CAT811, CAT812

4-Pin Microprocessor Power Supply Supervisors

FEATURES

- **Precision monitoring of +5.0 V (+/- 5%, +/- 10%, +/- 20%), +3.3 V (+/- 5%, +/ 10%), +3.0 V (+/- 10%) and +2.5 V (+/- 5%) power supplies**
- **Offered in two output configurations: - CAT811: Active LOW reset - CAT812: Active HIGH reset**
- **Manual reset input**
- **Direct replacements for the MAX811 and MAX812 in applications operating over the industrial temperature range**
- **Reset valid down to V_{cc} = 1.0 V**
- **6 µA power supply current**
- **Power supply transient immunity**
- **Compact 4-pin SOT143 package**
- **Industrial temperature range: -40˚C to +85˚C**

APPLICATIONS

- **Computers**
- **Servers**
- **Laptops**
- **Cable modems**
- **Wireless communications**
- **Embedded control systems**
- **White goods**
- **Power meters**
- **Intelligent instruments**
- **PDAs and handheld equipment**

DESCRIPTION

The CAT811 and CAT812 are µP supervisory circuits that monitor power supplies in digital systems. The CAT811 and CAT812 are direct replacements for the MAX811 and MAX812 in applications operating over the industrial temperature range; both have a manual reset input.

These devices generate a reset signal, which is asserted while the power supply voltage is below a preset threshold level and for at least 140 ms after the power supply level has risen above that level. The underlying floating gate technology, AE$^{2(TM)}$ used by Catalyst Semiconductor, makes it possible to offer any custom reset threshold value. Seven industry standard threshold levels are offered to support +5.0 V, +3.3 V, +3.0 V and +2.5 V systems.

The CAT811 features a $\overline{\text{RESET}}$ push-pull output (active LOW) and the CAT812 features a RESET push-pull output (active HIGH).

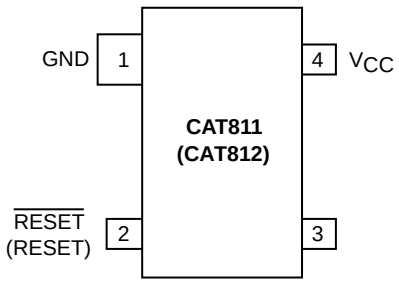
Fast transients on the power supply are ignored and the output is guaranteed to be in the correct state at V_{cc} levels as low as 1.0 V.

The CAT811/812 are fully specified over the industrial temperature range (-40˚C to 85˚C) and are available in a compact 4-pin SOT143 package.

THRESHOLD SUFFIX SELECTOR

Nominal Threshold Voltage	Threshold Suffix Designation
4.63V	L
4.38V	M
4.00V	J
3.08V	T
2.93V	S
2.63V	R
2.32V	Z

PIN CONFIGURATION



Doc. No. 3005, Rev. P

ORDERING INFORMATION

Ordering Part Number	RESET Polarity	Package	Parts per Reel
CAT811_EUS-T	Push-Pull $\overline{\text{RESET}}$	4-pin, SOT143	3k
CAT811_EUS-T10	Push-Pull $\overline{\text{RESET}}$	4-pin, SOT143	10k
CAT811_TBI-T	Push-Pull $\overline{\text{RESET}}$	4-pin, SOT143 Green	3k
CAT811_TBI-T10	Push-Pull $\overline{\text{RESET}}$	4-pin, SOT143 Green	10k
CAT812_EUS-T	Push-Pull RESET	4-pin, SOT143	3k
CAT812_EUS-T10	Push-Pull RESET	4-pin, SOT143	10k
CAT812_TBI-T	Push-Pull RESET	4-pin, SOT143 Green	3k
CAT812_TBI-T10	Push-Pull RESET	4-pin, SOT143 Green	10k

Insert threshold suffix (L, M, J, T, S, R or Z) into the blank position. Example: CAT811LTBI-T for 4.63 V, and lead-free SOT143 package.

TOP MARKING

	SOT143	SOT143 Green
CAT811L	AMYM	DHYM
CAT811M	ANYM	DJYM
CAT811J	AZYM	CKYM
CAT811T	APYM	DLYM
CAT811S	AQYM	DMYM
CAT811R	ARYM	DNYM
CAT811Z	AYYM	CPYM
CAT812L	ASYM	DRYM
CAT812M	ATYM	DTYM
CAT812J	AUYM	DUYM
CAT812T	AVYM	DVYM
CAT812S	AWYM	DWYM
CAT812R	AXYM	DXYM
CAT812Z	CIYM	CYYM

Where YM stands for Year and Month.

PIN DESCRIPTIONS

Pin Number		Name	Description
CAT811	CAT812		
1	1	GND	Ground
2	—	$\overline{\text{RESET}}$	Active LOW reset. $\overline{\text{RESET}}$ is asserted if V_{CC} falls below the reset threshold and remains low for at least 140ms after V_{CC} rises above the reset threshold.
—	2	RESET	Active HIGH reset. RESET is asserted if V_{CC} falls below the reset threshold and remains high for at least 140ms after V_{CC} rises above the reset threshold.
3	3	$\overline{\text{MR}}$	Manual Reset Input. A logic LOW on $\overline{\text{MR}}$ asserts RESET. RESET remains active as long as $\overline{\text{MR}}$ is LOW and for 140ms after $\overline{\text{MR}}$ returns HIGH. The active low input has an internal 20kΩ pull-up resistor. The input should be left open if not used. It can be driven by TTL or CMOS logic or shorted to ground by a switch.
4	4	V_{CC}	Power supply voltage that is monitored.

ABSOLUTE MAXIMUM RATINGS*

Any pin with respect to ground ..... -0.3 V to +6.0 V
Input Current, V_{CC} ..... 20 mA
Output Current, RESET, $\overline{RESET}$ ..... 20 mA
Rate of Rise, V_{CC} ..... 100 V/µs
Continuous Power Dissipation
Derate 4mW/˚C above 70˚C (SOT143) ..... 320 mW

Operating Temperature Range ..... -40°C to +85°C
Storage Temperature Range ..... -65°C to +105°C
Lead Soldering Temperature (10 sec) ..... 300°C

***COMMENT**

Stresses above those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions outside of those listed in the operational sections of this specification is not implied. Exposure to any absolute maximum rating for extended periods may affect device performance and reliability.

ELECTRICAL CHARACTERISTICS

V_{CC} = Full range, T_A = -40°C to +85°C unless otherwise noted. Typical values at T_A = +25˚C and V_{CC} = 5 V for the L/M/J versions, V_{CC} = 3.3 V for the T/S versions, V_{CC}=3 V for the R version and V_{CC} = 2.5 V for the Z version.

Parameter	Symbol	Conditions		Min	Typ	Max	Units
VCC Range		T_A = 0˚C to +70˚C		1.0		5.5	V
		T_A = -40˚C to +85˚C		1.2		5.5	
Supply Current	I_{CC}	T_A = -40˚C to +85˚C	V_{CC} < 5.5 V, J/L/M		8	20	µA
			V_{CC} < 3.6 V, R/S/T/Z		6	15	
Reset Threshold Voltage	V_{TH}	L Threshold	T_A = +25˚C	4.56	4.63	4.70	V
			T_A = -40˚C to +85˚C	4.50		4.75	
		M Threshold	T_A = +25˚C	4.31	4.38	4.45	
			T_A = -40˚C to +85˚C	4.25		4.50	
		J Threshold	T_A = +25˚C	3.93	4.00	4.06	
			T_A = -40˚C to +85˚C	3.89		4.10	
		T Threshold	T_A = +25˚C	3.04	3.08	3.11	
			T_A = -40˚C to +85˚C	3.00		3.15	
		S Threshold	T_A = +25˚C	2.89	2.93	2.96	
			T_A = -40˚C to +85˚C	2.85		3.00	
		R Threshold	T_A = +25˚C	2.59	2.63	2.66	
			T_A = -40˚C to +85˚C	2.55		2.70	
		Z Threshold	T_A = +25˚C	2.28	2.32	2.35	
			T_A = -40˚C to +85˚C	2.25		2.38	

ELECTRICAL CHARACTERISTICS (continued)

V_{CC} = Full range, T_A = -40°C to +85°C unless otherwise noted. Typical values at T_A = +25°C and V_{CC} = 5 V for L/M/J versions, V_{CC} = 3.3 V for T/S versions, V_{CC} = 3 V for R version and V_{CC} = 2.5 V for Z version.

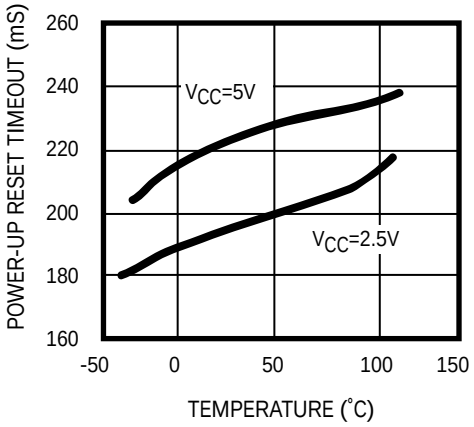
Parameter	Symbol	Conditions	Min	Typ(1)	Max	Units
Reset Threshold Tempco				30		ppm/°C
V_{CC} to Reset Delay (Note 2)		V_{CC} = V_{TH} to (V_{TH} - 100 mV)		20		µs
Reset Active Timeout Period		T_A = -40°C to +85°C	140	240	400	ms
$\overline{RESET}$ Output Voltage Low (Push-pull, active LOW, CAT811)	V_{OL}	V_{CC} = V_{TH} min, I_{SINK} = 1.2 mA CAT811R/S/T/Z			0.3	V
		V_{CC} = V_{TH} min, I_{SINK} = 3.2 mA CAT811J/L/M			0.4	
		V_{CC} > 1.0 V, I_{SINK} = 50 µA			0.3	
$\overline{RESET}$ Output Voltage High (Push-pull, active LOW, CAT811)	V_{OH}	V_{CC} = V_{TH} max, I_{SOURCE} = 500 µA CAT811R/S/T/Z	0.8 V_{CC}			V
		V_{CC} = V_{TH} max, I_{SOURCE} = 800 µA CAT811J/L/M	V_{CC} - 1.5			
RESET Output Voltage Low (Push-pull, active HIGH, CAT812)	V_{OL}	V_{CC} > V_{TH} max, I_{SINK} = 1.2 mA CAT812R/S/T/Z			0.3	V
		V_{CC} > V_{TH} max, I_{SINK} = 3.2 mA CAT812J/L/M			0.4	
RESET Output Voltage High (Push-pull active HIGH, CAT812)	V_{OH}	1.8 V < V_{CC} ≤ V_{TH} min, I_{SOURCE} = 150 µA	0.8 V_{CC}			V
$\overline{MR}$ Minimum Pulse Width	t_{MR}		10			µs
MR Glitch Immunity		Note 3		100		ns
$\overline{MR}$ to RESET Propagation Delay	t_{MD}	Note 2		0.5		µs
$\overline{MR}$ Input Threshold	V_{IH}	V_{CC} > $V_{TH\ (MAX)}$, CAT811/812L/M/J	2.3 V			V
	V_{IL}				0.8	
	V_{IH}	V_{CC} > $V_{IH\ (MAX)}$, CAT811/812R/S/T/Z	0.7V_{CC}			
	V_{IL}				0.25V_{CC}	
$\overline{MR}$ Pull-up Resistance			10	20	30	kΩ

Note 1: Production testing done at T_A = +25°C; limits over temperature guaranteed by design only.
Note 2: $\overline{RESET}$ output for the CAT811; RESET output for the CAT812
Note 3: Glitches of 100 ns or less typically will not generate a reset pulse.

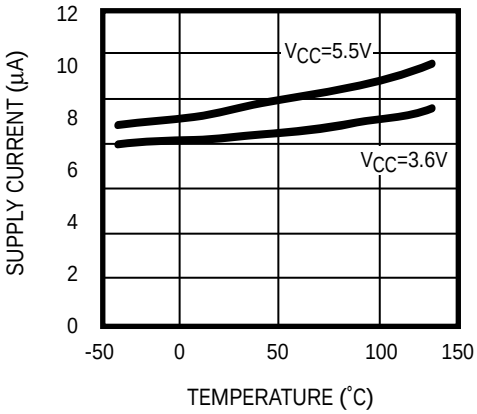
TYPICAL OPERATING CHARACTERISTICS

V_{CC} = Full range, T_A = -40°C to +85°C unless otherwise noted. Typical values at T_A = +25°C and V_{CC} = 5 V for L/M/J versions, V_{CC}=3.3 V for T/S versions, V_{CC} = 3 V for R version and V_{CC} = 2.5 V for Z version.

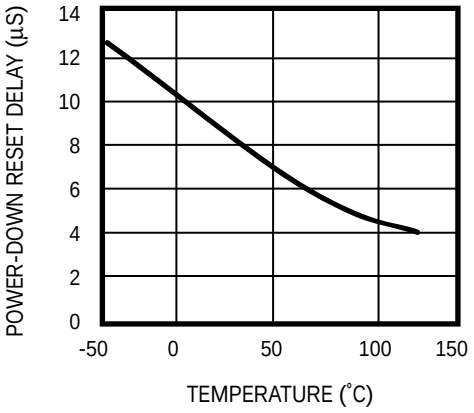
POWER-UP RESET TIMEOUT VS. TEMPERATURE



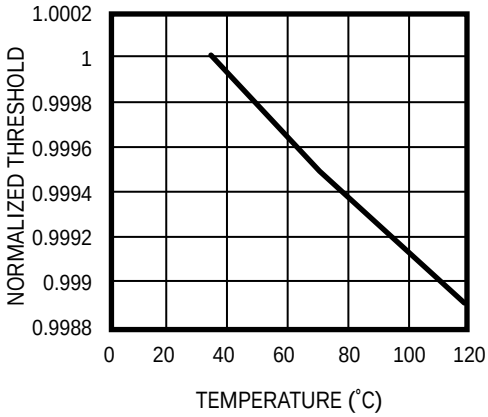
SUPPLY CURRENT VS. TEMPERATURE (NO LOAD, CAT8xxR/S/T/Z)



POWER-DOWN RESET DELAY VS. TEMPERATURE (CAT8xxR/S/T/Z)



NORMALIZED RESET THRESHOLD VS. TEMPERATURE



DETAILED DESCRIPTIONS

RESET TIMING

The reset signal is asserted LOW for the CAT811 and HIGH for the CAT812 when the power supply voltage falls below the threshold trip voltage and remains asserted for at least 140ms after the power supply voltage has risen above the threshold.

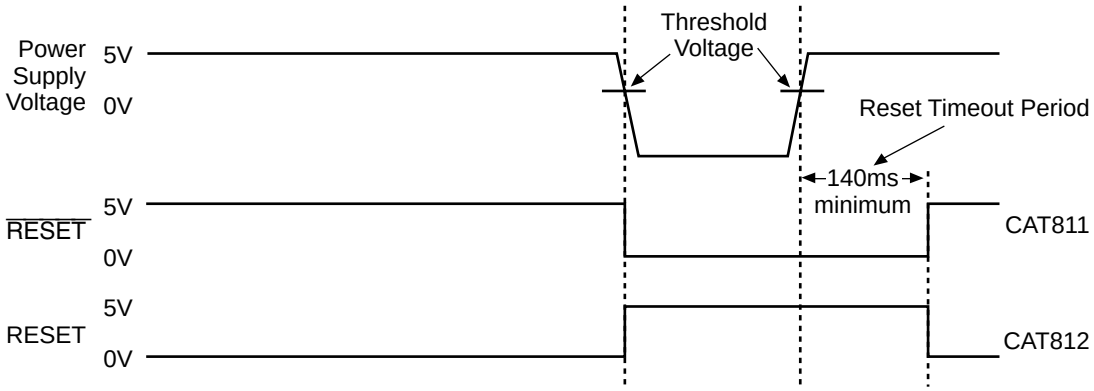


Figure 1. Reset Timing Diagram

V_{CC} TRANSIENT RESPONSE

The CAT811/812 protect µPs against brownout failure. Short duration transients of 4µsec or less and 100 mV amplitude typically do not cause a false RESET.

Figure 2 shows the maximum pulse duration of negative-going V_{CC} transients that do not cause a reset condition. As the amplitude of the transient goes further below the threshold (increasing V_{TH} - V_{CC}), the maximum pulse duration decreases. In this test, the V_{CC} starts from an initial voltage of 0.5V above the threshold and drops below it by the amplitude of the overdrive voltage (V_{TH} - V_{CC}).

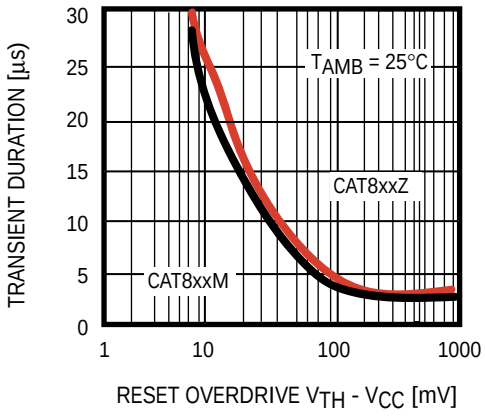


Figure 2. Maximum Transient Duration Without Causing a Reset Pulse vs. Reset Comparator Overdrive

VALID RESET WITH V_{CC} UNDER 1.0 V

To ensure that the CAT811 $\overline{\text{RESET}}$ pin is in a known state when V_{CC} is under 1.0 V, a 100 kΩ pull-down resistor between $\overline{\text{RESET}}$ pin and GND is recommended; the value is not critical. For the CAT812, a pull-up resistor from RESET pin to V_{CC} is needed.

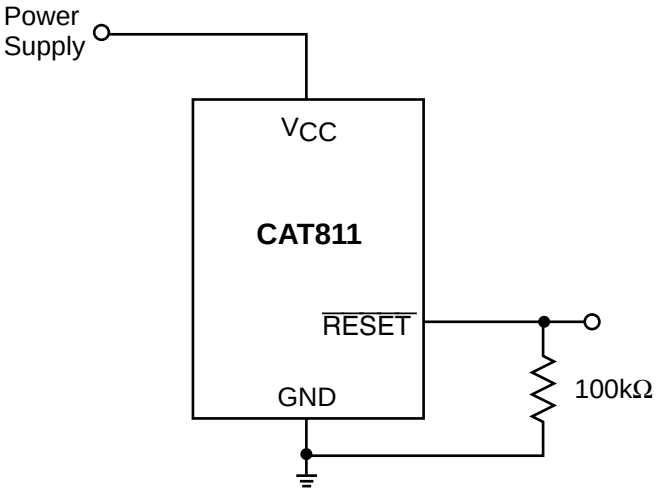


FIGURE 3. $\overline{\text{RESET}}$ Valid with VCC Under 1.0 V

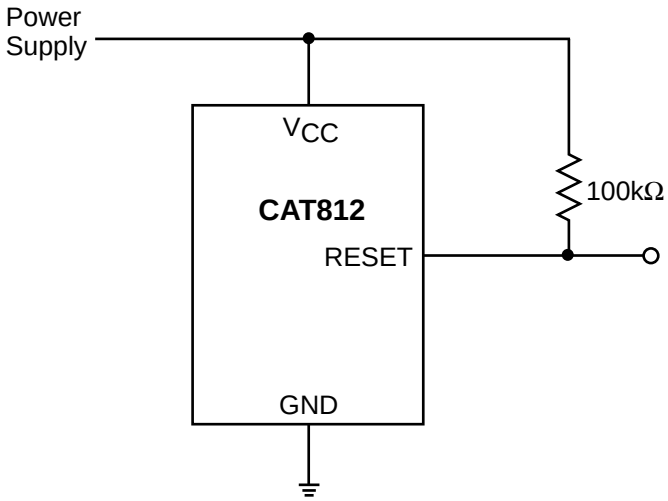


FIGURE 4. RESET Valid with VCC Under 1.1 V

BI-DIRECTIONAL RESET PIN INTERFACING

The CAT811/812 can interface with µP/µC bi-directional reset pins by connecting a 4.7 kΩ resistor in series with the CAT811/812 reset output and the µP/µC bi-directional reset pin.

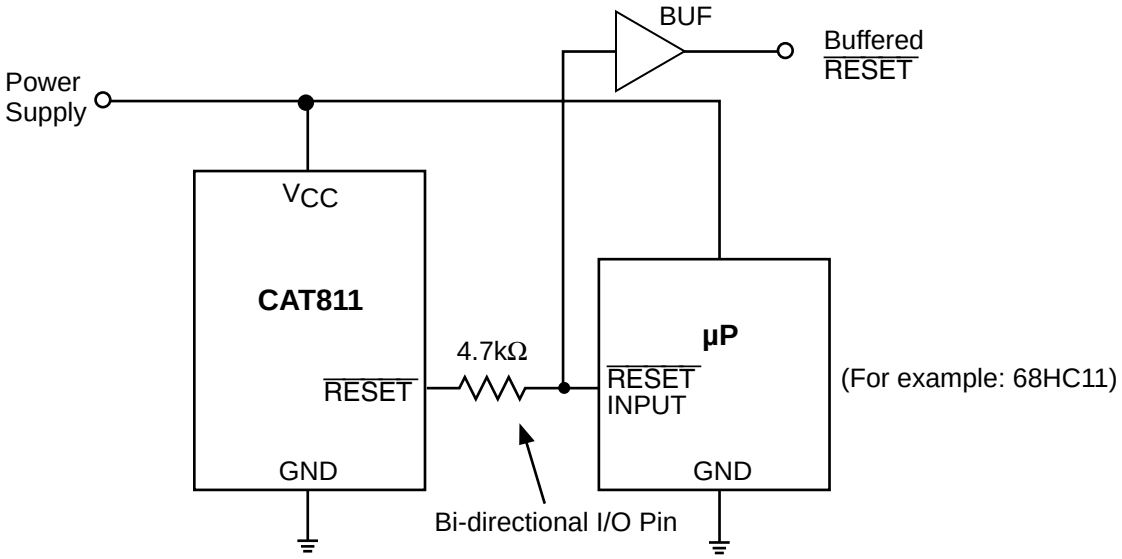


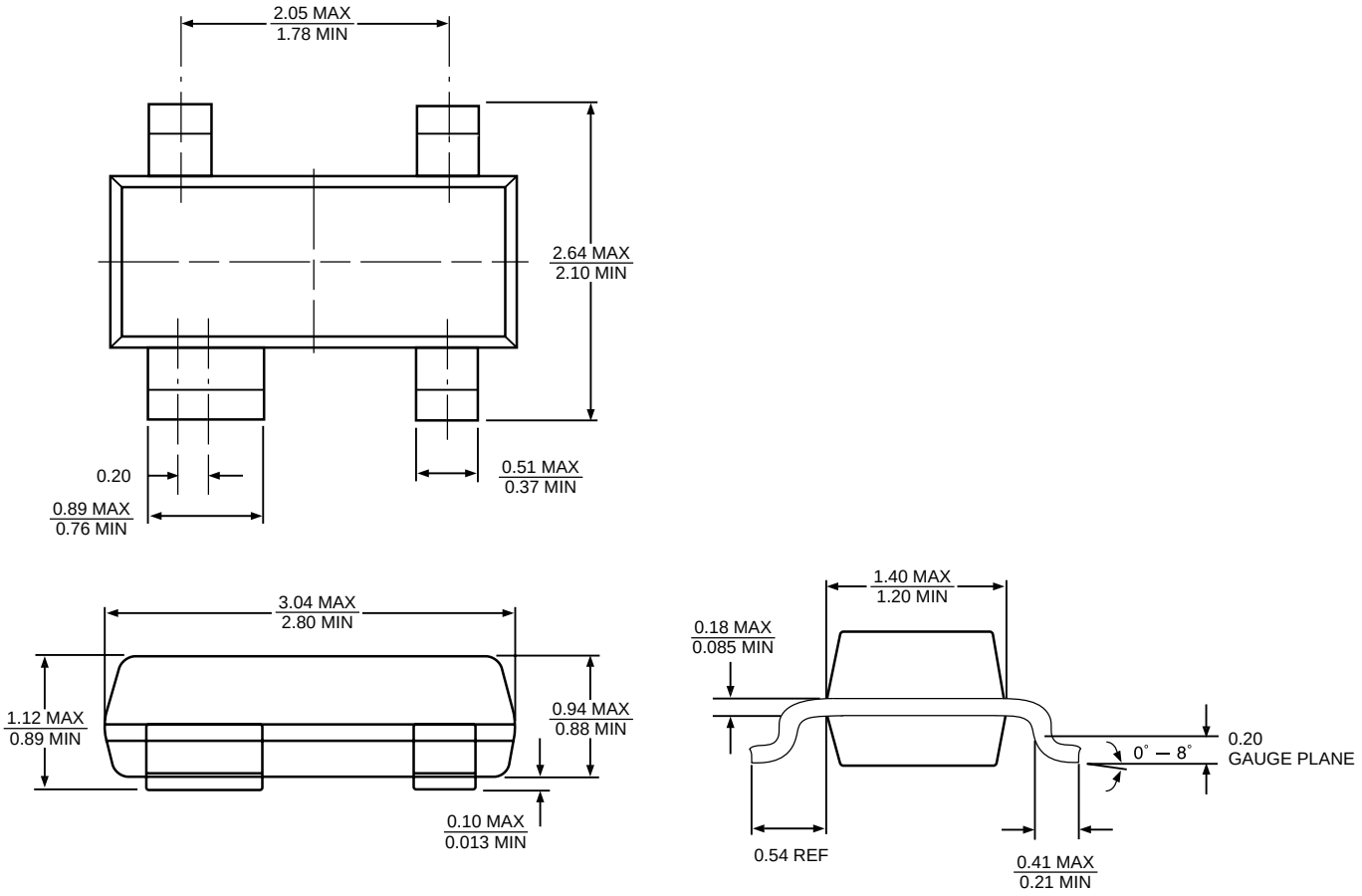
FIGURE 5. Bi-directional Reset Pin Interfacing

OTHER SUPERVISORY PRODUCTS

Function	CAT1161/3	CAT1162	CAT809	CAT810	CAT811	CAT812
With 16k Bit Serial EEPROM Memory	●	●				
Watchdog Timer	●					
Manual Reset Input	●	●			●	●
Active Low Reset			●		●	
Active High Reset				●		●
Dual Polarity Reset Outputs	●	●				
Package	8-pin DIP and SOIC	8-pin DIP and SOIC	3-pin SOT23 and SC70	3-pin SOT23 and SC70	4-pin SOT143	4-pin SOT143

PACKAGE INFORMATION

Plastic SOT143 (4-Pin)



REVISION HISTORY

Date	Rev.	Reason
10/22/03	L	Updated Ordering Information
12/22/2003	M	Updated Features Replaced power-up reset timeout vs. temperature graph with updated one Relaced VCC Transient Response graph with updated one
3/22/04	N	Updated Features Updated Description Updated Ordering Information Added Top Markings Updated Absolute Maximum Ratings Updated Electrical Characteristics Updated Detailed Description
3/25/2004	O	Changed Preliminary designation to Final Updated Top Markings Updated Electrical Characteristics (Reset Active Timeout Period Max)
3/25/2004	P	Corrected Pin Configure diagram

Catalyst Semiconductor, Inc.
Corporate Headquarters
1250 Borregas Avenue
Sunnyvale, CA 94089
Phone: 408.542.1000
Fax: 408.542.1200
www.catalyst-semiconductor.com

Publication #: 3005
Revison: P
Issue date: 3/25/04
Type: Final
Patent Pending