

# MCP120/130

# Microcontroller Supervisory Circuit with Open Drain Output

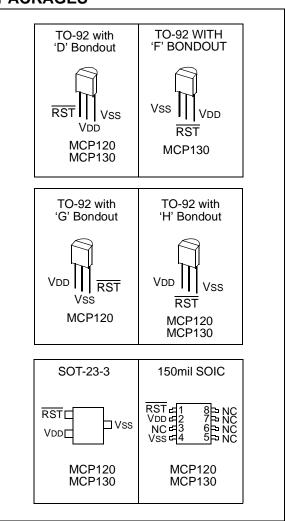
#### **FEATURES**

- 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 RESET pin
- · Open drain output
- Internal pull-up resistor (5 k $\Omega$ ) for MCP130
- Holds RESET for 350 ms (typical)
- RESET to Vcc = 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

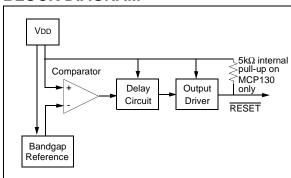
#### DESCRIPTION

The Microchip Technology Inc. MCP120/130 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 open drain outputs. The MCP130 has an internal  $5~\mathrm{k}\Omega$  pullup resistor. Both devices have active low RESET pins. The MCP120/130 will assert the RESET signal whenever the voltage on the VDD pin is below the trip-point voltage.

#### **PACKAGES**



#### **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.		VDD = 1.0 - Industrial (I		+85°C			
Parameter		Symbol	Min.	Тур.	Max.	Units	Test Conditions
Operating Voltage	ge Range	VDD	1.0	_	5.5	V	
VDD Value to RE	SET	VDD <sub>MIN</sub>	1.0	_	_	V	
Operating Curre	nt	IDD	_	45	60	μΑ	VDD = 5.5V (no load)
VDD Trip Point	MCP1X0-270 MCP1X0-300 MCP1X0-315 MCP1X0-450 MCP1X0-460 MCP1X0-475 MCP1X0-485	VTRIP	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	
RESET Low Level Output Voltage	MCP1X0-270 MCP1X0-300 MCP1X0-315	VoL	_		0.4	V	IOL = 3.2 mA, VDD = VTRIP <sub>MIN</sub>
MCP1X0-450 MCP1X0-460 MCP1X0-475 MCP1X0-485			_	_	0.6		IOL = 8.5 mA, VDD = VTRIP <sub>MIN</sub>
RESET High Level Output (All VTRIP Voltage (MCP130 Only)		Voн	VDD-0.7			V	IOH = $50 \mu A$ , VDD > VTRIP <sub>MAX</sub>
Pull-up Resistor	(MCP130 Only)		_	5	_	kΩ	
Output Leakage	(MCP120 Only)		_	1	_	μΑ	
Threshold Hyste	resis	VHYS	_	50	_	mV	
VDD Detect to RESET Inactive		trpu	150	350	700	ms	
VDD Detect to RESET		trpd	_	10	_	μs	VDD ramped from VTRIP <sub>MAX +</sub> 250 mV down to VTRIP <sub>MIN</sub> - 250 mV
Note: Typical values are for 25°C and VDD = 5.0V							

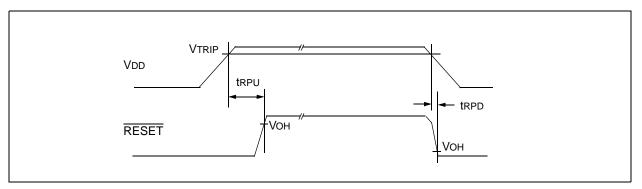


Figure 1-1: MCP120/130 Timing Diagram

#### 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.

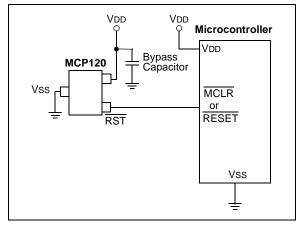


Figure 2-1: Typical Application

### 2.2 Negative Going VDD 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 voltage below the trip point (VTRIP - VDD) vs. transient duration. 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  $\mu F$  bypass cap mounted as close as possible to the VDD pin provides additional transient immunity.

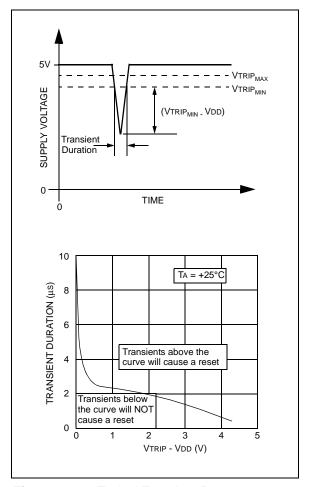


Figure 2-2: Typical Transient Response

# 2.3 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.

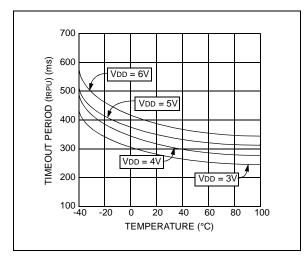


Figure 2-3: tRPU vs. Temperature

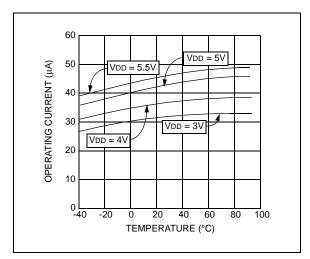


Figure 2-4: IDD vs. Temperature

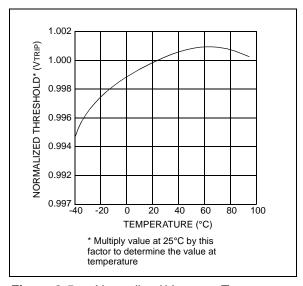


Figure 2-5: Normalized VTRIP vs. Temperature

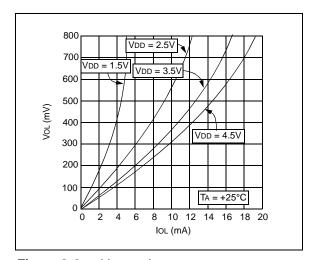


Figure 2-6: Vol. vs. Iol.

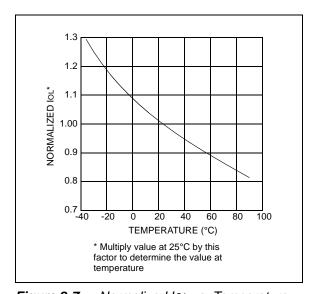
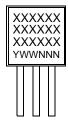


Figure 2-7: Normalized IoL vs. Temperature

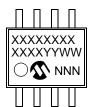
# 3.0 PACKAGING INFORMATION

# 3.1 Package Marking Information

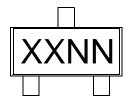
3-Lead Plastic Transistor Outline (TO-92)



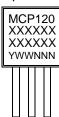
8-Lead Plastic Small Outline (SOIC)



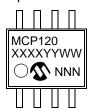
3-Lead Plastic Small Outline Transistor (SOT23)



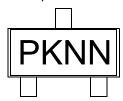




Example:



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.

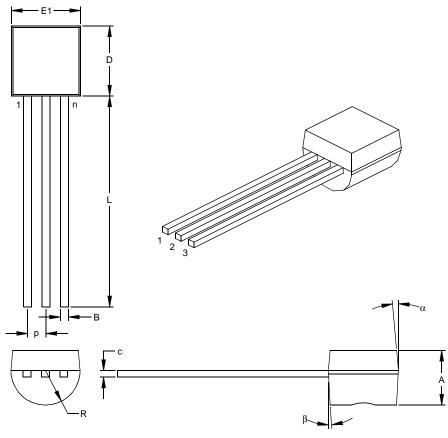
Mark	Part Number	Mark	Part Number
SJ	MCP120T-270I/TT	PJ	MCP130T-270I/TT
SK	MCP120T-300I/TT	PK	MCP130T-300I/TT
SL	MCP120T-315I/TT	PL	MCP130T-315I/TT
SM	MCP120T-450I/TT	PM	MCP130T-450I/TT
SN	MCP120T-460I/TT	PN	MCP130T-460I/TT
SO	MCP120T-475I/TT	PO	MCP130T-475I/TT
SP	MCP120T-485I/TT	PP	MCP130T-485I/TT

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.

<sup>\*</sup> 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.

#### **Package Detail Information** 3.2

# 3-Lead Plastic Transistor Outline (TO) (TO-92)



	Units	Units INCHES*			N	3	
Dimension	Limits	MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		3			3	
Pitch	р		.050			1.27	
Bottom to Package Flat	Α	.130	.143	.155	3.30	3.62	3.94
Overall Width	E1	.175	.186	.195	4.45	4.71	4.95
Overall Length	D	.170	.183	.195	4.32	4.64	4.95
Molded Package Radius	R	.085	.090	.095	2.16	2.29	2.41
Tip to Seating Plane	L	.500	.555	.610	12.70	14.10	15.49
Lead Thickness	С	.014	.017	.020	0.36	0.43	0.51
Lead Width	В	.016	.019	.022	0.41	0.48	0.56
Mold Draft Angle Top	α	4	5	6	4	5	6
Mold Draft Angle Bottom	β	2	3	4	2	3	4

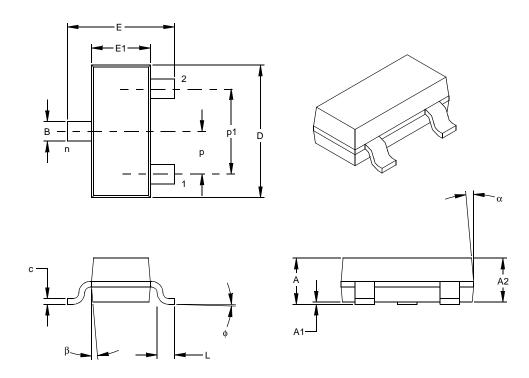
<sup>\*</sup>Controlling Parameter

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-92

Drawing No. C04-101

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



	INCHES*			MILLIMETERS			
Dimension	Limits	MIN	MOM	MAX	MIN	NOM	MAX
Number of Pins	n		3			3	
Pitch	р		.038			0.96	
Outside lead pitch (basic)	p1		.076			1.92	
Overall Height	Α	.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	Е	.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	ф	0	5	10	0	5	10
Lead Thickness	С	.004	.006	.007	0.09	0.14	0.18
Lead Width	В	.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

#### Notes:

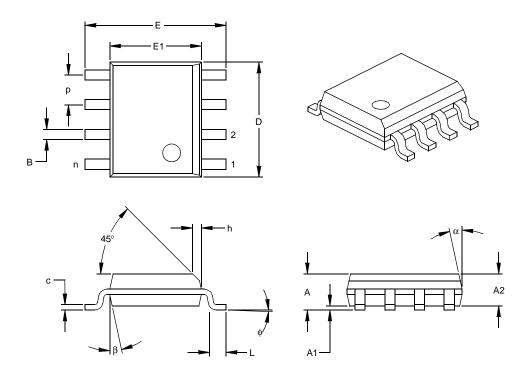
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC Equivalent: TO-236

Drawing No. C04-104

<sup>\*</sup> Controlling Parameter § Significant Characteristic

# 8-Lead Plastic Small Outline (SN) - Narrow, 150 mil (SOIC



	INCHES*			MILLIMETERS			
Dimension	Limits	MIN	NOM	MAX	MIN	NOM	MAX
Number of Pins	n		8			8	
Pitch	р		.050			1.27	
Overall Height	Α	.053	.061	.069	1.35	1.55	1.75
Molded Package Thickness	A2	.052	.056	.061	1.32	1.42	1.55
Standoff §	A1	.004	.007	.010	0.10	0.18	0.25
Overall Width	Е	.228	.237	.244	5.79	6.02	6.20
Molded Package Width	E1	.146	.154	.157	3.71	3.91	3.99
Overall Length	D	.189	.193	.197	4.80	4.90	5.00
Chamfer Distance	h	.010	.015	.020	0.25	0.38	0.51
Foot Length	L	.019	.025	.030	0.48	0.62	0.76
Foot Angle	ф	0	4	8	0	4	8
Lead Thickness	С	.008	.009	.010	0.20	0.23	0.25
Lead Width	В	.013	.017	.020	0.33	0.42	0.51
Mold Draft Angle Top	α	0	12	15	0	12	15
Mold Draft Angle Bottom	β	0	12	15	0	12	15

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: MS-012 Drawing No. C04-057

<sup>\*</sup> Controlling Parameter § Significant Characteristic

# MCP120/130

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# MCP120/130

NOTES:

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# PRODUCT IDENTIFICATION SYSTEM

To order or to obtain information (e.g., on pricing or delivery), please refer to the factory or the listed sales offices.

PART NO. X	¥	X	/XX	Ex	amples:
Device RESE RESE	T Opti	out Temperature on Range	Package	a)	MCP120–270I/SN = VTRIP range of 2.55V - 2.70V, Industrial Temp., SOIC package
VTRII Voltaç				b)	MCP120–300DI/TO = VTRIP range of 2.85V - 3.00V, Bonding Option D, Industrial Temp.,
Device:	MCP120: MCP120T:	Supervisor circuit w	vith open drain output vith open drain output	c)	TO-92 package MCP120T-315I/TT = VTRIP range of 3.00V - 3.15V, Industrial Temp., SOT-23 package
	MCP130:	internal pull-up resi		d)	MCP130–450I/SN = VTRIP range of 4.25V - 4.50V, Industrial Temp., SOIC package
	MCP130T:	Supervisor circuit w internal pull-up resi	vith open drain output and stor (tape & reel)	e)	MCP130–460FI/TO = VTRIP range of 4.35V - 4.60V, Bonding Option F, Industrial Temp., TO-92 package
RESET/RESET VTRIP Voltage	270 = 300 = 315 = 450 = 460 =	2.55 ≤ VTRIP ≤ 2.70 2.85 ≤ VTRIP ≤ 3.00 3.00 ≤ VTRIP ≤ 3.15 4.25 ≤ VTRIP ≤ 4.50 4.35 ≤ VTRIP ≤ 4.60		f)	MCP130T-475I/TT = Tape & Reel, VTRIP range of 4.50V - 4.75V, Industrial Temp., SOT-23 package
	475 = 485 =	$4.50 \le VTRIP \le 4.00$ $4.50 \le VTRIP \le 4.75$ $4.60 \le VTRIP \le 4.85$			TO-92 with TO-92 with 'D' Bondout 'F' Bondout
Bondout Option: (TO-92 Only)	D = F = G = H =	D Bond Option (see F Bond Option G Bond Option H Bond Option	bond option chart)		$\overline{RST} \bigvee_{VDD} VSS \qquad VSS \bigvee_{\overline{RST}} VDD$
Temperature Range:	I =	-40°C to +85°C (only	offered in I)		MCP120 MCP130 MCP130
Package:	SN = TO = TT =	SOIC (8-lead, 150 TO-92 (3-lead) [offo SOT-23 (3-lead) [or			TO-92 with TO-92 with 'G' Bondout 'H' Bondout
					V <sub>DD</sub> RST V <sub>DD</sub> V <sub>SS</sub> RST

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MCP120 MCP130

MCP120

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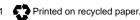
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