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MOTOROLA

MC33464

Micropower Undervoltage Sensing Circuits

The MC33464 series are micropower undervoltage sensing circuits that are specifically designed for use with battery powered microprocessor based systems, where extended battery life is required. A choice of several threshold voltages from 0.9 V to 4.5 V are available. These devices feature a very low quiescent bias current of 0.8 μA typical.

The MC33464 series features a highly accurate voltage reference, a comparator with precise thresholds and built–in hysteresis to prevent erratic reset operation, a choice of output configurations between open drain or complementary MOS, and guaranteed operation below 1.0 V with extremely low standby current. These devices are available in either SOT–89 3–pin or SOT–23 5–pin surface mount packages.

Applications include direct monitoring of the MPU/logic power supply used in portable, appliance, automotive and industrial equipment.

MC33464 Features:

- Extremely Low Standby Current of 0.8 μA at V_{in} = 1.5 V
- Wide Input Voltage Range (0.7 V to 10 V)
- Monitors Power Supply Voltages from 1.1 V to 5.0 V
- High Accuracy Detector Threshold (±2.5%)
- Two $\overline{\text{Reset}}$ Output Types (Open Drain or Complementary Drive)
- Two Surface Mount Packages (SOT–89 or SOT–23 5–Pin)

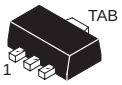
ORDERING INFORMATION

Device	Threshold Voltage	Type	Marking	Package (Qty/Reel)
MC33464H–09AT1	0.9	Open Drain $\overline{\text{Reset}}$	T09A	SOT–89 (1000)
MC33464H–20AT1	2.0		T20A	
MC33464H–27AT1	2.7		T27A	
MC33464H–30AT1	3.0		T30A	
MC33464H–45AT1	4.5		T45A	
MC33464H–09CT1	0.9	Compl. MOS $\overline{\text{Reset}}$	T09C	
MC33464H–20CT1	2.0		T20C	
MC33464H–27CT1	2.7		T27C	
MC33464H–30CT1	3.0		T30C	
MC33464H–43CT1	4.3		T43C	
MC33464H–45CT1	4.5		T45C	
MC33464N–09ATR	0.9	Open Drain $\overline{\text{Reset}}$	9N	SOT–23 (3000)
MC33464N–20ATR	2.0		0R	
MC33464N–21ATR	2.1		1R	
MC33464N–27ATR	2.7		7R	
MC33464N–30ATR	3.0		0S	
MC33464N–45ATR	4.5		5T	
MC33464N–48ATR	4.8		8T	
MC33464N–09CTR	0.9	Compl. MOS $\overline{\text{Reset}}$	9F	
MC33464N–20CTR	2.0		0J	
MC33464N–27CTR	2.7		7J	
MC33464N–30CTR	3.0		0K	
MC33464N–45CTR	4.5		5L	

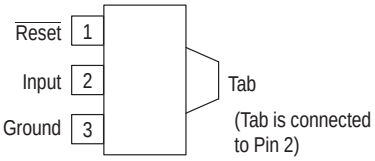
Other voltages from 0.9 to 6.0 V, in 0.1 V increments, are available. Consult factory for information.

MICROPOWER UNDERVOLTAGE SENSING CIRCUITS

SEMICONDUCTOR TECHNICAL DATA

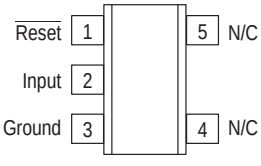


H SUFFIX
PLASTIC PACKAGE
CASE 1213
(SOT–89)



(Top View)

N SUFFIX
PLASTIC PACKAGE
CASE 1212
(SOT–23–5)

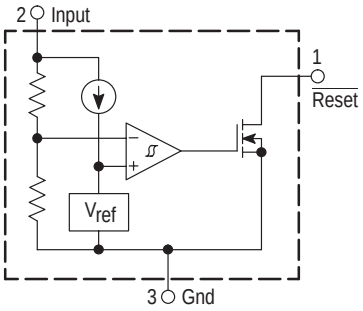


(Top View)

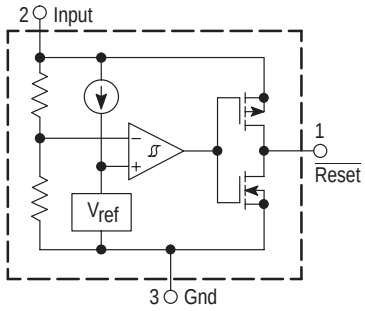
Rev 2, 07/1999

Representative Block Diagrams

MC33464X–YYATZ
Open Drain Configuration



MC33464X–YYCTZ
Complementary Drive Configuration



X Denotes Package Type
YY Denotes Threshold Voltage
TZ Denotes Taping Type

This device contains 25 active transistors.

MAXIMUM RATINGS (T_C = 25°C, unless otherwise noted.)

Rating	Symbol	Value	Unit
Power Input Supply Voltage	V_{in}	0 to 10	V
$\overline{\text{Reset}}$ Output Voltage	V_O	–0.3 to 10	V
$\overline{\text{Reset}}$ Output Current (Source or Sink)	I_O	70	mA
Power Dissipation and Thermal Characteristics Maximum Power Dissipation Case 1212 (SOT–23) N Suffix Thermal Resistance, Junction–to–Ambient Maximum Power Dissipation Case 1213 (SOT–89) H suffix Thermal Resistance, Junction–to–Ambient	 P_D $R_{\theta JA}$ P_D $R_{\theta JA}$	 150 667 300 333	 mW °C/W mW °C/W
Operating Junction Temperature	T_J	+125	°C
Operating Ambient Temperature	T_A	–40 to +85	°C
Storage Temperature Range	T_{stg}	–40 to +125	°C
Lead Temperature (Soldering)	T_{solder}	260°C, 10 s	–

ELECTRICAL CHARACTERISTICS (For all values T_A = 25°C (Note 1), unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
COMPARATOR					
Threshold Voltage					V
High State Output (V_{in} Decreasing)	V_{IH}				
09 Suffix		0.878	0.9	0.922	
20 Suffix		1.95	2.0	2.05	
21 Suffix		2.048	2.1	2.152	
27 Suffix		2.633	2.7	2.768	
30 Suffix		2.925	3.0	3.075	
43 Suffix		4.193	4.3	4.407	
45 Suffix		4.388	4.5	4.613	
48 Suffix		4.680	4.8	4.920	
Threshold Hysteresis	V_H				V
09 Suffix		0.027	0.045	0.063	
20 Suffix		0.060	0.100	0.140	
21 Suffix		0.063	0.105	0.147	
27 Suffix		0.081	0.135	0.189	
30 Suffix		0.090	0.150	0.210	
43 Suffix		0.129	0.215	0.301	
45 Suffix		0.135	0.225	0.315	
48 Suffix		0.144	0.240	0.336	
Threshold Voltage Temperature Coefficient	T_C	–	±100	–	PPM/°C
$\overline{\text{RESET}}$ OUTPUT					
Output Voltage					V
High State (Complementary Output: I_{source} = 1.0 mA)	V_{OH}	V_{in} – 2.1	V_{in} – 1.0	V_{in}	
Low State (Complementary or Open Drain: I_{sink} = 1.0 mA)	V_{OL}	–	0.025	0.05	
Output Sink Current (V_{in} = 1.5 V, V_{OL} = 0.5 V)	I_{OL}	1.0	2.0	–	mA
Output Source Current (V_{in} = 4.5 V, V_{OL} = 2.4 V)	I_{OH}	1.0	2.0	–	mA
TOTAL DEVICE					
Operating Input Voltage Range	V_{in}	0.7 to 10	–	–	V
Quiescent Input Current	I_{in}				µA
V_{in} = 2.9 V		–	0.9	2.7	
V_{in} = 5.6 V		–	1.2	3.6	
Propagation Delay Time (Note 2)	t_p	–	–	100	µs

NOTES: 1. Low duty pulse techniques are used during test to maintain junction temperature as close to ambient as possible.
2. Propagation delay time is measured from the rising or falling edge of the input voltage to the point where the output voltage has transitioned to 50% of its final value.

Figure 1. Quiescent Current versus Input Voltage

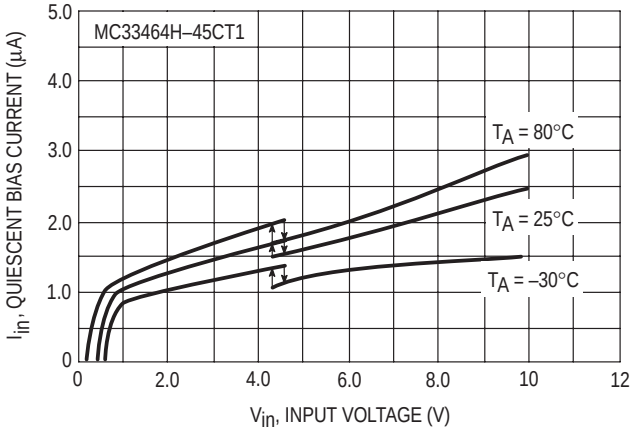


Figure 2. Detector Threshold versus Temperature

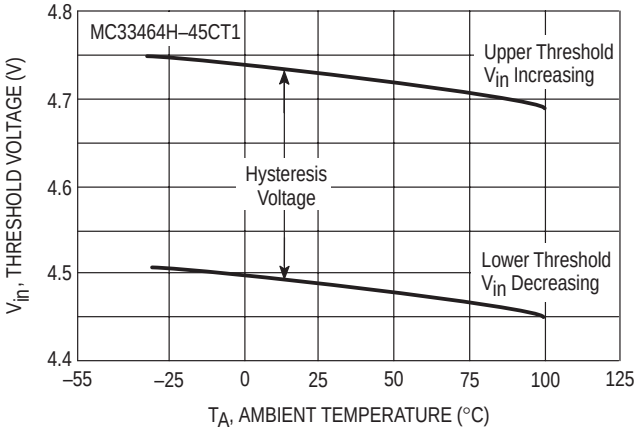


Figure 3. $\overline{\text{Reset}}$ Output Voltage versus Input Voltage

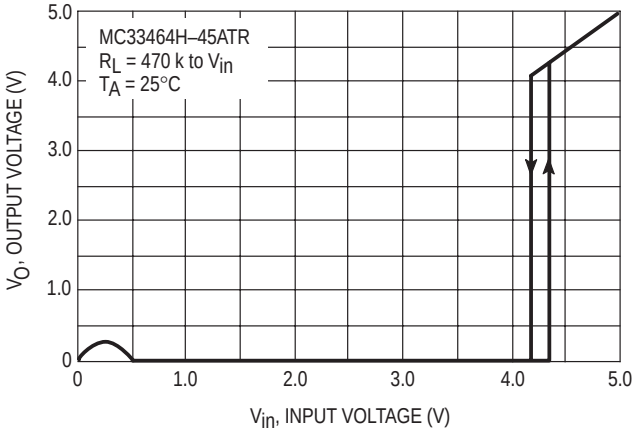


Figure 4. $\overline{\text{Reset}}$ Output Voltage versus Sink Current

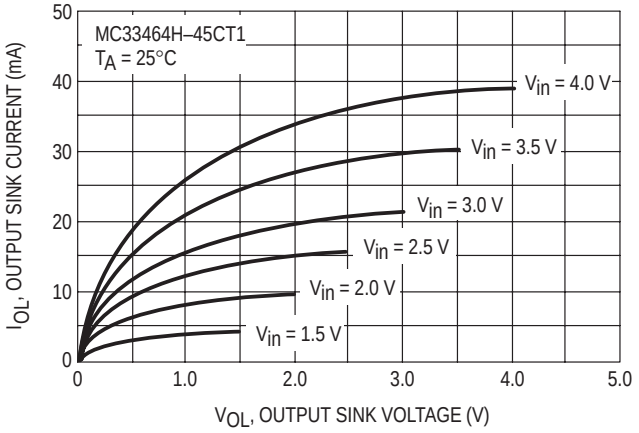


Figure 5. Output Delay Time versus Load Capacitance

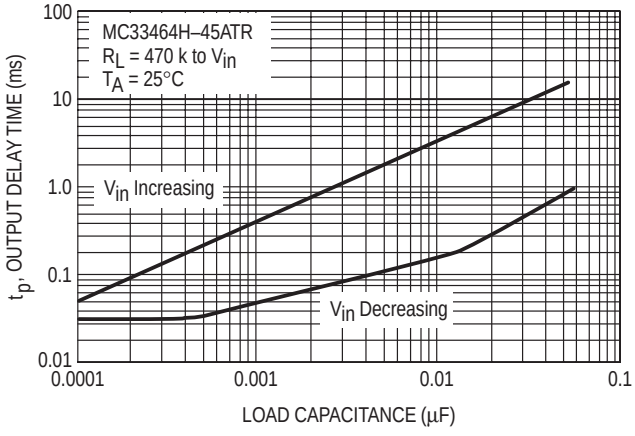


Figure 6. Output Sink Current versus Input Voltage

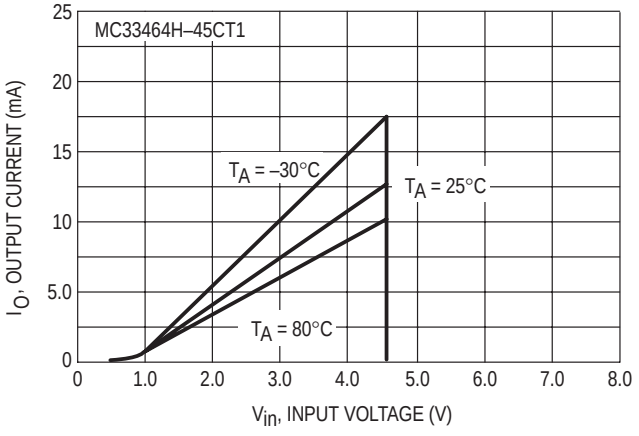
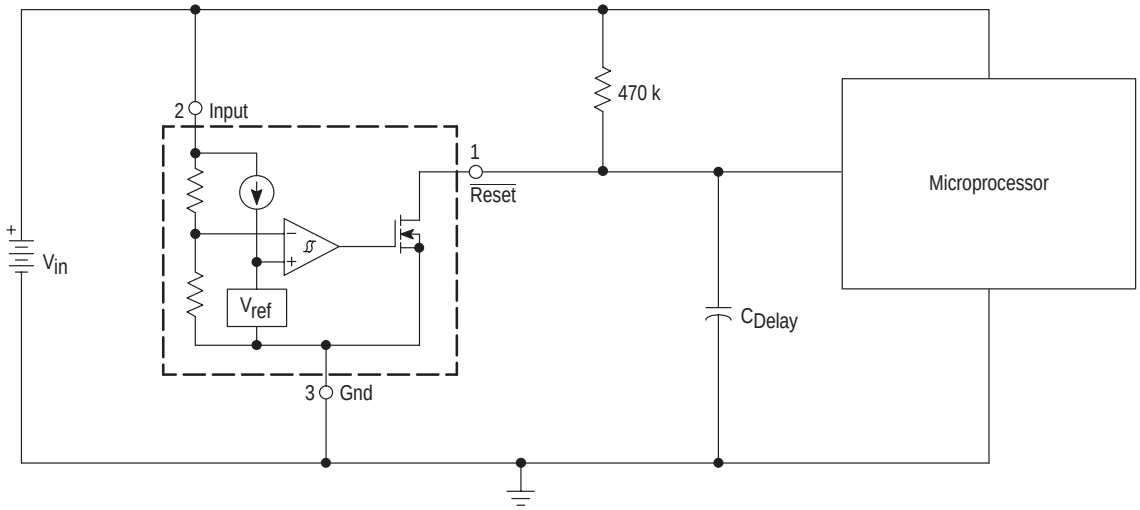


Figure 7. Microprocessor Reset Circuit with Delay

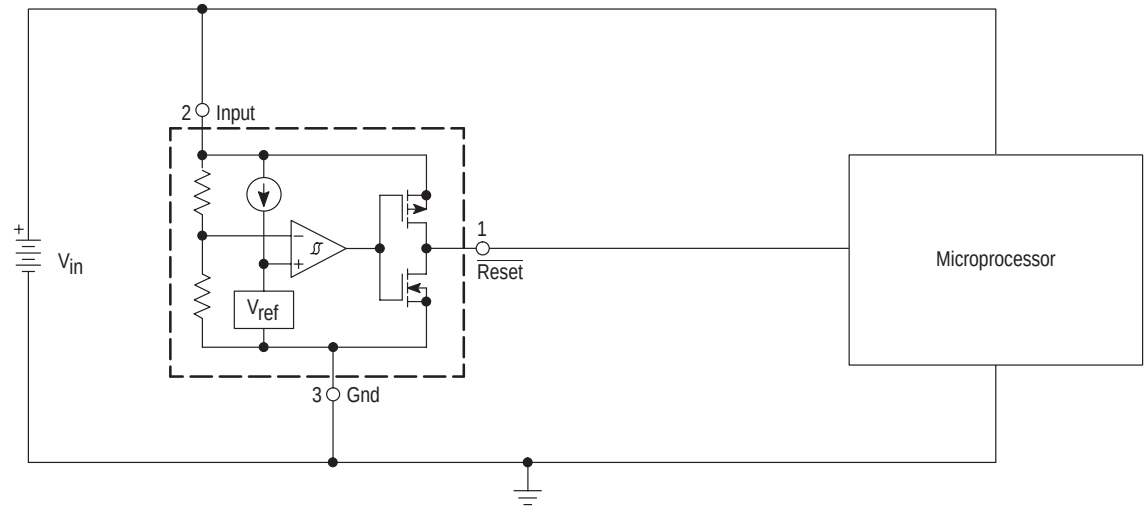


A time delayed reset can be accomplished with the addition of C_{Delay}. Figure 5 provides a graph of time delays, for both rising and falling output waveform edges, as a function of C_{Delay}. If another value of pullup resistance is used, the time delay can be calculated by using the equation:

$$t_{Delay} = R\ C_{Delay} \left[\frac{1}{\left(1 - \frac{V_{th(MPU)}}{V_{in}} \right)} \right] + t_p$$

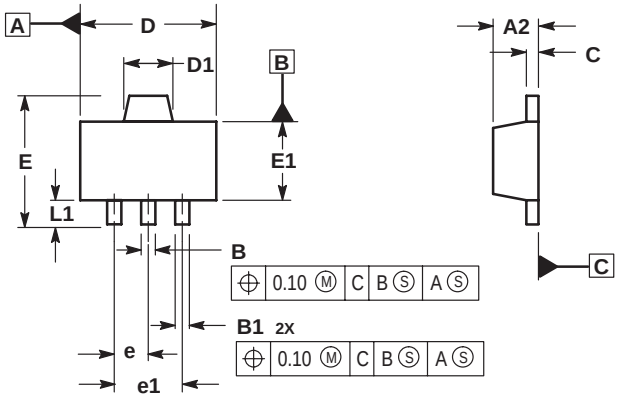
where Vth_{MPU} is the microprocessor reset input threshold voltage and t_p is the propagation delay internal to the MC33464.

Figure 8. Microprocessor Reset Circuit



OUTLINE DIMENSIONS

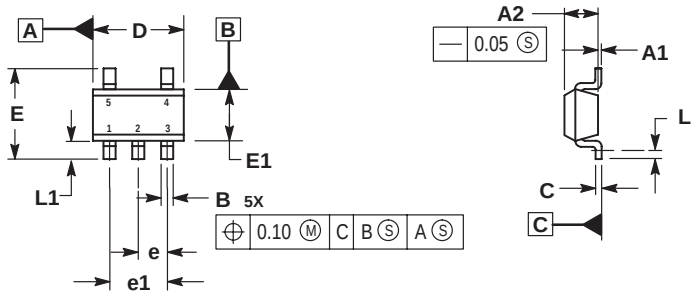
H SUFFIX
PLASTIC PACKAGE
CASE 1213–01
(SOT–89)
ISSUE O



NOTES:
1. DIMENSIONS ARE IN MILLIMETERS.
2. INTERPRET DIMENSIONS AND TOLERANCING PER ASME Y14.5M, 1994.
3. DATUM C IS A SEATING PLANE.

	MILLIMETERS	
DIM	MIN	MAX
A2	1.40	1.60
B	0.37	0.57
B1	0.32	0.52
C	0.30	0.50
D	4.40	4.60
D1	1.50	1.70
E	—	4.25
E1	2.40	2.60
e	1.50 BSC	
e1	3.00 BSC	
L1	0.80	—

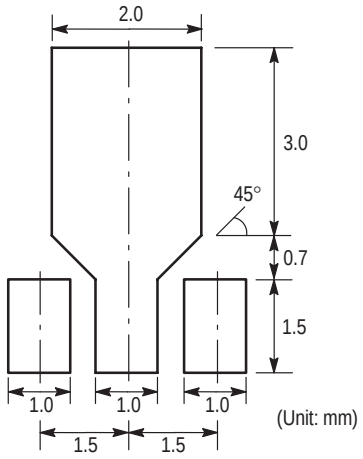
N SUFFIX
PLASTIC PACKAGE
CASE 1212–01
(SOT–23–5)
ISSUE O



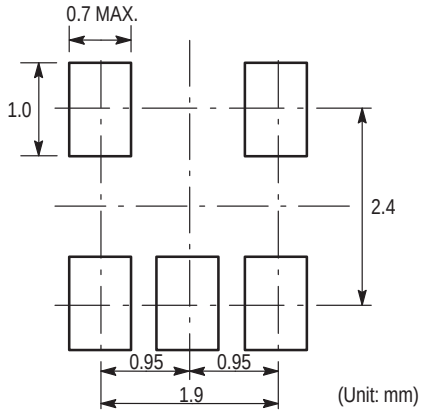
NOTES:
1. DIMENSIONS ARE IN MILLIMETERS.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DATUM C IS A SEATING PLANE.

	MILLIMETERS	
DIM	MIN	MAX
A1	0.00	0.10
A2	1.00	1.30
B	0.30	0.50
C	0.10	0.25
D	2.80	3.00
E	2.50	3.10
E1	1.50	1.80
e	0.95 BSC	
e1	1.90 BSC	
L	0.20	—
L1	0.45	0.75

Recommended Footprint for Surface Mount Applications



SOT–89



SOT–23–5

NOTES

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