

# MC34063A, MC33063A, NCV33063A



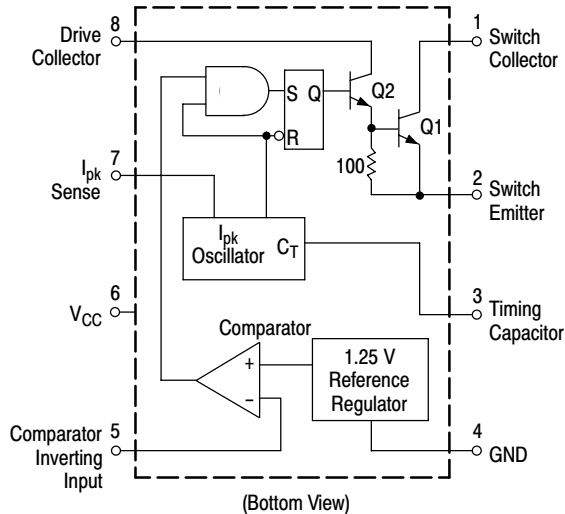
ON Semiconductor®

## 1.5 A, Step-Up/Down/ Inverting Switching Regulators

The MC34063A Series is a monolithic control circuit containing the primary functions required for DC-to-DC converters. These devices consist of an internal temperature compensated reference, comparator, controlled duty cycle oscillator with an active current limit circuit, driver and high current output switch. This series was specifically designed to be incorporated in Step-Down and Step-Up and Voltage-Inverting applications with a minimum number of external components. Refer to Application Notes AN920A/D and AN954/D for additional design information.

### Features

- Operation from 3.0 V to 40 V Input
- Low Standby Current
- Current Limiting
- Output Switch Current to 1.5 A
- Output Voltage Adjustable
- Frequency Operation to 100 kHz
- Precision 2% Reference
- Pb-Free Packages are Available



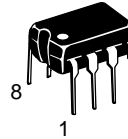
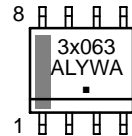
This device contains 51 active transistors.

Figure 1. Representative Schematic Diagram

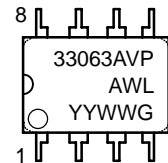
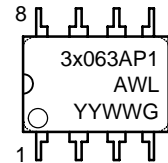
### MARKING DIAGRAMS



SOIC-8  
D SUFFIX  
CASE 751

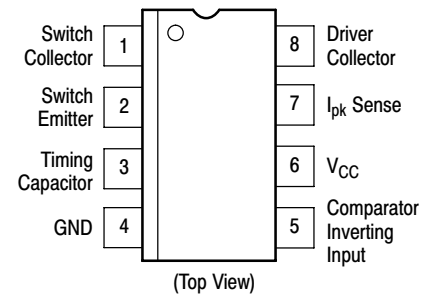


PDIP-8  
P, P1 SUFFIX  
CASE 626



- x = 3 or 4
- A = Assembly Location
- L, WL = Wafer Lot
- Y, YY = Year
- W, WW = Work Week
- G or ■ = Pb-Free Package

### PIN CONNECTIONS



### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 11 of this data sheet.

# MC34063A, MC33063A, NCV33063A

## MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Power Supply Voltage	$V_{CC}$	40	Vdc
Comparator Input Voltage Range	$V_{IR}$	-0.3 to +40	Vdc
Switch Collector Voltage	$V_{C(\text{switch})}$	40	Vdc
Switch Emitter Voltage ( $V_{P_{in\ 1}} = 40\text{ V}$ )	$V_{E(\text{switch})}$	40	Vdc
Switch Collector to Emitter Voltage	$V_{CE(\text{switch})}$	40	Vdc
Driver Collector Voltage	$V_{C(\text{driver})}$	40	Vdc
Driver Collector Current (Note 1)	$I_{C(\text{driver})}$	100	mA
Switch Current	$I_{SW}$	1.5	A
Power Dissipation and Thermal Characteristics			
Plastic Package, P, P1 Suffix			
$T_A = 25^\circ\text{C}$	$P_D$	1.25	W
Thermal Resistance	$R_{\theta JA}$	100	$^\circ\text{C/W}$
SOIC Package, D Suffix			
$T_A = 25^\circ\text{C}$	$P_D$	625	mW
Thermal Resistance	$R_{\theta JA}$	160	$^\circ\text{C/W}$
Operating Junction Temperature	$T_J$	+150	$^\circ\text{C}$
Operating Ambient Temperature Range	$T_A$		$^\circ\text{C}$
MC34063A		0 to +70	
MC33063AV, NCV33063A		-40 to +125	
MC33063A		-40 to +85	
Storage Temperature Range	$T_{stg}$	-65 to +150	$^\circ\text{C}$

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Maximum package power dissipation limits must be observed.
2. This device series contains ESD protection and exceeds the following tests: Human Body Model 4000 V per MIL-STD-883, Method 3015. Machine Model Method 400 V.
3. NCV prefix is for automotive and other applications requiring site and change control.

# MC34063A, MC33063A, NCV33063A

**ELECTRICAL CHARACTERISTICS** ( $V_{CC} = 5.0\text{ V}$ ,  $T_A = T_{low}$  to  $T_{high}$  [Note 4], unless otherwise specified.)

Characteristics	Symbol	Min	Typ	Max	Unit
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## OSCILLATOR

Frequency ( $V_{Pin5} = 0\text{ V}$ , $C_T = 1.0\text{ nF}$ , $T_A = 25^\circ\text{C}$ )	$f_{osc}$	24	33	42	kHz
Charge Current ( $V_{CC} = 5.0\text{ V to } 40\text{ V}$ , $T_A = 25^\circ\text{C}$ )	$I_{chg}$	24	35	42	$\mu\text{A}$
Discharge Current ( $V_{CC} = 5.0\text{ V to } 40\text{ V}$ , $T_A = 25^\circ\text{C}$ )	$I_{dischg}$	140	220	260	$\mu\text{A}$
Discharge to Charge Current Ratio (Pin 7 to $V_{CC}$ , $T_A = 25^\circ\text{C}$ )	$I_{dischg}/I_{chg}$	5.2	6.5	7.5	–
Current Limit Sense Voltage ( $I_{chg} = I_{dischg}$ , $T_A = 25^\circ\text{C}$ )	$V_{ipk(sense)}$	250	300	350	mV

## OUTPUT SWITCH (Note 5)

Saturation Voltage, Darlington Connection ( $I_{SW} = 1.0\text{ A}$ , Pins 1, 8 connected)	$V_{CE(sat)}$	–	1.0	1.3	V
Saturation Voltage (Note 6) ( $I_{SW} = 1.0\text{ A}$ , $R_{Pin8} = 82\ \Omega$ to $V_{CC}$ , Forced $\beta \approx 20$ )	$V_{CE(sat)}$	–	0.45	0.7	V
DC Current Gain ( $I_{SW} = 1.0\text{ A}$ , $V_{CE} = 5.0\text{ V}$ , $T_A = 25^\circ\text{C}$ )	$h_{FE}$	50	75	–	–
Collector Off-State Current ( $V_{CE} = 40\text{ V}$ )	$I_{C(off)}$	–	0.01	100	$\mu\text{A}$

## COMPARATOR

Threshold Voltage $T_A = 25^\circ\text{C}$ $T_A = T_{low}$ to $T_{high}$	$V_{th}$	1.225 1.21	1.25 –	1.275 1.29	V
Threshold Voltage Line Regulation ( $V_{CC} = 3.0\text{ V to } 40\text{ V}$ ) MC33063A, MC34063A MC33063AV, NCV33063A	$Reg_{line}$	– –	1.4 1.4	5.0 6.0	mV
Input Bias Current ( $V_{in} = 0\text{ V}$ )	$I_{IB}$	–	–20	–400	nA

## TOTAL DEVICE

Supply Current ( $V_{CC} = 5.0\text{ V to } 40\text{ V}$ , $C_T = 1.0\text{ nF}$ , Pin 7 = $V_{CC}$ , $V_{Pin5} > V_{th}$ , Pin 2 = GND, remaining pins open)	$I_{CC}$	–	–	4.0	mA
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- $T_{low} = 0^\circ\text{C}$  for MC34063A,  $-40^\circ\text{C}$  for MC33063A, AV, NCV33063A  
 $T_{high} = +70^\circ\text{C}$  for MC34063A,  $+85^\circ\text{C}$  for MC33063A,  $+125^\circ\text{C}$  for MC33063AV, NCV33063A
- Low duty cycle pulse techniques are used during test to maintain junction temperature as close to ambient temperature as possible.
- If the output switch is driven into hard saturation (non-Darlington configuration) at low switch currents ( $\leq 300\text{ mA}$ ) and high driver currents ( $\geq 30\text{ mA}$ ), it may take up to  $2.0\ \mu\text{s}$  for it to come out of saturation. This condition will shorten the off time at frequencies  $\geq 30\text{ kHz}$ , and is magnified at high temperatures. This condition does not occur with a Darlington configuration, since the output switch cannot saturate. If a non-Darlington configuration is used, the following output drive condition is recommended:

$$\text{Forced } \beta \text{ of output switch : } \frac{I_{C \text{ output}}}{I_{C \text{ driver}} - 7.0\text{ mA}} \geq 10$$

\* The  $100\ \Omega$  resistor in the emitter of the driver device requires about  $7.0\text{ mA}$  before the output switch conducts.

# MC34063A, MC33063A, NCV33063A

## ORDERING INFORMATION

Device	Package	Shipping†
MC33063AD	SOIC-8	98 Units / Rail
MC33063ADG	SOIC-8 (Pb-Free)	98 Units / Rail
MC33063ADR2	SOIC-8	2500 Units / Tape & Reel
MC33063ADR2G	SOIC-8 (Pb-Free)	2500 Units / Tape & Reel
MC33063AP1	PDIP-8	50 Units / Rail
MC33063AP1G	PDIP-8 (Pb-Free)	50 Units / Rail
MC33063AVD	SOIC-8	98 Units / Rail
MC33063AVDG	SOIC-8 (Pb-Free)	98 Units / Rail
MC33063AVDR2	SOIC-8	2500 Units / Tape & Reel
MC33063AVDR2G	SOIC-8 (Pb-Free)	
NCV33063AVDR2*	SOIC-8	
NCV33063AVDR2G*	SOIC-8 (Pb-Free)	
MC33063AVP	PDIP-8	50 Units / Rail
MC33063AVPG	PDIP-8 (Pb-Free)	50 Units / Rail
MC34063AD	SOIC-8	98 Units / Rail
MC34063ADG	SOIC-8 (Pb-Free)	98 Units / Rail
MC34063ADR2	SOIC-8	2500 Units / Tape & Reel
MC34063ADR2G	SOIC-8 (Pb-Free)	2500 Units / Tape & Reel
MC34063AP1	PDIP-8	50 Units / Rail
MC34063AP1G	PDIP-8 (Pb-Free)	50 Units / Rail

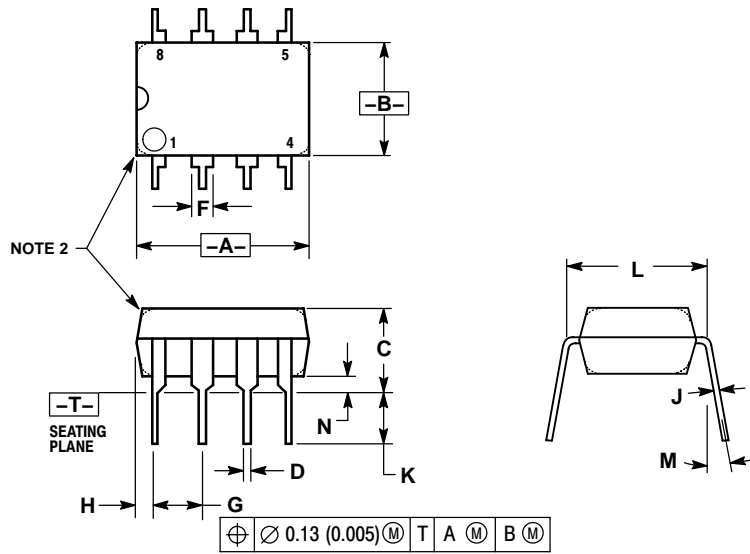
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

\*NCV33063A:  $T_{low} = -40^{\circ}C$ ,  $T_{high} = +125^{\circ}C$ . Guaranteed by design. NCV prefix is for automotive and other applications requiring site and change control.

# MC34063A, MC33063A, NCV33063A

## PACKAGE DIMENSIONS

PDIP-8  
P, P1 SUFFIX  
CASE 626-05  
ISSUE L



### NOTES:

1. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.
2. PACKAGE CONTOUR OPTIONAL (ROUND OR SQUARE CORNERS).
3. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	9.40	10.16	0.370	0.400
B	6.10	6.60	0.240	0.260
C	3.94	4.45	0.155	0.175
D	0.38	0.51	0.015	0.020
F	1.02	1.78	0.040	0.070
G	2.54 BSC		0.100 BSC	
H	0.76	1.27	0.030	0.050
J	0.20	0.30	0.008	0.012
K	2.92	3.43	0.115	0.135
L	7.62 BSC		0.300 BSC	
M	---	10°	---	10°
N	0.76	1.01	0.030	0.040