

NCP3063, NCP3063B, NCV3063



ON Semiconductor®

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

The NCP3063 Series is a higher frequency upgrade to the popular MC34063A and MC33063A monolithic DC-DC converters. These devices consist of an internal temperature compensated reference, comparator, a controlled duty cycle oscillator with an active current limit circuit, a driver and a high current output switch. This series was specifically designed to be incorporated in Step-Down, Step-Up and Voltage-Inverting applications with a minimum number of external components.

Features

- Operation to 40 V Input
- Low Standby Current
- Output Switch Current to 1.5 A
- Output Voltage Adjustable
- Frequency Operation of 150 kHz
- Precision 1.5% Reference
- New Features: Internal Thermal Shutdown with Hysteresis
Cycle-by-Cycle Current Limiting
- Pb-Free Packages are Available

Applications

- Step-Down, Step-Up and Inverting supply applications
- High Power LED Lighting
- Battery Chargers

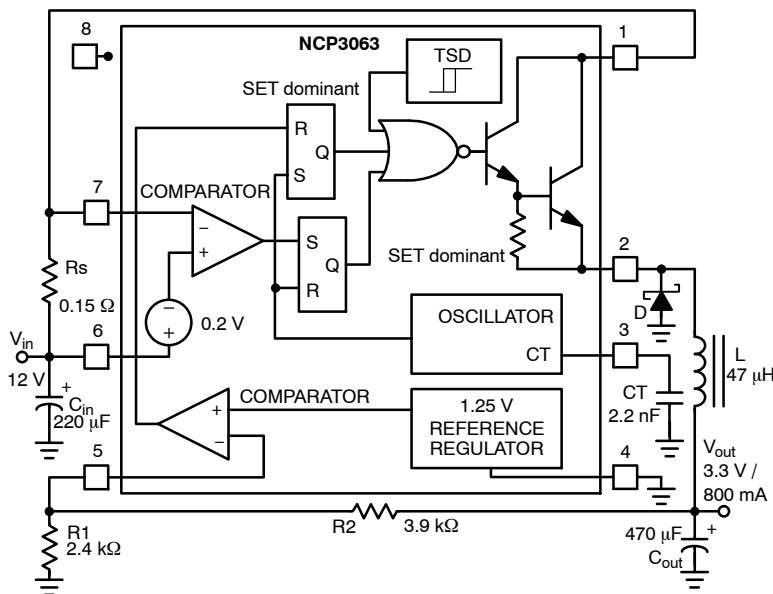
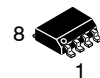
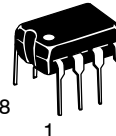
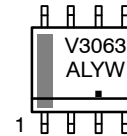
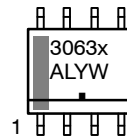


Figure 1. Typical Buck Application Circuit

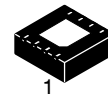
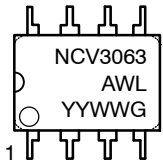
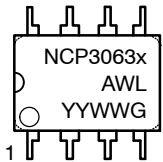
MARKING DIAGRAMS



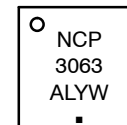
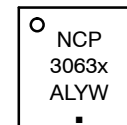
SOIC-8
D SUFFIX
CASE 751



PDIP-8
P, P1 SUFFIX
CASE 626



DFN-8
CASE 488AF



NCP3063x = Specific Device Code
x = B
A = Assembly Location
L, WL = Wafer Lot
Y, YY = Year
W, WW = Work Week
▪ = Pb-Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 16 of this data sheet.

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PIN DESCRIPTION

Pin No.	Pin Name	Description
1	Switch Collector	Internal Darlington switch collector
2	Switch Emitter	Internal Darlington switch emitter
3	Timing Capacitor Oscillator Input	Timing Capacitor
4	GND	Ground pin for all internal circuits
5	Comparator Inverting Input	Inverting input pin of internal comparator
6	V _{CC}	Voltage Supply
7	I _{pk} Sense	Peak Current Sense Input to monitor the voltage drop across an external resistor to limit the peak current through the circuit
8	N.C.	Pin Not Connected
Exposed Pad	Exposed Pad	The exposed pad beneath the package must be connected to GND (Pin 4). Additionally, using proper layout techniques, the exposed pad can greatly enhance the power dissipation capabilities of the NCP3063.

MAXIMUM RATINGS (measured vs. Pin 4, unless otherwise noted)

Rating	Symbol	Value	Unit
V _{CC} pin 6	V _{CC}	0 to +40	V
Comparator Inverting Input pin 5	V _{CI}	-0.2 to + V _{CC}	V
Darlington Switch Collector pin 1	V _{SWC}	0 to +40	V
Darlington Switch Emitter pin 2 (transistor OFF)	V _{SWE}	-0.6 to + V _{CC}	V
Darlington Switch Collector to Emitter pin 1-2	V _{SWCE}	0 to +40	V
Darlington Switch Current	I _{SW}	1.5	A
I _{pk} Sense Pin 7	V _{IPK}	-0.2 to V _{CC} + 0.2	V
Timing Capacitor Pin 3	V _{TCAP}	-0.2 to +1.4	V

POWER DISSIPATION AND THERMAL CHARACTERISTICS

Rating	Symbol	Value	Unit
PDIP-8 Thermal Resistance Junction-to-Air	R _{θJA}	100	°C/W
SOIC-8 Thermal Resistance Junction-to-Air	R _{θJA}	180	°C/W
DFN-8 Thermal Resistance Junction-to-Air	R _{θJA}	80	°C/W
Storage Temperature Range	T _{STG}	-65 to +150	°C
Maximum Junction Temperature	T _{J MAX}	+150	°C
Operating Junction Temperature Range (Note 3) NCP3063 NCP3063B, NCV3063	T _J	0 to +70 -40 to +125	°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.

- This device series contains ESD protection and exceeds the following tests:
Pin 1-8: Human Body Model 2000 V per AEC Q100-002; 003 or JESD22/A114; A115
Machine Model Method 200 V
- This device contains latch-up protection and exceeds 100 mA per JEDEC Standard JESD78.
- The relation between junction temperature, ambient temperature and Total Power dissipated in IC is $T_J = T_A + R_{\theta} \cdot P_D$
- The pins which are not defined may not be loaded by external signals

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ELECTRICAL CHARACTERISTICS ($V_{CC} = 5.0\text{ V}$, $T_J = T_{low}$ to T_{high} [Note 5], unless otherwise specified)

Symbol	Characteristic	Conditions	Min	Typ	Max	Unit
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OSCILLATOR

f_{OSC}	Frequency	($V_{Pin\ 5} = 0\text{ V}$, $C_T = 2.2\text{ nF}$, $T_J = 25^\circ\text{C}$)	110	150	190	kHz
I_{DISCHG} / I_{CHG}	Discharge to Charge Current Ratio	(Pin 7 to V_{CC} , $T_J = 25^\circ\text{C}$)	5.5	6.0	6.5	–
I_{DISCHG}	Capacitor Discharging Current	(Pin 7 to V_{CC} , $T_J = 25^\circ\text{C}$)		1650		μA
I_{CHG}	Capacitor Charging Current	(Pin 7 to V_{CC} , $T_J = 25^\circ\text{C}$)		275		μA
$V_{IPK(Sense)}$	Current Limit Sense Voltage	($T_J = 25^\circ\text{C}$) (Note 6)	165	200	235	mV

OUTPUT SWITCH (Note 7)

$V_{SWCE(DROP)}$	Darlington Switch Collector to Emitter Voltage Drop	($I_{SW} = 1.0\text{ A}$, Pin 2 to GND, $T_J = 25^\circ\text{C}$) (Note 7)		1.0	1.3	V
$I_{C(OFF)}$	Collector Off-State Current	($V_{CE} = 40\text{ V}$)		0.01	100	μA

COMPARATOR

V_{TH}	Threshold Voltage	$T_J = 25^\circ\text{C}$		1.250		V
		NCP3063	-1.5		+1.5	%
		NCP3063B, NCV3063	-2		+2	%
REG_{LINE}	Threshold Voltage Line Regulation	($V_{CC} = 5.0\text{ V}$ to 40 V)	-6.0	2.0	6.0	mV
$I_{CII\ in}$	Input Bias Current	($V_{in} = V_{th}$)	-1000	-100	1000	nA

TOTAL DEVICE

I_{CC}	Supply Current	($V_{CC} = 5.0\text{ V}$ to 40 V , $C_T = 2.2\text{ nF}$, Pin 7 = V_{CC} , $V_{Pin\ 5} > V_{th}$, Pin 2 = GND, remaining pins open)			7.0	mA
	Thermal Shutdown Threshold			160		$^\circ\text{C}$
	Hysteresis			10		$^\circ\text{C}$

5. NCP3063: $T_{low} = 0^\circ\text{C}$, $T_{high} = +70^\circ\text{C}$;
NCP3063B, NCV3063: $T_{low} = -40^\circ\text{C}$, $T_{high} = +125^\circ\text{C}$
6. The $V_{IPK(Sense)}$ Current Limit Sense Voltage is specified at static conditions. In dynamic operation the sensed current turn-off value depends on comparator response time and di/dt current slope. See the Operating Description section for details.
7. Low duty cycle pulse techniques are used during test to maintain junction temperature as close to ambient temperature as possible.
8. NCV prefix is for automotive and other applications requiring site and change control.

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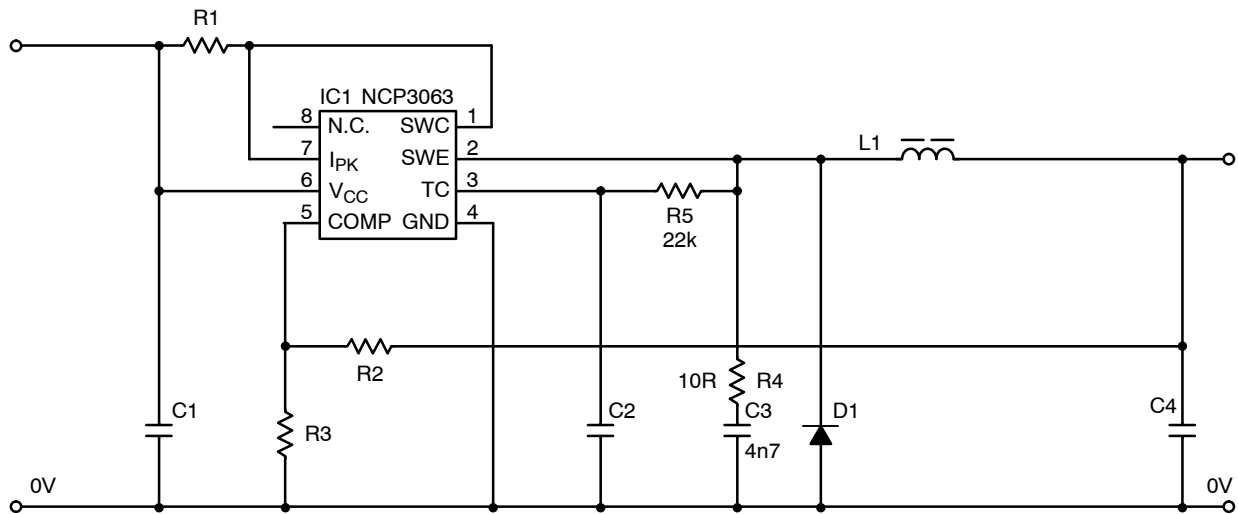


Figure 31. Typical Schematic of Buck Converter with RC Snubber and Pulse Feedback

In some cases where there are oscillations on the output due to the input/output combination, output load variations or PCB layout a snubber circuit on the SWE Pin will help

minimize the oscillation. Typical usage is shown in the Figure 31. C3 values can be selected between 2.2 nF and 6.8 nF and R4 can be from 10 Ω to 22 Ω .

ORDERING INFORMATION

Device	Package	Shipping†
NCP3063PG	PDIP-8 (Pb-Free)	50 Units / Rail
NCP3063BPG	PDIP-8 (Pb-Free)	50 Units / Rail
NCP3063BMNTXG	DFN-8 (Pb-Free)	4000 / Tape & Reel
NCP3063DR2G	SOIC-8 (Pb-Free)	2500 / Tape & Reel
NCP3063BDR2G	SOIC-8 (Pb-Free)	2500 / Tape & Reel
NCP3063MNTXG	DFN-8 (Pb-Free)	4000 / Tape & Reel
NCV3063PG	PDIP-8 (Pb-Free)	50 Units / Rail
NCV3063DR2G	SOIC-8 (Pb-Free)	2500 / Tape & Reel
NCV3063MNTXG	DFN-8 (Pb-Free)	4000 / Tape & Reel

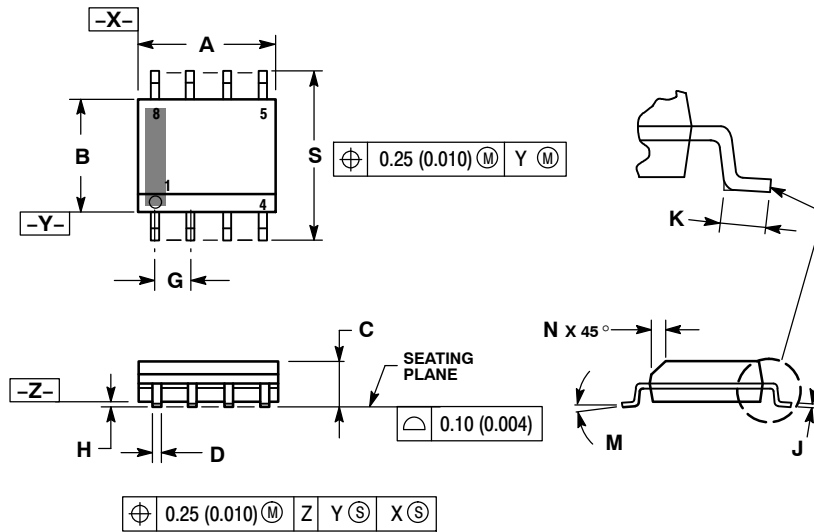
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

NCV prefix is for automotive and other applications requiring site and change control.

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PACKAGE DIMENSIONS

SOIC-8 NB
CASE 751-07
ISSUE AJ

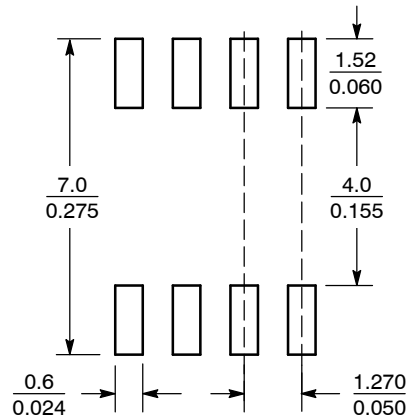


NOTES:

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*



SCALE 6:1 (mm/inches)

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