MCP809/810

Microcontroller Supervisory Circuit with Push-Pull Output

Features

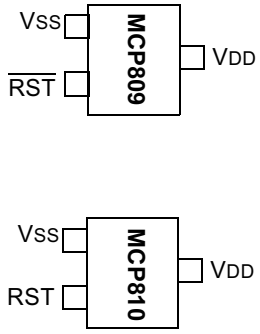
- Holds microcontroller in reset until supply voltage reaches stable operating level
- Resets microcontroller during power loss
- Precision monitoring of 3V, 3.3V and 5V systems
- 7 voltage trip points available
- Active low $\overline{\text{RESET}}$ pin (MCP809) or active high RESET (MCP810)
- Push-pull output
- Holds $\overline{\text{RESET}}$/RESET for 350 ms (typical)
- $\overline{\text{RESET}}$/RESET to V_{DD} = 1.0V
- Accuracy of ±125 mV for 5V systems and ±75 mV for 3V systems over temperature
- 45 µA typical operating current
- Temperature range:
  - Industrial (I): -40°C to +85°C

DESCRIPTION

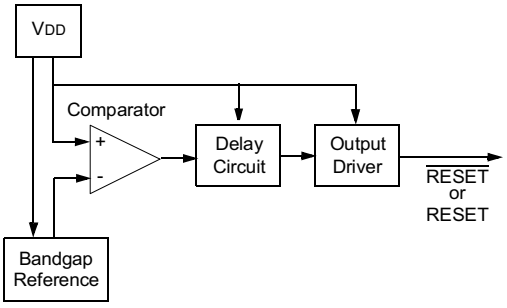
The Microchip Technology Inc. MCP809/810 is a voltage supervisory device designed to keep a microcontroller in reset until the system voltage has reached the proper level and stabilized. It also operates as protection from brown-out conditions when the supply voltage drops below a safe operating level. 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

SOT-23-3



BLOCK DIAGRAM



1.0 ELECTRICAL CHARACTERISTICS

1.1 Maximum Ratings*

VDD.....7.0V

All inputs and outputs w.r.t. VSS .....-0.6V to VDD +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_{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 $\overline{RESET}$/RESET		V_{DDMIN}	1.0	—	—	V	
Operating Current		I_{DD}	—	45	60	µA	V_{DD} = 5.5V (no load)
V_{DD} Trip Point	MCP8XX-270 MCP8XX-300 MCP8XX-315 MCP8XX-450 MCP8XX-460 MCP8XX-475 MCP8XX-485	V_{TRIP}	2.55 2.85 3.0 4.25 4.35 4.50 4.60	2.625 2.925 3.075 4.375 4.475 4.625 4.725	2.7 3.0 3.15 4.50 4.60 4.75 4.85	V	
$\overline{RESET}$ Low Level Output Voltage (MCP809)	MCP809-270 MCP809-300 MCP809-315	V_{OL}	—	—	0.4	V	I_{OL} = 3.2 mA, V_{DD} = $V_{TRIP_{MIN}}$
	MCP809-450 MCP809-460 MCP809-475 MCP809-485		—	—	0.6		I_{OL} = 8.5 mA, V_{DD} = $V_{TRIP_{MIN}}$
$\overline{RESET}$ High Level Output Voltage (MCP809)	MCP809-xxx (All V_{TRIP} Points)	V_{OH}	VDD-0.7	—	—	V	I_{OH} = 3 mA, V_{DD} > $V_{TRIP_{MAX}}$
RESET Low Level Output Voltage (MCP810)	MCP810-270 MCP810-300 MCP810-315	V_{OL}	—	—	0.4	V	I_{OL} = 3.2 mA, V_{DD} > $V_{TRIP_{MAX}}$
	MCP810-450 MCP810-460 MCP810-475 MCP810-485		—	—	0.6		I_{OL} = 8.5 mA, V_{DD} > $V_{TRIP_{MAX}}$
RESET High Level Output Voltage (MCP810)	MCP810-xxx (All VTRIP Points)	V_{OH}	V_{DD}-0.7	—	—	V	I_{OH} = 3 mA, V_{DD} = $V_{TRIP_{MIN}}$
Threshold Hysteresis		V_{HYS}	—	50	—	mV	
V_{DD} Detect to $\overline{RESET}$/RESET Inactive		t_{RPU}	150	350	700	ms	
V_{DD} Detect to $\overline{RESET}$/RESET		t_{RPD}	—	10	—	µs	V_{DD} ramped from V_{TRPMAX} + 250 mV down to $V_{TRIPMIN}$ - 250 mV

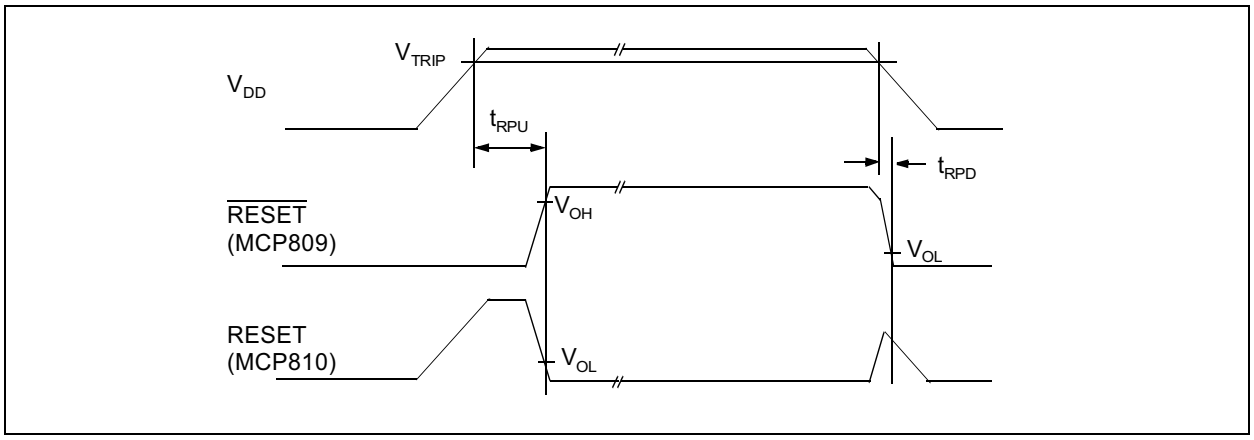


FIGURE 1-1: MCP809/810 TIMING DIAGRAM

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.

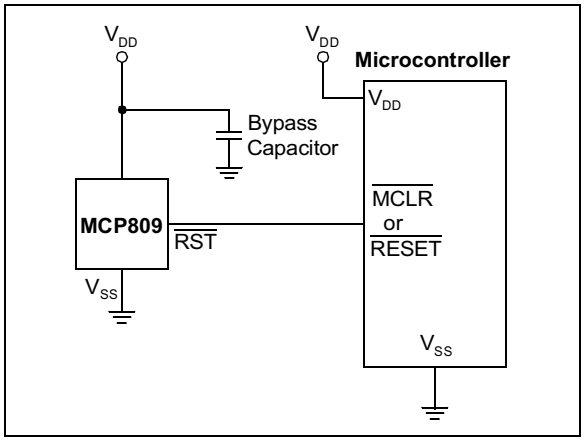


FIGURE 2-1: TYPICAL APPLICATION

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 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 µF bypass cap mounted as close as possible to the V_{DD} pin provides additional transient immunity.

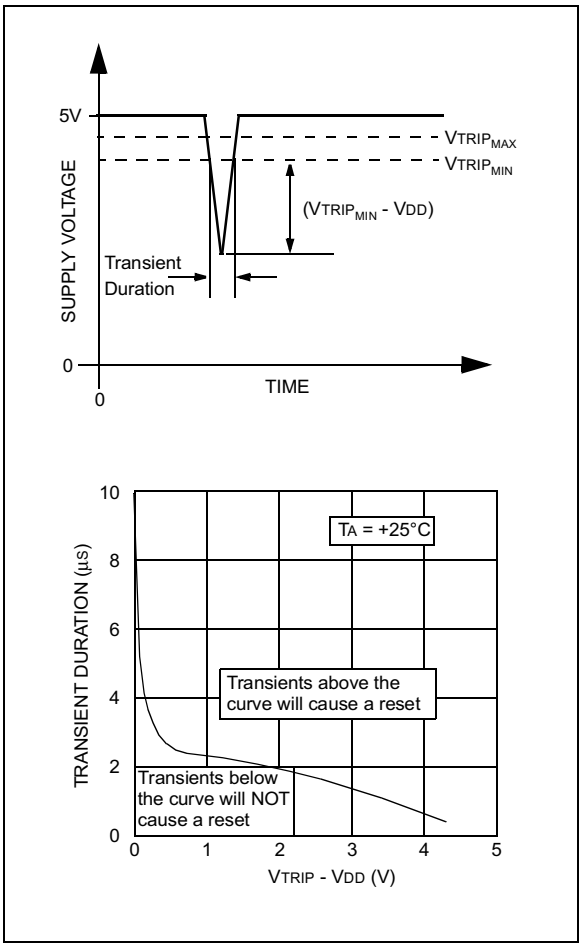


FIGURE 2-2: TYPICAL TRANSIENT RESPONSE

Effect of Temperature on Timeout Period (tRPU)

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

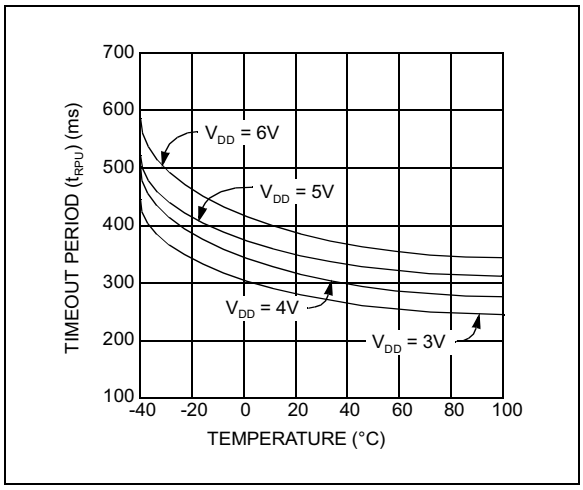


FIGURE 2-3: TYPICAL T_{RPU} VS. TEMPERATURE

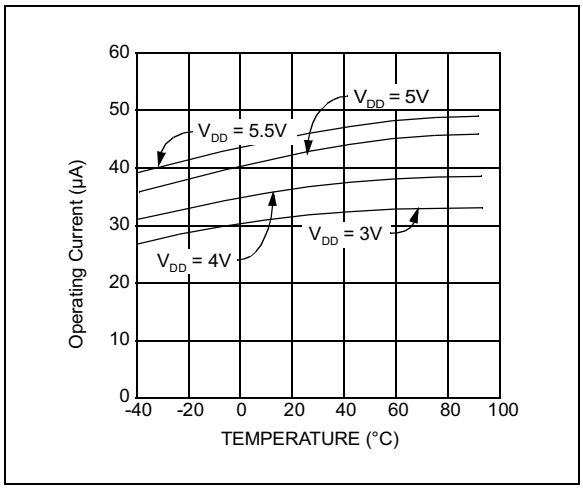


FIGURE 2-4: I_{DD} VS. TEMPERATURE

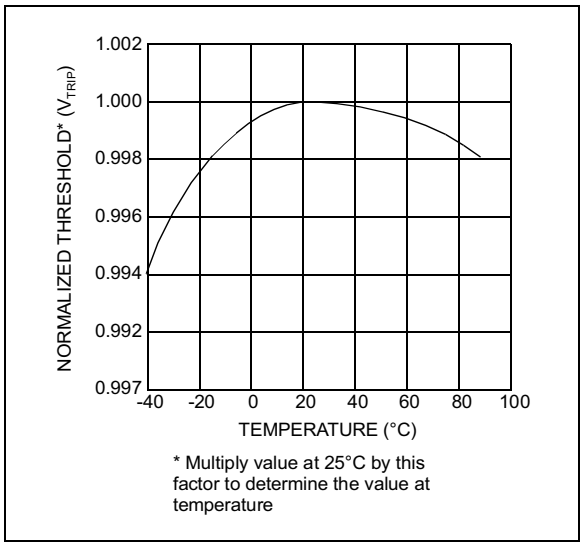


FIGURE 2-5: NORMALIZED V_{TRIP} VS. TEMPERATURE

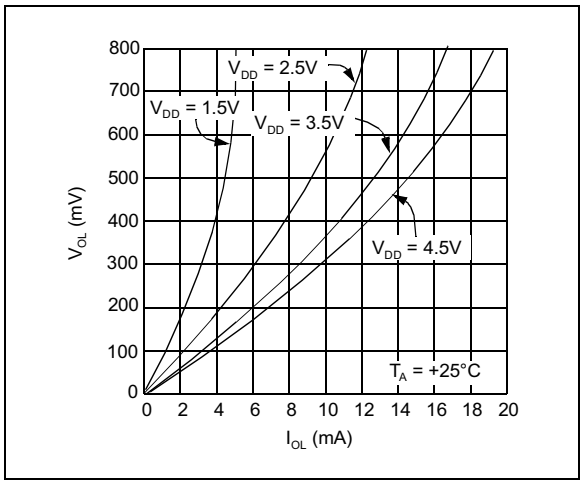


FIGURE 2-6: V_{OL} VS. I_{OL}

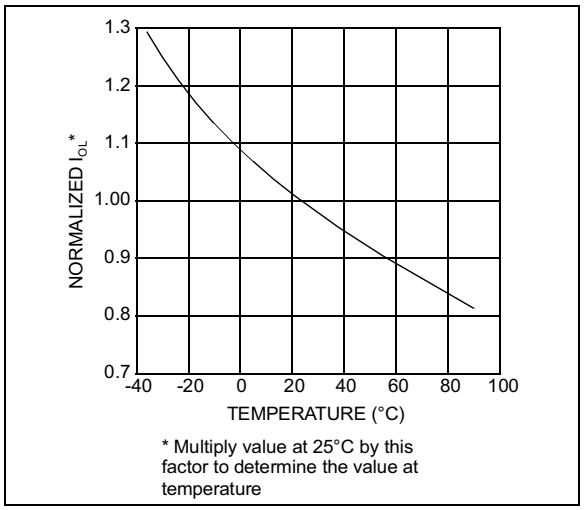


FIGURE 2-7: NORMALIZED I_{OL} vs. TEMPERATURE

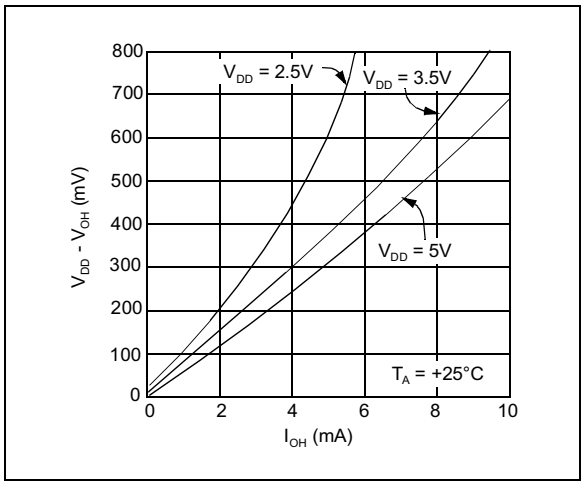


FIGURE 2-8: V_{DD} - V_{OH} *vs.* I_{OH}

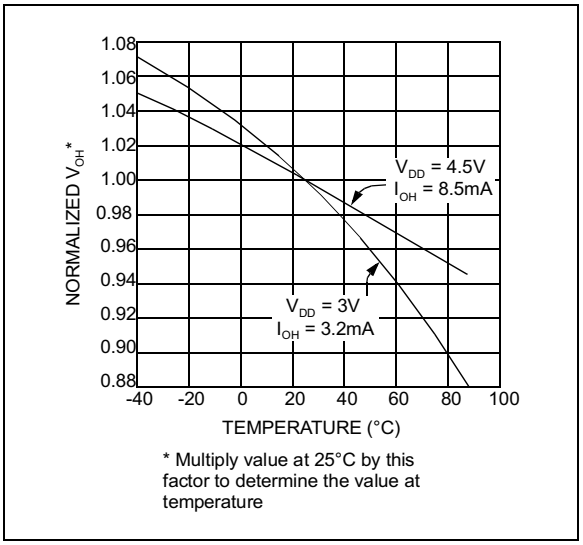
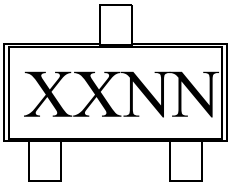


FIGURE 2-9: NORMALIZED V_{OH} vs. TEMPERATURE

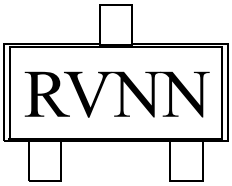
3.0 PACKAGING INFORMATION

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

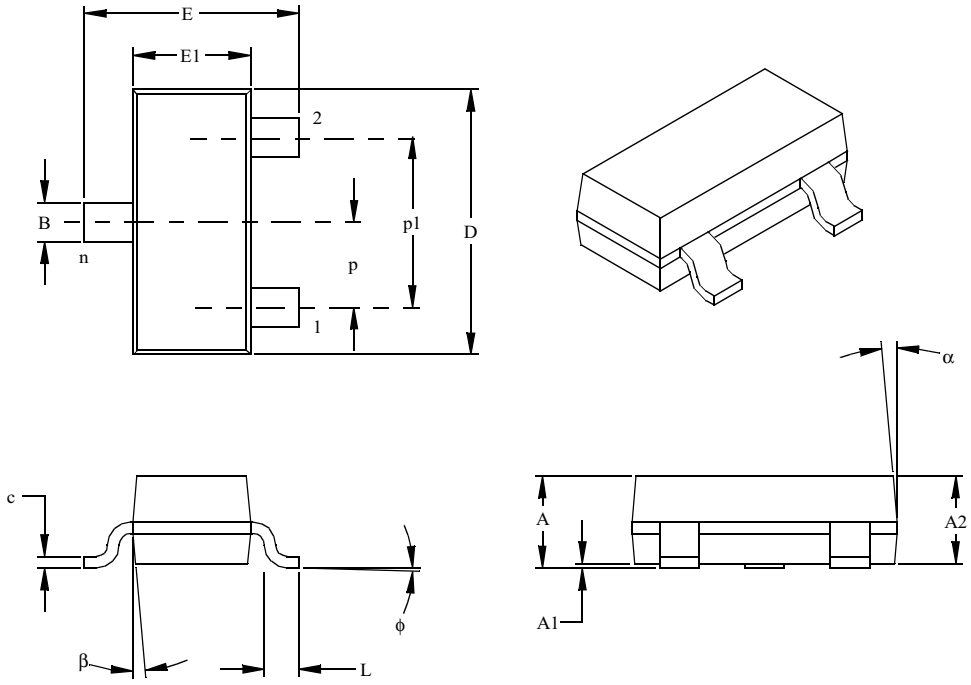
Legend:	XX...X	Customer specific information*
	YY	Year code (last 2 digits of calendar year)
	WW	Week code (week of January 1 is week ‘01’)
	NNN	Alphanumeric traceability code

Note: 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.

* 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.

3.2 Package Detail Information

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



Units		INCHES*			MILLIMETERS		
Dimension Limits		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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8. How would you improve our software, systems, and silicon products?

PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, refer to the factory or the listed sales office.

PART NO.	X	X	/XX
Device	RESET/ $\overline{\text{RESET}}$ V_{TRIP} Voltage	Temperature Range	Package

Device:	MCP809T:	Supervisory circuit with active low $\overline{\text{RESET}}$ output (tape & reel)
	MCP810T:	Supervisory circuit with active high $\overline{\text{RESET}}$ output (tape & reel)
$\overline{\text{RESET}}$/RESET V_{TRIP} Voltage:	270 =	$2.55 \le V_{TRIP} \le 2.70$
	300 =	$2.85 \le V_{TRIP} \le 3.00$
	315 =	$3.00 \le V_{TRIP} \le 3.15$
	450 =	$4.25 \le V_{TRIP} \le 4.50$
	460 =	$4.35 \le V_{TRIP} \le 4.60$
	475 =	$4.50 \le V_{TRIP} \le 4.75$
	485 =	$4.60 \le V_{TRIP} \le 4.85$
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_{TRIP} range of 2.55V - 2.70V, Industrial Temp., SOT-23 package

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

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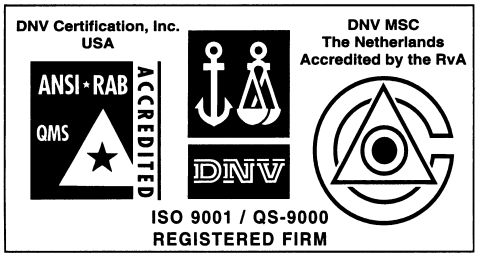

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