

MC33464

Advance Information

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 μ A 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 μ A 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 ($\pm 2.5\%$)
- Two Reset Output Types (Open Drain or Complementary Drive)
- Two Surface Mount Packages (SOT-89 or SOT-23 5-Pin)

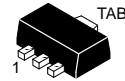
ORDERING INFORMATION

| Device | Threshold Voltage | Type | Operating Temperature Range | Package (Qty/Reel) | | |
|----------------|-------------------|------------------------|------------------------------------|--------------------|------------------------------------|------------------|
| MC33464H-09AT1 | 0.9 | Open Drain Reset | $T_A = -30^\circ$ to $+80^\circ$ C | SOT-89 (1000) | | |
| MC33464H-20AT1 | 2.0 | | | | | |
| MC33464H-27AT1 | 2.7 | | | | | |
| MC33464H-30AT1 | 3.0 | | | | | |
| MC33464H-45AT1 | 4.5 | | | | | |
| MC33464H-09CT1 | 0.9 | Compl. MOS Reset | | | $T_A = -30^\circ$ to $+80^\circ$ C | SOT-89 (1000) |
| MC33464H-20CT1 | 2.0 | | | | | |
| MC33464H-27CT1 | 2.7 | | | | | |
| MC33464H-30CT1 | 3.0 | | | | | |
| MC33464H-45CT1 | 4.5 | | | | | |
| MC33464N-09ATR | 0.9 | Open Drain Reset | $T_A = -30^\circ$ to $+80^\circ$ C | SOT-23 (3000) | | |
| MC33464N-20ATR | 2.0 | | | | | |
| MC33464N-27ATR | 2.7 | | | | | |
| MC33464N-30ATR | 3.0 | | | | | |
| MC33464N-45ATR | 4.5 | | | | | |
| MC33464N-09CTR | 0.9 | Compl. MOS Reset | | | $T_A = -30^\circ$ to $+80^\circ$ C | SOT-23 (3000) |
| MC33464N-20CTR | 2.0 | | | | | |
| MC33464N-27CTR | 2.7 | | | | | |
| MC33464N-30CTR | 3.0 | | | | | |
| MC33464N-45CTR | 4.5 | | | | | |

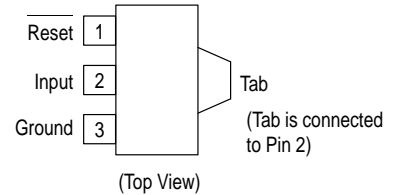
Other voltages from 0.9 to 6.0 V, in 0.1 V increments, are available. Consult factory for information.

MICROPOWER UNDERVOLTAGE SENSING CIRCUITS

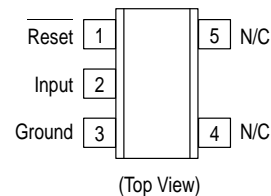
SEMICONDUCTOR TECHNICAL DATA



H SUFFIX
PLASTIC PACKAGE
CASE 1213
SOT-89



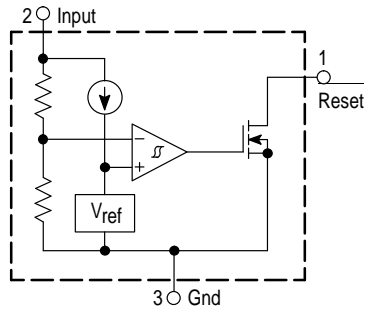
N SUFFIX
PLASTIC PACKAGE
CASE 1212
SOT-23



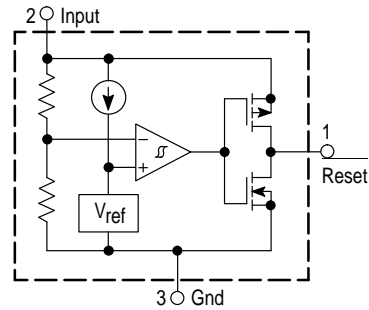
MC33464

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 | P _D | 150 | mW |
| Thermal Resistance, Junction–to–Ambient | R _{θJA} | 667 | °C/W |
| Maximum Power Dissipation | | | |
| Case 1213 (SOT–89) H suffix | P _D | 300 | mW |
| Thermal Resistance, Junction–to–Ambient | R _{θJA} | 333 | °C/W |
| Operating Junction Temperature | T _J | +125 | °C |
| Operating Ambient Temperature | T _A | –30 to +80 | °C |
| Storage Temperature Range | T _{stg} | –40 to +125 | °C |
| Lead Temperature (Soldering) | T _{solder} | 260°C, 10 s | – |

MC33464

ELECTRICAL CHARACTERISTICS (For all values $T_A = 25^\circ\text{C}$ (Note 1), unless otherwise noted.)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|----------|-------|-----------|-------|-----------------------|
| COMPARATOR | | | | | |
| Threshold Voltage High State Output (V_{in} Decreasing) | V_{IH} | | | | V |
| 09 Suffix | | 0.878 | 0.9 | 0.922 | |
| 20 Suffix | | 1.95 | 2.0 | 2.05 | |
| 27 Suffix | | 2.633 | 2.7 | 2.768 | |
| 30 Suffix | | 2.925 | 3.0 | 3.075 | |
| 45 Suffix | 4.388 | 4.5 | 4.613 | | |
| Threshold Hysteresis | V_H | 0.027 | 0.045 | 0.063 | V |
| Threshold Voltage Temperature Coefficient | T_C | – | ± 100 | – | PPM/ $^\circ\text{C}$ |

RESET OUTPUT

| | | | | | |
|--|----------------------|---------------------|-------------------------|------------------|----|
| Output Voltage High State (Complementary Output: $I_{source} = 1.0\text{ mA}$) Low State (Complementary or Open Drain: $I_{sink} = 1.0\text{ mA}$) | V_{OH} V_{OL} | $V_{in} - 2.1$ – | $V_{in} - 1.0$ 0.025 | V_{in} 0.05 | V |
| Output Sink Current ($V_{in} = 1.5\text{ V}$, $V_{OL} = 0.5\text{ V}$) | I_{OL} | 1.0 | 2.0 | – | mA |
| Output Source Current ($V_{in} = 4.5\text{ V}$, $V_{OL} = 2.4\text{ V}$) | I_{OH} | 1.0 | 2.0 | – | mA |

TOTAL DEVICE

| | | | | | |
|---|----------|-----------|------------|------------|---------------|
| Operating Input Voltage Range | V_{in} | 0.7 to 10 | – | – | V |
| Quiescent Input Current $V_{in} = 2.9\text{ V}$ $V_{in} = 5.6\text{ V}$ | 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.

Figure 1. Quiescent Current versus Input Voltage

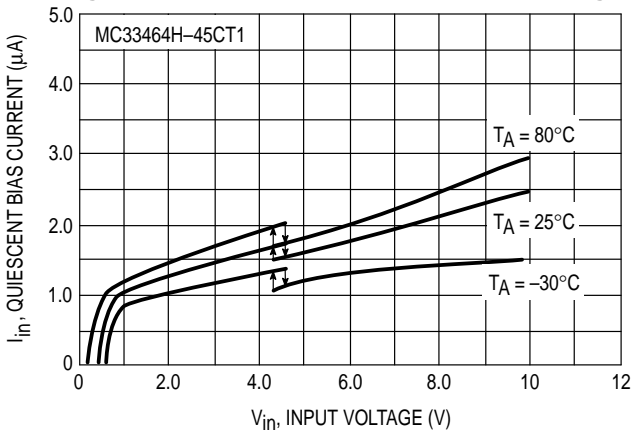


Figure 2. Detector Threshold versus Temperature

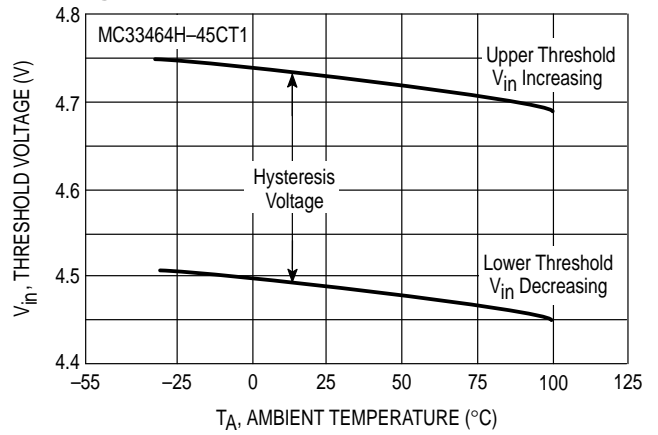


Figure 3. Reset Output Voltage versus Input Voltage

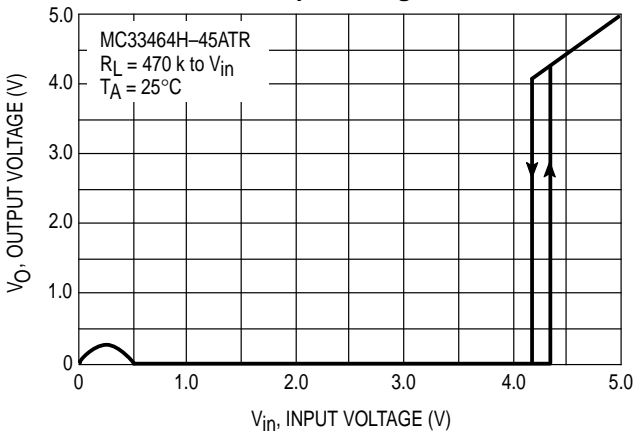


Figure 4. Reset Output Voltage versus Sink Current

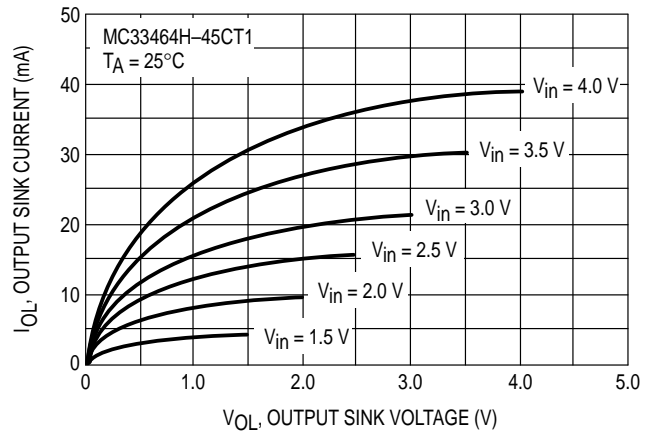


Figure 5. Output Delay Time versus Load Capacitance

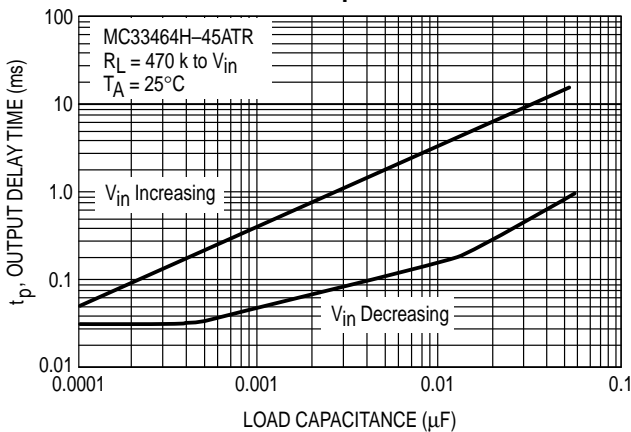
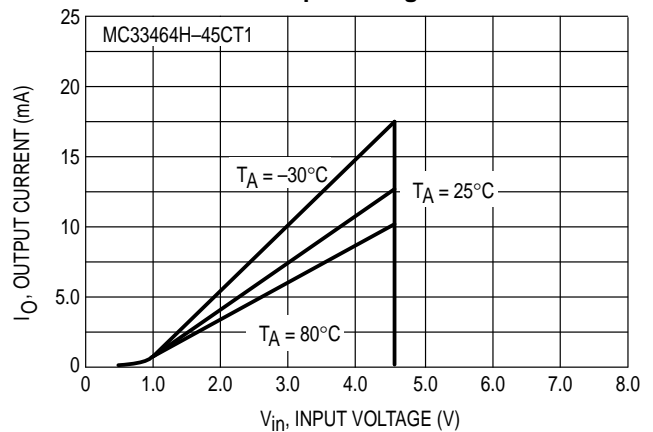
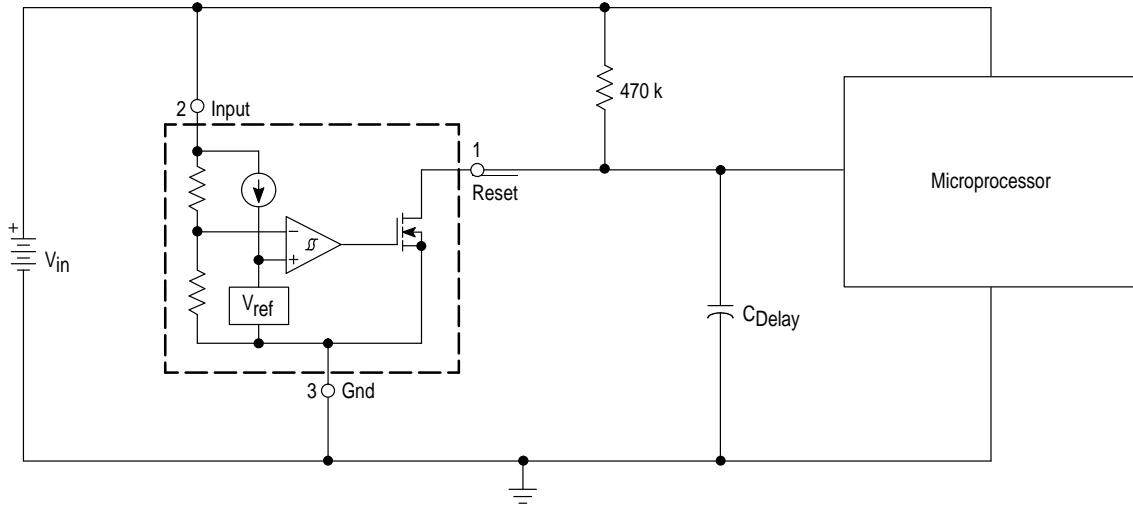


Figure 6. Output Sink Current versus Input Voltage



MC33464

Figure 7. Microprocessor Reset Circuit with Delay

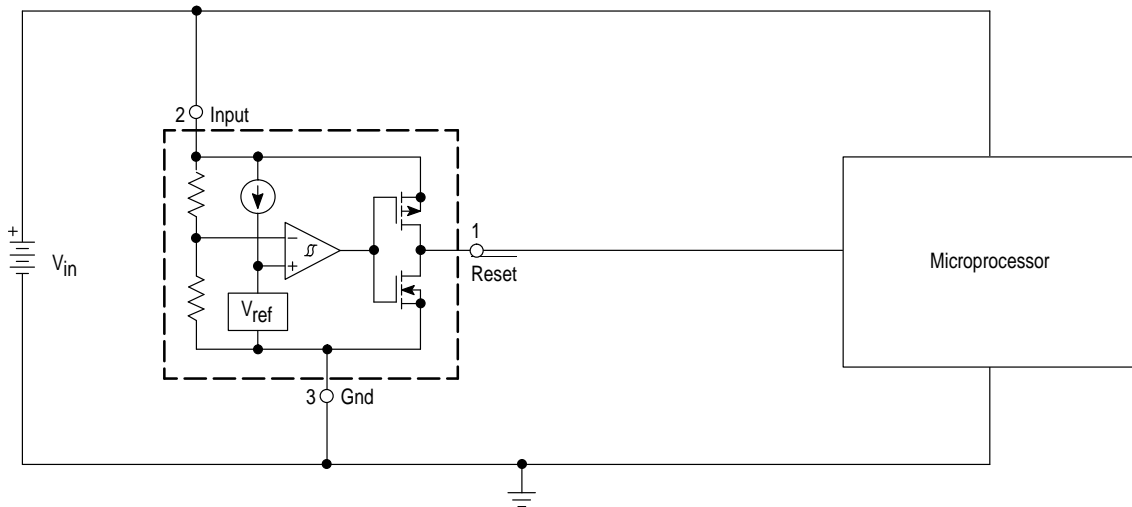


A time delayed reset can be accomplished with the addition of C_{Delay} . Figure 5 provides a graph of time delays, for both rising and falling output waveform edges, as a function of C_{Delay} . If another value of pullup resistance is used, the time delay can be calculated by using the equation:

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

where $V_{th(MPU)}$ is the microprocessor reset input threshold voltage and t_p is the propagation delay internal to the MC33464.

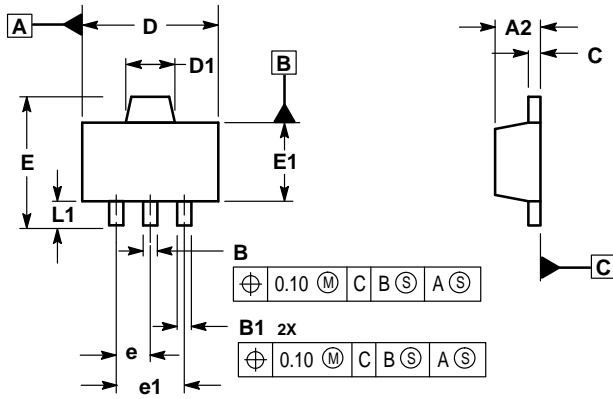
Figure 8. Microprocessor Reset Circuit



MC33464

OUTLINE DIMENSIONS

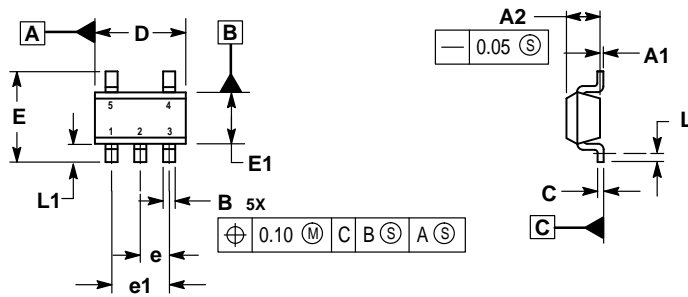
H SUFFIX
 PLASTIC PACKAGE
 CASE 1213-01
 (SOT-89)
 ISSUE O



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

| 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)
 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 |

Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters which may be provided in Motorola data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Motorola does not convey any license under its patent rights nor the rights of others. Motorola products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Motorola was negligent regarding the design or manufacture of the part. Motorola and  are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

MC33464

Mfax is a trademark of Motorola, Inc.

How to reach us:

USA/EUROPE/Locations Not Listed: Motorola Literature Distribution;
P.O. Box 5405, Denver, Colorado 80217. 303-675-2140 or 1-800-441-2447

JAPAN: Nippon Motorola Ltd.; Tatsumi-SPD-JLDC, 6F Seibu-Butsuryu-Center,
3-14-2 Tatsumi Koto-Ku, Tokyo 135, Japan. 81-3-3521-8315

Mfax™: RMFAX0@email.sps.mot.com – TOUCHTONE 602-244-6609
INTERNET: <http://Design-NET.com>

ASIA/PACIFIC: Motorola Semiconductors H.K. Ltd.; 8B Tai Ping Industrial Park,
51 Ting Kok Road, Tai Po, N.T., Hong Kong. 852-26629298



MOTOROLA



MC33464/D