

Micropower Voltage Supervisors

Features:

- Ultra-Low Supply Current: 1.75 μ A (steady-state maximum)
- Precision Monitoring Options of:
 - 1.90V, 2.32V, 2.63V, 2.93V, 3.08V, 4.38V and 4.63V
- Resets Microcontroller in a Power-Loss Event
- $\overline{\text{RST}}$ Pin (active-low):
 - **MCP121**: Active-low, Open-drain
 - **MCP131**: Active-low, Open-drain with Internal Pull-up Resistor
 - **MCP102** and **MCP103**: Active-low, Push-pull
- Reset Delay Timer (120 ms delay, typical)
- Available in SOT-23, TO-92 and SC70 Packages
- Temperature Range:
 - Extended: -40°C to $+125^{\circ}\text{C}$ (except **MCP1XX-195**)
 - Industrial: -40°C to $+85^{\circ}\text{C}$ (**MCP1XX-195** only)
- Pb-free Devices

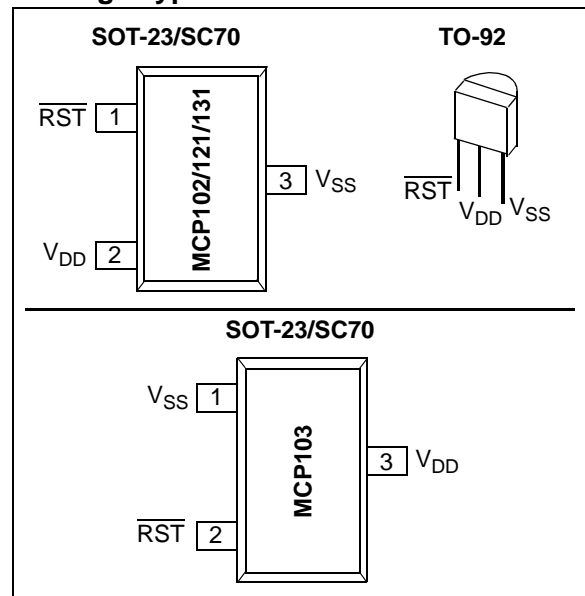
Applications:

- Critical Microcontroller and Microprocessor Power-monitoring Applications
- Computers
- Intelligent Instruments
- Portable Battery-powered Equipment

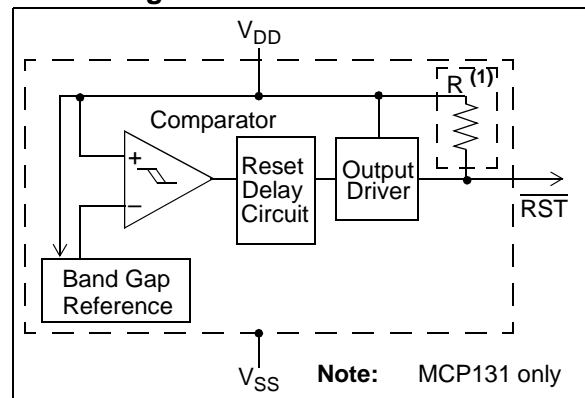
General Description:

The MCP102/103/121/131 devices are voltage supervisor devices designed to keep a microcontroller in reset until the system voltage has reached and stabilized at the proper level for reliable system operation. [Table 1](#) shows the available features for these devices.

Package Types



Block Diagram



MCP102/103/121/131

TABLE 1: DEVICE FEATURES

Device	Output		Reset Delay (typ)	Package Pinout (Pin # 1, 2, 3)	Comment
	Type	Pull-up Resistor			
MCP102	Push-pull	No	120 ms	\overline{RST} , V_{DD} , V_{SS}	
MCP103	Push-pull	No	120 ms	V_{SS} , \overline{RST} , V_{DD}	
MCP121	Open-drain	External	120 ms	\overline{RST} , V_{DD} , V_{SS}	
MCP131	Open-drain	Internal (~95 k Ω)	120 ms	\overline{RST} , V_{DD} , V_{SS}	
MCP111	Open-drain	External	No	V_{OUT} , V_{SS} , V_{DD}	See MCP111/112 Data Sheet (DS21889)
MCP112	Push-Pull	No	No	V_{OUT} , V_{SS} , V_{DD}	See MCP111/112 Data Sheet (DS21889)

1.0 ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings†

V_{DD}	7.0V
Input current (V_{DD})	10 mA
Output current (\overline{RST})	10 mA
Rated Rise Time of V_{DD}	100V/ μ s
All inputs and outputs (except \overline{RST}) w.r.t. V_{SS}	-0.6V to ($V_{DD} + 1.0V$)
\overline{RST} output w.r.t. V_{SS}	-0.6V to 13.5V
Storage temperature	-65°C to + 150°C
Ambient temperature with power applied	-40°C to + 125°C
Maximum Junction temperature with power applied	150°C
ESD protection on all pins	³ 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 CHARACTERISTICS

Electrical Specifications: Unless otherwise indicated, all limits are specified for: $V_{DD} = 1V$ to 5.5V, $R_{PU} = 100\text{ k}\Omega$ (**MCP121** only), $T_A = -40^\circ\text{C}$ to $+125^\circ\text{C}$.

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions	
Operating Voltage Range	V_{DD}	1.0	—	5.5	V		
Specified V_{DD} Value to \overline{RST} low	V_{DD}	1.0	—		V	$I_{\overline{RST}} = 10\ \mu\text{A}$, $V_{\overline{RST}} < 0.2V$	
Operating Current	MCP102, MCP103, MCP121	I_{DD}	—	< 1	1.75	μA	Reset Power-up Timer (t_{RPU}) Inactive
			—	—	20.0	μA	Reset Power-up Timer (t_{RPU}) Active
	MCP131	I_{DD}	—	< 1	1.75	μA	$V_{DD} > V_{TRIP}$ and Reset Power-up Timer (t_{RPU}) Inactive
			—	—	75	μA	$V_{DD} < V_{TRIP}$ and Reset Power-up Timer (t_{RPU}) Inactive (Note 3)
			—	—	90	μA	Reset Power-up Timer (t_{RPU}) Active (Note 4)

- Note 1:** Trip point is $\pm 1.5\%$ from typical value.
Note 2: Trip point is $\pm 2.5\%$ from typical value.
Note 3: \overline{RST} output is forced low. There is a current through the internal pull-up resistor.
Note 4: This includes the current through the internal pull-up resistor and the reset power-up timer.
Note 5: This specification allows this device to be used in PIC[®] microcontroller applications that require In-Circuit Serial Programming™ (ICSP™) (see device-specific programming specifications for voltage requirements). This specification DOES NOT allow a continuous high voltage to be present on the open-drain output pin (V_{OUT}). The total time that the V_{OUT} pin can be above the maximum device operational voltage (5.5V) is 100s. Current into the V_{OUT} pin should be limited to 2 mA and it is recommended that the device operational temperature be maintained between 0°C to 70°C (+25°C preferred). For additional information, please refer to [Figure 2-33](#).
Note 6: This parameter is established by characterization and not 100% tested.

MCP102/103/121/131

DC CHARACTERISTICS (CONTINUED)

Electrical Specifications: Unless otherwise indicated, all limits are specified for: $V_{DD} = 1V$ to $5.5V$, $R_{PU} = 100\text{ k}\Omega$ (**MCP121** only), $T_A = -40^\circ\text{C}$ to $+125^\circ\text{C}$.

Parameters		Sym.	Min.	Typ.	Max.	Units	Conditions
V _{DD} Trip Point	MCP1XX-195	V _{TRIP}	1.872	1.900	1.929	V	T _A = +25°C (Note 1)
			1.853	1.900	1.948	V	T _A = -40°C to +85°C (Note 2)
	MCP1XX-240		2.285	2.320	2.355	V	T _A = +25°C (Note 1)
			2.262	2.320	2.378	V	Note 2
	MCP1XX-270		2.591	2.630	2.670	V	T _A = +25°C (Note 1)
			2.564	2.630	2.696	V	Note 2
	MCP1XX-300		2.886	2.930	2.974	V	T _A = +25°C (Note 1)
			2.857	2.930	3.003	V	Note 2
	MCP1XX-315		3.034	3.080	3.126	V	T _A = +25°C (Note 1)
			3.003	3.080	3.157	V	Note 2
	MCP1XX-450		4.314	4.380	4.446	V	T _A = +25°C (Note 1)
			4.271	4.380	4.490	V	Note 2
MCP1XX-475	4.561	4.630	4.700	V	T _A = +25°C (Note 1)		
	4.514	4.630	4.746	V	Note 2		
V _{DD} Trip Point Tempco		T _{TPCO}	—	±100	—	ppm/°C	
Threshold Hysteresis (min. = 1%, max = 6%)	MCP1XX-195	V _{HYS}	0.019	—	0.114	V	T _A = +25°C
	MCP1XX-240		0.023	—	0.139	V	
	MCP1XX-270		0.026	—	0.158	V	
	MCP1XX-300		0.029	—	0.176	V	
	MCP1XX-315		0.031	—	0.185	V	
	MCP1XX-450		0.044	—	0.263	V	
	MCP1XX-475		0.046	—	0.278	V	
R _{ST} Low-level Output Voltage		V _{OL}	—	—	0.4	V	I _{OL} = 500 μA, V _{DD} = V _{TRIP(MIN)}
R _{ST} High-level Output Voltage (MCP102 and MCP103 only)		V _{OH}	V _{DD} - 0.6	—	—	V	I _{OH} = 1 mA; for MCP102/MCP103 only (push-pull output)
Internal Pull-up Resistor (MCP131 only)		R _{PU}	—	95	—	kΩ	V _{DD} = 5.5V
Open-drain High Voltage on Output (MCP121 only)		V _{ODH}	—	—	13.5 ⁽⁵⁾	V	V _{DD} = 3.0V, Time voltage > 5.5V applied ≤ 100s, current into pin limited to 2 mA, 25°C operation recommended (Note 5, Note 6)
Open-drain Output Leakage Current (MCP121 only)		I _{OD}	—	0.1	—	μA	

- Note**
- 1: Trip point is ±1.5% from typical value.
 - 2: Trip point is ±2.5% from typical value.
 - 3: R_{ST} output is forced low. There is a current through the internal pull-up resistor.
 - 4: This includes the current through the internal pull-up resistor and the reset power-up timer.
 - 5: This specification allows this device to be used in PIC[®] microcontroller applications that require In-Circuit Serial Programming[™] (ICSP[™]) (see device-specific programming specifications for voltage requirements). This specification DOES NOT allow a continuous high voltage to be present on the open-drain output pin (V_{OUT}). The total time that the V_{OUT} pin can be above the maximum device operational voltage (5.5V) is 100s. Current into the V_{OUT} pin should be limited to 2 mA and it is recommended that the device operational temperature be maintained between 0°C to 70°C (+25°C preferred). For additional information, please refer to [Figure 2-33](#).
 - 6: This parameter is established by characterization and not 100% tested.

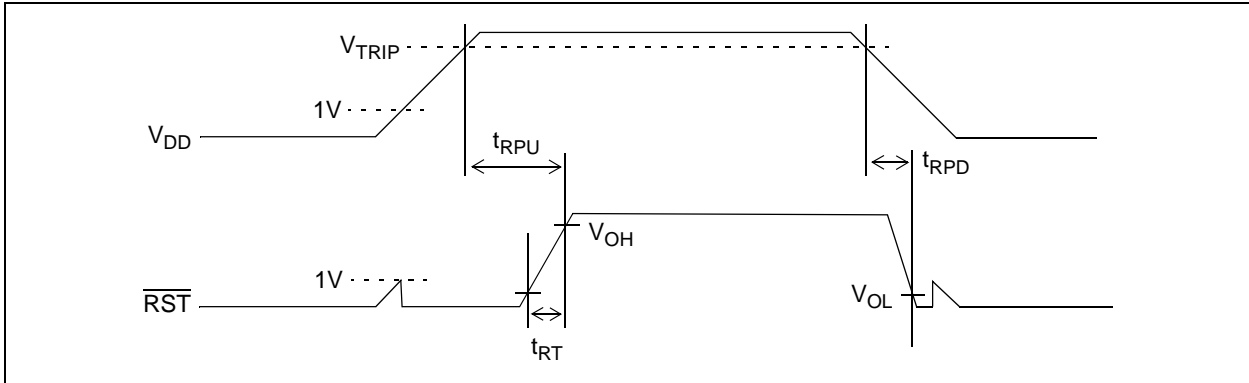


FIGURE 1-1: Timing Diagram.

AC CHARACTERISTICS

Electrical Specifications: Unless otherwise indicated, all limits are specified for: $V_{DD} = 1V$ to $5.5V$, $R_{PU} = 100\text{ k}\Omega$ (MCP121 only), $T_A = -40^\circ\text{C}$ to $+125^\circ\text{C}$.

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions
V_{DD} Detect to $\overline{\text{RST}}$ Inactive	t_{RPU}	80	120	180	ms	Figure 1-1 and $C_L = 50\text{ pF}$
V_{DD} Detect to $\overline{\text{RST}}$ Active	t_{RPD}	—	130	—	μs	V_{DD} ramped from $V_{TRIP(MAX)} + 250\text{ mV}$ down to $V_{TRIP(MIN)} - 250\text{ mV}$, per Figure 1-1, $C_L = 50\text{ pF}$ (Note 1)
$\overline{\text{RST}}$ Rise Time After $\overline{\text{RST}}$ Active (MCP102 and MCP103 only)	t_{RT}	—	5	—	μs	For $\overline{\text{RST}}$ 10% to 90% of final value per Figure 1-1, $C_L = 50\text{ pF}$ (Note 1)

Note 1: These parameters are for design guidance only and are not 100% tested.

TEMPERATURE CHARACTERISTICS

Electrical Specifications: Unless otherwise noted, all limits are specified for: $V_{DD} = 1V$ to $5.5V$, $R_{PU} = 100\text{ k}\Omega$ (MCP121 only), $T_A = -40^\circ\text{C}$ to $+125^\circ\text{C}$.

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions
Temperature Ranges						
Specified Temperature Range	T_A	-40	—	+85	$^\circ\text{C}$	MCP1XX-195
Specified Temperature Range	T_A	-40	—	+125	$^\circ\text{C}$	Except MCP1XX-195
Maximum Junction Temperature	T_J	—	—	+150	$^\circ\text{C}$	
Storage Temperature Range	T_A	-65	—	+150	$^\circ\text{C}$	
Package Thermal Resistances						
Thermal Resistance, 3L-SOT-23	θ_{JA}	—	308	—	$^\circ\text{C/W}$	
Thermal Resistance, 3L-SC70	θ_{JA}	—	335	—	$^\circ\text{C/W}$	
Thermal Resistance, 3L-TO-92	θ_{JA}	—	146	—	$^\circ\text{C/W}$	

MCP102/103/121/131

2.0 TYPICAL PERFORMANCE CURVES

Note: The graphs and tables provided following this note are a statistical summary based on a limited number of samples and are provided for informational purposes only. The performance characteristics listed herein are not tested or guaranteed. In some graphs or tables, the data presented may be outside the specified operating range (e.g., outside specified power supply range) and therefore outside the warranted range.

Note: Unless otherwise indicated, all limits are specified for: $V_{DD} = 1V$ to $5.5V$, $R_{PU} = 100\text{ k}\Omega$ (MCP121 only; see Figure 4-1), $T_A = -40^\circ\text{C}$ to $+125^\circ\text{C}$.

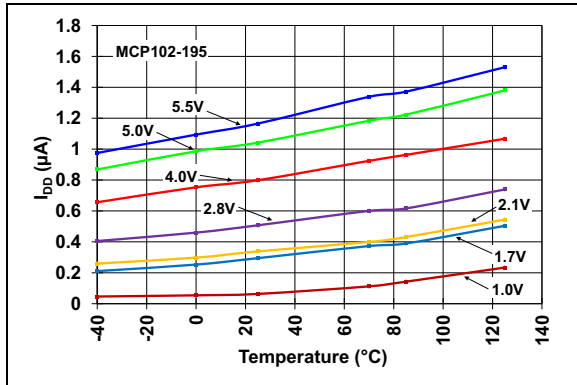


FIGURE 2-1: I_{DD} vs. Temperature (Reset Power-up Timer Inactive) (MCP102-195).

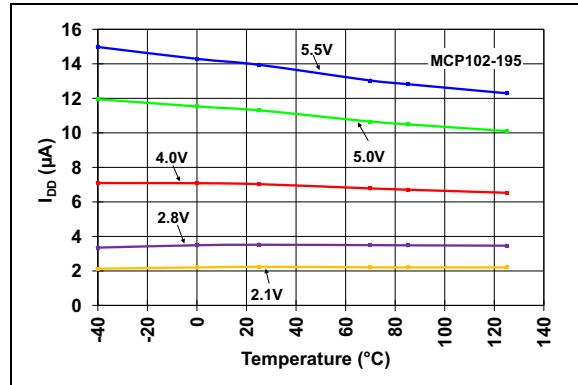


FIGURE 2-4: I_{DD} vs. Temperature (Reset Power-up Timer Active) (MCP102-195).

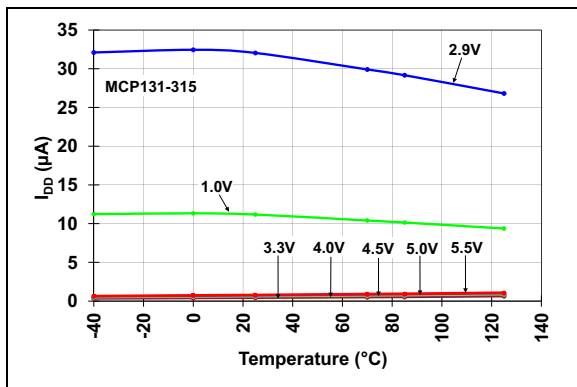


FIGURE 2-2: I_{DD} vs. Temperature (Reset Power-up Timer Inactive) (MCP131-315).

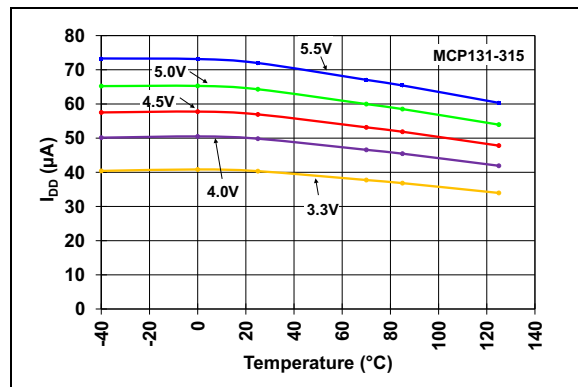


FIGURE 2-5: I_{DD} vs. Temperature (Reset Power-up Timer Active) (MCP131-315).

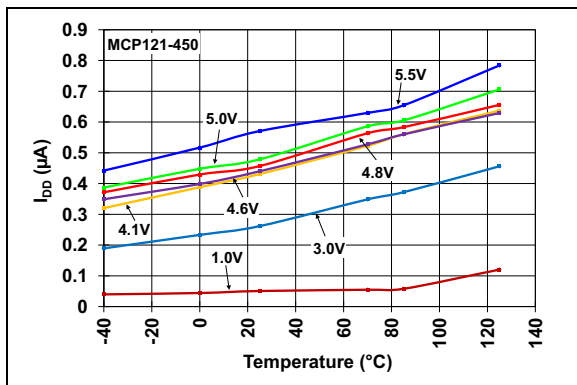


FIGURE 2-3: I_{DD} vs. Temperature (Reset Power-up Timer Inactive) (MCP121-450).

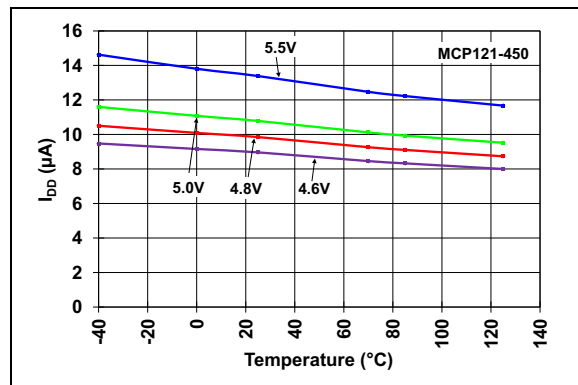


FIGURE 2-6: I_{DD} vs. Temperature (Reset Power-up Timer Active) (MCP121-450).

MCP102/103/121/131

Note: Unless otherwise indicated, all limits are specified for: $V_{DD} = 1V$ to $5.5V$, $R_{PU} = 100\text{ k}\Omega$ (MCP121 only; see Figure 4-1), $T_A = -40^\circ\text{C}$ to $+125^\circ\text{C}$.

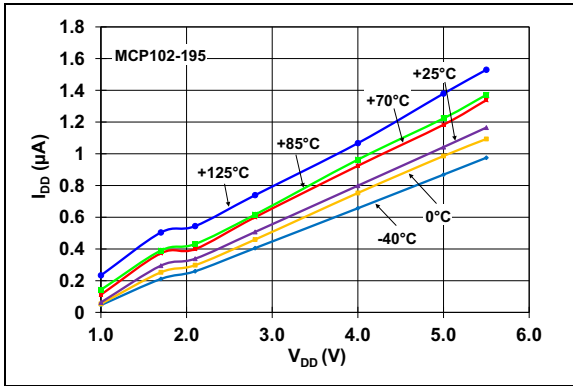


FIGURE 2-7: I_{DD} vs. V_{DD}
(Reset Power-up Timer Inactive) (MCP102-195).

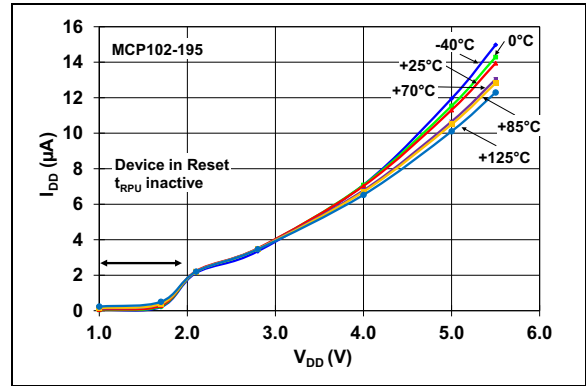


FIGURE 2-10: I_{DD} vs. V_{DD}
(Reset Power-up Timer Active) (MCP102-195).

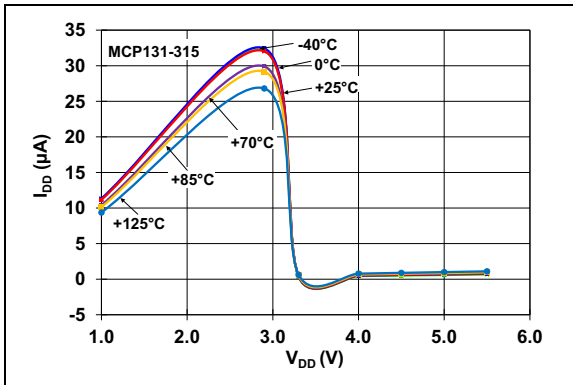


FIGURE 2-8: I_{DD} vs. V_{DD}
(Reset Power-up Timer Inactive) (MCP131-315).

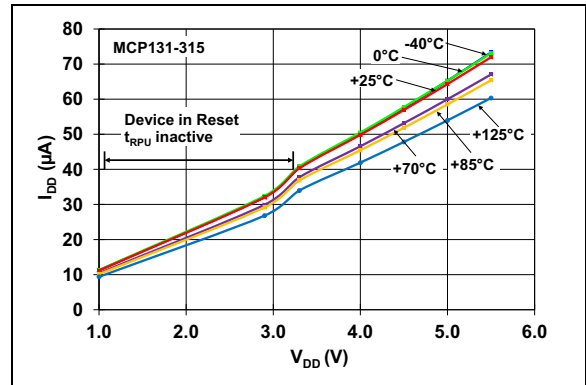


FIGURE 2-11: I_{DD} vs. V_{DD}
(Reset Power-up Timer Active) (MCP131-315).

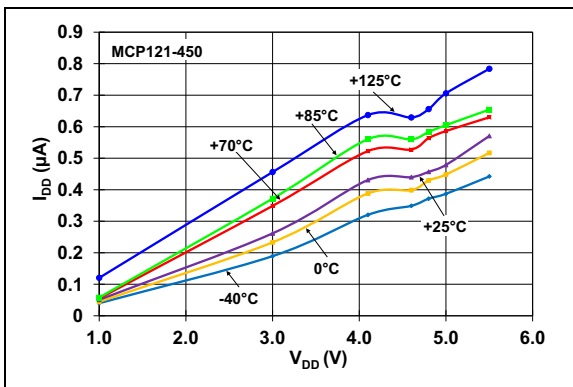


FIGURE 2-9: I_{DD} vs. V_{DD}
(Reset Power-up Timer Inactive) (MCP121-450).

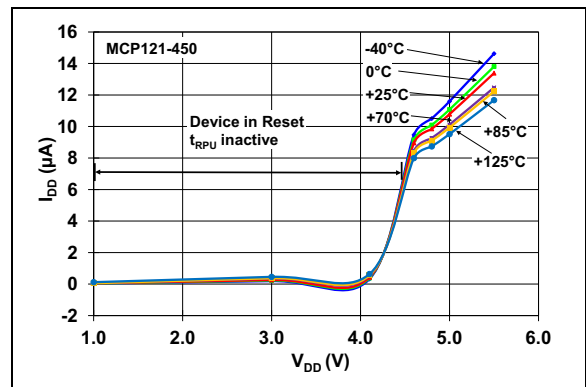


FIGURE 2-12: I_{DD} vs. V_{DD}
(Reset Power-up Timer Active) (MCP121-450).

MCP102/103/121/131

Note: Unless otherwise indicated, all limits are specified for: $V_{DD} = 1V$ to $5.5V$, $R_{PU} = 100\text{ k}\Omega$ (MCP121; see Figure 4-1), $T_A = -40^\circ\text{C}$ to $+125^\circ\text{C}$.

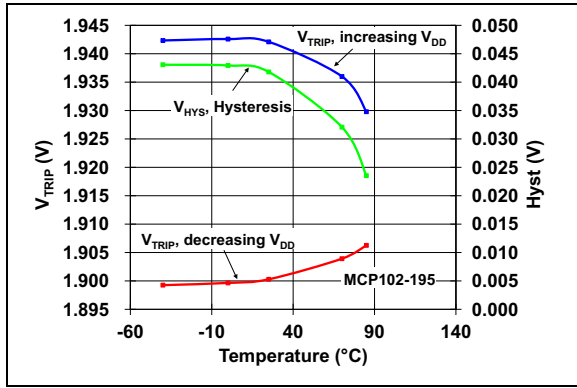


FIGURE 2-13: V_{TRIP} vs. Temperature vs. Hysteresis (MCP102-195).

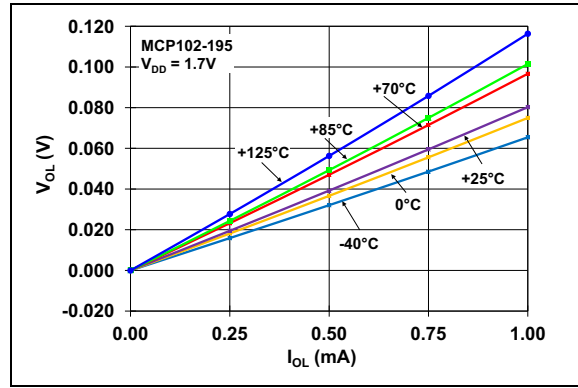


FIGURE 2-16: V_{OL} vs. I_{OL} (MCP102-195 @ $V_{DD} = 1.7V$).

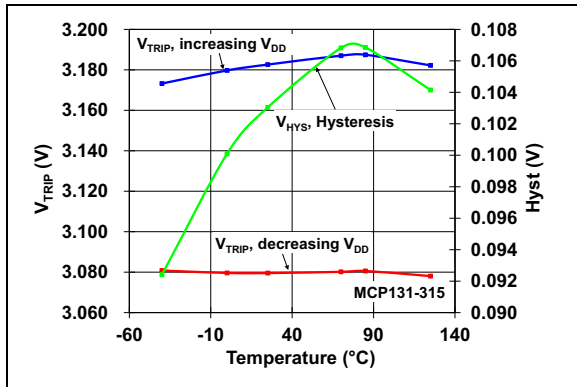


FIGURE 2-14: V_{TRIP} vs. Temperature vs. Hysteresis (MCP131-315).

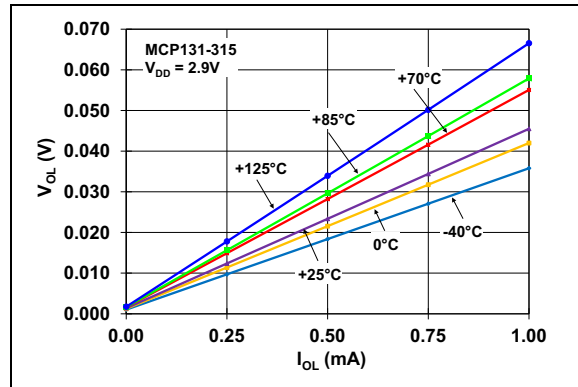


FIGURE 2-17: V_{OL} vs. I_{OL} (MCP131-315 @ $V_{DD} = 2.9V$).

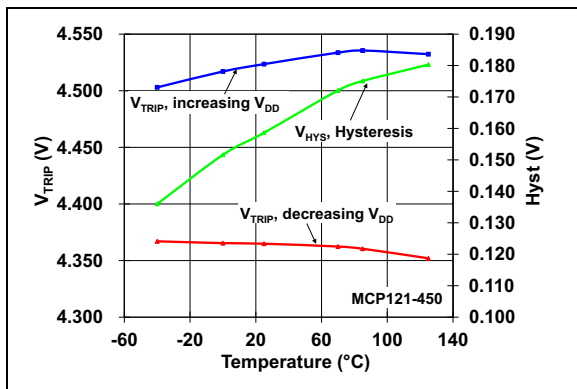


FIGURE 2-15: V_{TRIP} vs. Temperature vs. Hysteresis (MCP121-450).

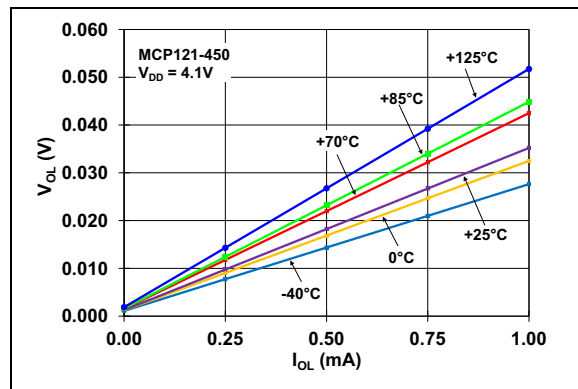


FIGURE 2-18: V_{OL} vs. I_{OL} (MCP121-450 @ $V_{DD} = 4.1V$).

MCP102/103/121/131

Note: Unless otherwise indicated, all limits are specified for: $V_{DD} = 1V$ to $5.5V$, $R_{PU} = 100\text{ k}\Omega$ (MCP121 only; see Figure 4-1), $T_A = -40^\circ\text{C}$ to $+125^\circ\text{C}$.

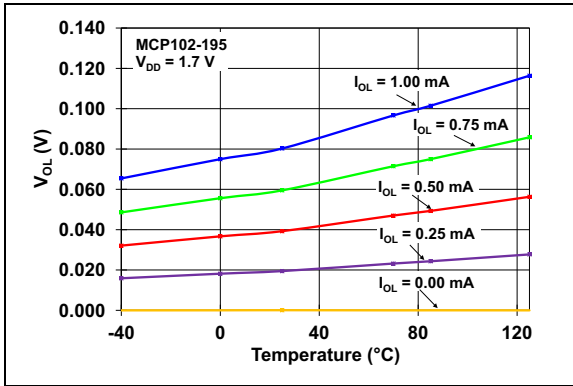


FIGURE 2-19: V_{OL} vs. Temperature (MCP102-195 @ $V_{DD} = 1.7V$).

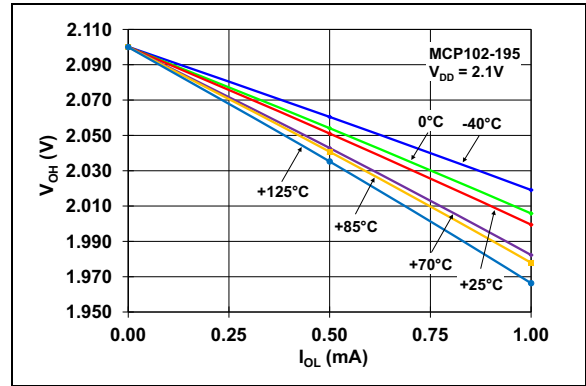


FIGURE 2-22: V_{OH} vs. I_{OL} (MCP102-195 @ $V_{DD} = 2.1V$).

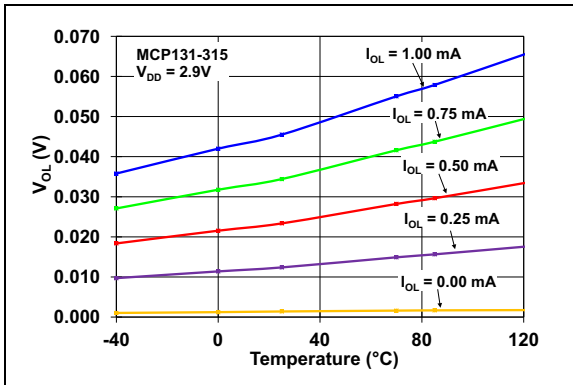


FIGURE 2-20: V_{OL} vs. Temperature (MCP131-315 @ $V_{DD} = 2.9V$).

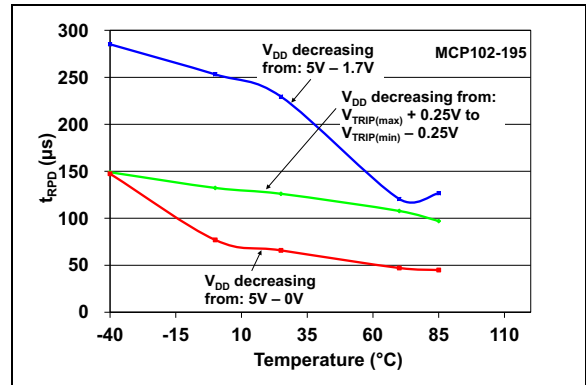


FIGURE 2-23: t_{RPD} vs. Temperature (MCP102-195).

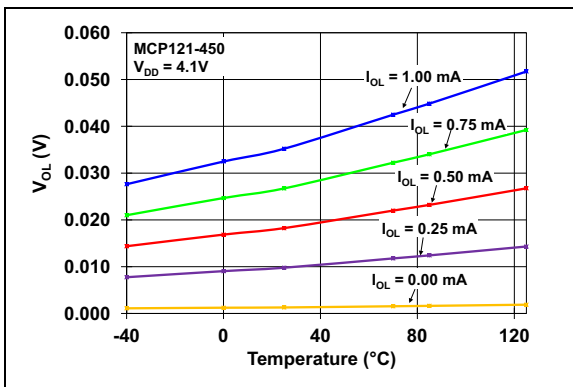


FIGURE 2-21: V_{OL} vs. Temperature (MCP121-450 @ $V_{DD} = 4.1V$).

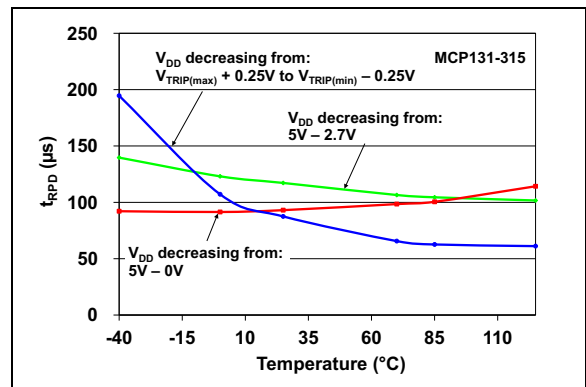


FIGURE 2-24: t_{RPD} vs. Temperature (MCP131-315).

MCP102/103/121/131

Note: Unless otherwise indicated, all limits are specified for: $V_{DD} = 1V$ to $5.5V$, $R_{PU} = 100\text{ k}\Omega$ (MCP121 only; see Figure 4-1), $T_A = -40^\circ\text{C}$ to $+125^\circ\text{C}$.

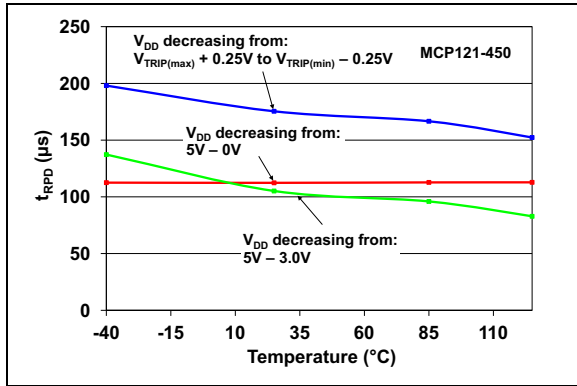


FIGURE 2-25: t_{RPD} vs. Temperature (MCP121-450).

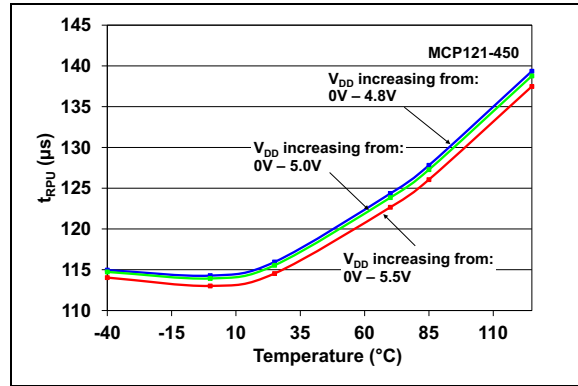


FIGURE 2-28: t_{RPU} vs. Temperature (MCP121-450).

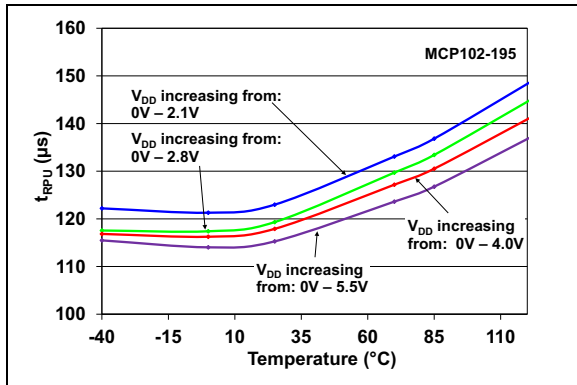


FIGURE 2-26: t_{RPU} vs. Temperature (MCP102-195).

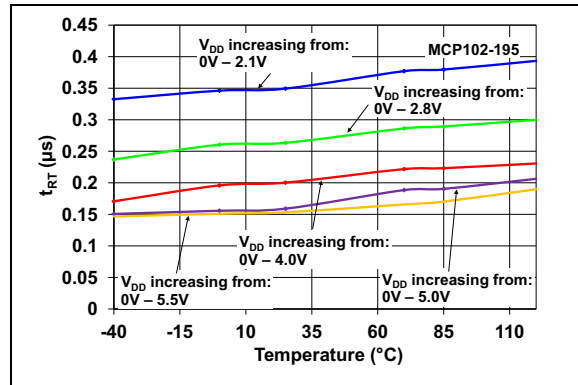


FIGURE 2-29: t_{RT} vs. Temperature (MCP102-195).

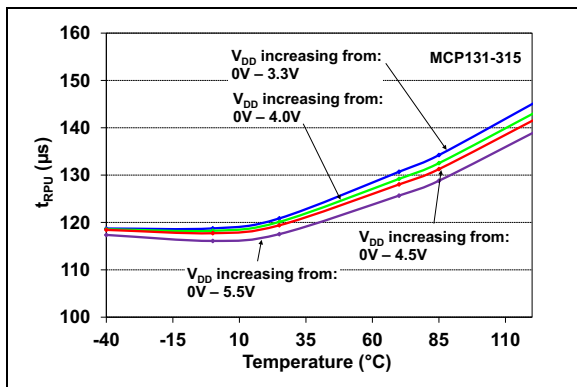


FIGURE 2-27: t_{RPU} vs. Temperature (MCP131-315).

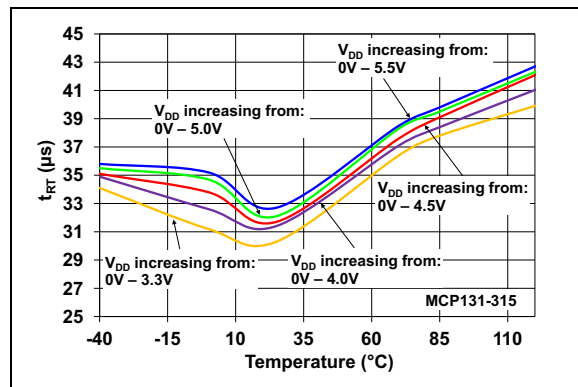


FIGURE 2-30: t_{RT} vs. Temperature (MCP131-315).

Note: Unless otherwise indicated, all limits are specified for: $V_{DD} = 1V$ to $5.5V$, $R_{PU} = 100\text{ k}\Omega$ (MCP121 only; see Figure 4-1), $T_A = -40^\circ\text{C}$ to $+125^\circ\text{C}$.

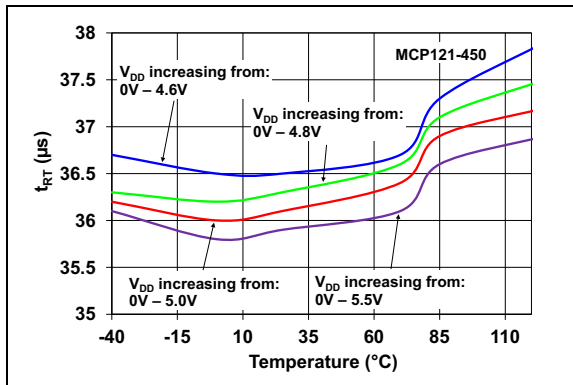


FIGURE 2-31: t_{RT} vs. Temperature (MCP121-450).

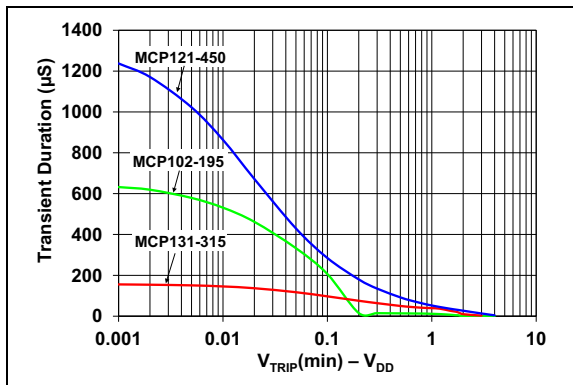


FIGURE 2-32: Transient Duration vs. $V_{TRIP(min)} - V_{DD}$.

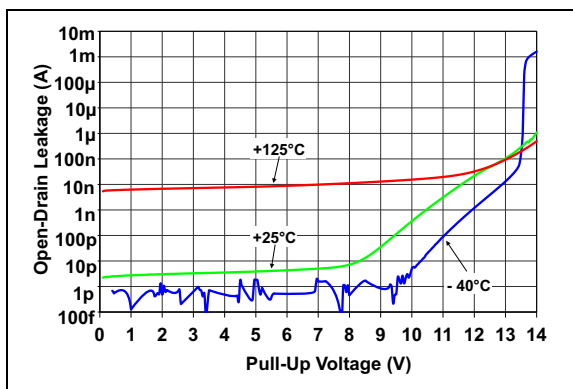


FIGURE 2-33: Open-Drain Leakage Current vs. Voltage Applied to V_{OUT} Pin (MCP121-195).

MCP102/103/121/131

3.0 PIN DESCRIPTION

The descriptions of the pins are listed in [Table 3-1](#).

TABLE 3-1: PIN FUNCTION TABLE

Pin No.		Symbol	Function
MCP102 MCP121 MCP131	MCP103		
1	2	$\overline{\text{RST}}$	Output State V_{DD} Falling: $H = V_{DD} > V_{TRIP}$ $L = V_{DD} < V_{TRIP}$ V_{DD} Rising: $H = V_{DD} > V_{TRIP} + V_{HYS}$ $L = V_{DD} < V_{TRIP} + V_{HYS}$
2	3	V_{DD}	Positive power supply
3	1	V_{SS}	Ground reference

4.0 APPLICATION INFORMATION

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. The second most common cause is when a slowly decaying power supply causes the microcontroller to begin executing instructions without sufficient voltage to sustain volatile memory (RAM), thus producing indeterminate results. Figure 4-1 shows a typical application circuit.

MCP102/103/121/131 are voltage supervisor devices designed to keep a microcontroller in reset until the system voltage has reached and stabilized at the proper level for reliable system operation. These devices also operate as protection from brown-out conditions.

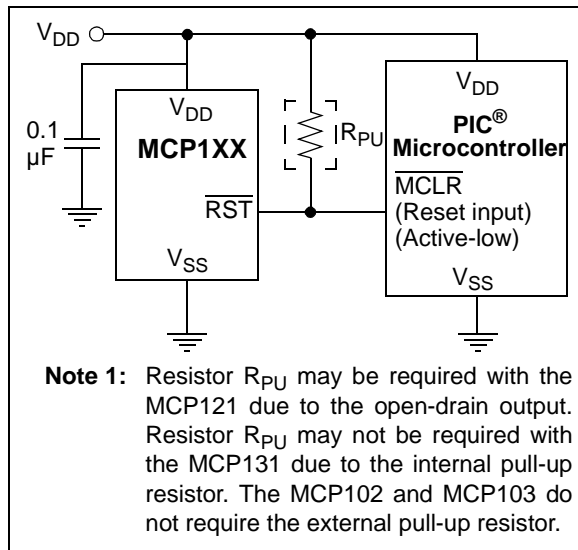


FIGURE 4-1: Typical Application Circuit.

4.1 \overline{RST} Operation

The \overline{RST} output pin operation determines how the device can be used and indicates when the system should be forced into reset. To accomplish this, an internal voltage reference is used to set the voltage trip point (V_{TRIP}). Additionally, there is a hysteresis on this trip point.

When the falling edge of V_{DD} crosses this voltage threshold, the reset power-down timer (t_{RPD}) starts. When this delay timer times out, the \overline{RST} pin is forced low.

When the rising edge of V_{DD} crosses this voltage threshold, the reset power-up timer (t_{RPU}) starts. When this delay timer times out, the \overline{RST} pin is forced high, t_{RPU} is active and there is additional system current.

The actual voltage trip point (V_{TRIPAC}) will be between the minimum trip point ($V_{TRIPMIN}$) and the maximum trip point ($V_{TRIPMAX}$). The hysteresis on this trip point and the delay timer (t_{RPU}) are to remove any "jitter" that would occur on the \overline{RST} pin when the device V_{DD} is at the trip point.

Figure 4-2 shows the waveform of the \overline{RST} pin as determined by the V_{DD} voltage, while Table 4-1 shows the state of the \overline{RST} pin. The V_{TRIP} specification is for falling V_{DD} voltages. When the V_{DD} voltage is rising, the \overline{RST} will not be driven high until V_{DD} is at $V_{TRIP} + V_{HYS}$. Once V_{DD} has crossed the voltage trip point, there is also a minimal delay time (t_{RPD}) before the \overline{RST} pin is driven low.

TABLE 4-1: \overline{RST} PIN STATES

Device	State of \overline{RST} Pin when:		Output Driver
	$V_{DD} < V_{TRIP}$	$V_{DD} > V_{TRIP} + V_{HYS}$	
MCP102	L	H	Push-pull
MCP103	L	H	Push-pull
MCP121	L	H (1)	Open-drain (1)
MCP131	L	H (2)	Open-drain (2)

Note 1: Requires external pull-up resistor

2: Has internal pull-up resistor

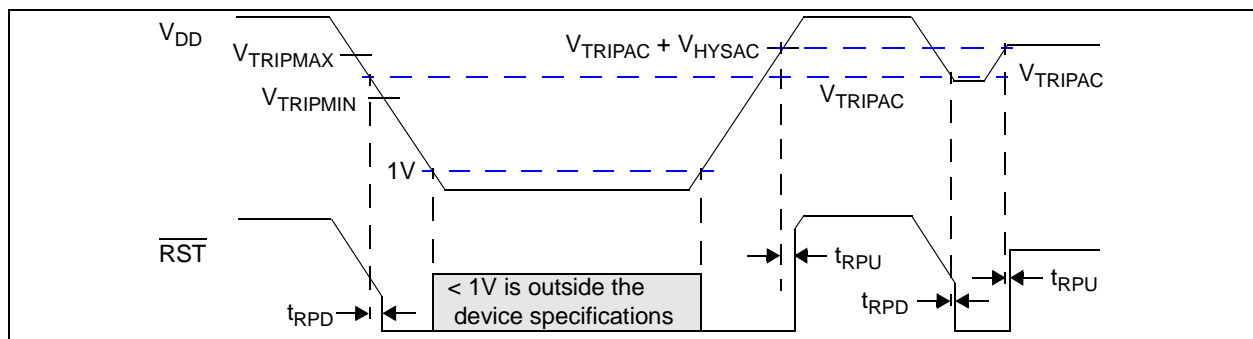


FIGURE 4-2: \overline{RST} Operation as Determined by the V_{TRIP} and V_{HYS} .

MCP102/103/121/131

4.2 Negative Going V_{DD} Transients

The minimum pulse width (time) required to cause a reset may be an important criterion in the implementation of a Power-on Reset (POR) circuit. This time is referred to as transient duration, defined as the amount of time needed for these supervisory devices to respond to a drop in V_{DD} . The transient duration time is dependent on the magnitude of $V_{TRIP} - V_{DD}$. Generally speaking, the transient duration decreases with increases in $V_{TRIP} - V_{DD}$.

Figure 4-3 shows a typical transient duration versus reset comparator overdrive, for which the MCP102/103/121/131 will not generate a reset pulse. It shows that the farther below the trip point of the transient pulse goes, the shorter the duration of the pulse required to cause a reset gets. Figure 2-32 shows the transient response characteristics for the MCP102/103/121/131.

A 0.1 μF bypass capacitor, mounted as close as possible to the V_{DD} pin, provides additional transient immunity (refer to Figure 4-1).

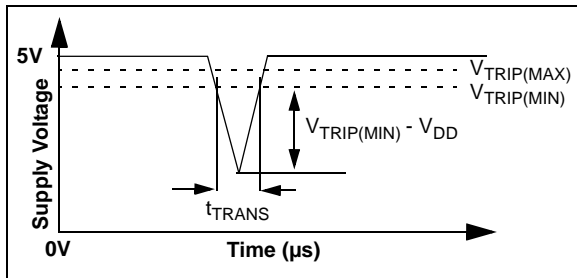


FIGURE 4-3: Example of Typical Transient Duration Waveform.

4.3 Reset Power-up Timer (t_{RPU})

Figure 4-4 illustrates the device's current states. While the system is powering down, the device has a low current. This current is dependent on the device V_{DD} and trip point. When the device V_{DD} rises through the voltage trip point (V_{TRIP}), an internal timer starts. This timer consumes additional current until the $\overline{\text{RST}}$ pin is driven (or released) high. This time is known as the Reset Power-up Time (t_{RPU}). Figure 4-4 shows when t_{RPU} is active (device consuming additional current).

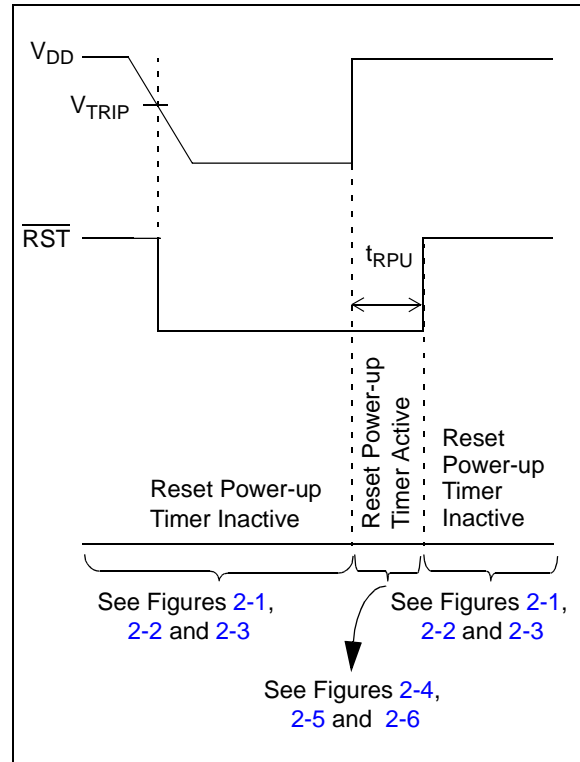


FIGURE 4-4: Reset Power-up Timer Waveform.

4.3.1 EFFECT OF TEMPERATURE ON RESET POWER-UP TIMER (T_{RPU})

The Reset Power-up timer time-out period (t_{RPU}) determines how long the device remains in the reset condition. This is affected by both V_{DD} and temperature. Typical responses for different V_{DD} values and temperatures are shown in Figures 2-26, 2-27 and 2-28.

4.4 Usage in PIC[®] Microcontroller, ICSP[™] Applications (MCP121 only)

Figure 4-5 shows the typical application circuit for using the MCP121 for voltage supervision function when the PIC microcontroller will be programmed via the ICSP feature. Additional information is available in TB087, "Using Voltage Supervisors with PIC[®] Microcontroller Systems which Implement In-Circuit Serial Programming[™]", DS91087.

Note: It is recommended that the current into the RST pin be current limited by a 1 k Ω resistor.

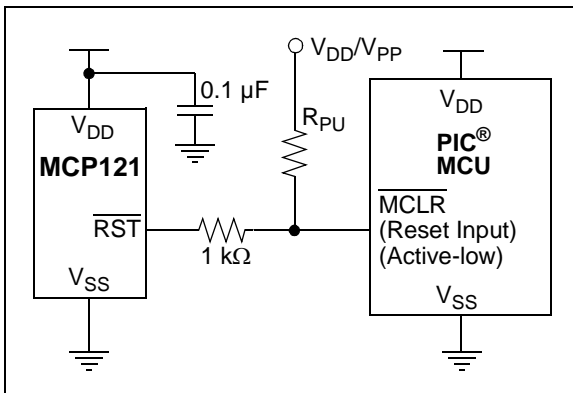


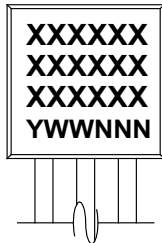
FIGURE 4-5: Typical Application Circuit for PIC[®] Microcontroller with the ICSP[™] Feature.

MCP102/103/121/131

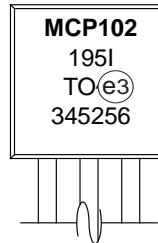
5.0 PACKAGING INFORMATION

5.1 Package Marking Information

3-Lead TO-92

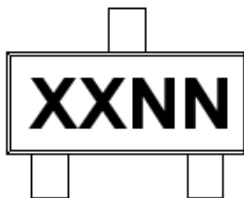


Example



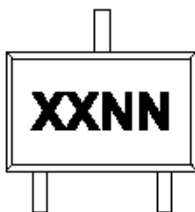
Example

3-Lead SOT-23



Part Number	MCP1xx =			
	MCP102	MCP103	MCP121	MCP131
MCP1xxT-195I/TT	JGNN	TGNN	LGNN	KGNN
MCP1xxT-240ETT	JHNN	THNN	LHNN	KHNN
MCP1xxT-270E/TT	JJNN	TJNN	LJNN	KJNN
MCP1xxT-300E/TT	JKNN	TKNN	LKNN	KKNN
MCP1xxT-315E/TT	JLNN	TLNN	LLNN	KLNN
MCP1xxT-450E/TT	JMNN	TMNN	LMNN	KMNN
MCP1xxT-475E/TT	JPNN	TPNN	LPNN	KPNN

3-Lead SC70



Example

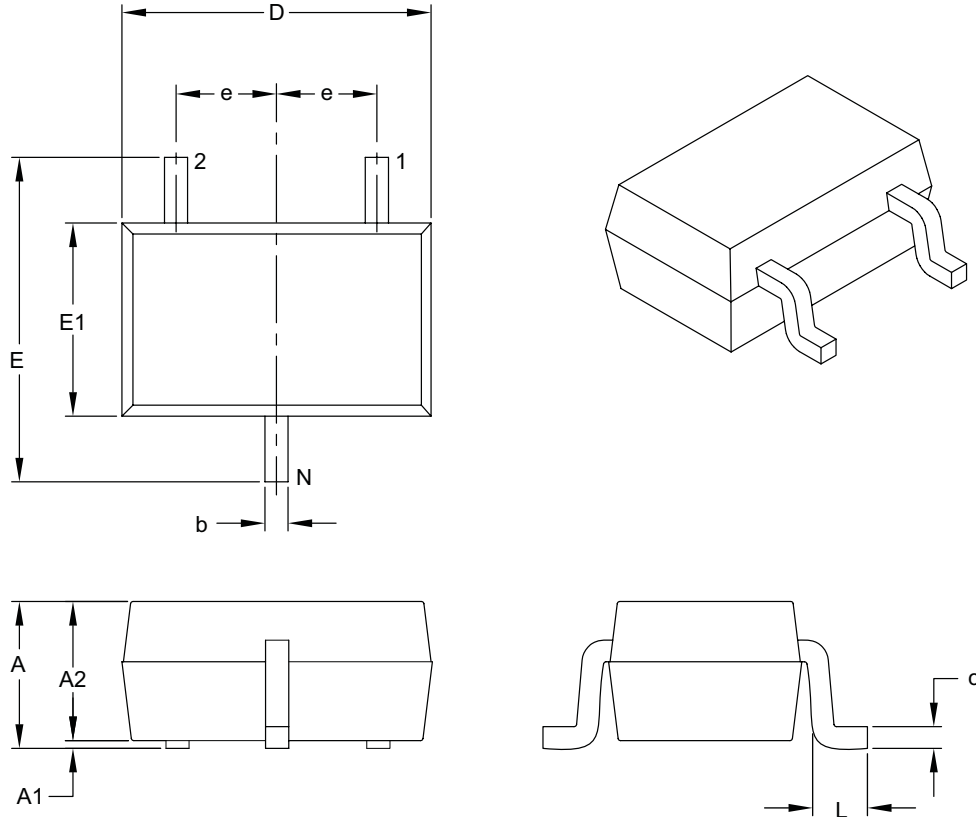
Part Number	MCP1xx =			
	MCP102	MCP103	MCP121	MCP131
MCP1xxT-195I/LB	BGNN	FGNN	DGNN	CGNN
MCP1xxT-240E/LB	BHNN	FHNN	DHNN	CHNN
MCP1xxT-270E/LB	BJNN	FJNN	DJNN	CJNN
MCP1xxT-300E/LB	BKNN	FKNN	DKNN	CKNN
MCP1xxT-315E/LB	BLNN	FLNN	DLNN	CLNN
MCP1xxT-450E/LB	BMNN	FMNN	DMNN	CMNN
MCP1xxT-475E/LB	BPNN	FPNN	DPNN	CPNN

Legend:	XX...X	Customer-specific information
	Y	Year code (last digit of calendar year)
	WW	Week code (week of January 1 is week '01')
	NNN	Alphanumeric traceability code
	(e3)	Pb-free JEDEC designator for Matte Tin (Sn)
	*	This package is Pb-free. The Pb-free JEDEC designator (e3) can be found on the outer packaging for this package.

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.

3-Lead Plastic Small Outline Transistor (LB) [SC70]

Note: For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



Dimension Limits	Units	MILLIMETERS		
		MIN	NOM	MAX
Number of Pins	N	3		
Pitch	e	0.65 BSC		
Overall Height	A	0.80	–	1.10
Molded Package Thickness	A2	0.80	–	1.00
Standoff	A1	0.00	–	0.10
Overall Width	E	1.80	2.10	2.40
Molded Package Width	E1	1.15	1.25	1.35
Overall Length	D	1.80	2.00	2.25
Foot Length	L	0.10	0.20	0.46
Lead Thickness	c	0.08	–	0.26
Lead Width	b	0.15	–	0.40

Notes:

- Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.127 mm per side.
- Dimensioning and tolerancing per ASME Y14.5M.

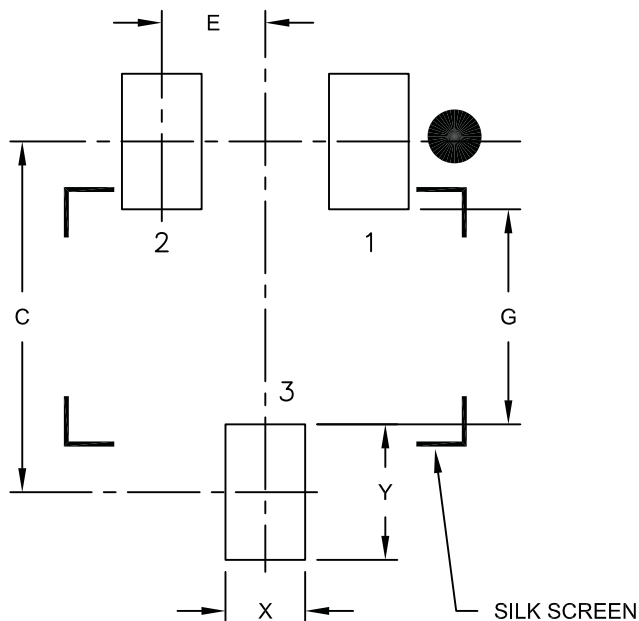
BSC: Basic Dimension. Theoretically exact value shown without tolerances.

Microchip Technology Drawing C04-060B

MCP102/103/121/131

3-Lead Plastic Small Outline Transistor (LB) [SC70]

Note: For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



RECOMMENDED LAND PATTERN

Dimension Limits	Units	MILLIMETERS		
		MIN	NOM	MAX
Contact Pitch	E	0.65 BSC		
Contact Pad Spacing	C		2.20	
Contact Pad Width	X			0.50
Contact Pad Length	Y			0.95
Distance Between Pads	G	1.25		

Notes:

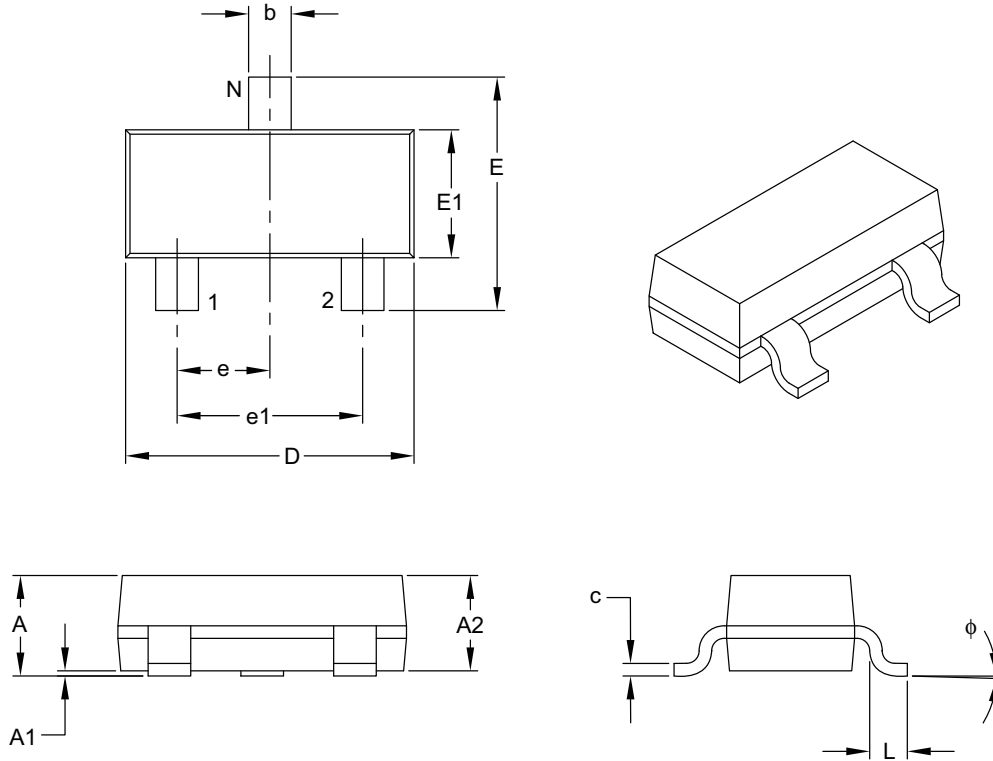
1. Dimensioning and tolerancing per ASME Y14.5M

BSC: Basic Dimension. Theoretically exact value shown without tolerances.

Microchip Technology Drawing No. C04-2060A

3-Lead Plastic Small Outline Transistor (TT) [SOT-23]

Note: For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



Dimension Limits	Units	MILLIMETERS		
		MIN	NOM	MAX
Number of Pins	N	3		
Lead Pitch	e	0.95 BSC		
Outside Lead Pitch	e1	1.90 BSC		
Overall Height	A	0.89	–	1.12
Molded Package Thickness	A2	0.79	0.95	1.02
Standoff	A1	0.01	–	0.10
Overall Width	E	2.10	–	2.64
Molded Package Width	E1	1.16	1.30	1.40
Overall Length	D	2.67	2.90	3.05
Foot Length	L	0.13	0.50	0.60
Foot Angle	ϕ	0°	–	10°
Lead Thickness	c	0.08	–	0.20
Lead Width	b	0.30	–	0.54

Notes:

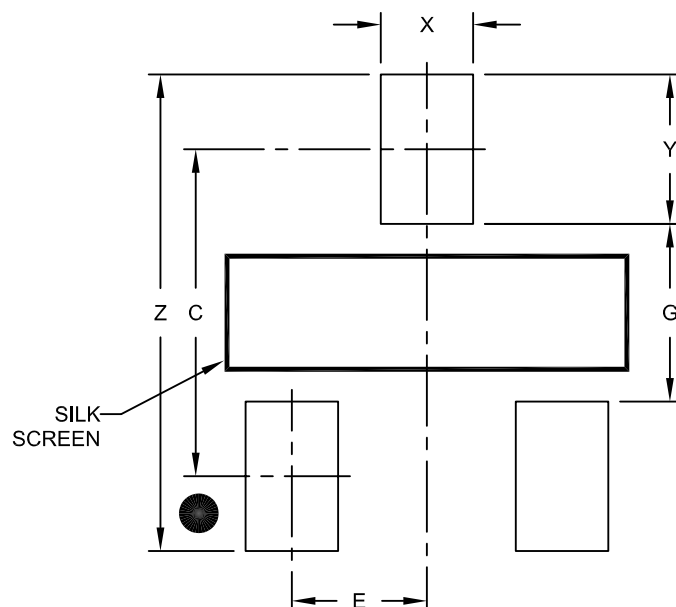
- Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.25 mm per side.
- Dimensioning and tolerancing per ASME Y14.5M.
BSC: Basic Dimension. Theoretically exact value shown without tolerances.

Microchip Technology Drawing C04-104B

MCP102/103/121/131

3-Lead Plastic Small Outline Transistor (TT) [SOT-23]

Note: For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



RECOMMENDED LAND PATTERN

Dimension Limits	Units	MILLIMETERS		
		MIN	NOM	MAX
Contact Pitch	E	0.95 BSC		
Contact Pad Spacing	C		2.30	
Contact Pad Width (X3)	X			0.65
Contact Pad Length (X3)	Y			1.05
Distance Between Pads	G	1.25		
Overall Width	Z			3.35

Notes:

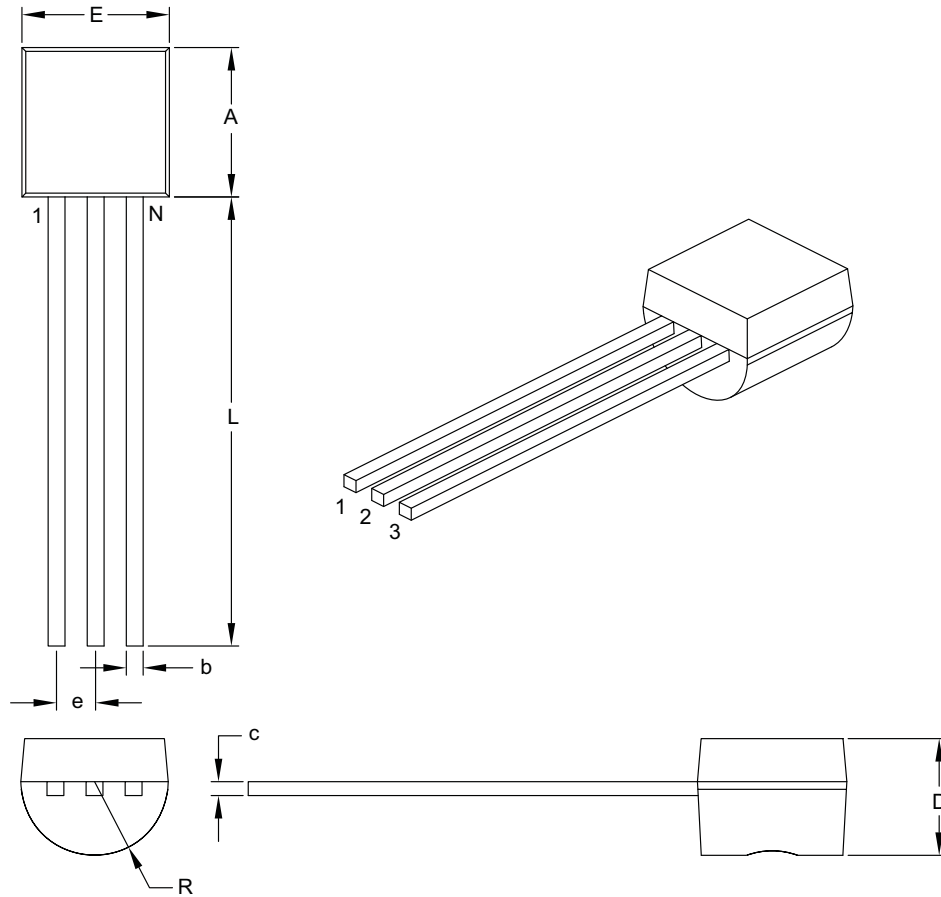
1. Dimensioning and tolerancing per ASME Y14.5M

BSC: Basic Dimension. Theoretically exact value shown without tolerances.

Microchip Technology Drawing No. C04-2104A

3-Lead Plastic Transistor Outline (TO) [TO-92]

Note: For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



Dimension Limits	Units	INCHES	
		MIN	MAX
Number of Pins	N	3	
Pitch	e	.050 BSC	
Bottom to Package Flat	D	.125	.165
Overall Width	E	.175	.205
Overall Length	A	.170	.210
Molded Package Radius	R	.080	.105
Tip to Seating Plane	L	.500	—
Lead Thickness	c	.014	.021
Lead Width	b	.014	.022

Notes:

- Dimensions A and E do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .005" per side.
- Dimensioning and tolerancing per ASME Y14.5M.

BSC: Basic Dimension. Theoretically exact value shown without tolerances.

Microchip Technology Drawing C04-101B

MCP102/103/121/131

5.2 Product Tape and Reel Specifications

FIGURE 5-1: EMBOSSED CARRIER DIMENSIONS (8, 12, 16 AND 24 MM TAPE ONLY)

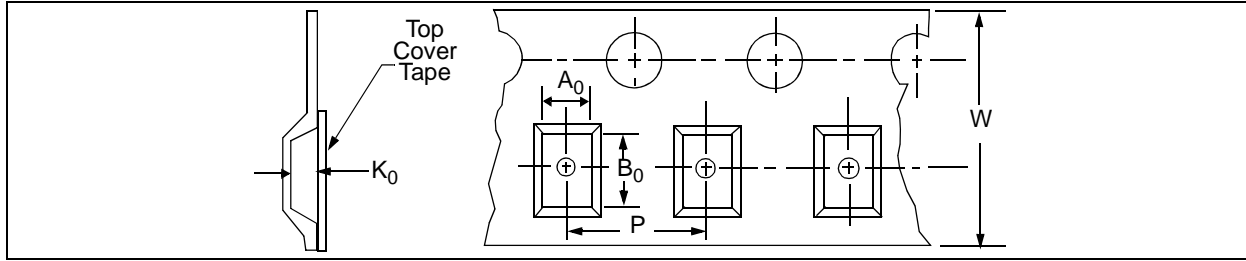


TABLE 5-1: CARRIER TAPE/CAVITY DIMENSIONS

Case Outline	Package Type		Carrier Dimensions		Cavity Dimensions			Output Quantity Units	Reel Diameter in mm
			W mm	P mm	A0 mm	B0 mm	K0 mm		
TT	SOT-23	3L	8	4	3.15	2.77	1.22	3000	180
LB	SC70	3L	8	4	2.4	2.4	1.19	3000	180

FIGURE 5-2: 3-LEAD SOT-23/SC70 DEVICE TAPE AND REEL SPECIFICATIONS

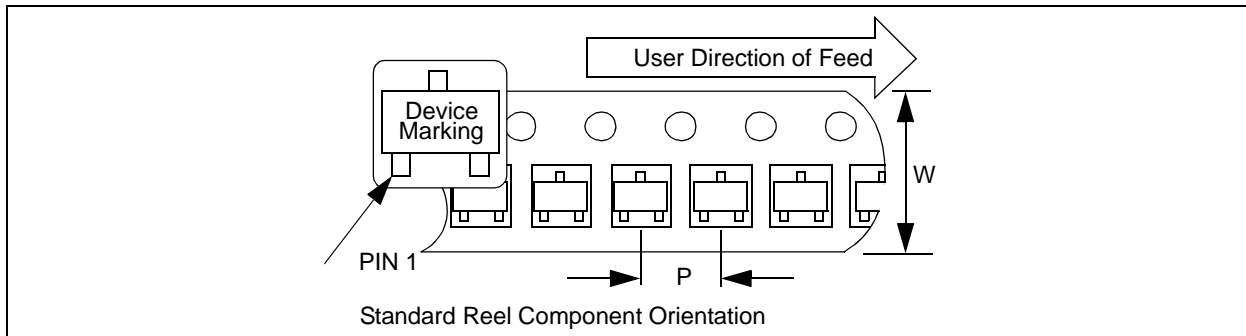
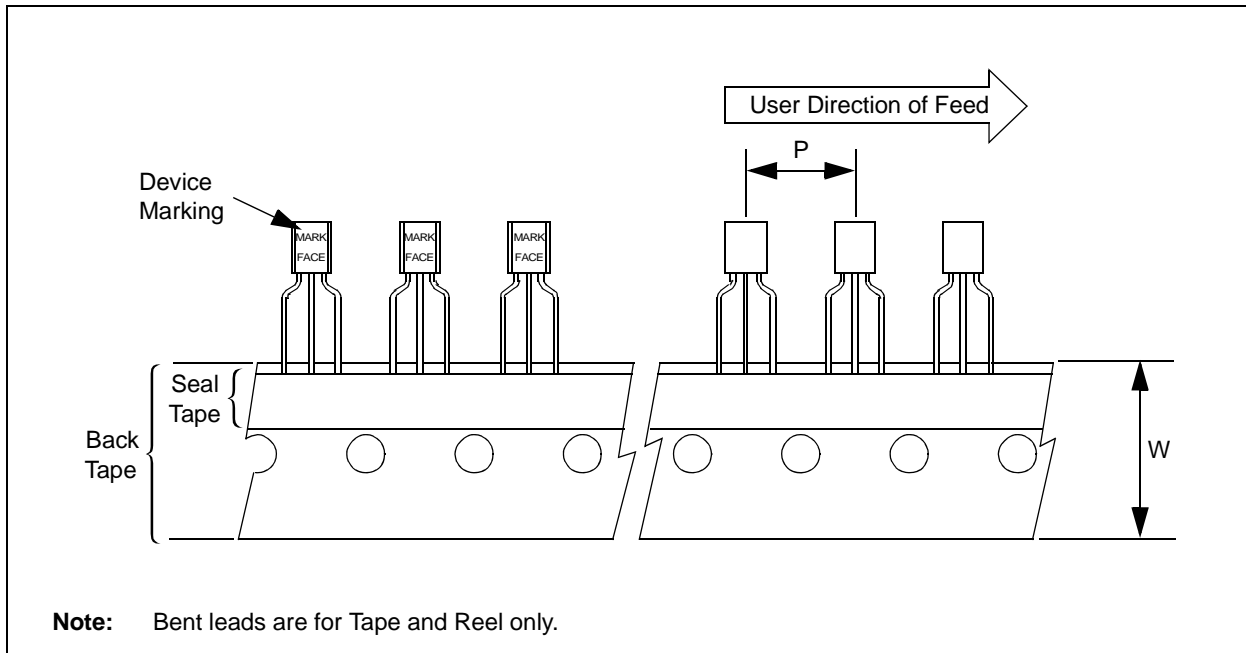


FIGURE 5-3: TO-92 DEVICE TAPE AND REEL SPECIFICATIONS



APPENDIX A: REVISION HISTORY

Revision D (February 2014)

The following is the list of modifications:

1. Updated [Table 3-1](#).
2. Updated [Figure 2-25](#).
3. Updated SC70, SOT-23 and TO-92 package drawings and markings in [Section 5.0 “Packaging Information”](#).

Revision C (January 2013)

- Added a note to each package outline drawing.

Revision B (March 2005)

The following is the list of modifications:

1. Added [Section 4.4 “Usage in PIC® Microcontroller, ICSP™ Applications \(MCP121 only\)”](#) on using the MCP121 in PIC microcontroller ICSP applications.
2. Added V_{ODH} specifications in [Section 1.0 “Electrical Characteristics”](#) (for ICSP applications).
3. Added [Figure 2-23](#).
4. Updated SC70 package markings and added Pb-free marking information to [Section 5.0 “Packaging Information”](#).
5. Added [Appendix A: “Revision History”](#).

Revision A (August 2004)

- Original Release of this Document.

MCP102/103/121/131

NOTES:

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	XXX	X	/	XX
Device	Tape/Reel Option	Monitoring Options	Temperature Range		Package
Device:					
		MCP102: MicroPower Voltage Supervisor, push-pull			
		MCP102T: MicroPower Voltage Supervisor, push-pull (Tape and Reel)			
		MCP103: MicroPower Voltage Supervisor, push-pull			
		MCP103T: MicroPower Voltage Supervisor, push-pull (Tape and Reel)			
		MCP121 MicroPower Voltage Supervisor, open-drain			
		MCP121T: MicroPower Voltage Supervisor, open-drain (Tape and Reel)			
		MCP131 MicroPower Voltage Supervisor, open-drain			
		MCP131T: MicroPower Voltage Supervisor, open-drain (Tape and Reel)			
Monitoring Options:		195 = 1.90V			
		240 = 2.32V			
		270 = 2.63V			
		300 = 2.93V			
		315 = 3.08V			
		450 = 4.38V			
		475 = 4.63V			
Temperature Range:			I = -40°C to +85°C (MCP1xx(T)-195 only)		
			E = -40°C to +125°C (Except for MCP1xx(T)-195)		
Package:					TT = SOT-23, 3-lead
					LB = SC70, 3-lead
					TO = TO-92, 3-lead
Examples:					
a) MCP102T-195I/TT: Tape and Reel, 1.95V MicroPower Voltage Supervisor, push-pull, -40°C to +85°C, SOT-23 package					
b) MCP102-300E/TO: 3.00V MicroPower Voltage Supervisor, push-pull, -40°C to +125°C, TO-92 package					
a) MCP103T-270E/TT: Tape and Reel, 2.70V MicroPower Voltage Supervisor, push-pull, -40°C to +125°C, SOT-23 package					
b) MCP103T-475E/LB: Tape and Reel, 4.75V MicroPower Voltage Supervisor, push-pull, -40°C to +125°C, SC70 package					
a) MCP121T-315E/LB: Tape and Reel, 3.15V MicroPower Voltage Supervisor, open-drain, -40°C to +125°C, SC70 package					
b) MCP121-300E/TO: 3.00V MicroPower Voltage Supervisor, open-drain, -40°C to +125°C, TO-92 package					
a) MCP131T-195I/TT: Tape and Reel, 1.95V MicroPower Voltage Supervisor, open-drain, -40°C to +85°C, SOT-23 package					
b) MCP131-300E/TO: 3.00V MicroPower Voltage Supervisor, open-drain, -40°C to +125°C, TO-92 package					

MCP102/103/121/131

NOTES:

Note the following details of the code protection feature on Microchip devices:

- Microchip products meet the specification contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is one of the most secure families of its kind on the market today, when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods used to breach the code protection feature. All of these methods, to our knowledge, require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Most likely, the person doing so is engaged in theft of intellectual property.
- Microchip is willing to work with the customer who is concerned about the integrity of their code.
- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of their code. Code protection does not mean that we are guaranteeing the product as “unbreakable.”

Code protection is constantly evolving. We at Microchip are committed to continuously improving the code protection features of our products. Attempts to break Microchip's code protection feature may be a violation of the Digital Millennium Copyright Act. If such acts allow unauthorized access to your software or other copyrighted work, you may have a right to sue for relief under that Act.

Information contained in this publication regarding device applications and the like is provided only for your convenience and may be superseded by updates. It is your responsibility to ensure that your application meets with your specifications. MICROCHIP MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WHETHER EXPRESS OR IMPLIED, WRITTEN OR ORAL, STATUTORY OR OTHERWISE, RELATED TO THE INFORMATION, INCLUDING BUT NOT LIMITED TO ITS CONDITION, QUALITY, PERFORMANCE, MERCHANTABILITY OR FITNESS FOR PURPOSE. Microchip disclaims all liability arising from this information and its use. Use of Microchip devices in life support and/or safety applications is entirely at the buyer's risk, and the buyer agrees to defend, indemnify and hold harmless Microchip from any and all damages, claims, suits, or expenses resulting from such use. No licenses are conveyed, implicitly or otherwise, under any Microchip intellectual property rights.

Trademarks

The Microchip name and logo, the Microchip logo, dsPIC, FlashFlex, KEELOQ, KEELOQ logo, MPLAB, PIC, PICmicro, PICSTART, PIC³² logo, rPIC, SST, SST Logo, SuperFlash and UNI/O are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

FilterLab, Hampshire, HI-TECH C, Linear Active Thermistor, MTP, SEEVAL and The Embedded Control Solutions Company are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Silicon Storage Technology is a registered trademark of Microchip Technology Inc. in other countries.

Analog-for-the-Digital Age, Application Maestro, BodyCom, chipKIT, chipKIT logo, CodeGuard, dsPICDEM, dsPICDEM.net, dsPICworks, dsSPEAK, ECAN, ECONOMONITOR, FanSense, HI-TIDE, In-Circuit Serial Programming, ICSP, Mindi, MiWi, MPASM, MPF, MPLAB Certified logo, MPLIB, MPLINK, mTouch, Omniclient Code Generation, PICC, PICC-18, PICDEM, PICDEM.net, PICkit, PICtail, REAL ICE, rLAB, Select Mode, SQI, Serial Quad I/O, Total Endurance, TSHARC, UniWinDriver, WiperLock, ZENA and Z-Scale are trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

SQTP is a service mark of Microchip Technology Incorporated in the U.S.A.

GestIC and ULPP are registered trademarks of Microchip Technology Germany II GmbH & Co. KG, a subsidiary of Microchip Technology Inc., in other countries.

All other trademarks mentioned herein are property of their respective companies.

© 2004-2014, Microchip Technology Incorporated, Printed in the U.S.A., All Rights Reserved.

 Printed on recycled paper.

ISBN: 978-1-62077-945-3

Microchip received ISO/TS-16949:2009 certification for its worldwide headquarters, design and wafer fabrication facilities in Chandler and Tempe, Arizona; Gresham, Oregon and design centers in California and India. The Company's quality system processes and procedures are for its PIC[®] MCUs and dsPIC[®] DSCs, KEELOQ[®] code hopping devices, Serial EEPROMs, microperipherals, nonvolatile memory and analog products. In addition, Microchip's quality system for the design and manufacture of development systems is ISO 9001:2000 certified.

QUALITY MANAGEMENT SYSTEM
CERTIFIED BY DNV
== ISO/TS 16949 ==



MICROCHIP

Worldwide Sales and Service

AMERICAS

Corporate Office
2355 West Chandler Blvd.
Chandler, AZ 85224-6199
Tel: 480-792-7200
Fax: 480-792-7277
Technical Support:
<http://www.microchip.com/support>
Web Address:
www.microchip.com

Atlanta
Duluth, GA
Tel: 678-957-9614
Fax: 678-957-1455

Austin, TX
Tel: 512-257-3370

Boston
Westborough, MA
Tel: 774-760-0087
Fax: 774-760-0088

Chicago
Itasca, IL
Tel: 630-285-0071
Fax: 630-285-0075

Cleveland
Independence, OH
Tel: 216-447-0464
Fax: 216-447-0643

Dallas
Addison, TX
Tel: 972-818-7423
Fax: 972-818-2924

Detroit
Novi, MI
Tel: 248-848-4000

Houston, TX
Tel: 281-894-5983

Indianapolis
Noblesville, IN
Tel: 317-773-8323
Fax: 317-773-5453

Los Angeles
Mission Viejo, CA
Tel: 949-462-9523
Fax: 949-462-9608

New York, NY
Tel: 631-435-6000

San Jose, CA
Tel: 408-735-9110

Canada - Toronto
Tel: 905-673-0699
Fax: 905-673-6509

ASIA/PACIFIC

Asia Pacific Office
Suites 3707-14, 37th Floor
Tower 6, The Gateway
Harbour City, Kowloon
Hong Kong
Tel: 852-2401-1200
Fax: 852-2401-3431

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

China - Beijing
Tel: 86-10-8569-7000
Fax: 86-10-8528-2104

China - Chengdu
Tel: 86-28-8665-5511
Fax: 86-28-8665-7889

China - Chongqing
Tel: 86-23-8980-9588
Fax: 86-23-8980-9500

China - Hangzhou
Tel: 86-571-2819-3187
Fax: 86-571-2819-3189

China - Hong Kong SAR
Tel: 852-2943-5100
Fax: 852-2401-3431

China - Nanjing
Tel: 86-25-8473-2460
Fax: 86-25-8473-2470

China - Qingdao
Tel: 86-532-8502-7355
Fax: 86-532-8502-7205

China - Shanghai
Tel: 86-21-5407-5533
Fax: 86-21-5407-5066

China - Shenyang
Tel: 86-24-2334-2829
Fax: 86-24-2334-2393

China - Shenzhen
Tel: 86-755-8864-2200
Fax: 86-755-8203-1760

China - Wuhan
Tel: 86-27-5980-5300
Fax: 86-27-5980-5118

China - Xian
Tel: 86-29-8833-7252
Fax: 86-29-8833-7256

China - Xiamen
Tel: 86-592-2388138
Fax: 86-592-2388130

China - Zhuhai
Tel: 86-756-3210040
Fax: 86-756-3210049

ASIA/PACIFIC

India - Bangalore
Tel: 91-80-3090-4444
Fax: 91-80-3090-4123

India - New Delhi
Tel: 91-11-4160-8631
Fax: 91-11-4160-8632

India - Pune
Tel: 91-20-3019-1500

Japan - Osaka
Tel: 81-6-6152-7160
Fax: 81-6-6152-9310

Japan - Tokyo
Tel: 81-3-6880-3770
Fax: 81-3-6880-3771

Korea - Daegu
Tel: 82-53-744-4301
Fax: 82-53-744-4302

Korea - Seoul
Tel: 82-2-554-7200
Fax: 82-2-558-5932 or
82-2-558-5934

Malaysia - Kuala Lumpur
Tel: 60-3-6201-9857
Fax: 60-3-6201-9859

Malaysia - Penang
Tel: 60-4-227-8870
Fax: 60-4-227-4068

Philippines - Manila
Tel: 63-2-634-9065
Fax: 63-2-634-9069

Singapore
Tel: 65-6334-8870
Fax: 65-6334-8850

Taiwan - Hsin Chu
Tel: 886-3-5778-366
Fax: 886-3-5770-955

Taiwan - Kaohsiung
Tel: 886-7-213-7830

Taiwan - Taipei
Tel: 886-2-2508-8600
Fax: 886-2-2508-0102

Thailand - Bangkok
Tel: 66-2-694-1351
Fax: 66-2-694-1350

EUROPE

Austria - Wels
Tel: 43-7242-2244-39
Fax: 43-7242-2244-393

Denmark - Copenhagen
Tel: 45-4450-2828
Fax: 45-4485-2829

France - Paris
Tel: 33-1-69-53-63-20
Fax: 33-1-69-30-90-79

Germany - Dusseldorf
Tel: 49-2129-3766400

Germany - Munich
Tel: 49-89-627-144-0
Fax: 49-89-627-144-44

Germany - Pforzheim
Tel: 49-7231-424750

Italy - Milan
Tel: 39-0331-742611
Fax: 39-0331-466781

Italy - Venice
Tel: 39-049-7625286

Netherlands - Drunen
Tel: 31-416-690399
Fax: 31-416-690340

Poland - Warsaw
Tel: 48-22-3325737

Spain - Madrid
Tel: 34-91-708-08-90
Fax: 34-91-708-08-91

Sweden - Stockholm
Tel: 46-8-5090-4654

UK - Wokingham
Tel: 44-118-921-5800
Fax: 44-118-921-5820

10/28/13

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[Microchip:](#)

[MCP102T-315E/LB](#) [MCP131T-450E/TT](#) [MCP121T-195/LB](#) [MCP131T-240E/TT](#) [MCP102T-270E/TT](#) [MCP102T-300E/LB](#)

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: ocean@oceanchips.ru

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А