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.

- 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)

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**MICROPOWER
UNDERVOLTAGE
SENSING CIRCUITS**

**SEMICONDUCTOR
TECHNICAL DATA**

H SUFFIX
PLASTIC PACKAGE
CASE 1213
(SOT−89)

(Top View)

(Tab is connected to Pin 2)
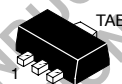
N SUFFIX
PLASTIC PACKAGE
CASE 1212
(SOT−23−5)

(Top View)

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	

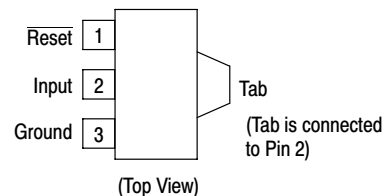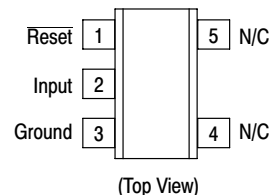Other voltages from 0.9 to 6.0 V, in 0.1 V increments, are available. Consult factory for information.

MC33464

ORDERING INFORMATION

Device	Threshold Voltage	Type	Marking	Package (Qty/Reel)
MC33464N−09ATR	0.9		9N	
MC33464N−20ATR	2.0		0R	
MC33464N−21ATR	2.1	Open	1R	
MC33464N−27ATR	2.7	Drain	7R	
MC33464N−30ATR	3.0	Reset	0S	
MC33464N−45ATR	4.5		5T	SOT−23
MC33464N−48ATR	4.8		8T	(3000)
MC33464N−09CTR	0.9		9F	
MC33464N−20CTR	2.0	Compl.	0J	
MC33464N−27CTR	2.7	MOS	7J	
MC33464N−30CTR	3.0	Reset	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.

Representative Block Diagrams

MC33464X−YYATZ
Open Drain Configuration
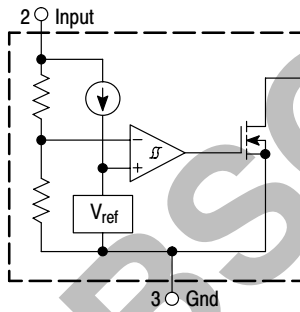
MC33464X−YYCTZ
Complementary Drive Configuration
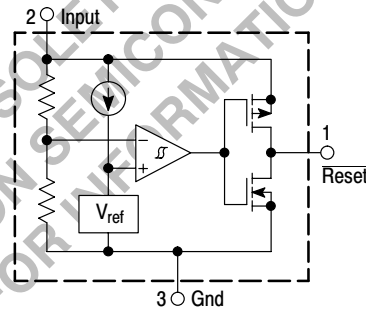
X Denotes Package Type
YY Denotes Threshold Voltage
TZ Denotes Taping Type

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
Reset Output Voltage	V_O	−0.3 to 10	V
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 High State Output (V_{in} Decreasing) 09 Suffix 20 Suffix 21 Suffix 27 Suffix 30 Suffix 43 Suffix 45 Suffix 48 Suffix	V_{IH}	 0.878 1.95 2.048 2.633 2.925 4.193 4.388 4.680	 0.9 2.0 2.1 2.7 3.0 4.3 4.5 4.8	 0.922 2.05 2.152 2.768 3.075 4.407 4.613 4.920	V
Threshold Hysteresis 09 Suffix 20 Suffix 21 Suffix 27 Suffix 30 Suffix 43 Suffix 45 Suffix 48 Suffix	V_H	 0.027 0.060 0.063 0.081 0.090 0.129 0.135 0.144	 0.045 0.100 0.105 0.135 0.150 0.215 0.225 0.240	 0.063 0.140 0.147 0.189 0.210 0.301 0.315 0.336	V
Threshold Voltage Temperature Coefficient	T_C	–	±100	–	PPM/°C
RESET OUTPUT					
Output Voltage High State (Complementary Output: I_{source} = 1.0 mA) Low State (Complementary or Open Drain: I_{sink} = 1.0 mA)	V_{OH} V_{OL}	V_{in} – 2.1 –	V_{in} – 1.0 0.025	V_{in} 0.05	V
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 V_{in} = 2.9 V V_{in} = 5.6 V	I_{in}	 – –	 0.9 1.2	 2.7 3.6	μA
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.

MC33464

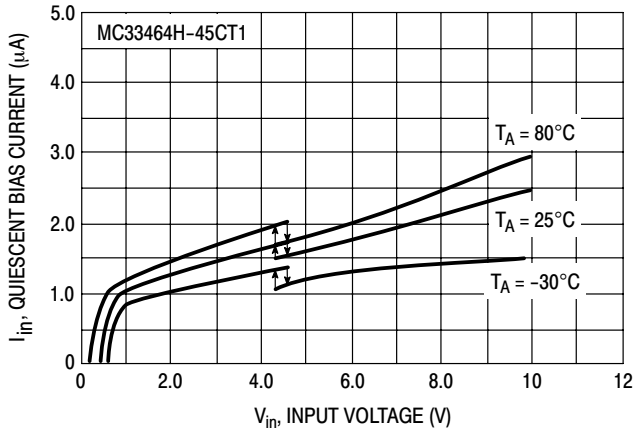### Figure 1. Quiescent Current versus Input Voltage

MC33464H–45CT1

I_{in}, QUIESCENT BIAS CURRENT (μA) vs V_{in}, INPUT VOLTAGE (V)

$T_A = 80°C$
$T_A = 25°C$
$T_A = -30°C$

Figure 2. Detector Threshold versus Temperature

MC33464H–45CT1

V_{in}, THRESHOLD VOLTAGE (V) vs T_A, AMBIENT TEMPERATURE (°C)

Upper Threshold
V_{in} Increasing

Hysteresis
Voltage

Lower Threshold
V_{in} Decreasing
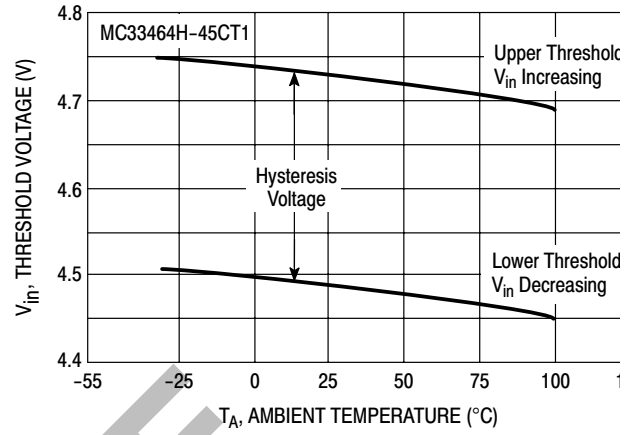
Figure 3. Reset Output Voltage versus Input Voltage

MC33464H–45ATR
$R_L = 470$ k to V_{in}
$T_A = 25°C$

V_O, OUTPUT VOLTAGE (V) vs V_{in}, INPUT VOLTAGE (V)
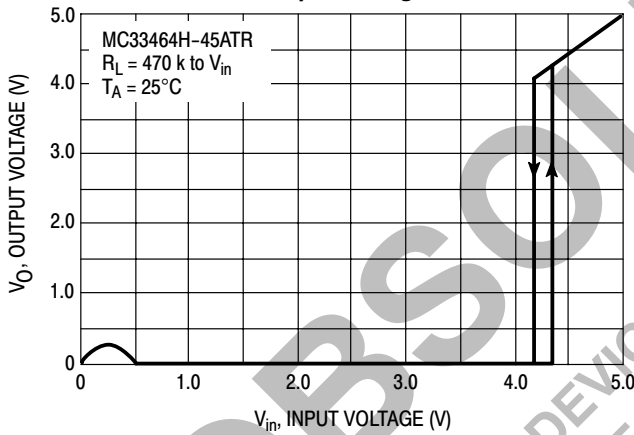
Figure 4. Reset Output Voltage versus Sink Current

MC33464H–45CT1
$T_A = 25°C$

I_{OL}, OUTPUT SINK CURRENT (mA) vs V_{OL}, OUTPUT SINK VOLTAGE (V)

$V_{in} = 4.0$ V
$V_{in} = 3.5$ V
$V_{in} = 3.0$ V
$V_{in} = 2.5$ V
$V_{in} = 2.0$ V
$V_{in} = 1.5$ V
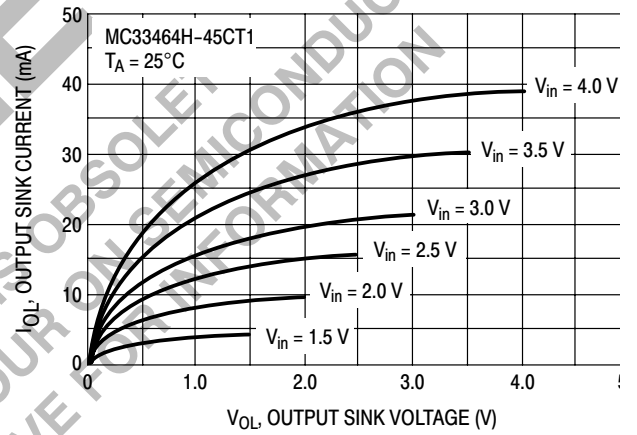
Figure 5. Output Delay Time versus Load Capacitance

MC33464H–45ATR
$R_L = 470$ k to V_{in}
$T_A = 25°C$

t_p, OUTPUT DELAY TIME (ms) vs LOAD CAPACITANCE (μF)

V_{in} Increasing

V_{in} Decreasing
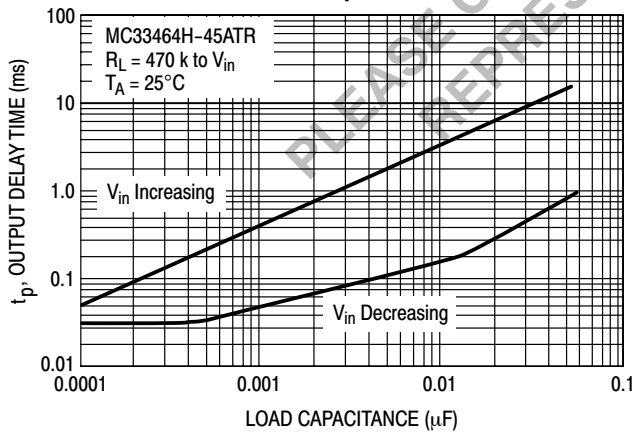
Figure 6. Output Sink Current versus Input Voltage

MC33464H–45CT1

I_O, OUTPUT CURRENT (mA) vs V_{in}, INPUT VOLTAGE (V)

$T_A = -30°C$
$T_A = 25°C$
$T_A = 80°C$
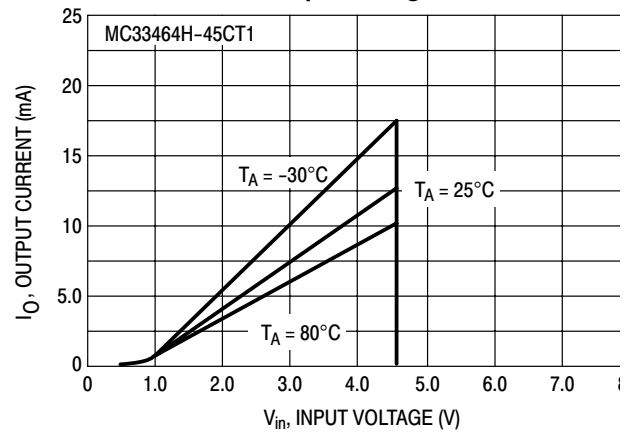
Figure 7. Microprocessor Reset Circuit with Delay
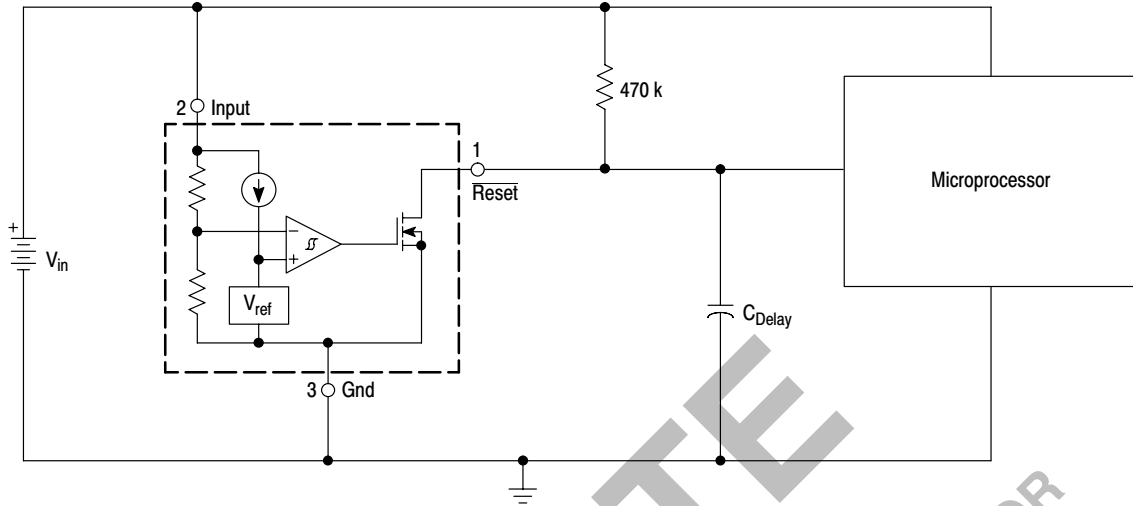
A time delayed reset can be accomplished with the addition of C_{Delay}. Figure 5 provides a graph of time delays, for both rising and falling output waveform edges, as a function of C_{Delay}. If another value of pullup resistance is used, the time delay can be calculated by using the equation:

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

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
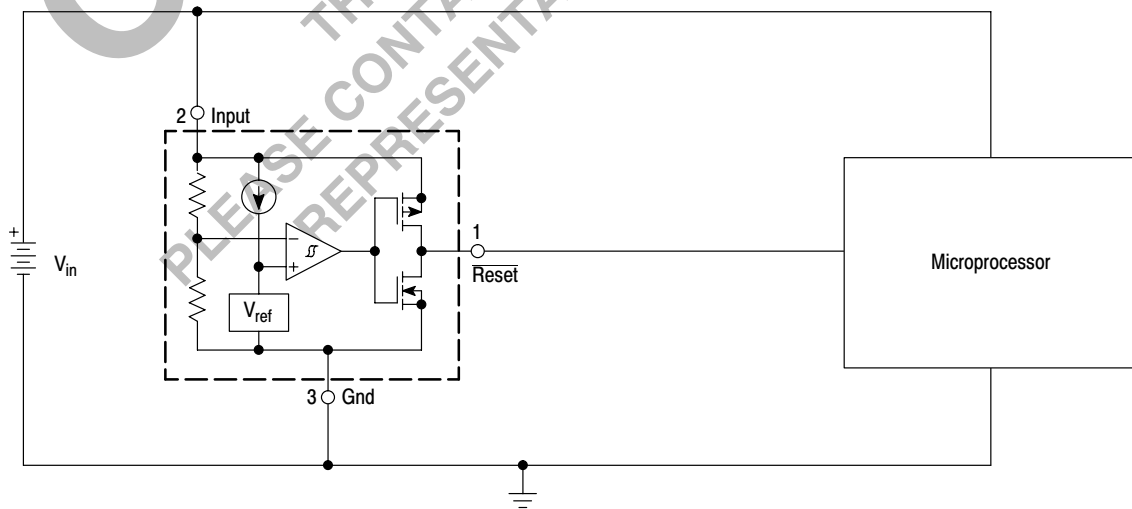
MC33464

OUTLINE DIMENSIONS

H SUFFIX
PLASTIC PACKAGE
CASE 1213−01
(SOT−89)
ISSUE O
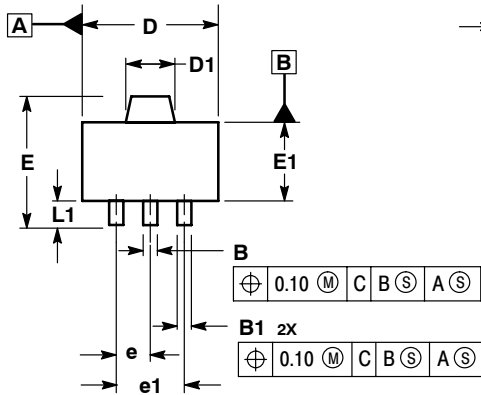
NOTES:
1. DIMENSIONS ARE IN MILLIMETERS.
2. INTERPRET DIMENSIONS AND TOLERANCING PER ASME Y14.5M, 1994.
3. DATUM C IS A SEATING PLANE.

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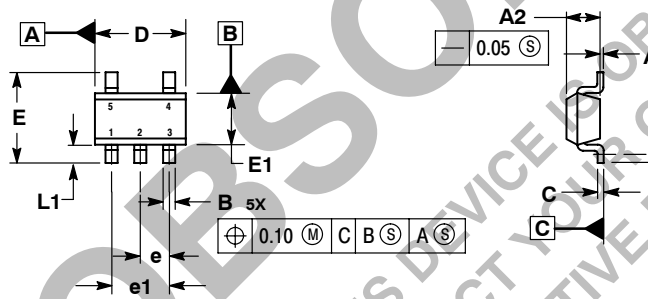
NOTES:
1. DIMENSIONS ARE IN MILLIMETERS.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DATUM C IS A SEATING PLANE.

DIM	MILLIMETERS	
	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

MC33464

PUBLICATION ORDERING INFORMATION