sub>TRIP</sub> 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 = $4.60 \leq V_{TRIP} \leq 4.85$		
Temperature Range:	I = -40°C to +85°C		
Package:	TT = SOT-23 (3 lead) (offered in tape & reel only)		

**Examples:**

a) MCP809T-270I/TT = Tape & Reel, V<sub>TRIP</sub> range of 2.55V - 2.70V, Industrial Temp., SOT-23 package

b) MCP810T-300/TT = Tape & Reel, V<sub>TRIP</sub> range of 2.85V - 3.00V, Industrial Temp., SOT-23 package

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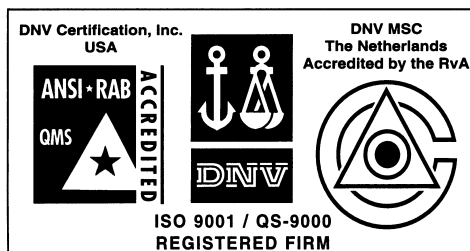
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Australia  
Tel: 61-2-9868-6733 Fax: 61-2-9868-6755

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Co., Ltd., Beijing Liaison Office  
Unit 915  
New China Hong Kong Manhattan Bldg.  
No. 6 Chaoyangmen Beidajie  
Beijing, 100027, No. China  
Tel: 86-10-85282100 Fax: 86-10-85282104

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Tel: 86-755-2350361 Fax: 86-755-2366086

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Unit 901, Tower 2, Metroplaza  
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Tel: 852-2401-1200 Fax: 852-2401-3431

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India Liaison Office  
Divyasree Chambers  
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Bangalore, 560 025, India  
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Lautrup høj 1-3  
Ballerup DK-2750 Denmark  
Tel: 45 4420 9895 Fax: 45 4420 9910

#### France

Arizona Microchip Technology SARL  
Parc d'Activite du Moulin de Massy  
43 Rue du Saule Trapu  
Batiment A - 1er Etage  
91300 Massy, France  
Tel: 33-1-69-53-63-20 Fax: 33-1-69-30-90-79

#### Germany

Arizona Microchip Technology GmbH  
Gustav-Heinemann Ring 125  
D-81739 Munich, Germany  
Tel: 49-89-627-144 0 Fax: 49-89-627-144-44

#### Germany - Analog

Lochamer Strasse 13  
D-82152 Martinsried, Germany  
Tel: 49-89-895650-0 Fax: 49-89-895650-22

#### Italy

Arizona Microchip Technology SRL  
Centro Direzionale Colleoni  
Palazzo Taurus 1 V. Le Colleoni 1  
20041 Agrate Brianza  
Milan, Italy  
Tel: 39-039-65791-1 Fax: 39-039-6899883

#### United Kingdom

Arizona Microchip Technology Ltd.  
505 Eskdale Road  
Winnersh Triangle  
Wokingham  
Berkshire, England RG41 5TU  
Tel: 44 118 921 5869 Fax: 44-118 921-5820

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