



# CAT809, CAT810

## 3-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:
  - CAT809: Active LOW reset
  - CAT810: Active HIGH reset
- Direct replacements for the MAX809 and MAX810 in applications operating over the industrial temperature range
- Reset valid down to  $V_{CC} = 1.0$  V
- 6  $\mu$ A power supply current
- Power supply transient immunity
- Compact 3-pin SOT23 and SC70 packages
- 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 CAT809 and CAT810 are  $\mu$ P supervisory circuits that monitor power supplies in digital systems. The CAT809 and CAT810 are direct replacements for the MAX809 and MAX810 in applications operating over the industrial temperature range.

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<sup>2</sup>(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 CAT809 features a  $\overline{\text{RESET}}$  push-pull output (active LOW) and the CAT810 features a RESET push-pull output (active HIGH).

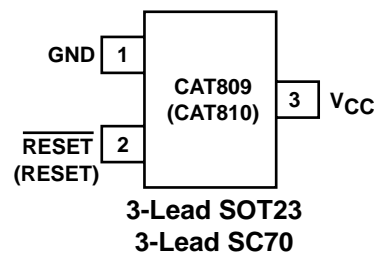
Fast transients on the power supply are ignored and the output is guaranteed to be in the correct state at  $V_{CC}$  levels as low as 1.0 V.

The CAT809/810 are fully specified over the industrial temperature range (-40°C to 85°C) and are available in compact 3-pin SOT23 and SC70 packages.

### 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



**ORDERING INFORMATION**

Ordering Part Number	RESET Polarity	Package	Parts per Reel
CAT809_EUR-T	Push-Pull $\overline{\text{RESET}}$	3-pin, SOT23	3k
CAT809_EUR-T10	Push-Pull $\overline{\text{RESET}}$	3-pin, SOT23	10k
CAT809_TBI-T	Push-Pull $\overline{\text{RESET}}$	3-pin, SOT23 Green	3k
CAT809_TBI-T10	Push-Pull $\overline{\text{RESET}}$	3-pin, SOT23 Green	10k
CAT809_EXR-T	Push-Pull $\overline{\text{RESET}}$	3-pin, SC70	3k
CAT809_EXR-T10	Push-Pull $\overline{\text{RESET}}$	3-pin, SC70	10k
CAT809_SDI-T	Push-Pull $\overline{\text{RESET}}$	3-pin, SC70 Green	3k
CAT809_SDI-T10	Push-Pull $\overline{\text{RESET}}$	3-pin, SC70 Green	10k
CAT810_EUR-T	Push-Pull RESET	3-pin, SOT23	3k
CAT810_EUR-T10	Push-Pull RESET	3-pin, SOT23	10k
CAT810_TBI-T	Push-Pull RESET	3-pin, SOT23 Green	3k
CAT810_TBI-T10	Push-Pull RESET	3-pin, SOT23 Green	10k
CAT810_EXR-T	Push-Pull RESET	3-pin, SC70	3k
CAT810_EXR-T10	Push-Pull RESET	3-pin, SC70	10k
CAT810_SDI-T	Push-Pull RESET	3-pin, SC70 Green	3k
CAT810_SDI-T10	Push-Pull RESET	3-pin, SC70 Green	10k

Insert threshold suffix (L, M, J, T, S, R or Z) into the blank position. Example: CAT809LTBI-T for 4.63 V.

**TOP MARKING**

	SOT23	SOT23 Green	SC70	SC70 Green
CAT809L	AAYM	DBYM	FA_	GA_
CAT809M	ABYM	DCYM	FB_	GB_
CAT809J	CWYM	DAYM	FG_	GG_
CAT809T	ACYM	DFYM	FE_	GE_
CAT809S	ADYM	DEYM	FD_	GD_
CAT809R	AFYM	DDYM	FC_	GC_
CAT809Z	CFYM	DGYM	FF_	GF_
CAT810L	AGYM	CKYM	FH_	GH_
CAT810M	AHYM	CLYM	FJ_	GJ_
CAT810J	AIYM	CJYM	FP_	GP_
CAT810T	AJYM	CPYM	FM_	GM_
CAT810S	AKYM	CNYM	FL_	GL_
CAT810R	ALYM	CMYM	FK_	GK_
CAT810Z	CGYM	CRYM	FN_	GN_

Where YM stands for Year and Month for the SOT23 package and the blank is replaced by the assembly location for the SC70 package.

**PIN DESCRIPTIONS**

Pin Number		Name	Description
CAT809	CAT810		
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	$V_{CC}$	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,  $\overline{\text{RESET}}$  ..... 20 mA  
 Rate of Rise,  $V_{CC}$  ..... 100 V/ $\mu$ s  
 Continuous Power Dissipation  
 Derate 2.2mW/ $^{\circ}$ C above 70 $^{\circ}$ C (SC70) ..... 175 mW  
 Derate 4mW/ $^{\circ}$ C above 70 $^{\circ}$ C (SOT23) ..... 320 mW

Operating Temperature Range ..... -40 $^{\circ}$ C to +85 $^{\circ}$ C  
 Storage Temperature Range ..... -65 $^{\circ}$ C to +105 $^{\circ}$ C  
 Lead Soldering Temperature (10 sec) ..... 300 $^{\circ}$ 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 $^{\circ}$ C to +85 $^{\circ}$ C unless otherwise noted. Typical values at  $T_A$  = +25 $^{\circ}$ 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		$T_A = 0^{\circ}\text{C to }+70^{\circ}\text{C}$	1.0		5.5	V	
		$T_A = -40^{\circ}\text{C to }+85^{\circ}\text{C}$	1.2		5.5		
Supply Current	$I_{CC}$	$T_A = -40^{\circ}\text{C to }+85^{\circ}\text{C}$	$V_{CC} < 5.5\text{ V, J/L/M}$		8	20	$\mu\text{A}$
			$V_{CC} < 3.6\text{ V, R/S/T/Z}$		6	15	
Reset Threshold Voltage	$V_{TH}$	L Threshold	$T_A = +25^{\circ}\text{C}$	4.56	4.63	4.70	V
			$T_A = -40^{\circ}\text{C to }+85^{\circ}\text{C}$	4.50		4.75	
		M Threshold	$T_A = +25^{\circ}\text{C}$	4.31	4.38	4.45	
			$T_A = -40^{\circ}\text{C to }+85^{\circ}\text{C}$	4.25		4.50	
		J Threshold	$T_A = +25^{\circ}\text{C}$	3.93	4.00	4.06	
			$T_A = -40^{\circ}\text{C to }+85^{\circ}\text{C}$	3.89		4.10	
		T Threshold	$T_A = +25^{\circ}\text{C}$	3.04	3.08	3.11	
			$T_A = -40^{\circ}\text{C to }+85^{\circ}\text{C}$	3.00		3.15	
		S Threshold	$T_A = +25^{\circ}\text{C}$	2.89	2.93	2.96	
			$T_A = -40^{\circ}\text{C to }+85^{\circ}\text{C}$	2.85		3.00	
		R Threshold	$T_A = +25^{\circ}\text{C}$	2.59	2.63	2.66	
			$T_A = -40^{\circ}\text{C to }+85^{\circ}\text{C}$	2.55		2.70	
		Z Threshold	$T_A = +25^{\circ}\text{C}$	2.28	2.32	2.35	
			$T_A = -40^{\circ}\text{C to }+85^{\circ}\text{C}$	2.25		2.38	

**ELECTRICAL CHARACTERISTICS** (continued)

$V_{CC}$  = Full range,  $T_A$  =  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  unless otherwise noted. Typical values at  $T_A$  =  $+25^{\circ}\text{C}$  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.

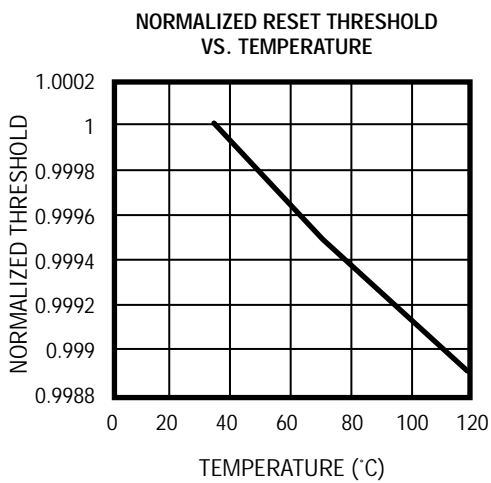
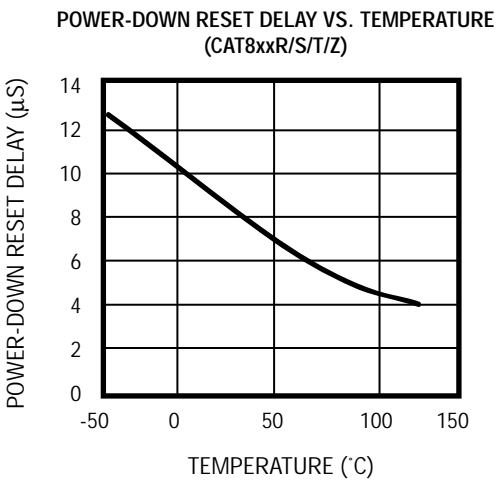
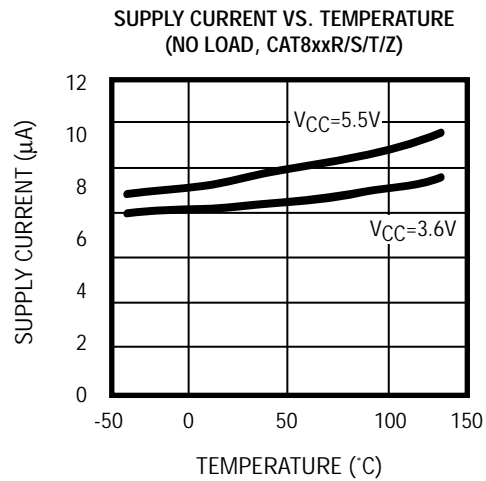
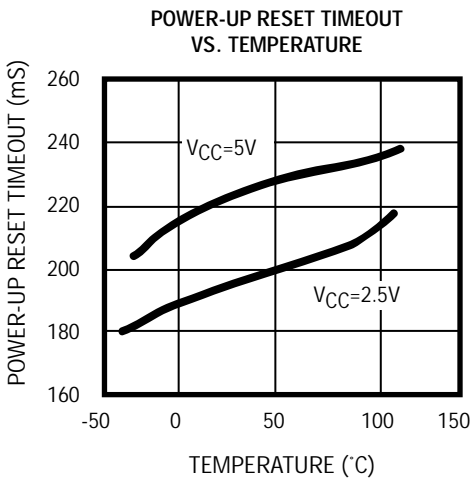
Parameter	Symbol	Conditions	Min	Typ <sup>(1)</sup>	Max	Units
Reset Threshold Tempco				30		ppm/ $^{\circ}\text{C}$
$V_{CC}$ to Reset Delay (Note 2)		$V_{CC} = V_{TH}$ to $(V_{TH} - 100\text{ mV})$		20		$\mu\text{s}$
Reset Active Timeout Period		$T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$	140	240	400	ms
$\overline{\text{RESET}}$ Output Voltage Low (Push-pull, active LOW, CAT809)	$V_{OL}$	$V_{CC} = V_{TH}$ min, $I_{SINK} = 1.2\text{ mA}$ CAT809R/S/T/Z			0.3	V
		$V_{CC} = V_{TH}$ min, $I_{SINK} = 3.2\text{ mA}$ CAT809J/L/M			0.4	
		$V_{CC} > 1.0\text{ V}$ , $I_{SINK} = 50\text{ }\mu\text{A}$			0.3	
$\overline{\text{RESET}}$ Output Voltage High (Push-pull, active LOW, CAT809)	$V_{OH}$	$V_{CC} = V_{TH}$ max, $I_{SOURCE} = 500\text{ }\mu\text{A}$ CAT809R/S/T/Z	$0.8 V_{CC}$			V
		$V_{CC} = V_{TH}$ max, $I_{SOURCE} = 800\text{ }\mu\text{A}$ CAT809J/L/M	$V_{CC} - 1.5$			
RESET Output Voltage Low (Push-pull, active HIGH, CAT810)	$V_{OL}$	$V_{CC} > V_{TH}$ max, $I_{SINK} = 1.2\text{ mA}$ CAT810R/S/T/Z			0.3	V
		$V_{CC} > V_{TH}$ max, $I_{SINK} = 3.2\text{ mA}$ CAT810J/L/M			0.4	
RESET Output Voltage High (Push-pull active HIGH, CAT810)	$V_{OH}$	$1.8\text{ V} < V_{CC} \leq V_{TH}$ min, $I_{SOURCE} = 150\text{ }\mu\text{A}$	$0.8 V_{CC}$			V

Note 1: Production testing done at  $T_A = +25^{\circ}\text{C}$ ; limits over temperature guaranteed by design only.

Note 2:  $\overline{\text{RESET}}$  output for the CAT809; RESET output for the CAT810

**TYPICAL OPERATING CHARACTERISTICS**

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



## DETAILED DESCRIPTIONS

### RESET TIMING

The reset signal is asserted LOW for the CAT809 and HIGH for the CAT810 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.

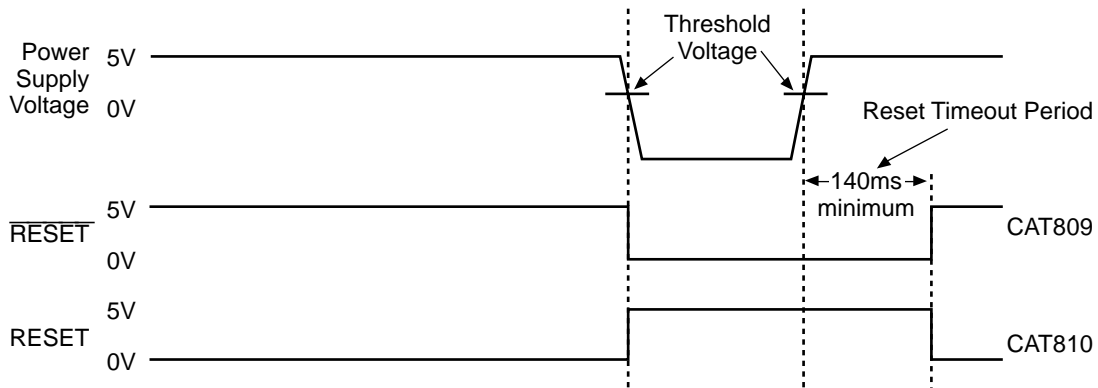


FIGURE 1. RESET TIMING DIAGRAM

### V<sub>CC</sub> TRANSIENT RESPONSE

The CAT809/810 protect  $\mu$ Ps against brownout failure. Short duration transients of 4 $\mu$ sec or less and 100 mV amplitude typically do not cause a false RESET.

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

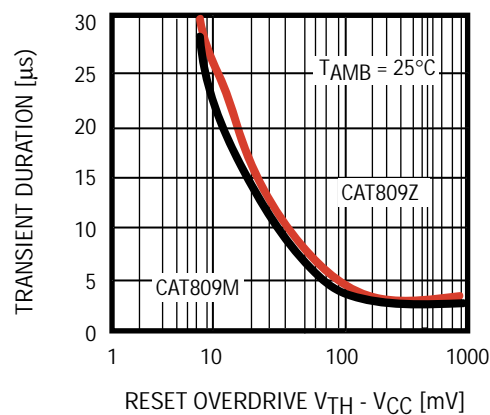


FIGURE 2. Maximum Transient Duration Without Causing a Reset Pulse vs. Reset Comparator Overdrive

**VALID RESET WITH V<sub>CC</sub> UNDER 1.0 V**

To ensure that the CAT809  $\overline{\text{RESET}}$  pin is in a known state when V<sub>CC</sub> 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 CAT810, a pull-up resistor from RESET pin to V<sub>CC</sub> is needed.

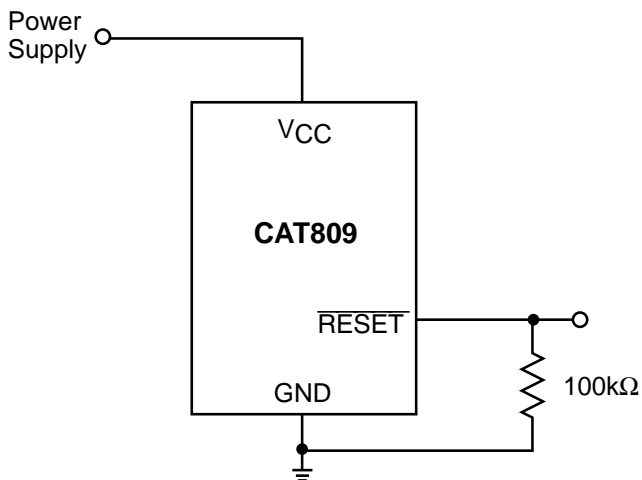


FIGURE 3.  $\overline{\text{RESET}}$  Valid with V<sub>CC</sub> Under 1.0 V

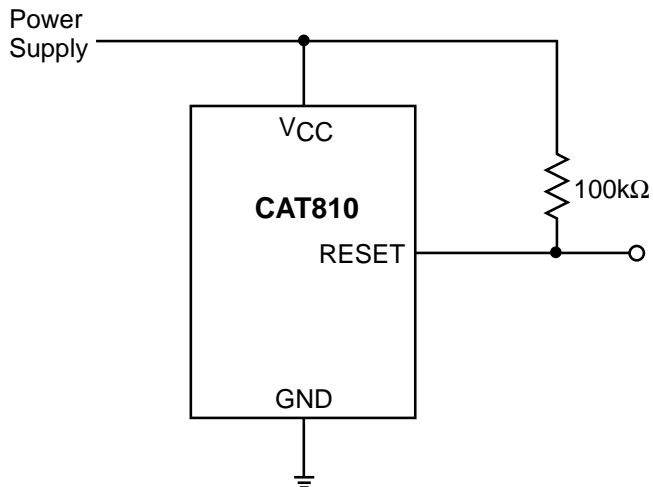


FIGURE 4. RESET Valid with V<sub>CC</sub> Under 1.1 V

**BI-DIRECTIONAL RESET PIN INTERFACING**

The CAT809/810 can interface with μP/μC bi-directional reset pins by connecting a 4.7 kΩ resistor in series with the CAT809/810 reset output and the μP/μC bi-directional reset pin.

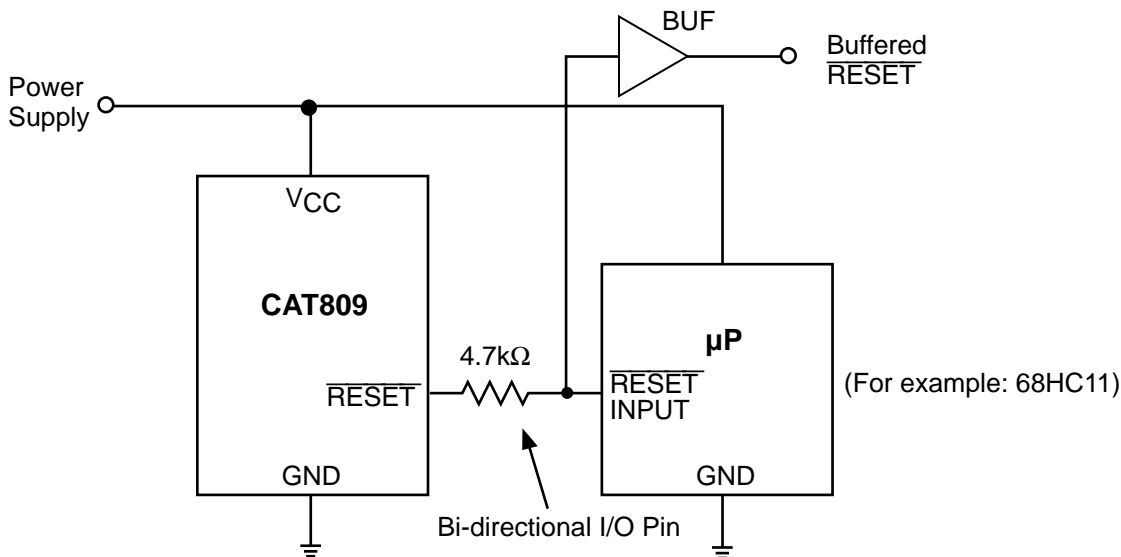


FIGURE 5. Bi-directional Reset Pin Interfacing



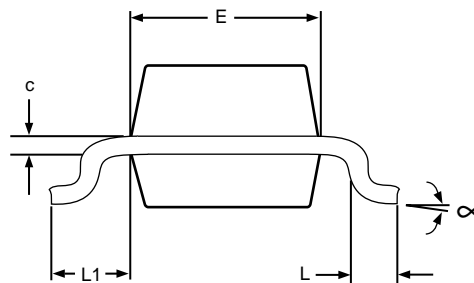
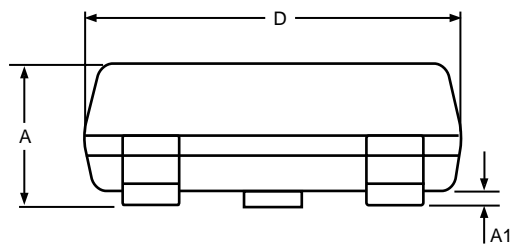
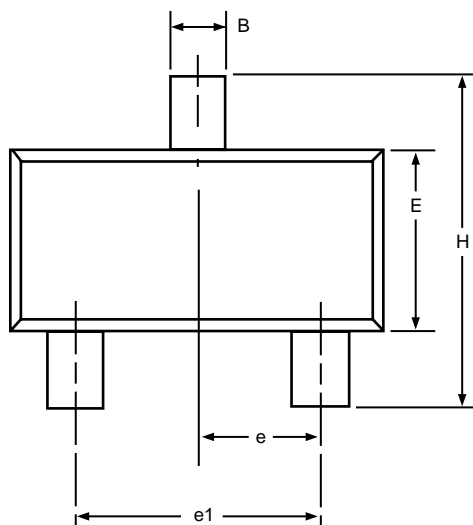
**OTHER SUPERVISORY PRODUCTS**

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 SOT-23 (3-Pin)

	Inches		Millimeters	
	Min	Max	Min	Max
<b>Plastic SOT-23 (3-Pin)</b>				
A	0.0350	0.0441	0.89	1.12
A1	0.0005	0.0039	0.013	0.10
B	0.0146	0.0197	0.37	0.50
c	0.0033	0.0071	0.085	0.18
D	0.1102	0.1197	2.80	3.04
E	0.0472	0.0551	1.20	1.40
e	0.0350	0.0406	0.89	1.03
e1	0.0701	0.0807	1.78	2.05
H	0.0827	0.1039	2.10	2.64
$\infty$	0°	8°	0°	8°
L	0.0083	0.0161	0.275	0.41
L1	0.0160	0.0270	0.275	0.685

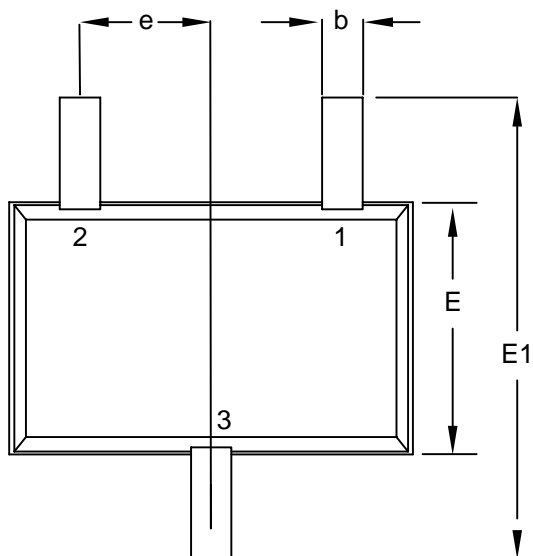


NOTE:

1. THIS PART IS COMPLIANT WITH JEDEC SPECIFICATION TO-236AB
2. DIE IS FACE UP FOR MOLD AND TRIM/FORM
3. DIMENSIONS ARE EXCLUSIVE OF MOLD FLASH AND METAL BURR

**PACKAGE INFORMATION**

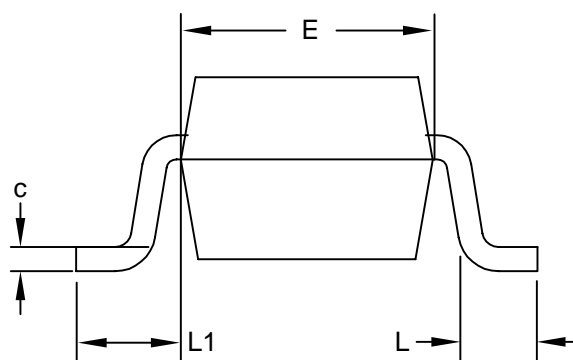
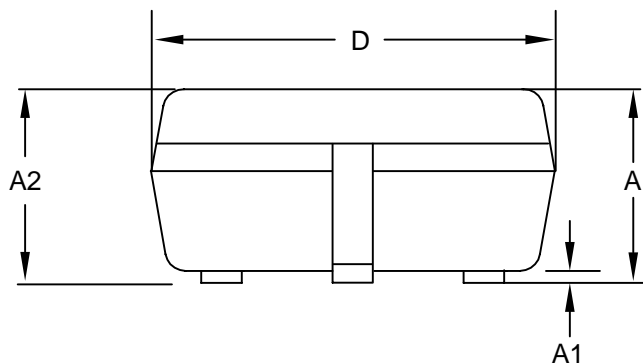
**SC-70 Package (3-Lead)**



	Inches		Millimeters	
	Min	Max	Min	Max
<b>Plastic SC-70 (3-Pin)</b>				
A	0.0315	0.0433	0.80	1.10
A1	0.0000	0.0039	0.00	0.10
A2	0.0315	0.0394	0.80	1.00
b	0.0059	0.00118	0.15	0.30
c	0.0035	0.0071	0.09	0.18
D	0.0709	0.0866	1.80	2.20
E	0.0453	0.0531	1.15	1.35
E1	0.0709	0.0945	1.80	2.40
e	0.00255 BSC		0.65BSC	
L	0.0102	0.0181	0.26	0.46
L1	0.0108	0.0226	0.275	0.575

**NOTE:**

1. THIS PART IS COMPLIANT WITH EIAJ SPECIFICATION SC-70
2. DIE IS FACE UP FOR MOLD. DIE IS FACING DOWN FOR TRIM/FORM
3. DIMENSIONS ARE EXCLUSIVE OF MOLD FLASH AND METAL BURR



**REVISION HISTORY**

Date	Rev.	Reason
10/29/2003	N	Updated VCC Transient Response text and Figure 2
10/30/2003	O	Updated Power Up Reset Timeout vs. Temperature curve
3/10/2004	P	Corrected temperature range Updated Description Updated Ordering Information Updated Absolute Maximum Ratings Updated Electrical Characteristics
03/23/2004	Q	Updated Description Updated Ordering Information Updated Absolute Maximum Ratings Updated Electrical Characteristics Updated Typical Operating Characteristics Updated Package Information
3/25/2004	R	Changed Preliminary designation to Final Updated Max Reset Active Timeout Period in Electrical Characteristics Updated package drawings
5/10/2004	S	Updated top marking table

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