Micro-Power Supply-Voltage Supervisors

General Description

The uP7601/2/3/4 are micro-power supply-voltage supervisors specifically designed for use in microcomputer and microprocessor systems. The supervisors monitor the supply voltage for under voltage conditions with only 3uA quiescent current.

Whenever the supply voltage falls below the factory-set reset threshold, the reset output assets and remains asserted for a minimum reset timeout period after the supply voltage rises above the reset threshold. Reset thresholds from 1.2V to 5V with 0.1V increments are available, covering most digital applications. Four minimum reset timeout delays ranging from 0ms to 320ms are available.

The devices feature a Manual Reset: an input that asserts reset when pulled low (MR# with internal 0.2uA pull-high current)

The uP7601 has a push-pull active-high reset, uP7602 push-pull active-low, uP7603 open-drain active-high, and uP7604 open-drain active-low reset output.

The uP7601/2/3/4 are available in SC70-3L, SC82-4L, TSOT23-3L, (T)SOT23-5L and SOT89-3L packages.

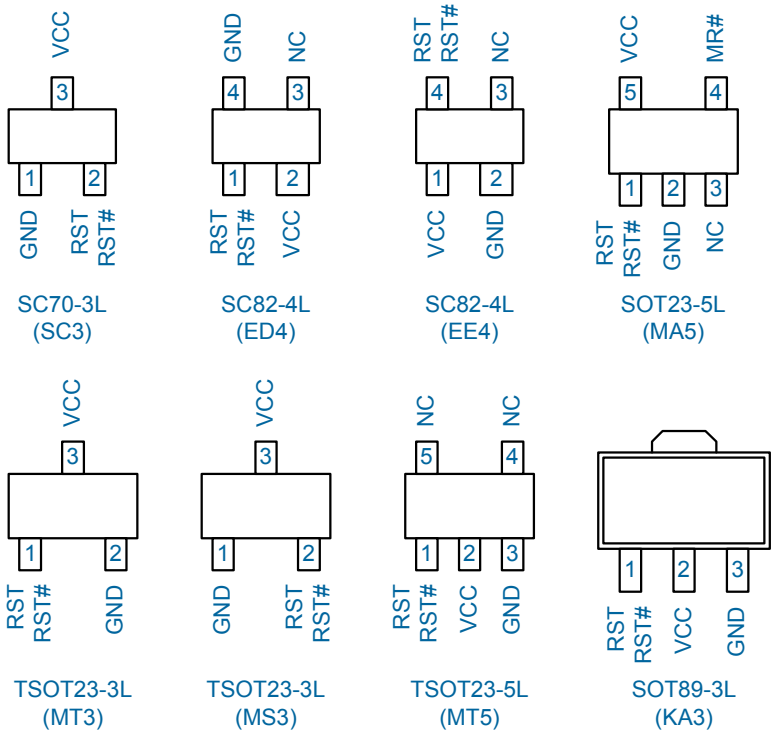
Features

- **Fixed Threshold from 1.2V to 5V in 0.1V Step**
- **High Accuracy +/-1%**
- **Low Supply Current 3uA**
- **Manual Reset Function**
- **No External Components Required**
- **Quick Reset within 40us**
- **Built-In Recovery Delay Time:**
  - **0ms, 40ms, 160ms, 320ms Options**
- **Low Functional Supply Voltage 0.9V**
- **Push-Pull or Open-Drain Output Options**
- **Active-High or Active-Low Options**
- **Tiny SC70-3L, SC82-4L, TSOT23-3L, (T)SOT23-5L, and SOT89-3L Packages**
- **RoHS Compliant and Halogen-Free**

Applications

- **Computers**
- **Controllers**
- **Intelligent Instruments**
- **Portable Battery-Powered Equipments**

Pin Configuration

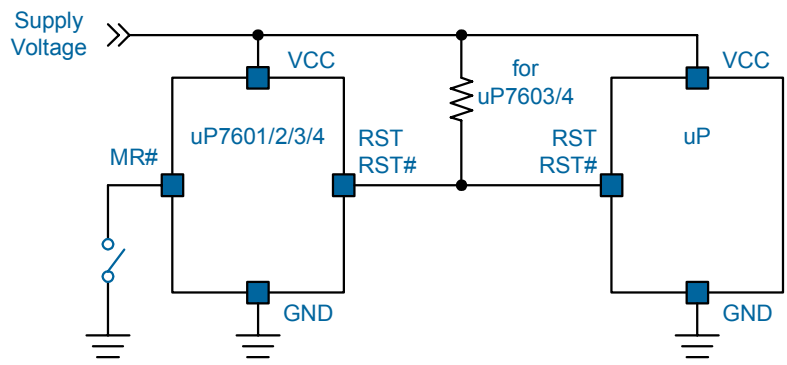


Ordering Information

Order Number	Package Type	Remark	Order Number	Package Type	Remark
uP7601XSC3-YY	SC70-3L		uP7603XSC3-YY	SC70-3L	
uP7601XED4-YY	SC82-4L		uP7603XED4-YY	SC82-4L	
uP7601XEE4-YY	SC82-4L		uP7603XEE4-YY	SC82-4L	
uP7601XMA5-YY	SOT23-5L		uP7603XMA5-YY	SOT23-5L	
uP7601XMT3-YY	TSOT23-3L		uP7603XMT3-YY	TSOT23-3L	
uP7601XMS3-YY	TSOT23-3L		uP7603XMS3-YY	TSOT23-3L	
uP7601XMT5-YY	TSOT23-5L		uP7603XMT5-YY	TSOT23-5L	
uP7601XKA3-YY	SOT89-3L		uP7603XKA3-YY	SOT89-3L	
uP7602XSC3-YY	SC70-3L		uP7604XSC3-YY	SC70-3L	
uP7602XED4-YY	SC82-4L		uP7604XED4-YY	SC82-4L	
uP7602XEE4-YY	SC82-4L		uP7604XEE4-YY	SC82-4L	
uP7602XMA5-YY	SOT23-5L		uP7604XMA5-YY	SOT23-5L	
uP7602XMT3-YY	TSOT23-3L		uP7604XMT3-YY	TSOT23-3L	
uP7602XMS3-YY	TSOT23-3L		uP7604XMS3-YY	TSOT23-3L	
uP7602XMT5-YY	TSOT23-5L		uP7604XMT5-YY	TSOT23-5L	
uP7602XKA3-YY	SOT89-3L		uP7604XKA3-YY	SOT89-3L	
uP7601: Push-Pull Active High uP7602: Push-Pull Active Low uP7603: Open-Drain Active High uP7604: Open-Drain Active Low					
Code X: Reset Timeout Delay A: 0ms; B: 40ms; C: 160ms; D: 320ms					
Code YY: Reset Threshold Voltage 12: 1.2V; 18: 1.8V; 25: 2.5V; 33: 3.3V ... etc. *Z3: 4.63V; P8: 3.08V; N3: 2.93V; K3: 2.63V; F6: 1.66V; E7: 1.57V; D8: 1.38V; D1: 1.31V*					

Note: uPI products are compatible with the current IPC/JEDEC J-STD-020 requirement. They are halogen-free, RoHS compliant and 100% matte tin (Sn) plating that are suitable for use in SnPb or Pb-free soldering processes.

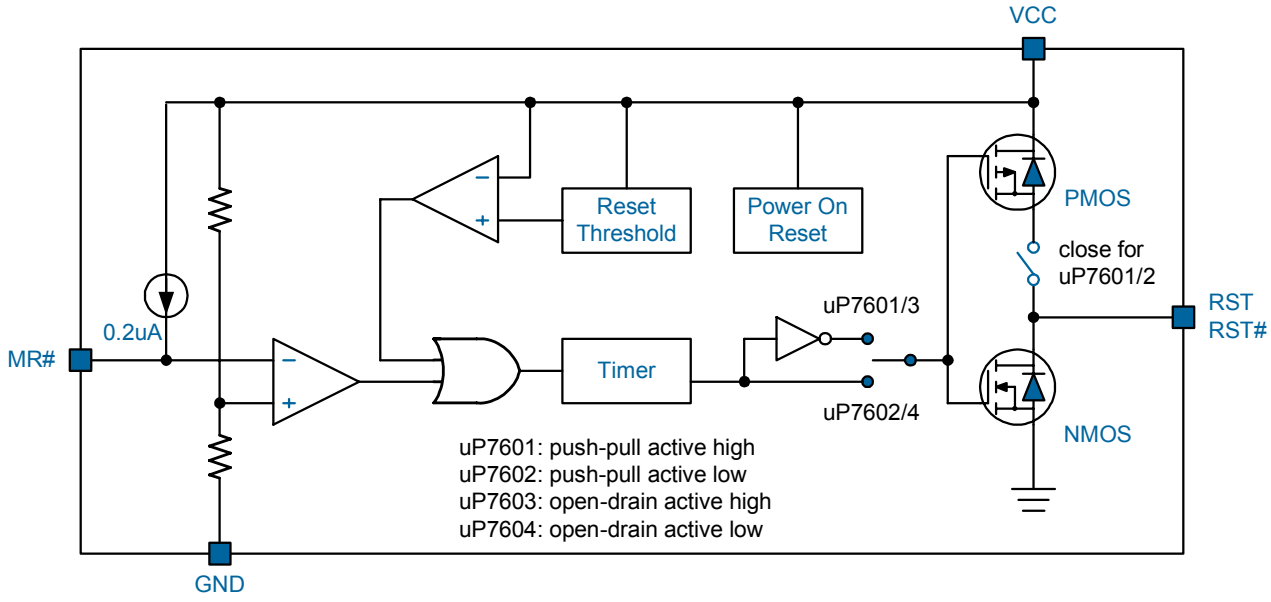
Typical Application Circuit



Functional Pin Description

Pin Name	Pin Function
VCC	**Supply Voltage Input.**
RST	**Active High Reset Output for uP7601/3.**
RST#	**Active Low Reset Output for uP7602/4.**
MR#	**Manual Reset Input.** Reset remains active when MR# is low and for T_{DLY} after MR# returns high. This pin is internally pulled high by a 0.2uA current source. The MR# can be driven with a CMOS output or shorted to ground with a switch.
GND	**Ground.**

Functional Block Diagram



Functional Description

The uP7601/2/3/4 supervisors monitor battery, power supply, and system voltage from 1.2V to 5V. These devices consume only 3uA of supply current with 3.6V supply voltage.

Figure 1 shows a typical timing diagram of uP7601/2/3/4. The output is undifined if V_{CC} is below the POR threshold level. The POR level is about 0.9V at V_{CC} rising. The output is asserted whenever the supply voltage falls below the internal threshold V_{TH}. The output is released until the supply voltage rises above the threshold V_{HYS} (V_{HYS} = 1.03 x V_{TH}) with a certain timeout delay T_{DLY}. V_{TH} range from 1.2V to 5.0V with 0.1V increments are available.

Manual Reset

The uP7601/2/3/4 features a manual reset input MR# that allows the operator, a test technician, or external logic circuitry to initiate a reset. The reset remains asserted when MR# is low, and with a fixed timeout delay T_{DLY} after MR# returns to high. The MR# is internally pulled to VCC by a 0.2uA current soruce. It can be driven with CMOS logic level or with open drain/collector outputs. Let the MR# floating or connect it to VCC when manual reset is not used.

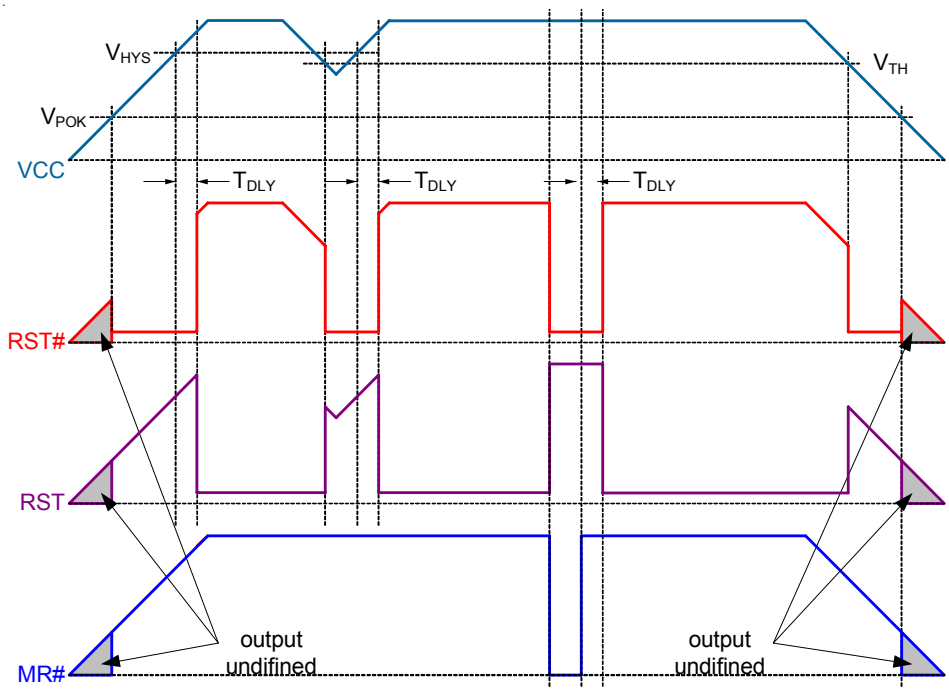


Figure 1. Typical Timing Diagram

Absolute Maximum Rating

Supply Input Voltage, V_{CC} (Note 1) ---------- -0.3V to +6.0V
RST, RST# ---------- -0.3V to V_{CC} + 0.3V
Storage Temperature ---------- -65°C to +150°C
Junction Temperature ---------- 150°C
Lead Temperature (Soldering, 10 sec) ---------- 260°C
ESD Rating (Note 2)
HBM (Human Body Mode) ---------- 2kV
MM (Machine Mode) ---------- 200V

Thermal Information

Package Thermal Resistance (Note 3)
SC70-3L θ_{JA} ---------- 333°C/W
SC82-4L θ_{JA} ---------- 333°C/W
SOT23-5L θ_{JA} ---------- 250°C/W
TSOT23-3/5L θ_{JA} ---------- 250°C/W
SOT89-3L θ_{JA} ---------- 180°C/W
Power Dissipation, P_D @ T_A = 70°C
SC70-3L ---------- 0.25W
SC82-4L ---------- 0.25W
SOT23-5L ---------- 0.4W
TSOT23-3/5L ---------- 0.4W
SOT89-3L ---------- 0.55W

Recommended Operation Conditions

Operating Junction Temperature Range (Note 4) ---------- -40°C to +125°C
Operating Ambient Temperature Range ---------- -40°C to +85°C
Supply Input Voltage, V_{CC} ---------- 1.2V to +5.5V

Electrical Characteristics

(V_{CC} = 3.6V, T_A = 25°C, unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Supply Voltage						
Supply Input Range	V_{CC}		1.2	--	5.5	V
Supply Input Current			--	3	--	uA
Reset Threshold Voltage						
Threshold Voltage Accuracy	V_{TH}		-1.0	--	1.0	%
Reset Hysteresis Voltage	V_{HYS}	% of V_{TH}	--	103	--	%
Reset Timeout Period	T_{DLY}	Code X = A	--	0	--	ms
		Code X = B	25	40	55	
		Code X = C	110	160	210	
		Code X = D	220	320	420	
VCC Drop to Reset Delay	T_{DROP}	V_{DROP} = 200mV	--	30	40	us

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
MR#						
MR# Input Voltage	V_{IH}		0.7*V_{CC}	--	--	V
	V_{IL}		--	--	0.3*V_{CC}	
MR# to Reset Delay			--	500	--	ns
MR# Pull High Current		MR# = 0V.	--	0.2	2	uA
Reset Output						
RST Output Low Voltage	V_{LOW}	V_{CC} > 3V, I_{SINK} = 3.5mA	--	--	0.4	V
		1.8V<V_{CC} < 3V, I_{SINK} = 1.2mA	--	--	0.3	V
		1.2V<V_{CC}<1.8V, I_{SINK} = 0.5mA	--	--	0.3	V
Output High Leakage Current, for uP7603/4	I_{HIGH}	VCC=V_{OUT} = 5V	--	--	1.0	uA
RST Output High Voltage, for uP7601/2	V_{HIGH}	1.1V<V_{CC} < V_{TH}, I_{SOURCE} = 200uA	0.8*V_{CC}	--	--	V
		1.8V<V_{CC} < V_{TH}, I_{SOURCE} = 500uA	0.8*V_{CC}	--	--	
		3V<V_{CC} < V_{TH}, I_{SOURCE} = 800uA	V_{CC}-1.5	--	--	

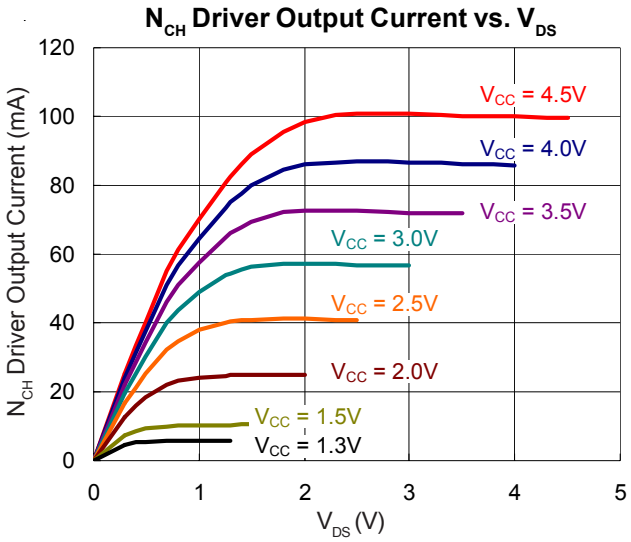
Note 1. Stresses listed as the above "Absolute Maximum Ratings" may cause permanent damage to the device. These are for stress ratings. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may remain possibility to affect device reliability.

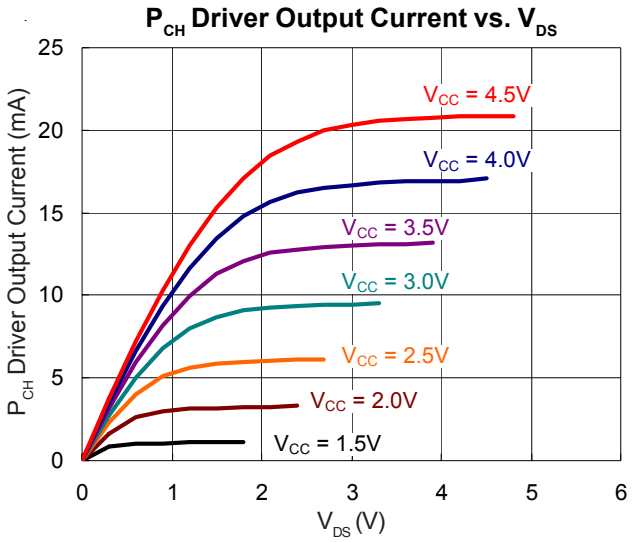
Note 2. Devices are ESD sensitive. Handling precaution recommended.

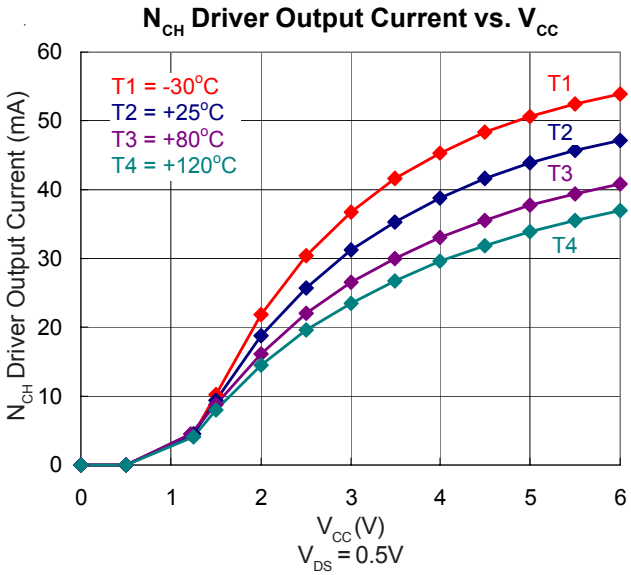
Note 3. θ_{JA} is measured in the natural convection at T_A = 25°C on a low effective thermal conductivity test board of JEDEC 51-3 thermal measurement standard.

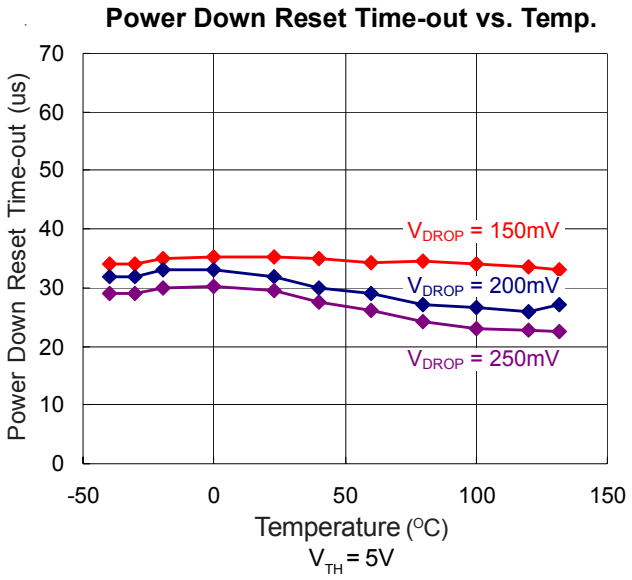
Note 4. The device is not guaranteed to function outside its operating conditions.

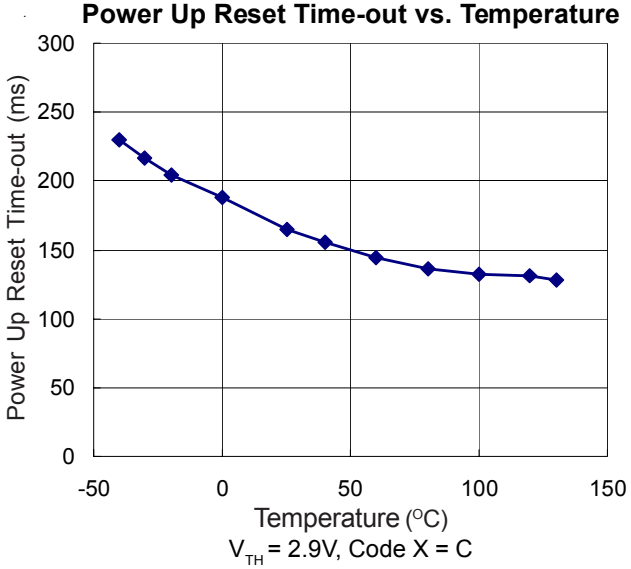
Typical Operation Characteristics

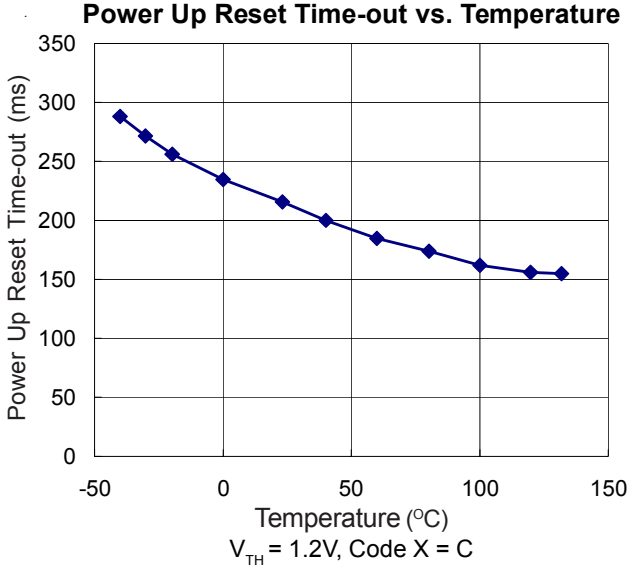






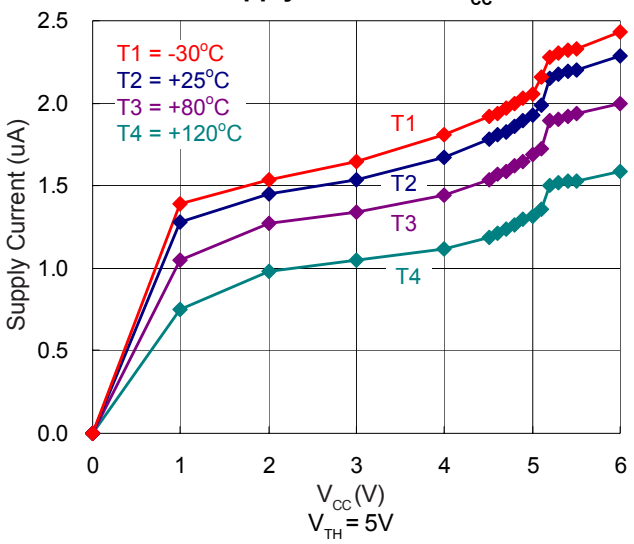




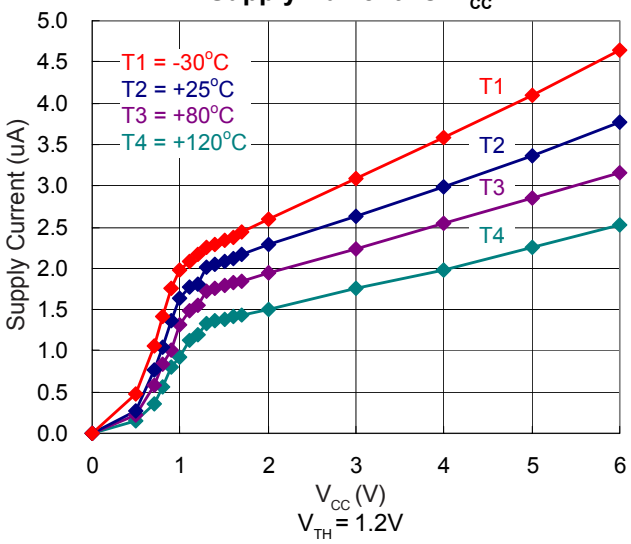


Typical Operation Characteristics

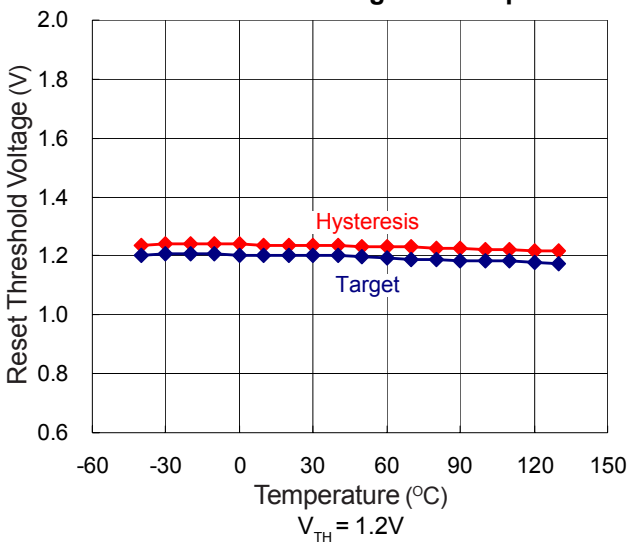
Supply Current vs. V_{CC}



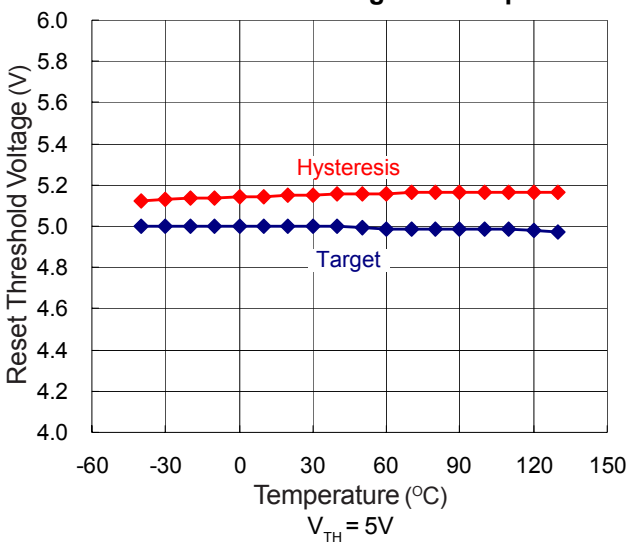
Supply Current vs. V_{CC}



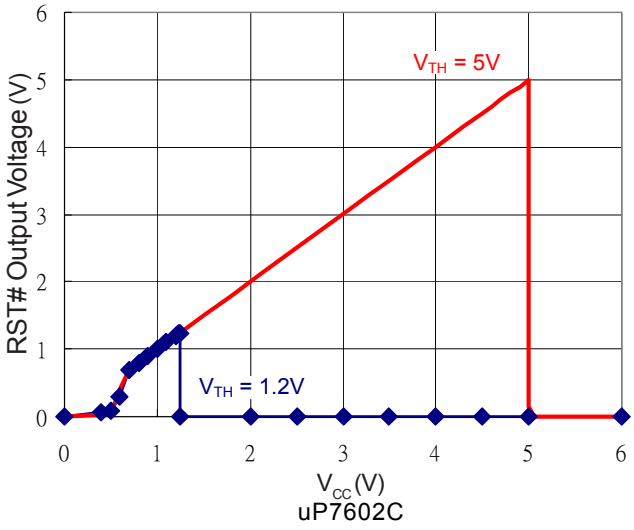
Reset Threshold Voltage vs. Temperature



Reset Threshold Voltage vs. Temperature



RST# Output Voltage vs. Input Voltage



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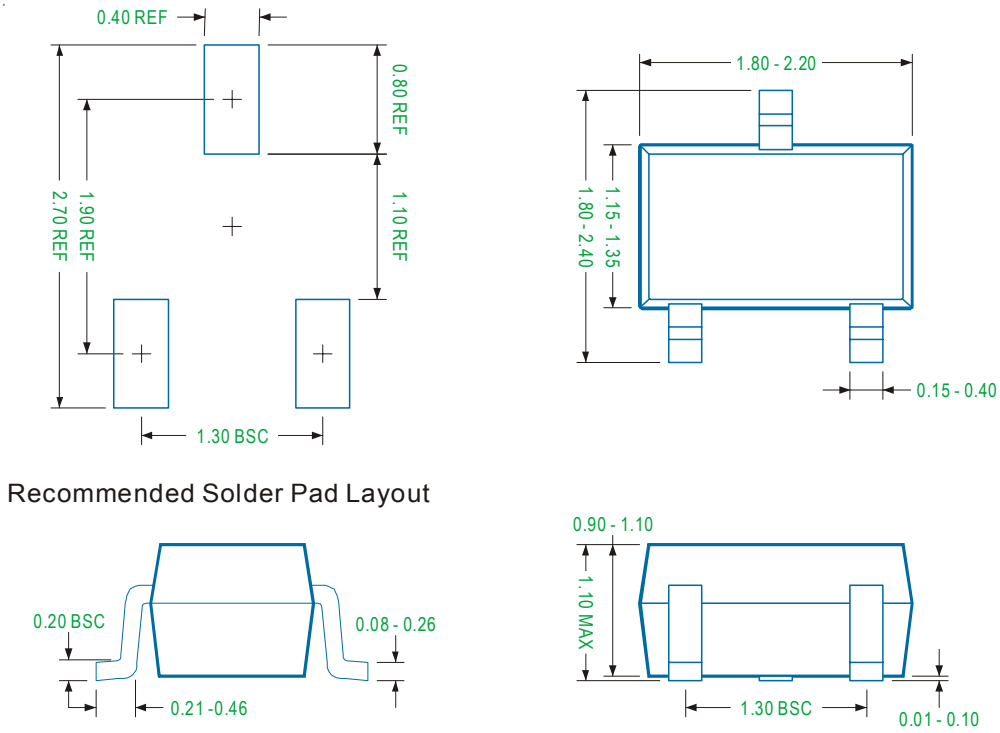
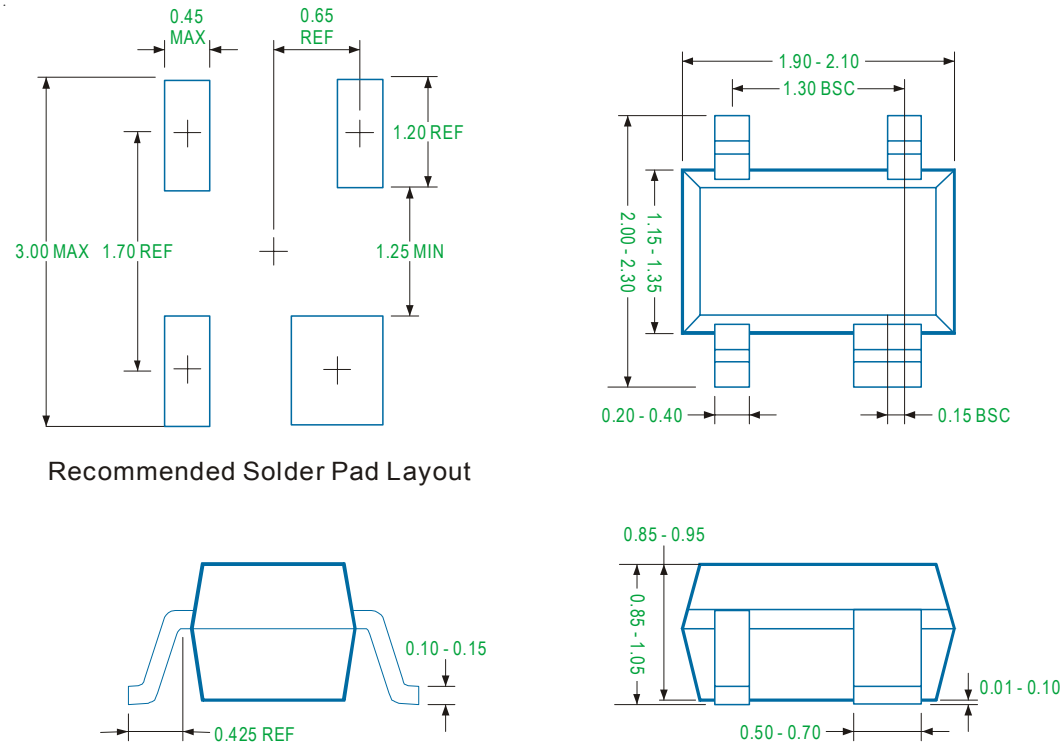
Package Information

SC70-3L Package

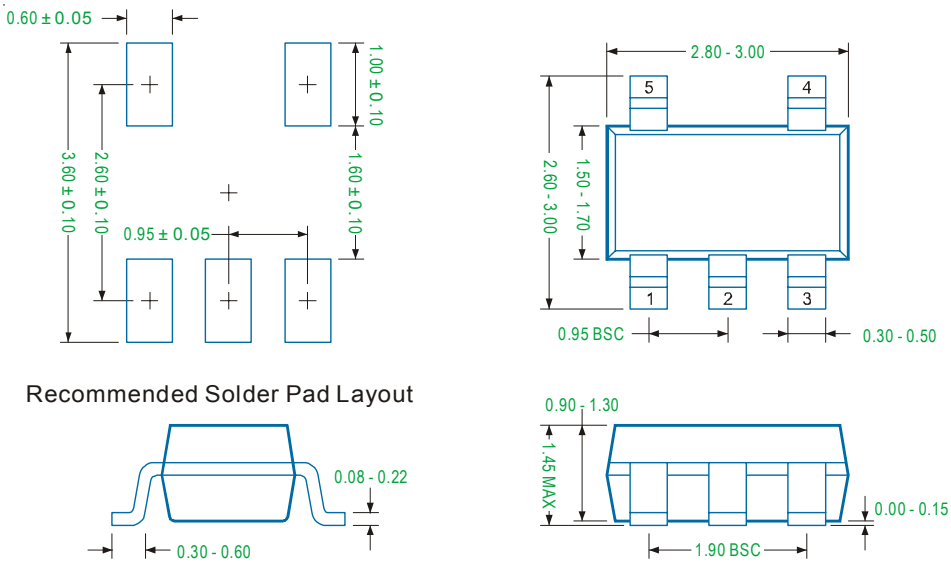


SC82-4L Package

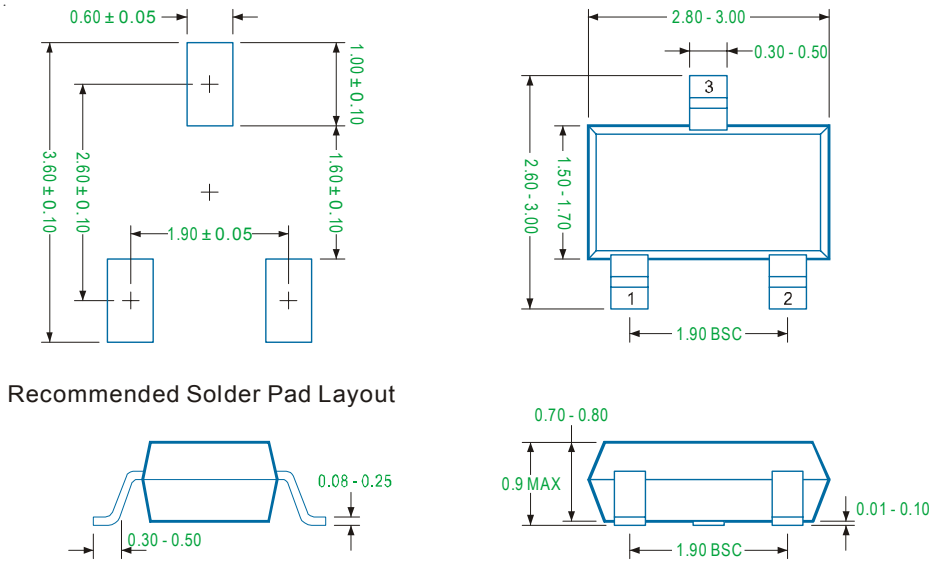


Package Information

SOT23-5L Package

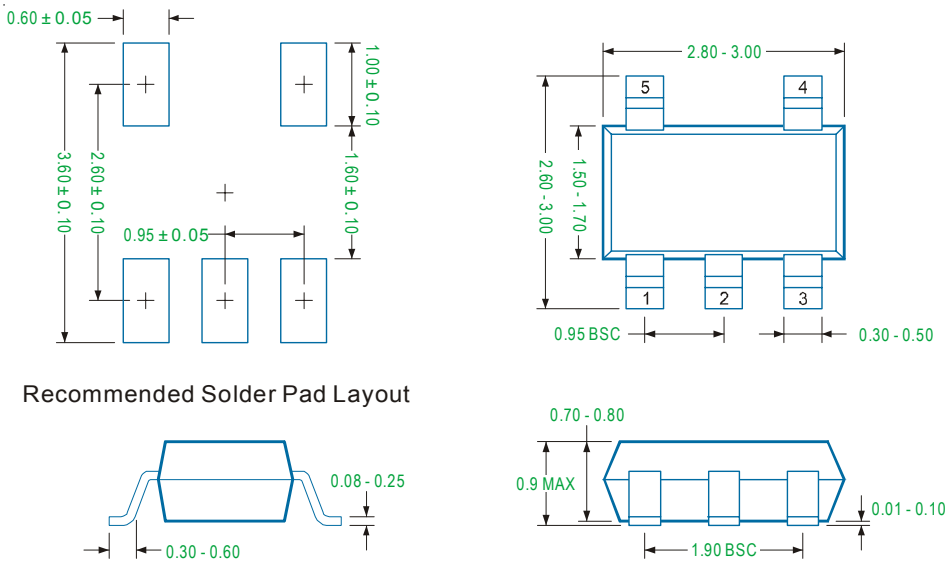


TSOT23-3L Package

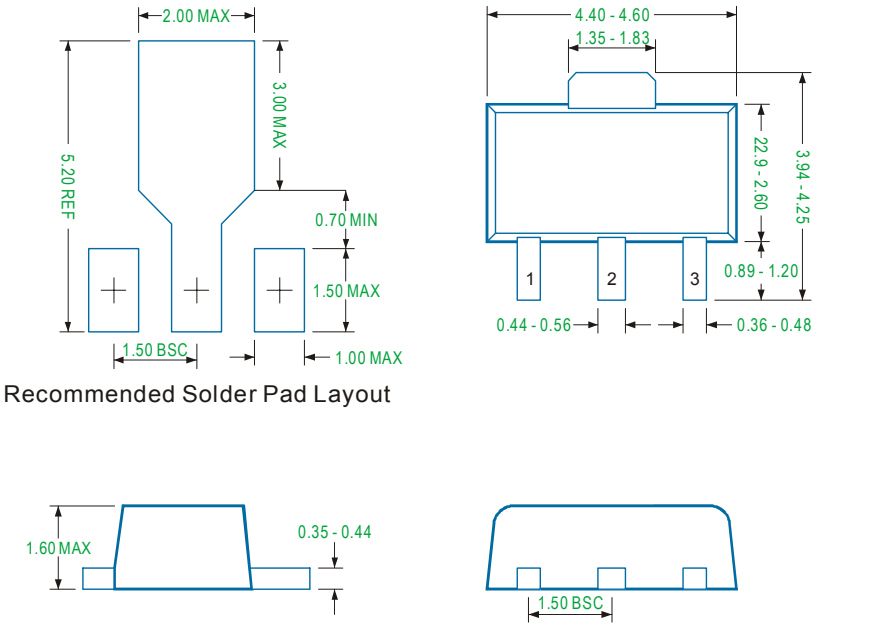


Package Information

TSOT23-5L Package



SOT89-3L Package



Note

1. Package Outline Unit Description:
   BSC: Basic. Represents theoretical exact dimension or dimension target
   MIN: Minimum dimension specified.
   MAX: Maximum dimension specified.
   REF: Reference. Represents dimension for reference use only. This value is not a device specification.
   TYP. Typical. Provided as a general value. This value is not a device specification.
2. Dimensions in Millimeters.
3. Drawing not to scale.
4. These dimensions no not include mold flash or protrusions. Mold flash or protrusions shell not exceed 0.15mm.