



钜地半导体
Tudi Semiconductor

Product Specification

TUDI-CAT705/CAT706/CAT813

Supervisory Circuits

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**semiconductor device
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- Design
- research and development
- production
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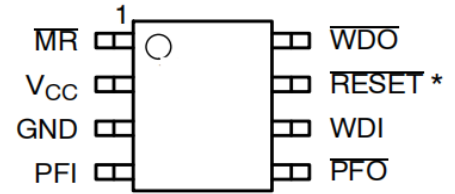


Features

- Reset Guaranteed Valid for 1.0 V VCC
- 6 μ A Supply Current
- 200 ms Reset Pulse Width
- Watchdog Timer Function 1.6 s Timeout
- Accurate Brownout Detection Reset in 3.0, 3.6, and 5.0 Volt Systems

Volt Systems

- Secondary Low Supply Monitoring on PFI Input
- Pin and Function Compatible with the MAX705/MAX706/MAX813L Products
- Operating Range from -40°C to +85°C
- SOIC 8-lead and MSOP 8-lead Packages
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant



SOP8 (V) (Top View)

Typical Applications

- Microprocessor and Microcontroller Based Systems
- Instrument and Control Systems
- Portable Equipment

Description

The CAT705, CAT706, and CAT813 provide reset and monitoring functions for the electronic systems. Each device monitors the system voltage and maintains a reset output until that voltage reaches the device's specified trip value and then maintains the reset output active condition until the device's internal timer allows the system power supply to stabilize. The devices have a watchdog input which can be used to monitor a system signal and causes WDO to go low if the signal fails to change state prior to a timeout condition. The supervisory circuits provide a MR input which initiates a reset if pulled low. The CAT705 and CAT706 provide an active low RESET output. The CAT813 provides an active high RESET output. There is a secondary supply monitor (PFI) included for power-fail warning.

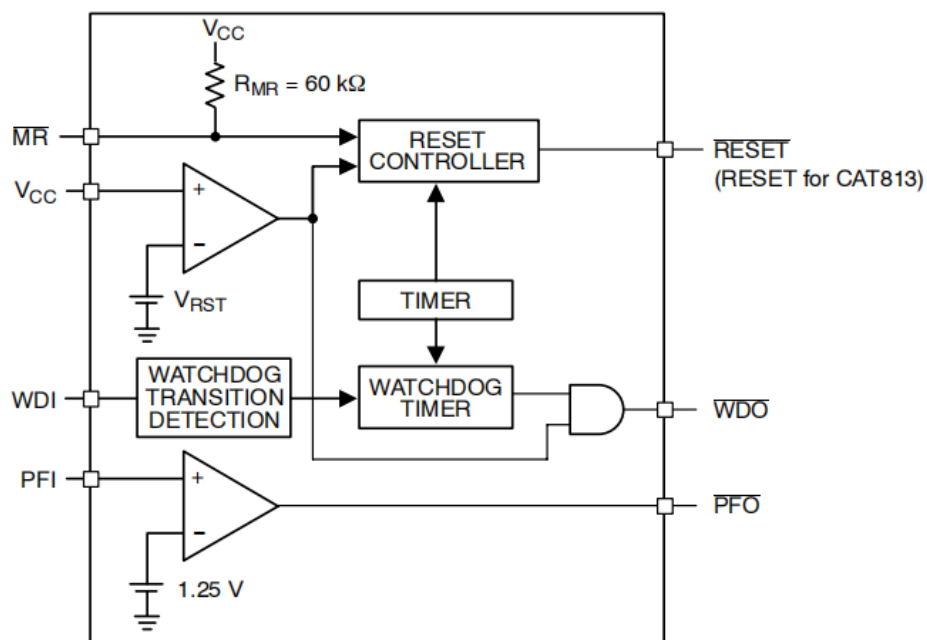


Figure 1. Functional Block Diagram

Device	RESET	RESET	MR	WDI	WDO	PFI
CAT705	@ 4.65 V		x	x	x	@ 1.25 V
CAT706	x		x	x	x	@ 1.25 V
CAT813		@ 4.65 V	x	x	x	@ 1.25 V



Table 1. PIN FUNCTION DESCRIPTION

Pin Name	Function
$\overline{\text{MR}}$	Manual Reset Input
V_{CC}	Power Supply
GND	Ground
PFI	Power Fail voltage monitor Input
PFO	Power Fail Output
WDI	Watchdog Timer Input
$\overline{\text{RESET}}$	CMOS Push-Pull Active Low Reset Output (CAT705 & CAT706)
RESET	CMOS Push-Pull Active High Reset Output (CAT813)
$\overline{\text{WDO}}$	Watchdog Timer Output

Table 2. ABSOLUTE MAXIMUM RATINGS

Parameters	Ratings	Units
Supply Voltage	6.5	V
All other pins	-0.3 to ($V_{\text{CC}} + 0.3$)	V
Output Current $\overline{\text{RESET}}$, $\overline{\text{RESET}}$, $\overline{\text{WDO}}$	20	mA
Continuous Power Dissipations ($T_A = +70^\circ\text{C}$) SOIC 8-lead (derate 5.9 mW/ $^\circ\text{C}$ above $+70^\circ\text{C}$) MSOP 8-lead (derate 4.1 mW/ $^\circ\text{C}$ above $+70^\circ\text{C}$)	471 330	mW
Storage Temperature	-65 to 150	$^\circ\text{C}$
Lead Soldering (10 seconds max)	+300	$^\circ\text{C}$
ESD Rating: Human Body Model	2000	V
ESD Rating: Machine Model	200	V

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

Table 3. RECOMMENDED OPERATING CONDITIONS

Parameter	Rating	Unit
V_{CC} ($T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$)	1.0 to 5.5	V
All Other Pins	-0.1 to ($V_{\text{CC}} + 0.1$)	V
Ambient Temperature	-40 to +85	$^\circ\text{C}$



Table 4. ELECTRICAL OPERATING CHARACTERISTICS (Typical values at $T_A = 25^\circ\text{C}$ and $V_{CC} = 5\text{ V}$ for CAT705, CAT706 and CAT813 versions. $V_{CC} = 3.3\text{ V}$ for the CAT706 T/S versions; $V_{CC} = 3.0\text{ V}$ for the CAT706 R version.) (Note 1)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Supply Current	I_{CC}	CAT705, CAT706, CAT813		6	17	μA
		CAT706 (R/S/T Versions)		4	12	μA
Reset Threshold	V_{RST}	CAT705 & CAT813 at $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$	4.50	4.65	4.75	V
		CAT706 at $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$	4.25	4.40	4.50	V
		CAT706T at $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$	3.00	3.08	3.15	V
		CAT706S at $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$	2.85	2.93	3.00	V
		CAT706R at $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$	2.55	2.63	2.70	V
Reset Threshold Tempco (Note 1)				40		ppm/ $^\circ\text{C}$
Reset Threshold Hysteresis (Note 1)		CAT705 & CAT813		10		mV
		CAT706		5		mV
V_{CC} to Reset Delay (Note 2)	t_{RD}	$V_{CC} = V_{TH}$ to $(V_{TH} - 100\text{ mV})$		20		μs
Reset Active Timeout Period	t_{RP}		140	200	400	ms
RESET Output High Voltage	V_{OH}	CAT705 & CAT706, $4.5\text{ V} < V_{CC} < 5.5\text{ V}$, $I_{SOURCE} = -800\text{ }\mu\text{A}$	$V_{CC} - 1.5\text{ V}$			V
		CAT705 & CAT706, $V_{RST(max)} < V_{CC} < 3.6\text{ V}$, $I_{SOURCE} = -500\text{ }\mu\text{A}$	$0.8 \times V_{CC}$			
RESET Output Low Voltage	V_{OL}	CAT705 & CAT706, $4.5\text{ V} < V_{CC} < 5.5\text{ V}$, $I_{SINK} = 3.2\text{ mA}$			0.4	V
		CAT705 & CAT706, $V_{RST(max)} < V_{CC} < 3.6\text{ V}$, $I_{SINK} = 1.2\text{ mA}$			0.3	
		CAT705 & CAT706, $V_{CC} = 1\text{ V}$, $I_{SINK} = 100\text{ }\mu\text{A}$			0.3	
RESET Output High Voltage	V_{OH}	CAT813, $V_{CC} = V_{RST max}$, $I_{SOURCE} = -120\text{ }\mu\text{A}$	$V_{CC} - 1.5\text{ V}$			V
		CAT813, $V_{CC} = V_{RST max}$, $I_{SOURCE} = -30\text{ }\mu\text{A}$	$0.8 \times V_{CC}$			
RESET Output Low Voltage	V_{OL}	CAT813, $V_{CC} = V_{RST min}$, $I_{SINK} = 3.2\text{ mA}$			0.4	V
		CAT813, $V_{CC} = 1.2\text{ V}$, $I_{SINK} = 100\text{ }\mu\text{A}$			0.3	

WATCHDOG INPUT

Watchdog Timeout Period	t_{WD}		1.00	1.6	2.25	s
WDI Pulse Width	t_{WP}	$V_{IL} = 0.4\text{ V}$, $V_{IH} = 0.8 \times V_{CC}$	50			ns
WDI Input Voltage (Note 3)	V_{IL}				$0.3 \times V_{CC}$	V
	V_{IH}		$0.7 \times V_{CC}$			
WDI Input Current (Note 3)		WDI = V_{CC} , Time Average		50	150	μA
		WDI = 0 V , Time Average	-150	-50		

- Limits are guaranteed by design and not production tested.
- The RESET short-circuit current is the maximum pull-up current when reset is driven low by a bidirectional output.
- WDI is internally serviced within the watchdog period if WDI is left open.
- RESET for CAT705 & CAT706 & RESET for CAT813.
- Not 100% tested but guaranteed by design.



Table 4. ELECTRICAL OPERATING CHARACTERISTICS (Typical values at $T_A = 25^\circ\text{C}$ and $V_{CC} = 5\text{ V}$ for CAT705, CAT706 and CAT813 versions. $V_{CC} = 3.3\text{ V}$ for the CAT706 T/S versions; $V_{CC} = 3.0\text{ V}$ for the CAT706 R version.) (Note 1)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
WATCHDOG INPUT						
WDO Output Voltage	V_{W_OH}	$V_{RST(max)} < V_{CC} < 3.6\text{ V}$; $I_{SOURCE} = -500\text{ }\mu\text{A}$	$0.8 \times V_{CC}$			V
		$4.5\text{ V} < V_{CC} < 5.5\text{ V}$; $I_{SOURCE} = -800\text{ }\mu\text{A}$	$V_{CC} - 1.5$	$V_{CC} - 0.25$		
	V_{W_OL}	$V_{RST(max)} < V_{CC} < 3.6\text{ V}$; $I_{SINK} = +500\text{ }\mu\text{A}$			0.3	
		$4.5\text{ V} < V_{CC} < 5.5\text{ V}$; $I_{SINK} = 1.2\text{ mA}$		0.1	0.4	
WDO to WDI setup time (Note 5)	t_{WDSU}		250			ns
MANUAL RESET INPUT						
MR Input Voltage	V_{IL}				$0.3 \times V_{CC}$	V
	V_{IH}		$0.7 \times V_{CC}$			
MR Pull-up Current		$\overline{MR} = 0\text{ V}$	40	70	140	μA
MR Pulse Width	t_{PB}		1			μs
MR Pull-up Resistance	R_{MR}		40	60	80	$k\Omega$
MR low to Reset Delay (Note 4)	t_{PDLY}				5	μs
POWER-FAIL INPUT						
PFI Input Threshold		$V_{CC} = 5\text{ V}$	1.2	1.25	1.3	V
PFI Input Current			-25	0.01	25	nA
PFO Output Voltage	V_{P_OH}	$V_{RST(max)} < V_{CC} < 3.6\text{ V}$; $I_{SOURCE} = -500\text{ }\mu\text{A}$	$0.8 \times V_{CC}$			V
		$4.5\text{ V} < V_{CC} < 5.5\text{ V}$; $I_{SOURCE} = -800\text{ }\mu\text{A}$	$V_{CC} - 1.5$		0.4	
	V_{P_OL}	$V_{RST(max)} < V_{CC} < 3.6\text{ V}$; $I_{SINK} = +1.2\text{ mA}$			0.3	
		$4.5\text{ V} < V_{CC} < 5.5\text{ V}$; $I_{SINK} = 3.2\text{ mA}$			0.4	

1. Limits are guaranteed by design and not production tested.
2. The RESET short-circuit current is the maximum pull-up current when reset is driven low by a bidirectional output.
3. WDI is internally serviced within the watchdog period if WDI is left open.
4. RESET for CAT705 & CAT706 & RESET for CAT813.
5. Not 100% tested but guaranteed by design.



FUNCTIONAL DESCRIPTION

Processor Reset

The CAT705, CAT706 & CAT813 detect supply voltage (V_{CC}) conditions that are below the specified voltage trip value (V_{RST}) and provide a reset output to maintain correct system operation. On power-up, $\overline{RESET}$ (or RESET for the CAT813) are kept active for a minimum delay t_{RP} of 140 ms after the supply voltage (V_{CC}) rises above V_{RST} to allow the power supply and processor to stabilize. When V_{CC} drops below the voltage trip value (V_{RST}), the reset output signals $\overline{RESET}$ (or RESET) are pulled active. $\overline{RESET}$ (or RESET) is specifically designed to provide the reset input signals for processors. This provides reliable and consistent operation as power is turned on, off or during brownout conditions by maintaining the processor operation in known conditions.

Manual Reset

The CAT705, CAT706 & CAT813 each have a Manual Reset ($\overline{MR}$) input to allow for alternative control of the reset outputs. The $\overline{MR}$ input is designed for direct connection to a pushbutton (see Figure 4). The $\overline{MR}$ input is internally pulled up by 60 k Ω resistor and must be pulled low to cause the reset output to go active. Internally, this input is debounced and timed such that $\overline{RESET}$ (or RESET) signals of at least 140 ms minimum will be generated. The min 140 ms t_{RP} delay commences as the Manual Reset input is released from the low level. (see Figure 5).

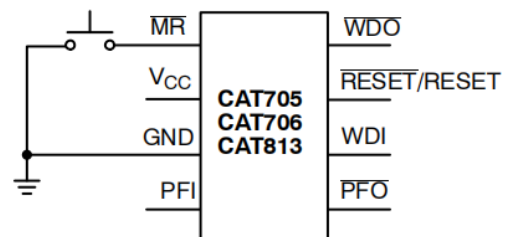


Figure 4. Pushbutton RESET

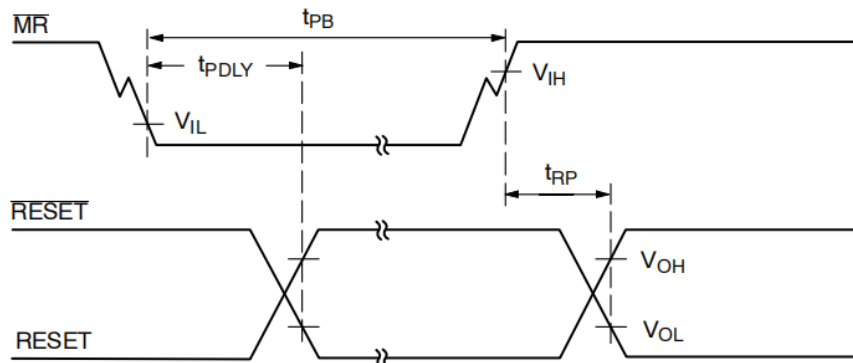


Figure 5. Timing Diagram – Pushbutton RESET



WATCHDOG TIMER

The CAT705, CAT706, & CAT813 provide a Watchdog input (WDI). The watchdog timer function controls the watchdog output ($\overline{\text{WDO}}$) signal and forces the $\overline{\text{WDO}}$ to be low (active) when the WDI input does not have a transition from low-to-high or high-to-low within 1.6 s typical. If a transition occurs on the WDI input pin prior to the watchdog time-out, the watchdog timer is restarted. The timing diagram is shown in Figure 6. The watchdog timer starts as soon as reset condition becomes inactive.

When the V_{CC} supply drops below the reset threshold, the $\overline{\text{WDO}}$ output becomes active and goes low independently of the watchdog timing stage.

Figure 7 below shows a typical implementation of a watchdog function. Any processor signal that repeats dependant on the normal operation of the processor or directed by the software operating on the processor can be

used to strobe the watchdog input. The most reliable is a dedicated I/O output transitioned by a specific software instruction.

The watchdog can be disabled by floating (or tri-stating) the WDI input (see Figure 8). If the watchdog is disabled the WDI pin will be pulled low for the first $7/8^{\text{th}}$'s of the watchdog period (t_{WD}) and pulled high for the last $1/8^{\text{th}}$ of the watchdog period. This pulling low of the WDI input and then high is used to detect an open or tri-state condition and will continue to repeat until the WDI input is driven high or low.

For most efficient operation of devices with the watchdog function the WDI input should be held low the majority of the time and only strobed high as required to reset the watchdog timer.

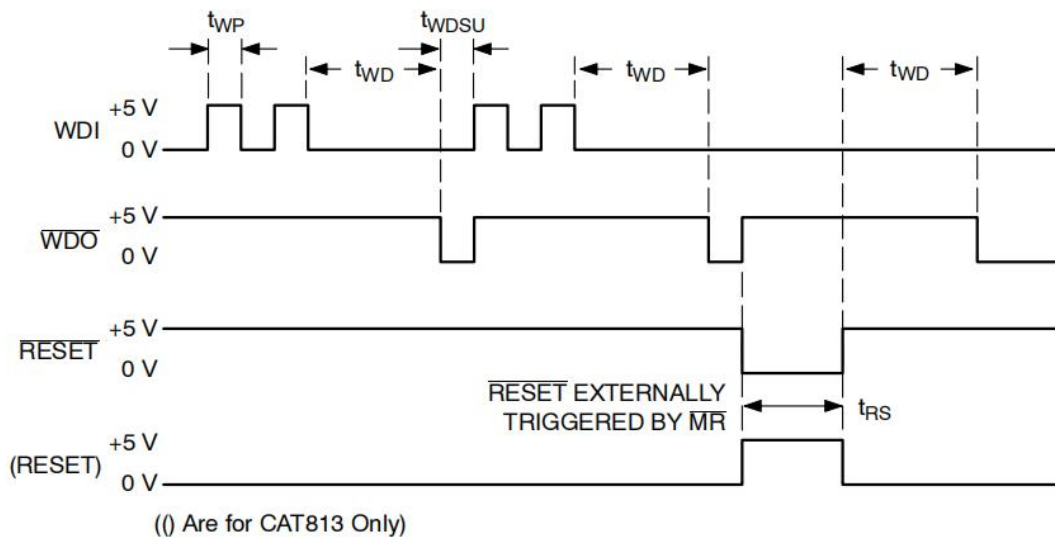


Figure 6. Watchdog Timing Diagram

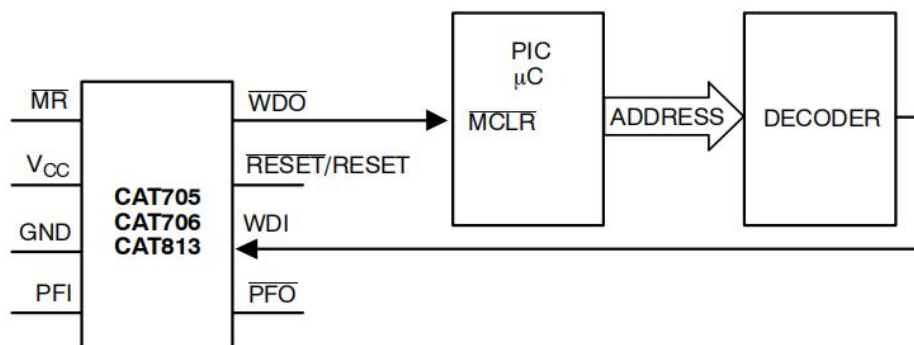


Figure 7. Watchdog Timer Circuit

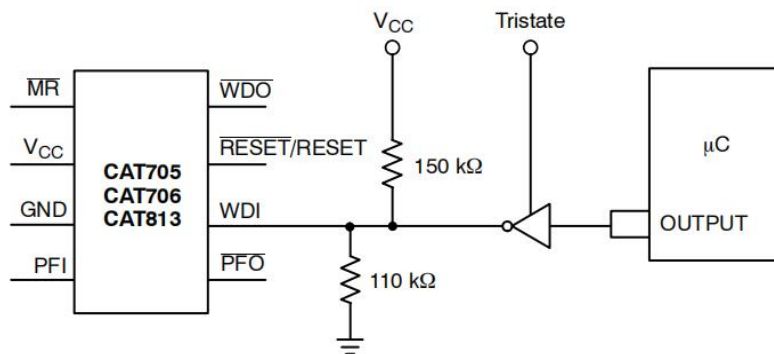


Figure 8. Watchdog Disable Circuit

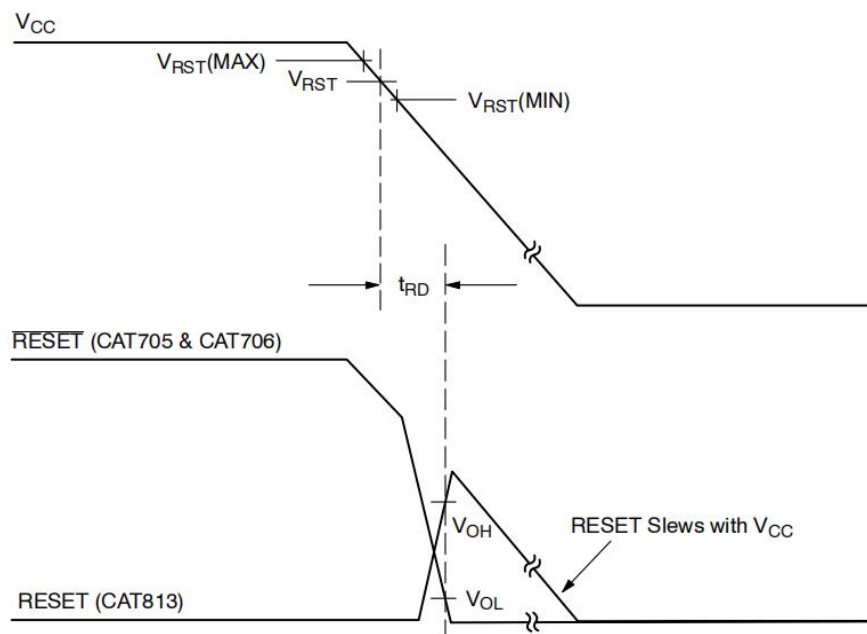


Figure 9. Timing Diagram – Power Down

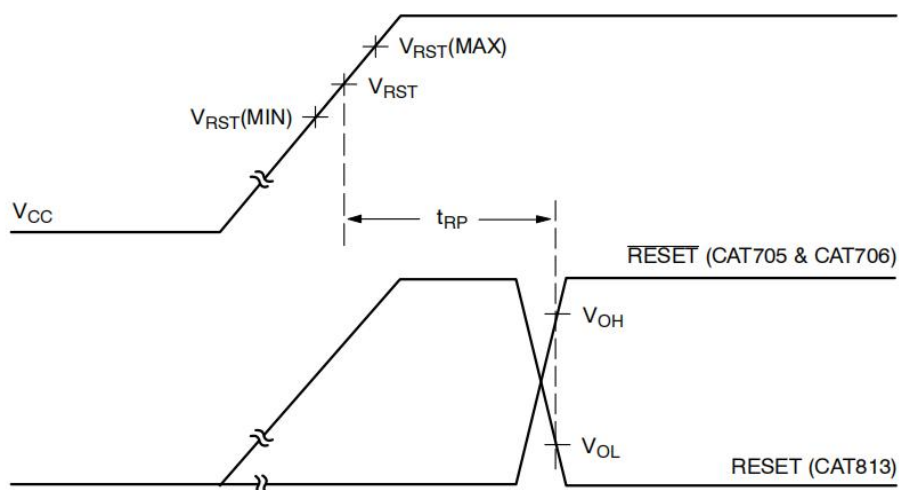


Figure 10. Timing Diagram – Power Up

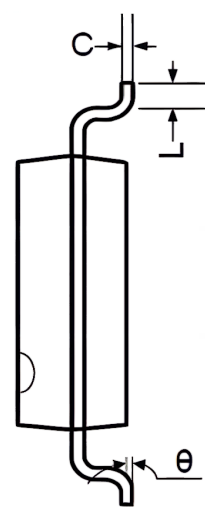
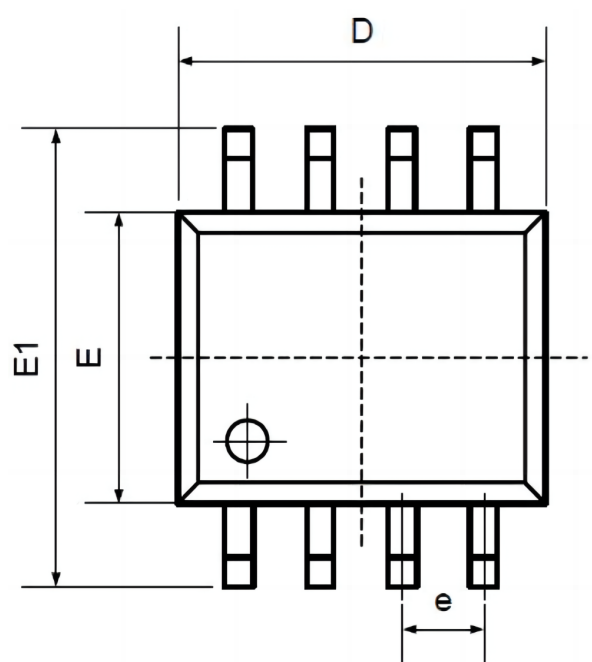


Order information

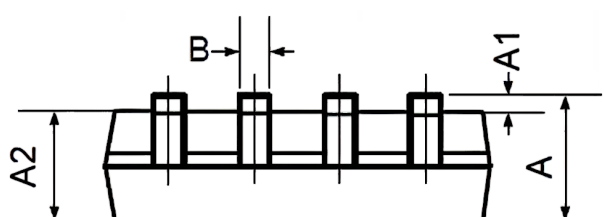
Order Number	Package	Package Quantity	Marking On The park
CAT705VI-GT3-TUDI	SOP8	Tape,Reel,2500	CAT705VI-GT3
CAT706RVI-GT3-TUDI	SOP8	Tape,Reel,2500	CAT706RVI-GT3
CAT706SVI-GT3-TUDI	SOP8	Tape,Reel,2500	CAT706SVI-GT3
CAT706TVI-GT3-TUDI	SOP8	Tape,Reel,2500	CAT706TVI-GT3
CAT706VI-GT3-TUDI	SOP8	Tape,Reel,2500	CAT706VI-GT3
CAT813VI-GT3-TUDI	SOP8	Tape,Reel,2500	CAT813VI-GT3



Package SOP8



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
B	0.330	0.510	0.013	0.020
C	0.190	0.250	0.007	0.010
D	4.780	5.000	0.188	0.197
E	3.800	4.000	0.150	0.157
E1	5.800	6.300	0.228	0.248
e	1.270TYP		0.050TYP	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°





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