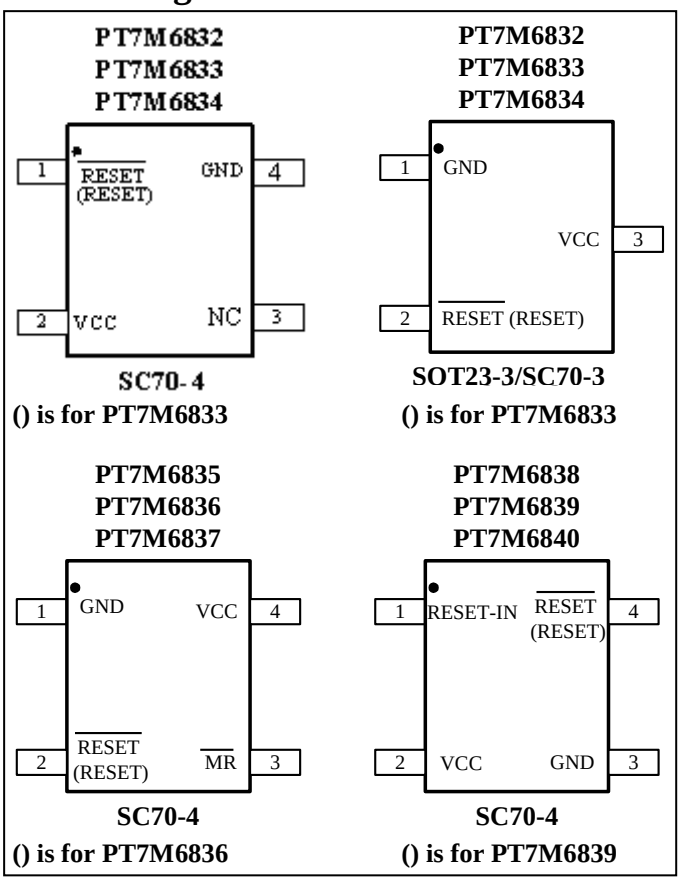
Ultra Low Voltage Detectors

Features

- Factory-Set Reset Threshold Voltages for Nominal Supplies from 1.2V to 1.8V
- Low power consumption : Typ 7.5µA
- Five different timeout periods available: 70µs(voltage detector), 1.5ms, 30ms, 210ms and 1.68s
- Output configuration: Push-pull $\overline{\text{RESET}}$, push-pull RESET or open-drain $\overline{\text{RESET}}$
- Guaranteed reset valid to Vcc: 0.9V—active low, 0.85V—active high
- Detect voltage accuracy: ±1.5%
- Adjustable threshold reset-in option
- Immune to short negative Vcc transients
- Small SOT23-3, SC70-3 or SC70-4 packages

Pad Configuration



Description

The PT7M6832–6840 are microprocessor (µP) supervisory circuits used to monitor low-voltage power supplies in µP and digital systems. They provide excellent circuit reliability and low cost by eliminating external components and adjustments when used with +1.2V to +1.8V powered circuits.

These devices assert a reset signal whenever the VCC supply voltage declines below a preset threshold or whenever manual reset (~~MR~~) is asserted. Reset remains asserted for a fixed timeout delay after VCC has risen above the reset threshold or when manual reset is deasserted. Five different timeout periods are available: 70µs (voltage detector), 1.5ms, 30ms, 210ms, and 1.68s. Reset thresholds suitable for operation with a variety of supply voltages are available.

The PT7M6832/PT7M6835/PT7M6838 have a push-pull active-low reset output ($\overline{\text{RESET}}$). The PT7M6833/ PT7M6836/PT7M6839 have a push-pull active-high reset output (RESET) and the PT7M 6834/ PT7M 6837/ PT7M 6840 have an open-drain active-low reset output ($\overline{\text{RESET}}$). The open-drain active-low reset output requires a pull-up resistor that can be connected to a voltage higher than VCC.

The PT7M6835/PT7M6836/PT7M6837 feature a debounced manual reset input ($\overline{\text{MR}}$), while the PT7M6838/PT7M6839/PT7M6840 provide a RESET-IN input allowing the user to externally adjust the reset threshold. The reset comparator is designed to ignore fast transients on VCC.

Low supply current of 7.5µA makes the PT7M6832–PT7M6840 ideal for use in portable equipment. These devices are available in 3-pin SOT23 or 4-pin SC70 packages.

Applications

- Computers
- Controllers
- Intelligent Instruments
- Critical µP and µC Power Monitoring
- Portable/Battery-Powered Equipment

Pin Description

PT7M6832- PT7M6837

PT7M6833 SOT23-3 SC70-3	PT7M6832/ PT7M6834 SOT23-3 SC70-3	PT7M6836	PT7M6835/ PT7M6837	Name	Description
1	1	1	1	GND	Ground
-	2	-	2	$\overline{\text{RESET}}$	Reset Output, Open-Drain or Push-Pull, Active-Low. /RESET changes from HIGH to LOW when Vcc drops below the selected reset threshold or /MR is pulled low. /RESET remains LOW for the reset timeout period after Vcc exceeds the device reset threshold and /MR is released high.
2	-	2	-	RESET	Reset Output, Push-Pull, Active-High. RESET changes from LOW to HIGH when the Vcc input drops below the selected reset threshold or /MR is pulled low. RESET remains HIGH for the reset timeout period after Vcc exceeds the device reset threshold and /MR is released high.
-	-	3	3	$\overline{\text{MR}}$	Active-Low Manual Reset Input. Internal 20kΩ pull-up to Vcc. Pull LOW to force a reset. Reset remains active as long as MR is LOW and for the reset timeout period after MR goes HIGH. Leave unconnected or connect to Vcc if unused
3	3	4	4	VCC	Supply Voltage and Monitored Supply

PT7M6833 SC70-4	PT7M6832/ PT7M6834 SC70-4	Name	Description
4	4	GND	Ground
-	1	$\overline{\text{RESET}}$	Reset Output, Open-Drain or Push-Pull, Active-Low. /RESET changes from HIGH to LOW when Vcc drops below the selected reset threshold or /MR is pulled low. /RESET remains LOW for the reset timeout period after Vcc exceeds the device reset threshold and /MR is released high.
1	-	RESET	Reset Output, Push-Pull, Active-High. RESET changes from LOW to HIGH when the Vcc input drops below the selected reset threshold or /MR is pulled low. RESET remains HIGH for the reset timeout period after Vcc exceeds the device reset threshold and /MR is released high.
2	2	VCC	Supply Voltage and Monitored Supply
3	3	NC	No connection.

PT7M6838- PT7M6840

PT7M6839	PT7M6838/ PT7M6840	Name	Description
1	1	RESET-IN	Adjustable Reset Threshold Input. High-impedance input for reset comparator. Connect this pin to an external resistive-divider network to set the reset threshold voltage; the typical threshold is 0.44V. Reset is asserted when RESET-IN is below the threshold (VCC is not monitored).
2	2	Vcc	Supply Voltage (1.3V to 5.5V)
3	3	GND	Ground
4	-	RESET	Reset Output, Push-Pull, Active-High. RESET changes from LOW to HIGH when the RESET-IN input drops below the typical reset threshold (0.44V). RESET remains HIGH for the reset timeout period after RESET-IN exceeds the reset threshold.
-	4	$\overline{\text{RESET}}$	Reset Output, Open-Drain or Push-Pull, Active-Low. /RESET changes from HIGH to LOW when RESET-IN drops below the typical reset threshold (0.44V). /RESET remains LOW for the reset timeout period after RESET-IN exceeds the reset threshold.

Block Diagram

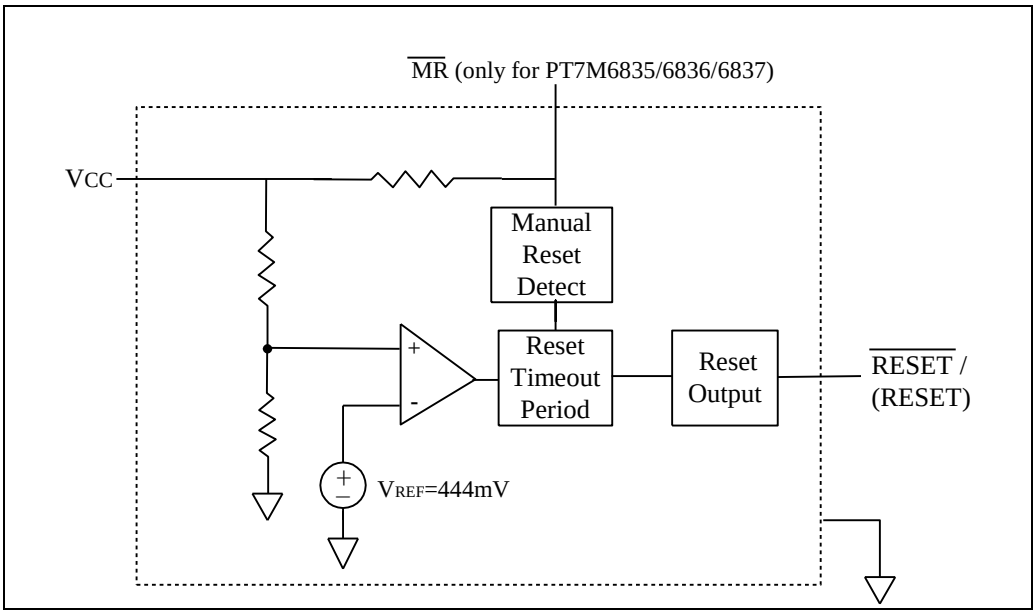


Fig.1 PT7M6832-PT7M6837 Block Diagram

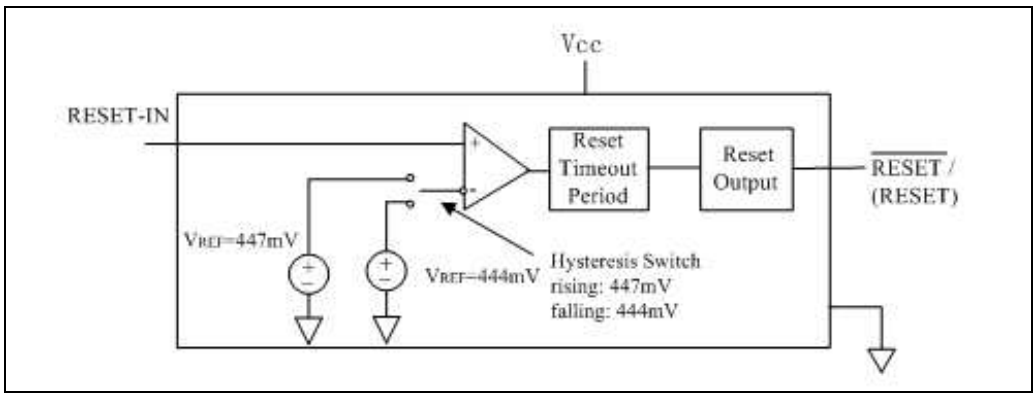


Fig.2 PT7M6838-PT7M6840 Block Diagram

Maximum Ratings

Storage Temperature…… - 65°C to +150°C
Ambient Temperature with Power Applied.....-40°C to +85°C
Supply Voltage to Ground Potential (V_{CC} to GND)……..... - 0.3V to +6.0V
Open-drain $\overline{\text{RESET}}$, $\overline{\text{MR}}$... ……..- 0.3V to +6.0V
RESET-IN, Push-pull RESET and $\overline{\text{RESET}}$…….-0.3V to +6.0V
DC Input/Output Current ……20mA
Power Dissipation……245mW

Note:
Stresses greater than 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 these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

AC Electrical Characteristics

(V_{CC} = +0.9V to +5.5V, unless otherwise noted. Typical values are at T_A = +25ºC)

Description	Symbol	Test Conditions	Min	Typ	Max	Unit
Reset Active Timeout Period	t_{PD}	D0	-	0.07	-	ms
		D1	1	1.5	2	
		D2	20	30	40	
		D3	140	210	280	
		D4	1120	1680	2240	
Vcc or RESET-IN to Reset Delay		Vcc falling, step signal from (V_{TH} +100mV) to (V_{TH} -100mV)	-	60	-	µs
Propagation Delay(D0 only)	t_P	Vcc rising, step signal from (V_{TH} -100mV) to (V_{TH} +100mV)	-	70	-	µs
Startup Time(D0 only)	-	Vcc rising from 0 to 1.1V(t_R <1µs)	-	150	-	µs
$\overline{\text{MR}}$ Minimum Input Pulse Width	-	$\overline{\text{MR}}$ driven from Vcc to 0	2	-	-	µs
$\overline{\text{MR}}$ Glitch Rejection	-	$\overline{\text{MR}}$ driven from Vcc to 0	-	100	-	ns
$\overline{\text{MR}}$ to Reset Delay	-	$\overline{\text{MR}}$ driven from Vcc to 0	-	500	-	ns

DC Electrical Characteristics

(V_{CC} = +0.9V to +5.5V, unless otherwise noted. Typical values are at T_A = +25ºC)

Description	Sym.	Test Conditions	Min	Typ	Max	Unit
Operating Voltage Range	V_{CC}	T_A= -40ºC ~+85ºC, PT7M6832/6835/6838, PT7M6834/6837/6840	0.9	-	5.5	V
		T_A= -40ºC ~+85ºC, PT7M6833/6836/6839	0.85	-	5.5	
		T_A= 0ºC ~+85ºC, PT7M6833/6836/6839	0.75	-	5.5	
		T_A= -40ºC ~+85ºC, PT7M6838/6839/6840	1.5	-	5.5	
Supply Current	I_{CC}	V_{CC}=1.2V, no load , reset not asserted	-	7.5	13	µA
		V_{CC}=1.8V, no load , reset not asserted	-	9	16	
		V_{CC}=3.6V, no load , reset not asserted	-	16	25	
Reset Threshold	V_{TH}	W	1.620	1.665	1.710	V
		V	1.530	1.575	1.620	
		I	1.350	1.388	1.425	
		H (-10ºC ~ +85ºC)	1.275	1.313	1.350	
		G (0ºC ~ +85ºC)	1.080	1.110	1.140	
		F*(0ºC ~+85ºC)	1.020	1.050	1.080	
RESET-IN Threshold	V_{RSTIN}	1.5V<=V_{CC}<=5.5V, RESET-IN falling from high to low(25ºC)	-2%	444	+2%	
		1.5V<=V_{CC}<=5.5V, RESET-IN rising from low to high(0ºC ~85ºC)	-5%	444	+5%	
Reference voltage temperature coefficient	T_C	Reference voltage temperature coefficient, -40ºC ~+85ºC	-	70	-	ppm/℃
Push-pull $\overline{\text{RESET}}$ Output High Voltage	V_{OH}	V_{CC}>=1.1V, I_{source}=50µA, reset not asserted	0.8×Vcc	-	-	-
		V_{CC}>=1.5V, I_{source}=150µA, reset not asserted	0.8×Vcc	-	-	
		V_{CC} >=1.0V, I_{source}=50µA, reset asserted	0.8×Vcc	-	-	
		V_{CC} >=1.5V, I_{source}=150µA, reset asserted	0.8×Vcc	-	-	
Push-pull $\overline{\text{RESET}}$ Output Low Voltage	V_{OL}	V_{CC} >=1.0V, I_{sink}=80µA, reset asserted	-	-	0.2×Vcc	V
		V_{CC} >=1.5V, I_{sink}=200µA, reset asserted	-	-	0.2×Vcc	
Push-pull $\overline{\text{RESET}}$ Output Low Voltage		V_{CC} >=1.1V, I_{sink}=80µA, reset not asserted	-	-	0.2×Vcc	
		V_{CC} >=1.5V, I_{sink}=200µA, reset not asserted	-	-	0.2×Vcc	
Open-Drain $\overline{\text{RESET}}$ Output Low Voltage		V_{CC} >=1.0V, I_{sink}=80µA, reset asserted	-	-	0.15	V
		V_{CC} >=1.5V, I_{sink}=200µA, reset asserted	-	-	0.2	
$\overline{\text{MR}}$ Input Voltage	V_{IL}	-	-	-	0.3×Vcc	V
	V_{IH}	-	0.7×Vcc	-	-	
Open-Drain $\overline{\text{RESET}}$ Output Leakage Current	I_{LKG}	V_{CC} > V_{TH} , reset not asserted	-	-	1.0	µA
RESET-IN Leakage Current	I_{RSTIN}	-	-25	-	+25	nA
Reset Threshold Hysteresis	V_{HYS}	-	-	0.75	-	% V_{TH}

Functional Description

Reset Output

The PT7M6832–PT7M6840 assert a reset to prevent code-execution errors during power-up, power-down, or brownout conditions. They also assert a reset signal whenever the Vcc supply voltage falls below a preset threshold (PT7M6832–PT7M6837) or RESET-IN falls below the adjustable threshold (PT7M6838-PT7M6840), keeping reset asserted for a fixed timeout delay (Table 2) after Vcc or RESET-IN has risen above the reset threshold. The PT7M6832/6835/6838 use a push-pull active-low output, the PT7M6833/6836/6839 have a push-pull active-high output, and the PT7M6834/6837/ 6840 have an open-drain active- low output stage. Connect a pull-up resistor on the PT7M6834/6837/ 6840's $\overline{\text{RESET}}$ output to any supply between 0 and 6V.

Manual Reset Input

Reset remains asserted while $\overline{\text{MR}}$ is low, and for a fixed timeout delay after $\overline{\text{MR}}$ returns high. This input has an internal 20kΩ pull-up resistor, so it can be left open if it is not used. $\overline{\text{MR}}$ can be driven with CMOS logic level, or with open-drain/collector outputs. To create a manual reset function, connect a normally open momentary switch from $\overline{\text{MR}}$ to ground; external debounce circuitry is not required.

RESET-IN

The PT7M6838/6839/6840 features a RESET-IN input for monitoring supply voltages down to 0.44V. An external resistive-divider network can be used to set voltage monitoring thresholds as shown in Fig.3. As the monitored voltage falls, the voltage at RESET-IN decreases and asserts a reset when it falls below the RESET-IN threshold(V_{RSTIN}). The low-leakage current at RESET-IN allows for relatively large-value resistors to be used, which reduce power consumption. For example, for a 0.6V monitored trip level, if R2 = 200kΩ, then R1 = 70.3kΩ.

Note: The minimum Vcc of 1.3V is required to guarantee the RESET-IN threshold accuracy.

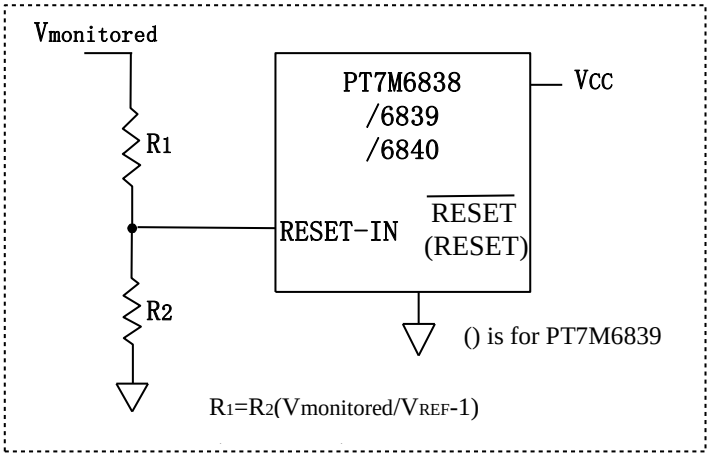


Fig.3 External setting of adjustable threshold

Application Information

Negative-Going VCC Transients

In addition to issuing a reset to the µP during power-up, power-down, and brownout conditions, the PT7M6832–PT7M6840 are relatively immune to short-duration negative-going Vcc transients. A 0.1µF bypass capacitor mounted as close as possible to the Vcc pin provides additional transient immunity.

Valid Reset Output Down to Vcc = 0

When Vcc falls below 0.9V, the PT7M6832/6835/6838 push-pull $\overline{\text{RESET}}$ output no longer sinks current for it becomes an open circuit. Therefore, high-impedance CMOS logic inputs connected to $\overline{\text{RESET}}$ can drift to undetermined voltages. This presents no problem in most applications since most µP and other circuitry are inoperative with Vcc lower than 0.9V. However, in applications where $\overline{\text{RESET}}$ must be valid down to 0, adding a pull-down resistor to $\overline{\text{RESET}}$ causes any stray leakage currents to flow to ground, holding $\overline{\text{RESET}}$ low(Fig.4). R3's value is not critical; 100kΩ is large enough not to load $\overline{\text{RESET}}$ and small enough to pull $\overline{\text{RESET}}$ to ground.

A 100kΩ pull-up resistor to Vcc is also recommended for the PT7M6833/PT7M6836/PT7M6839 if RESET is required to remain valid for Vcc < 0.85V.

Interfacing to µPs with Bidirectional Reset Pins

Since the $\overline{\text{RESET}}$ output on the PT7M6834/6837/6840 is open-drain, these devices interface easily with µPs that have bidirectional reset pins. Connecting the µP supervisor's $\overline{\text{RESET}}$ output directly to the µP's $\overline{\text{RESET}}$ pin with a single pull-up resistor allows either device to assert a reset (Fig.5).

Open-Drain $\overline{\text{RESET}}$ Output with Multiple Supplies

In some systems the open-drain output is used to level-shift from the monitored supply to reset circuitry powered by some other supply (Fig.6).

Note: As the PT7M6834/6837/6840's Vcc decreases, so does the IC's ability to sink current at $\overline{\text{RESET}}$. Also, with any pull-up, $\overline{\text{RESET}}$ will be pulled high as Vcc declines toward 0. The voltage where this occurs depends on the pull-up resistor value and the voltage to which it is connected.

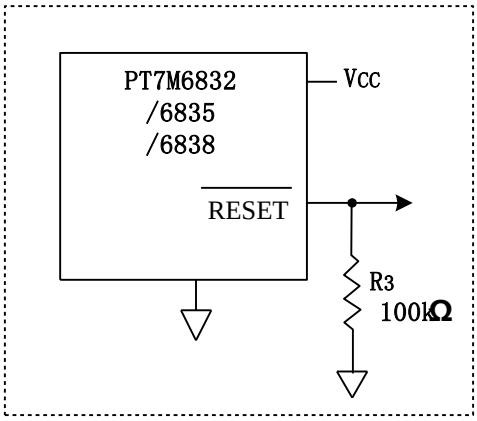


Fig.4 $\overline{\text{Reset}}$ output valid to VCC=0 circuit

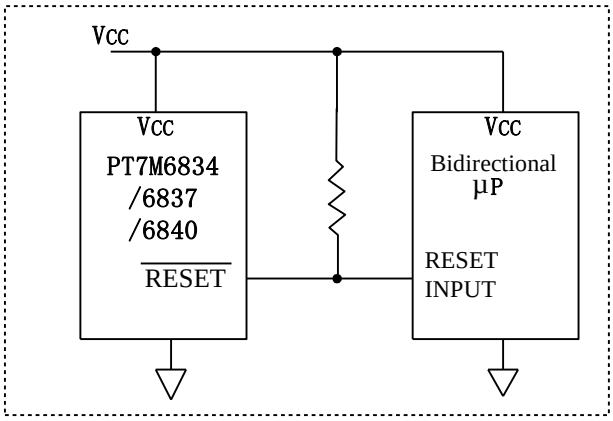


Fig.5 Interfacing to µPs with Bidirectional Reset I/O

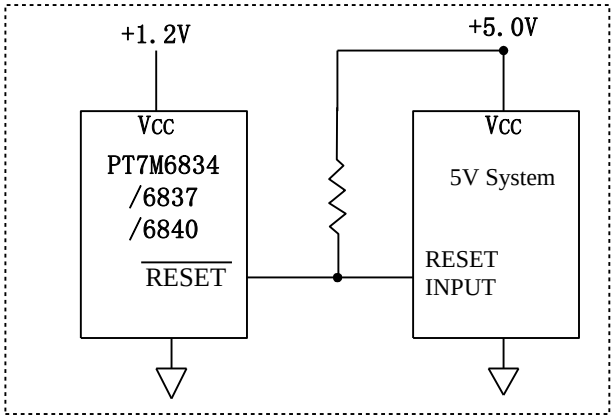
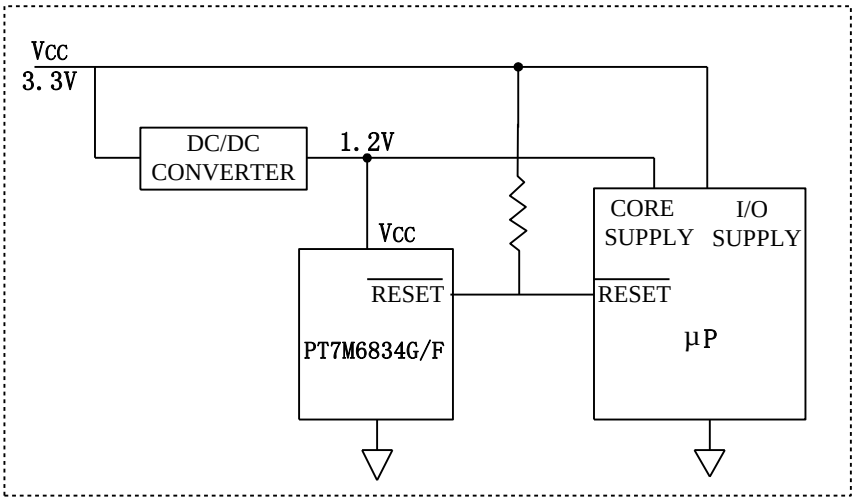


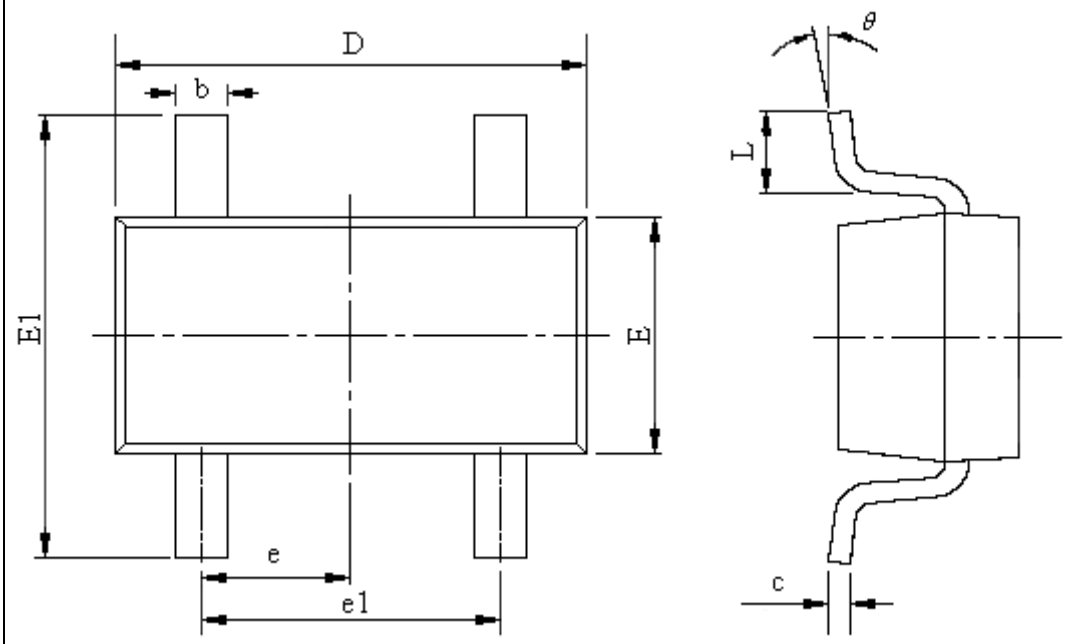
Fig.6 Open-drain $\overline{\text{Reset}}$ output with multiple supplies

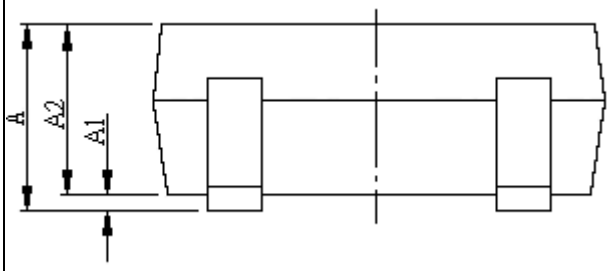
Application Circuit



Mechanical Information

C4 (SC70-4)

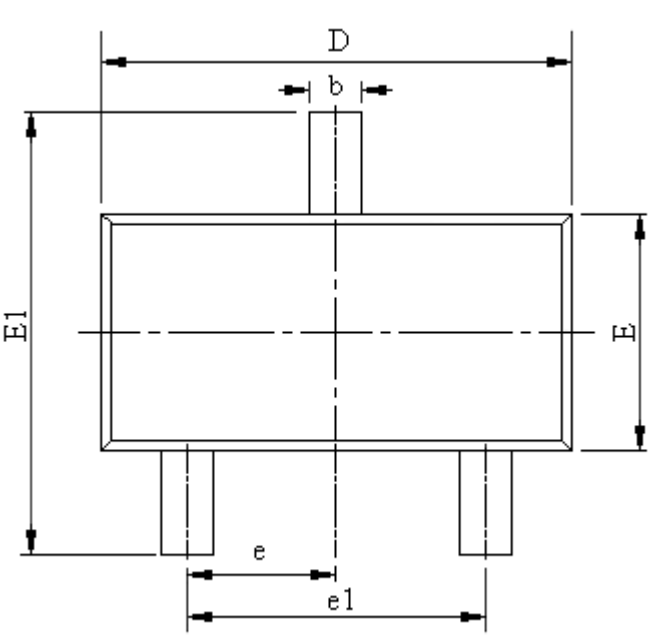


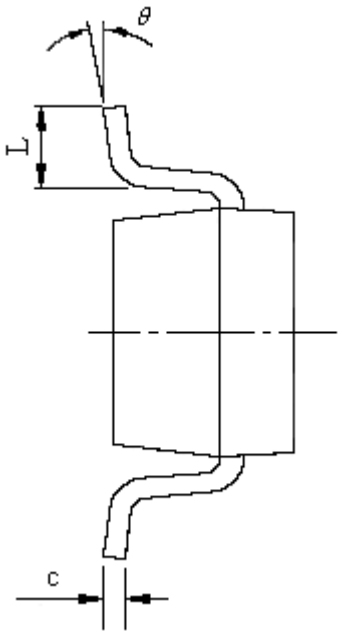


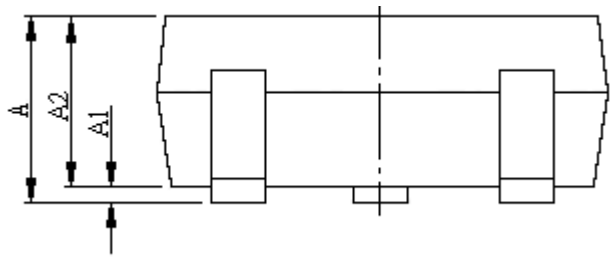
Note:
1) Controlling dimensions in millimeters.
2) Ref: JEDEC MO-203

PKG. DIMENSIONS(MM)		
SYMBOL	MIN	MAX
A	0.9	1.1
A1	0	0.1
A2	0.9	1
b	0.15	0.35
c	0.08	0.15
D	2	2.2
E	1.15	1.35
E1	2.15	2.45
e	0.65TYP	
e1	1.2	1.4
L	0.26	0.46
θ	0°	8°

TA (SOT23-3)



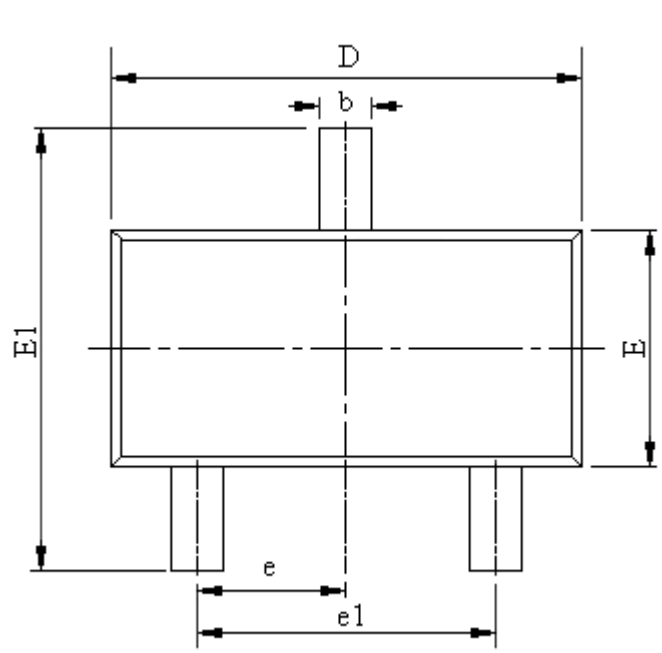


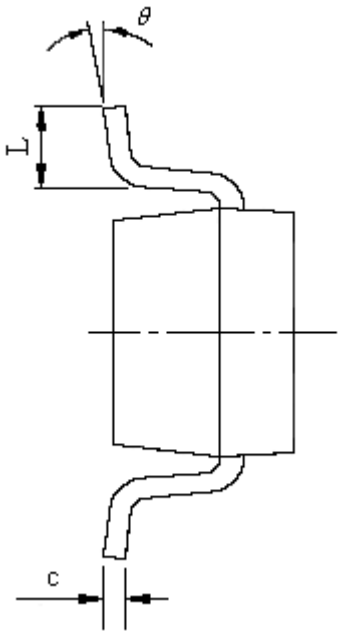


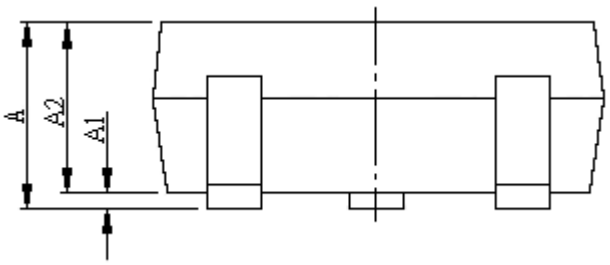
Note:
1) Controlling dimensions in millimeters.

PKG. DIMENSIONS(MM)		
SYMBOL	MIN	MAX
A	1.05	1.25
A1	0	0.1
A2	1.05	1.15
b	0.3	0.5
c	0.1	0.2
D	2.82	3.02
E	1.5	1.7
E1	2.65	2.95
e	0.95BSC	
e1	1.8	2
L	0.3	0.6
θ	0°	8°

C3 (SC70-3)







Note:
1) Controlling dimensions in millimeters.
2) Ref: JEDEC MO-203

PKG. DIMENSIONS(MM)		
SYMBOL	MIN	MAX
A	0.9	1.1
A1	0	0.1
A2	0.9	1
b	0.2	0.4
c	0.08	0.15
D	2	2.2
E	1.15	1.35
E1	2.15	2.45
e	0.65TYP	
e1	1.2	1.4
L	0.26	0.46
θ	0°	8°

Ordering Information

Part Number	Package Code	Package
PT7M6832xDxC4E	C4	Lead free and Green SC70-4
PT7M6832xDxTA3E	TA	Lead free and Green SOT23-3
PT7M6832xDxC3E	C3	Lead free and Green SC70-3
PT7M6833xDxC4E	C4	Lead free and Green SC70-4
PT7M6833xDxTA3E	TA	Lead free and Green SOT23-3
PT7M6833xDxC3E	C3	Lead free and Green SC70-3
PT7M6834xDxC4E	C4	Lead free and Green SC70-4
PT7M6834xDxTA3E	TA	Lead free and Green SOT23-3
PT7M6834xDxC3E	C3	Lead free and Green SC70-3
PT7M6835xDxC4E	C4	Lead free and Green SC70-4
PT7M6836xDxC4E	C4	Lead free and Green SC70-4
PT7M6837xDxC4E	C4	Lead free and Green SC70-4
PT7M6838DxC4E	C4	Lead free and Green SC70-4
PT7M6839DxC4E	C4	Lead free and Green SC70-4
PT7M6840DxC4E	C4	Lead free and Green SC70-4

Note:
- "x" refer to threshold. See below table 1.
- "Dx" refer to timeout period. See below table 2.
- E=Lead-free and Green Packaging
- Adding X suffix=Tape/Reel
- Contact Pericom for availability.

Table 1 Suffix "x" definition of Threshold

Suffix	Reset Threshold(V)
W	1.665
V	1.575
I	1.388
H	1.313
G	1.110
F	1.050

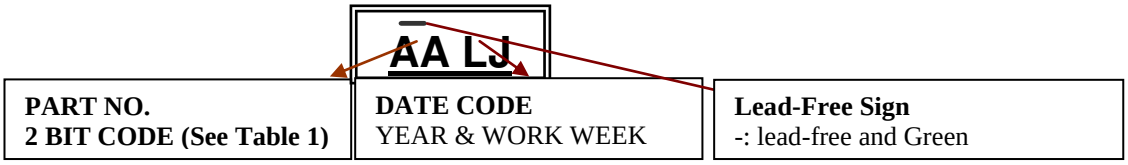
Table 2 Suffix "Dx" definition of Timeout Period

Suffix	Reset Active Timeout Period(ms)
D0	0.07
D1	1.5
D2	30
D3	210
D4	1680

Function comparison of PT7M6832- PT7M6840

Item	Part No.	Output Open-Drain		Output Push-Pull	
		Active high	Active low	Active high	Active low
1	PT7M6832/6835/6838	-	-	-	√
2	PT7M6833/6836/6839	-	-	√	-
3	PT7M6834/6837/6840	-	√	-	-

SOT23/SC70 Package Top Marking Instruction



Example: **$\overline{n}$x SN** PART NO.: PT7M6832WD0TA3E
DATE CODE: YEAR 2006 WW10
Lead free and Green package

Table 3 Part No code comparison table

No.	Part No.	Code	No.	Part No.	Code	No.	Part No.	Code
1	PT7M6832WD0	nx	**40**	PT7M6834VD0	ph	**79**	PT7M6836ID0	qp
2	PT7M6832WD3	ny	**41**	PT7M6834VD3	pi	**80**	PT7M6836ID3	qq
3	PT7M6832WD4	nz	**42**	PT7M6834VD4	pj	**81**	PT7M6836ID4	qr
4	PT7M6832VD0	oa	**43**	PT7M6834ID0	pk	**82**	PT7M6836HD0	qs
5	PT7M6832VD3	no	**44**	PT7M6834ID3	pl	**83**	PT7M6836HD3	qt
6	PT7M6832VD4	ob	**45**	PT7M6834ID4	pm	**84**	PT7M6836HD4	qu
7	PT7M6832ID0	oc	**46**	PT7M6834HD0	nw	**85**	PT7M6836GD0	qv
8	PT7M6832ID3	od	**47**	PT7M6834HD3	nt	**86**	PT7M6836GD3	qw
9	PT7M6832ID4	oe	**48**	PT7M6834HD4	pn	**87**	PT7M6836GD4	qx
10	PT7M6832HD0	of	**49**	PT7M6834GD0	nv	**88**	PT7M6836FD0	qy
11	PT7M6832HD3	nr	**50**	PT7M6834GD3	ns	**89**	PT7M6836FD3	qz
12	PT7M6832HD4	og	**51**	PT7M6834GD4	po	**90**	PT7M6836FD4	ra
13	PT7M6832GD0	nu	**52**	PT7M6834FD0	pp	**91**	PT7M6837WD0	rb
14	PT7M6832GD3	oh	**53**	PT7M6834FD3	pq	**92**	PT7M6837WD3	rc
15	PT7M6832GD4	oi	**54**	PT7M6834FD4	pr	**93**	PT7M6837WD4	rd
16	PT7M6832FD0	oj	**55**	PT7M6835WD0	ps	**94**	PT7M6837VD0	re
17	PT7M6832FD3	ok	**56**	PT7M6835WD3	pt	**95**	PT7M6837VD3	rf
18	PT7M6832FD4	ol	**57**	PT7M6835WD4	pu	**96**	PT7M6837VD4	rg
19	PT7M6833WD0	om	**58**	PT7M6835VD0	pv	**97**	PT7M6837ID0	rh
20	PT7M6833WD3	on	**59**	PT7M6835VD3	pw	**98**	PT7M6837ID3	ri
21	PT7M6833WD4	oo	**60**	PT7M6835VD4	px	**99**	PT7M6837ID4	rj
22	PT7M6833VD0	op	**61**	PT7M6835ID0	py	**100**	PT7M6837HD0	rk
23	PT7M6833VD3	oq	**62**	PT7M6835ID3	pz	**101**	PT7M6837HD3	rl
24	PT7M6833VD4	or	**63**	PT7M6835ID4	qa	**102**	PT7M6837HD4	rm
25	PT7M6833ID0	os	**64**	PT7M6835HD0	qb	**103**	PT7M6837GD0	rn
26	PT7M6833ID3	ot	**65**	PT7M6835HD3	qc	**104**	PT7M6837GD3	ro
27	PT7M6833ID4	ou	**66**	PT7M6835HD4	qd	**105**	PT7M6837GD4	rp
28	PT7M6833HD0	ov	**67**	PT7M6835GD0	qe	**106**	PT7M6837FD0	rq
29	PT7M6833HD3	ow	**68**	PT7M6835GD3	qf	**107**	PT7M6837FD3	rr
30	PT7M6833HD4	ox	**69**	PT7M6835GD4	qg	**108**	PT7M6837FD4	rs
31	PT7M6833GD0	oy	**70**	PT7M6835FD0	qh	**109**	PT7M6838D0	rt
32	PT7M6833GD3	oz	**71**	PT7M6835FD3	jj	**110**	PT7M6838D3	jh
33	PT7M6833GD4	pa	**72**	PT7M6835FD4	qi	**111**	PT7M6838D4	ru
34	PT7M6833FD0	pb	**73**	PT7M6836WD0	qj	**112**	PT7M6839D0	rv
35	PT7M6833FD3	pc	**74**	PT7M6836WD3	qk	**113**	PT7M6839D3	rw
36	PT7M6833FD4	pd	**75**	PT7M6836WD4	ql	**114**	PT7M6839D4	rx
37	PT7M6834WD0	pe	**76**	PT7M6836VD0	qm	**115**	PT7M6840D0	ry
38	PT7M6834WD3	pf	**77**	PT7M6836VD3	qn	**116**	PT7M6840D3	jk
39	PT7M6834WD4	pg	**78**	PT7M6836VD4	qo	**117**	PT7M6840D4	jo