

# MC34064, MC33064, NCV33064

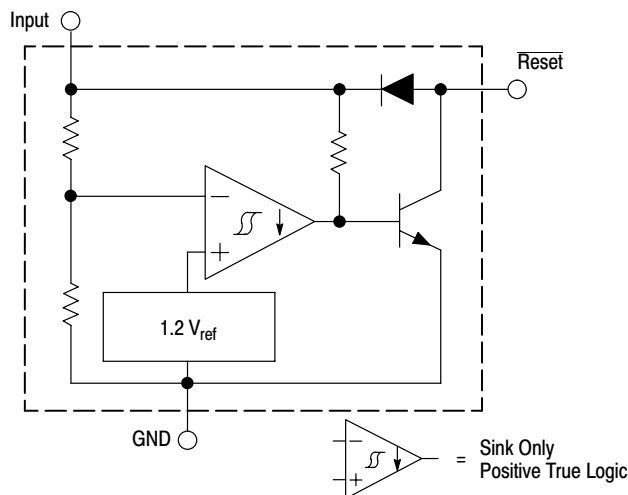
## Undervoltage Sensing Circuit

The MC34064 is an undervoltage sensing circuit specifically designed for use as a reset controller in microprocessor-based systems. It offers the designer an economical solution for low voltage detection with a single external resistor. The MC34064 features a trimmed-in-package bandgap reference, and a comparator with precise thresholds and built-in hysteresis to prevent erratic reset operation. The open collector reset output is capable of sinking in excess of 10 mA, and operation is guaranteed down to 1.0 V input with low standby current. The MC devices are packaged in 3-pin TO-92, micro size TSOP-5, 8-pin SOIC-8 and Micro8™ surface mount packages. The NCV device is packaged in SOIC-8 and TO-92.

Applications include direct monitoring of the 5.0 V MPU/logic power supply used in appliance, automotive, consumer and industrial equipment.

### Features

- Trimmed-In-Package Temperature Compensated Reference
- Comparator Threshold of 4.6 V at 25°C
- Precise Comparator Thresholds Guaranteed Over Temperature
- Comparator Hysteresis Prevents Erratic Reset
- Reset Output Capable of Sinking in Excess of 10 mA
- Internal Clamp Diode for Discharging Delay Capacitor
- Guaranteed Reset Operation with 1.0 V Input
- Low Standby Current
- Economical TO-92, TSOP-5, SOIC-8 and Micro8 Surface Mount Packages
- NCV Prefix for Automotive and Other Applications Requiring Site and Control Changes
- Pb-Free Packages are Available



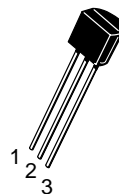
This device contains 21 active transistors.

**Figure 1. Representative Block Diagram**



**ON Semiconductor®**

<http://onsemi.com>



**TO-92  
P SUFFIX  
CASE 29**

Pin 1. Reset  
2. Input  
3. Ground



**SOIC-8  
D SUFFIX  
CASE 751**



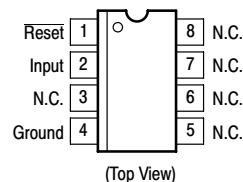
**Micro8  
DM SUFFIX  
CASE 846A**



**TSOP-5  
SN SUFFIX  
CASE 483**

Pin 1. Ground  
2. Input  
3. Reset  
4. NC  
5. NC

### PIN CONNECTIONS



### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 6 of this data sheet.

### DEVICE MARKING INFORMATION

See general marking information in the device marking section on page 7 of this data sheet.

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## MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Power Input Supply Voltage	$V_{in}$	-1.0 to 10	V
Reset Output Voltage	$V_O$	10	V
Reset Output Sink Current (Note 2)	$I_{Sink}$	Internally Limited	mA
Clamp Diode Forward Current, Reset to Input Pin (Note 2)	$I_F$	100	mA
Power Dissipation and Thermal Characteristics			
P Suffix, Plastic Package			
Maximum Power Dissipation @ $T_A = 25^\circ\text{C}$	$P_D$	625	mW
Thermal Resistance, Junction-to-Air	$R_{\theta JA}$	200	$^\circ\text{C/W}$
D Suffix, Plastic Package			
Maximum Power Dissipation @ $T_A = 25^\circ\text{C}$	$P_D$	625	mW
Thermal Resistance, Junction-to-Air	$R_{\theta JA}$	200	$^\circ\text{C/W}$
DM Suffix, Plastic Package			
Maximum Power Dissipation @ $T_A = 25^\circ\text{C}$	$P_D$	520	mW
Thermal Resistance, Junction-to-Air	$R_{\theta JA}$	240	$^\circ\text{C/W}$
Operating Junction Temperature	$T_J$	+150	$^\circ\text{C}$
Operating Ambient Temperature	$T_A$		$^\circ\text{C}$
MC34064		0 to +70	
MC33064		-40 to +85	
NCV33064		-40 to +125	
Storage Temperature Range	$T_{stg}$	-65 to +150	$^\circ\text{C}$

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

- ESD data available upon request.

**ELECTRICAL CHARACTERISTICS** (For typical values  $T_A = 25^\circ\text{C}$ , for min/max values  $T_A$  is the operating ambient temperature range that applies [Notes 3 and 4] unless otherwise noted.)

Characteristics	Symbol	Min	Typ	Max	Unit
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### COMPARATOR

Threshold Voltage					V
High State Output ( $V_{in}$ Increasing)	$V_{IH}$	4.5	4.61	4.7	
Low State Output ( $V_{in}$ Decreasing)	$V_{IL}$	4.5	4.59	4.7	
Hysteresis	$V_H$	0.01	0.02	0.05	

### RESET OUTPUT

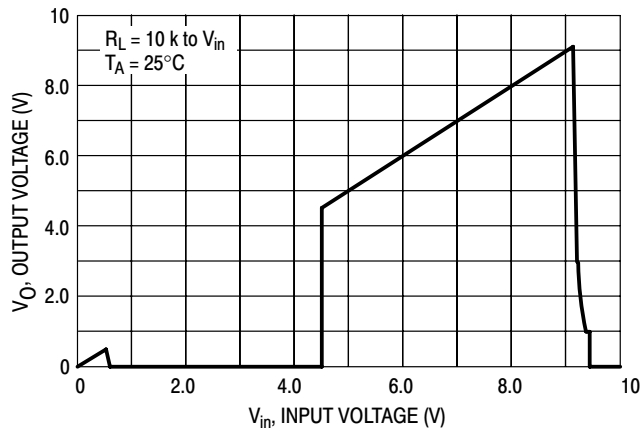
Output Sink Saturation	$V_{OL}$				V
( $V_{in} = 4.0\text{ V}$ , $I_{Sink} = 8.0\text{ mA}$ )		-	0.46	1.0	
( $V_{in} = 4.0\text{ V}$ , $I_{Sink} = 2.0\text{ mA}$ )		-	0.15	0.4	
( $V_{in} = 1.0\text{ V}$ , $I_{Sink} = 0.1\text{ mA}$ )		-	-	0.1	
Output Sink Current ( $V_{in}$ , $\overline{\text{Reset}} = 4.0\text{ V}$ )	$I_{Sink}$	10	27	60	mA
Output Off-State Leakage ( $V_{in}$ , $\overline{\text{Reset}} = 5.0\text{ V}$ )	$I_{OH}$	-	0.02	0.5	$\mu\text{A}$
Clamp Diode Forward Voltage, Reset to Input Pin ( $I_F = 10\text{ mA}$ )	$V_F$	0.6	0.9	1.2	V

### TOTAL DEVICE

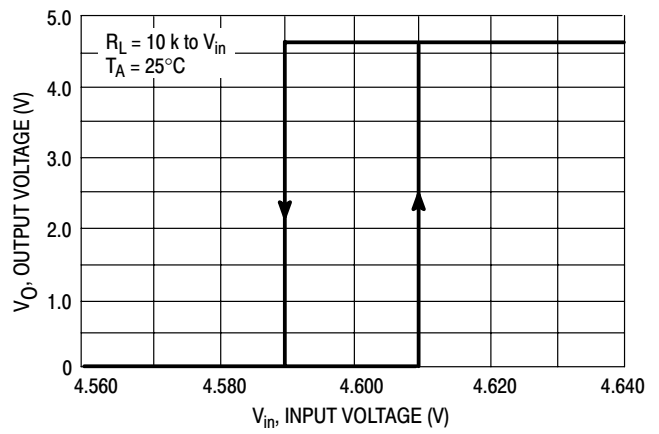
Operating Input Voltage Range	$V_{in}$	1.0 to 6.5	-	-	V
Quiescent Input Current ( $V_{in} = 5.0\text{ V}$ )	$I_{in}$	-	390	500	$\mu\text{A}$

- Maximum package power dissipation limits must be observed.
- Low duty cycle pulse techniques are used during test to maintain junction temperature as close to ambient as possible.
- $T_{low} = 0^\circ\text{C}$  for MC34064                       $T_{high} = +70^\circ\text{C}$  for MC34064  
            $-40^\circ\text{C}$  for MC33064                       $+85^\circ\text{C}$  for MC33064  
            $-40^\circ\text{C}$  for NCV33064                       $+125^\circ\text{C}$  for NCV33064
- NCV prefix is for automotive and other applications requiring site and change control.

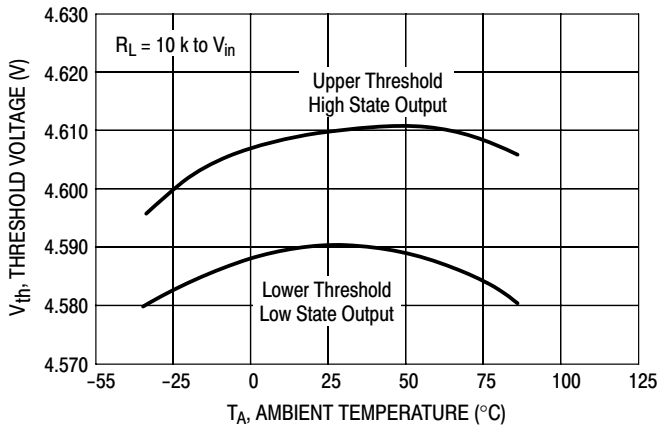
# MC34064, MC33064, NCV33064



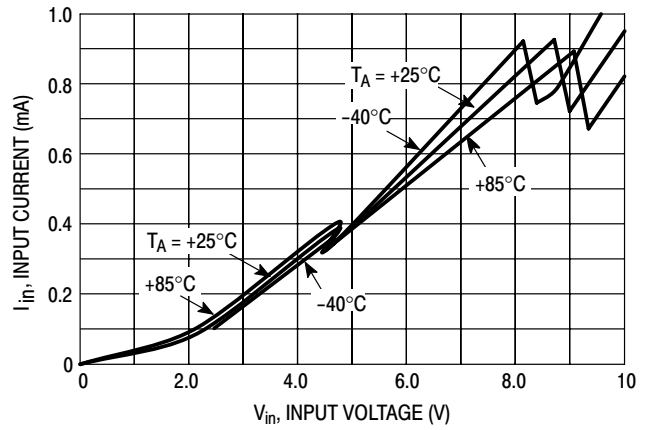
**Figure 2. Reset Output Voltage versus Input Voltage**



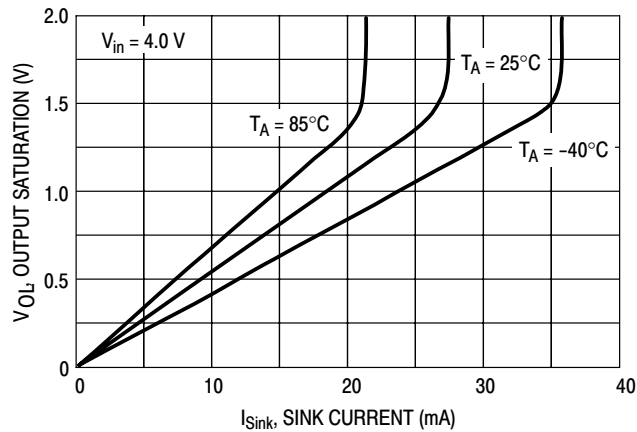
**Figure 3. Reset Output Voltage versus Input Voltage**



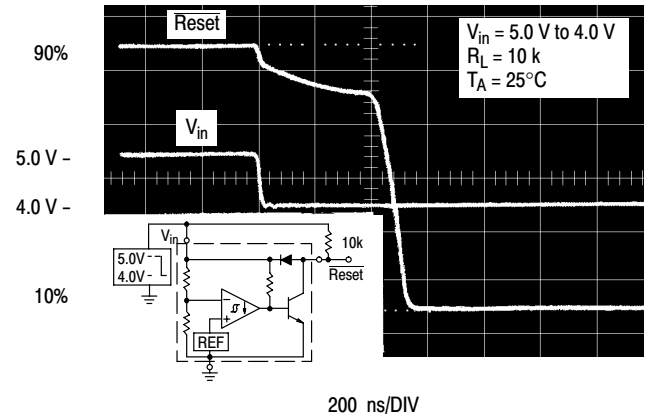
**Figure 4. Comparator Threshold Voltage versus Temperature**



**Figure 5. Input Current versus Input Voltage**



**Figure 6. Reset Output Saturation versus Sink Current**



**Figure 7. Reset Delay Time**

# MC34064, MC33064, NCV33064

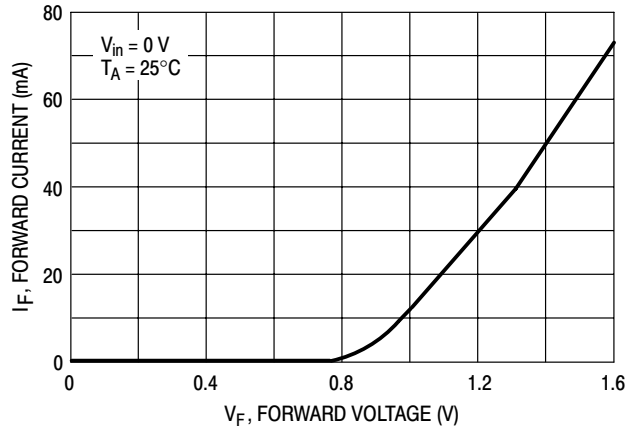


Figure 8. Clamp Diode Forward Current versus Voltage

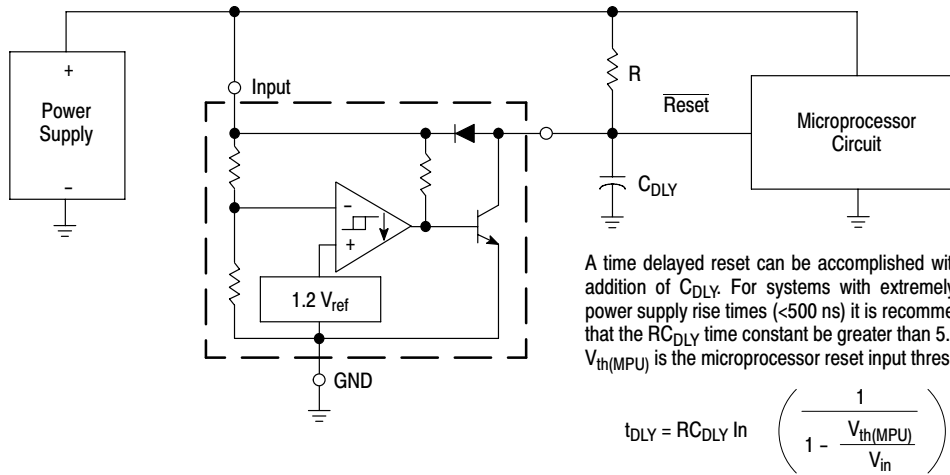
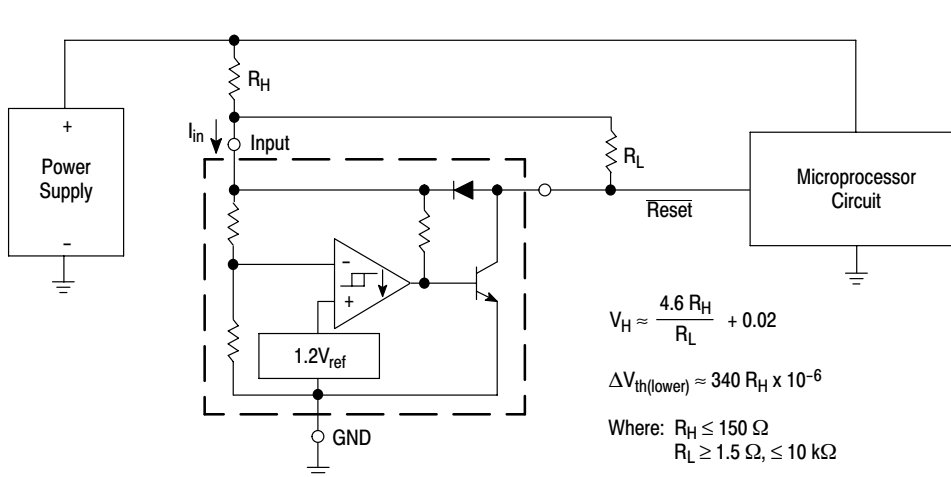


Figure 9. Low Voltage Microprocessor Reset



## TEST DATA

$V_H$ (mV)	$\Delta V_{th}$ (mV)	$R_H$ ( $\Omega$ )	$R_L$ (k $\Omega$ )
20	0	0	0
51	3.4	10	1.5
40	6.8	20	4.7
81	6.8	20	1.5
71	10	30	2.7
112	10	30	1.5
100	16	47	2.7
164	16	47	1.5
190	34	100	2.7
327	34	100	1.5
276	51	150	2.7
480	51	150	1.5

Comparator hysteresis can be increased with the addition of resistor  $R_H$ . The hysteresis equation has been simplified and does not account for the change of input current  $I_{in}$  as  $V_{CC}$  crosses the comparator threshold (Figure 4). An increase of the lower threshold  $\Delta V_{th(lower)}$  will be observed due to  $I_{in}$  which is typically  $340 \mu A$  at 4.59 V. The equations are accurate to  $\pm 10\%$  with  $R_H$  less than  $150 \Omega$  and  $R_L$  between  $1.5 k\Omega$  and  $10 k\Omega$ .

Figure 10. Low Voltage Microprocessor Reset with Additional Hysteresis

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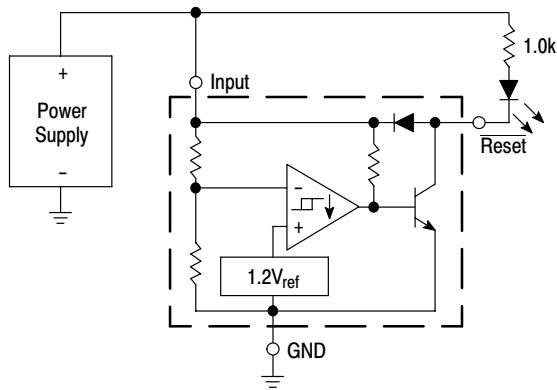


Figure 11. Voltage Monitor

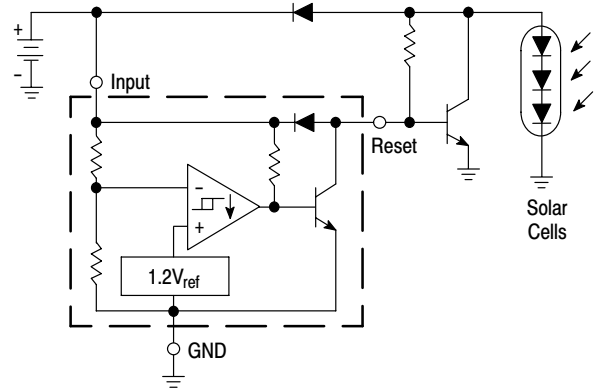
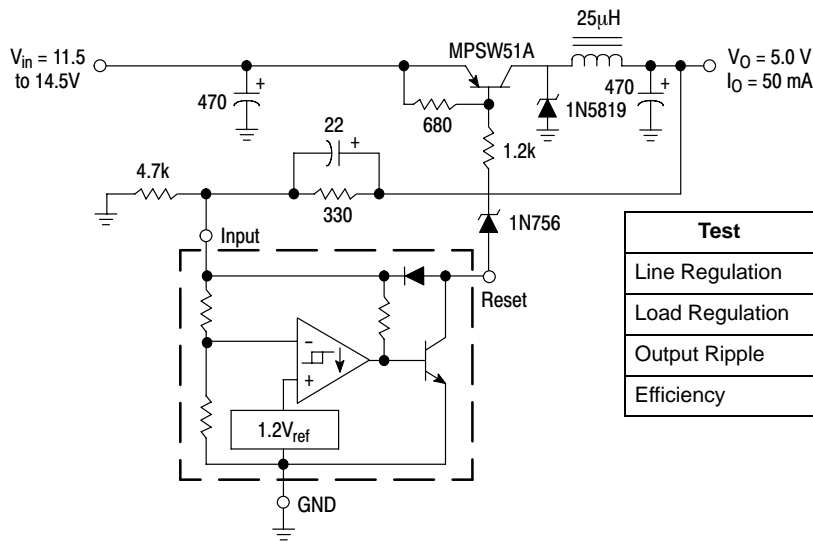
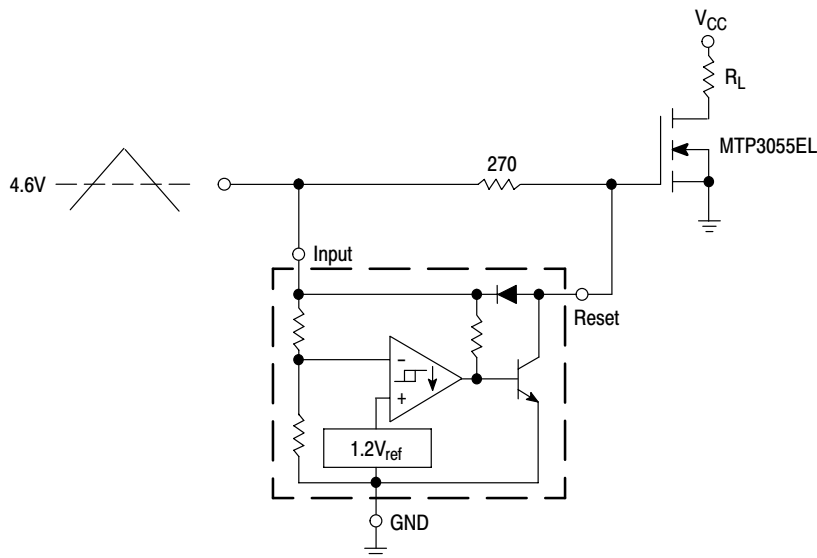


Figure 12. Solar Powered Battery Charger



Test	Conditions	Results
Line Regulation	$V_{in} = 11.5 \text{ V to } 14.5 \text{ V}, I_O = 50 \text{ mA}$	35 mV
Load Regulation	$V_{in} = 12.6 \text{ V}, I_O = 0 \text{ mA to } 50 \text{ mA}$	12 mV
Output Ripple	$V_{in} = 12.6 \text{ V}, I_O = 50 \text{ mA}$	60 mVpp
Efficiency	$V_{in} = 12.6 \text{ V}, I_O = 50 \text{ mA}$	77%

Figure 13. Low Power Switching Regulator



Overheating of the logic level power MOSFET due to insufficient gate voltage can be prevented with the above circuit. When the input signal is below the 4.6 V threshold of the MC34064, its output grounds the gate of the L<sup>2</sup> MOSFET.

Figure 14. MOSFET Low Voltage Gate Drive Protection

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## ORDERING INFORMATION

Device	Operating Temperature Range	Package	Shipping <sup>†</sup>	
MC34064D-005	T <sub>A</sub> = 0°C to +70°C	SOIC-8	98 Units / Rail	
MC34064D-005G		SOIC-8 (Pb-Free)		
MC34064D-5R2		SOIC-8	2500 Units/ Tape & Reel	
MC34064D-5R2G		SOIC-8 (Pb-Free)		
MC34064DM-5R2		Micro8	4000 Units / Tape & Reel	
MC34064DM-5R2G		Micro8 (Pb-Free)		
MC34064P-005		TO-92	2000 Units / Bag	
MC34064P-005G		TO-92 (Pb-Free)		
MC34064P-5RA		TO-92	2000 Units / Tape & Reel	
MC34064P-5RAG		TO-92 (Pb-Free)		
MC34064P-5RP		TO-92	2000 Units / Ammo Pack	
MC34064P-5RPG		TO-92 (Pb-Free)		
MC34064P-5RM		TO-92		
MC34064P-5RMG		TO-92 (Pb-Free)		
MC34064SN-5T1		TSOP-5	3000 Units / Tape & Reel	
MC34064SN-5T1G		TSOP-5 (Pb-Free)		
MC33064D-005		T <sub>J</sub> = -40°C to +85°C	SOIC-8	98 Units / Rail
MC33064D-005G			SOIC-8 (Pb-Free)	
MC33064D-5R2	SOIC-8		2500 Units / Tape & Reel	
MC33064D-5R2G	SOIC-8 (Pb-Free)			
MC33064DM-5R2	Micro8		4000 Units / Tape & Reel	
MC33064DM-5R2G	Micro8 (Pb-Free)			
MC33064P-005	TO-92		2000 Units / Bag	
MC33064P-005G	TO-92 (Pb-Free)			
MC33064P-5RA	TO-92		2000 Units / Tape & Reel	
MC33064P-5RAG	TO-92 (Pb-Free)			
MC33064P-5RP	TO-92		2000 Units / Ammo Pack	
MC33064P-5RPG	TO-92 (Pb-Free)			

# MC34064, MC33064, NCV33064

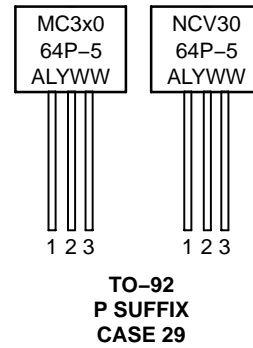
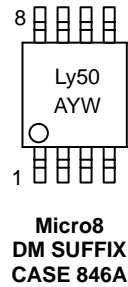
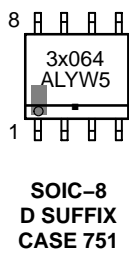
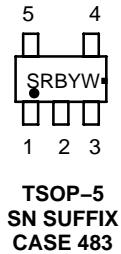
## ORDERING INFORMATION

Device	Operating Temperature Range	Package	Shipping <sup>†</sup>
NCV33064D-5R2*	T <sub>A</sub> = -40°C to +125°C	SOIC-8	2500 Units / Tape & Reel
NCV33064D-5R2G*		SOIC-8 (Pb-Free)	
NCV33064P-5RA*		TO-92	2000 Units / Tape & Reel
NCV33064P-5RAG*			2000 Units / Ammo Pack
NCV33064P-5RP*			
NCV33064DM-5R2*		Micro8	4000 Units / Tape & Reel
NCV33064DM-5R2G*		Micro8 (Pb-Free)	

\*NCV33064: T<sub>low</sub> = -40°C, T<sub>high</sub> = +125°C. Guaranteed by design. NCV prefix is for automotive and other applications requiring site and change control.

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

## MARKING DIAGRAMS

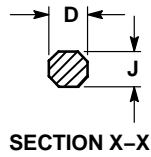
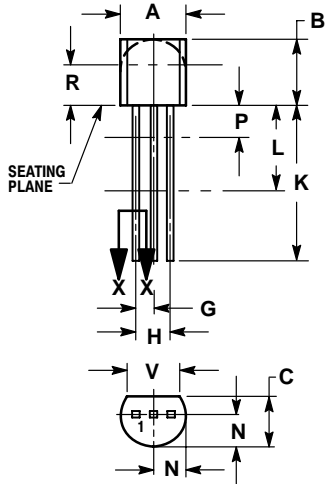


- SDY = Device Code
- x = 3 or 4
- y = I or C
- A = Assembly Location
- WL, L = Wafer Lot
- YY, Y = Year
- WW, W = Work Week
- = Pb-Free Package

# MC34064, MC33064, NCV33064

## PACKAGE DIMENSIONS

**P SUFFIX**  
**PLASTIC PACKAGE**  
**CASE 29-11**  
**(TO-92)**  
**ISSUE AL**



**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

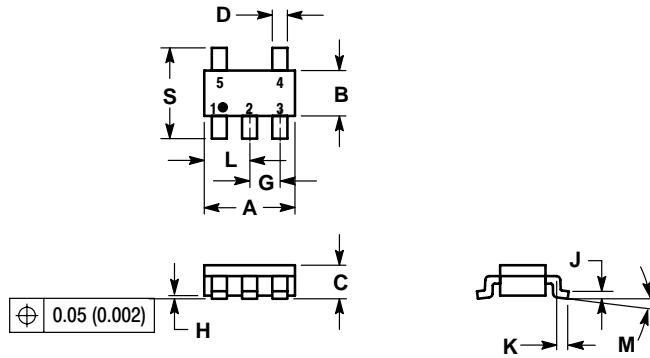
DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.175	0.205	4.45	5.20
B	0.170	0.210	4.32	5.33
C	0.125	0.165	3.18	4.19
D	0.016	0.021	0.407	0.533
G	0.045	0.055	1.15	1.39
H	0.095	0.105	2.42	2.66
J	0.015	0.020	0.39	0.50
K	0.500	---	12.70	---
L	0.250	---	6.35	---
N	0.080	0.105	2.04	2.66
P	---	0.100	---	2.54
R	0.115	---	2.93	---
V	0.135	---	3.43	---



# MC34064, MC33064, NCV33064

## PACKAGE DIMENSIONS

SN SUFFIX  
 PLASTIC PACKAGE  
 CASE 483-02  
 ISSUE D

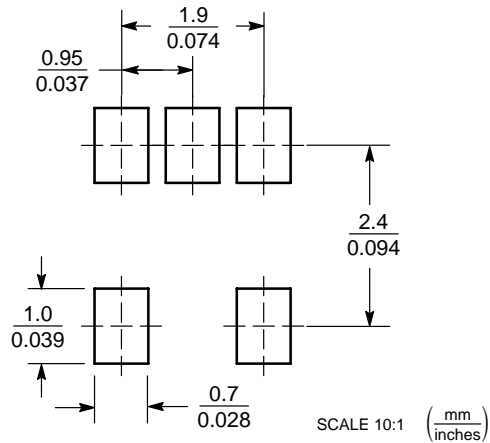


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. A AND B DIMENSIONS DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.90	3.10	0.1142	0.1220
B	1.30	1.70	0.0512	0.0669
C	0.90	1.10	0.0354	0.0433
D	0.25	0.50	0.0098	0.0197
G	0.85	1.05	0.0335	0.0413
H	0.013	0.100	0.0005	0.0040
J	0.10	0.26	0.0040	0.0102
K	0.20	0.60	0.0079	0.0236
L	1.25	1.55	0.0493	0.0610
M	0°	10°	0°	10°
S	2.50	3.00	0.0985	0.1181

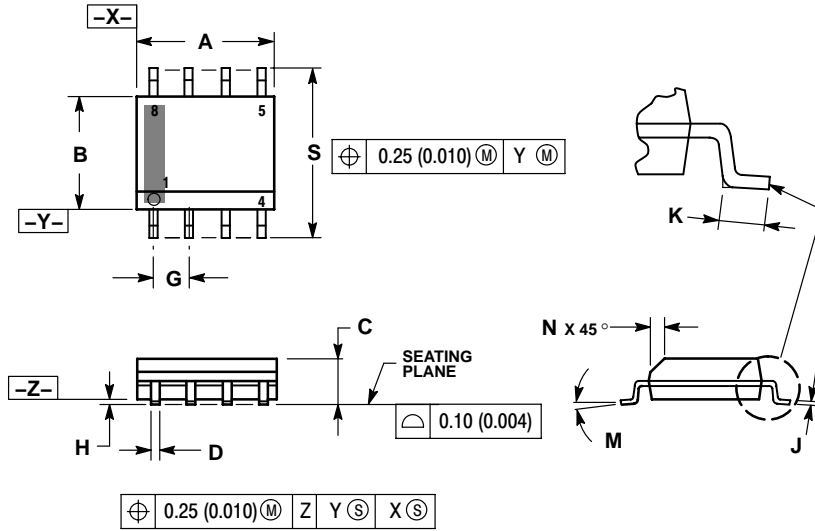
### SOLDERING FOOTPRINT\*



\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PACKAGE DIMENSIONS

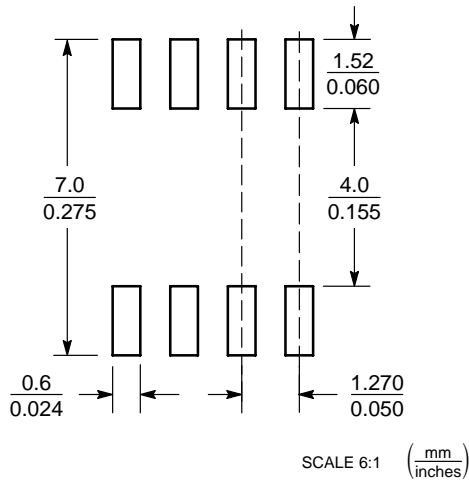
D SUFFIX  
PLASTIC PACKAGE  
CASE 751-07  
(SOIC-8 NB)  
ISSUE AG



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: MILLIMETER.
  3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
  4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
  5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.
  6. 751-01 THRU 751-06 ARE OBSOLETE. NEW STANDARD IS 751-07.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.80	5.00	0.189	0.197
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.053	0.069
D	0.33	0.51	0.013	0.020
G	1.27 BSC		0.050 BSC	
H	0.10	0.25	0.004	0.010
J	0.19	0.25	0.007	0.010
K	0.40	1.27	0.016	0.050
M	0°	8°	0°	8°
N	0.25	0.50	0.010	0.020
S	5.80	6.20	0.228	0.244

SOLDERING FOOTPRINT\*

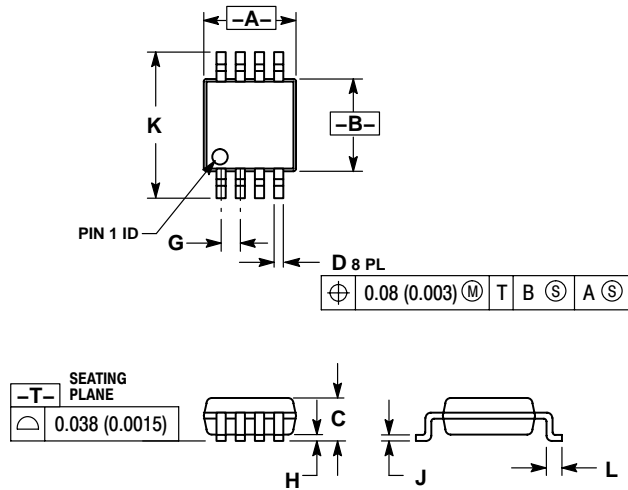


\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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## PACKAGE DIMENSIONS

DM SUFFIX  
 PLASTIC PACKAGE  
 CASE 846A-02  
 (Micro8)  
 ISSUE F

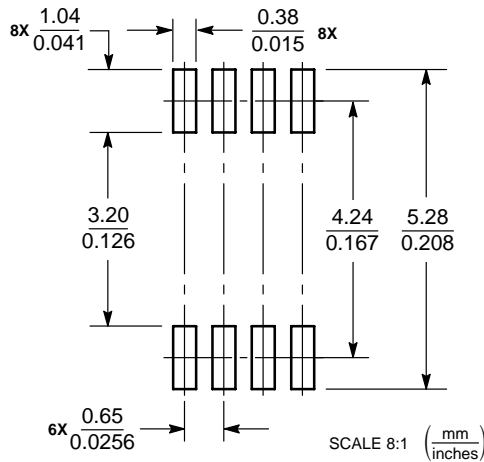


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
5. 846A-01 OBSOLETE, NEW STANDARD 846A-02.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.90	3.10	0.114	0.122
B	2.90	3.10	0.114	0.122
C	---	1.10	---	0.043
D	0.25	0.40	0.010	0.016
G	0.65 BSC		0.026 BSC	
H	0.05	0.15	0.002	0.006
J	0.13	0.23	0.005	0.009
K	4.75	5.05	0.187	0.199
L	0.40	0.70	0.016	0.028


### SOLDERING FOOTPRINT\*



\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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