

NCP57302, NCV57302

3.0 A, Very Low-Dropout (VLDO) Fast Transient Response Regulator

The NCP57302 is a high precision, very low dropout (VLDO), low minimum input voltage and low ground current positive voltage regulator that is capable of providing an output current in excess of 3.0 A with a typical dropout voltage of 315 mV at 3.0 A load current and input voltage from 1.8 V and up. The device is stable with ceramic output capacitors. The device can withstand up to 18 V max input voltage.

Internal protection features consist of output current limiting, built-in thermal shutdown and reverse output current protection. Logic level enable pin is available. The NCP57302 is an adjustable voltage device and is available in D2PAK-5 package.

Features

- Output Current in Excess of 3.0 A
- Minimum Operating Input Voltage 1.8 V for Full 3 A Output Current
- 315 mV Typical Dropout Voltage at 3.0 A
- Adjustable Output Voltage Range from 1.24 V to 13 V
- Low Ground Current
- Fast Transient Response
- Stable with Ceramic Output Capacitor
- Logic Compatible Enable Pin
- Current Limit, Reverse Current and Thermal Shutdown Protection
- Operation up to 13.5 V Input Voltage
- NCV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable
- These are Pb-Free Devices

Applications

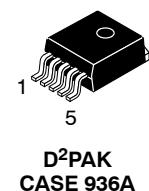
- Consumer and Industrial Equipment Point of Regulation
- Servers and Networking Equipment
- FPGA, DSP and Logic Power supplies
- Switching Power Supply Post Regulation
- Battery Chargers
- Functional Replacement for Industry Standard MIC29300, MIC39300, MIC37300 with Improved Minimum Input Voltage Specification



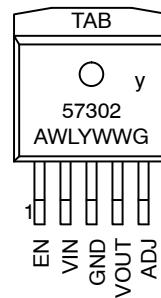
ON Semiconductor®

<http://onsemi.com>

MARKING DIAGRAMS



D²PAK
CASE 936A



y	= P (NCP), V (NCV)
A	= Assembly Location
WL	= Wafer Lot
Y	= Year
WW	= Work Week
G	= Pb-Free Package

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 9 of this data sheet.

NCP57302, NCV57302

TYPICAL APPLICATIONS

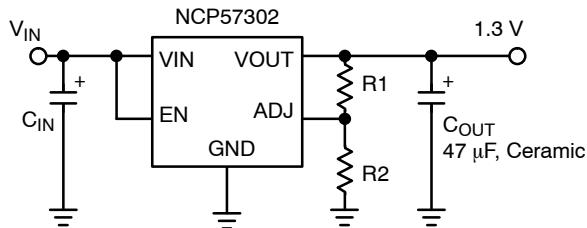


Figure 1. Adjustable Regulator

PIN FUNCTION DESCRIPTION

Pin Number	Pin Name	Pin Function
1	EN	Enable Input: CMOS and TTL logic compatible. Logic high = enable; Logic low = shutdown.
2	VIN	Input voltage which supplies both the internal circuitry and the current to the output load
3	GND	Ground
TAB	TAB	TAB is connected to ground.
4	VOUT	Linear Regulator Output.
5	ADJ	Adjustable Regulator Feedback Input. Connect to output voltage resistor divider central node.

ABSOLUTE MAXIMUM RATINGS

Symbol	Rating	Value	Unit
V _{IN}	Supply Voltage	0 to 18	V
V _{EN}	Enable Input Voltage	0 to 18	V
V _{OUT} – V _{IN}	Reverse V _{OUT} – V _{IN} Voltage (EN = Shutdown or V _{IN} = 0 V) (Note 1)	0 to 6.5	V
P _D	Power Dissipation (Notes 2 and 3)	Internally Limited	
T _J	Junction Temperature	–40 ≤ T _J ≤ +125	°C
T _S	Storage Temperature	–65 ≤ T _J ≤ +150	°C
	ESD Rating (Notes 4 and 5)	Human Body Model Machine Model	V
		2000 200	

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.

NOTE: All voltages are referenced to GND pin unless otherwise noted.

1. The ENABLE pin input voltage must be ≤ 0.8 V or V_{IN} must be connected to ground potential.
2. P_{D(max)} = (T_{J(max)} – T_A) / R_{θJA}, where R_{θJA} depends upon the printed circuit board layout.
3. This protection is not guaranteed outside the Recommended Operating Conditions.
4. Devices are ESD sensitive. Handling precautions recommended..
5. This device series incorporates ESD protection and is tested by the following methods:
ESD Human Body Model (HBM) tested per AEC – Q100 – 002 (EIA/JESD22 – A114C)
ESD Machine Model (MM) tested per AEC – Q100 – 003 (EIA/JESD22 – A115C)
This device contains latch-up protection and exceeds 100 mA per JEDEC Standard JESD78.

RECOMMENDED OPERATING CONDITIONS (Note 6)

Symbol	Rating	Value	Unit
V _{IN}	Supply Voltage	1.8 to 13.5	V
V _{EN}	Enable Input Voltage	0 to 13.5	V
T _J	Junction Temperature	–40 ≤ T _J ≤ +125	°C

6. The device is not guaranteed to function outside its Recommended operating conditions.

NCP57302, NCV57302

ELECTRICAL CHARACTERISTICS

$T_J = 25^\circ\text{C}$ with $V_{IN} = V_{OUT\ nominal} + 0.6\text{ V}$; $V_{EN} = V_{IN}$; $I_L = 10\text{ mA}$; bold values indicate $-40^\circ\text{C} < T_J < +125^\circ\text{C}$, unless noted. (Note 7)

Parameter	Conditions	Min	Typ	Max	Unit
Output Voltage Accuracy	$I_L = 10\text{ mA}$	-1.5		+1.5	%
	$10\text{ mA} < I_{OUT} < 3\text{ A}$, $V_{OUT\ nominal} + 0.6\text{ V} \leq V_{IN} \leq 13.5\text{ V}$	-2.5		+2.5	%
Output Voltage Line Regulation	$V_{IN} = V_{OUT\ nominal} + 0.6\text{ V}$ to 13.5 V ; $I_L = 10\text{ mA}$		0.02	0.5	%
Output Voltage Load Regulation	$I_L = 10\text{ mA}$ to 3 A		0.2	1	%
$V_{IN} - V_{OUT}$ Dropout Voltage (Note 8)	$I_L = 1.0\text{ A}$ (Note 10)		182	295	mV
	$I_L = 1.5\text{ A}$		220	350	mV
	$I_L = 2.0\text{ A}$ (Note 10)		250	410	mV
	$I_L = 3.0\text{ A}$		315	520	mV
Ground Pin Current (Note 9)	$I_L = 3.0\text{ A}$		60	90 120	mA
Ground Pin Current in Shutdown	$V_{EN} \leq 0.5\text{ V}$		1.0	5	μA
Overload Protection Current Limit	$V_{OUT} = 0\text{ V}$		3.5	5	A
Start-up Time	$V_{EN} = V_{IN}$, $V_{OUT\ nominal} = 2.5\text{ V}$, $I_{OUT} = 10\text{ mA}$, $C_{OUT} = 47\text{ }\mu\text{F}$		100	500	μs
Reference Voltage		1.221 1.209	1.240	1.259 1.271	V
Adjust Pin Bias Current			100	200 350	nA

ENABLE INPUT

Enable Input Signal Levels	Regulator enable	1.4			V
	Regulator shutdown			0.8	V
Enable pin Input Current	$V_{EN} \leq 0.8\text{ V}$ (Regulator shutdown)			2 4	μA
	$6.5\text{ V} > V_{EN} \geq 1.4\text{ V}$ (Regulator enable)		15	30 40	μA

7. $V_{OUT\ nominal}$ can be set by external resistor divider in the application. Tested for $V_{OUT\ nominal} = 1.240\text{ V}$ unless noted.
 8. $V_{DO} = V_{IN} - V_{OUT}$ when V_{OUT} decreases to 98% of its nominal output voltage with $V_{IN} = V_{OUT} + 1\text{ V}$. Tested for $V_{OUT\ nominal} = 2.5\text{ V}$.
 9. $I_{IN} = I_{GND} + I_{OUT}$.
 10. Guaranteed by design.

Package	Conditions / PCB Footprint	Thermal Resistance
D2PAK-5, Junction-to-Case		$R_{\theta JC} = 2.1^\circ\text{C/W}$
D2PAK-5, Junction-to-Air	PCB with 100 mm^2 2.0 oz Copper Heat Spreading Area	$R_{\theta JA} = 52^\circ\text{C/W}$

NCP57302, NCV57302

TYPICAL CHARACTERISTICS

$T_J = 25^\circ\text{C}$ if not otherwise noted

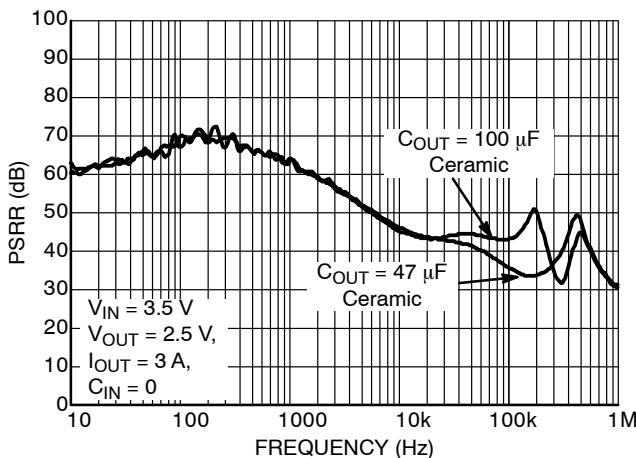


Figure 2. Power Supply Rejection Ratio

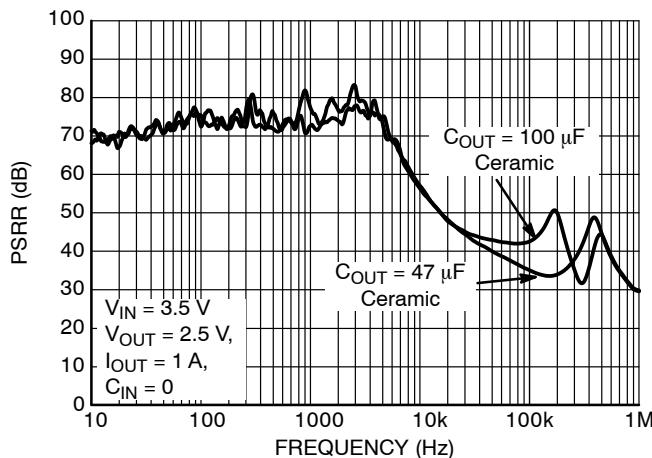


Figure 3. Power Supply Rejection Ratio

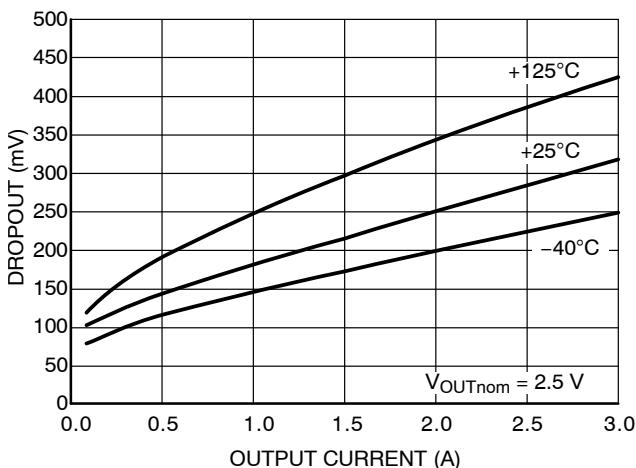


Figure 4. Dropout Voltage vs. Output Current

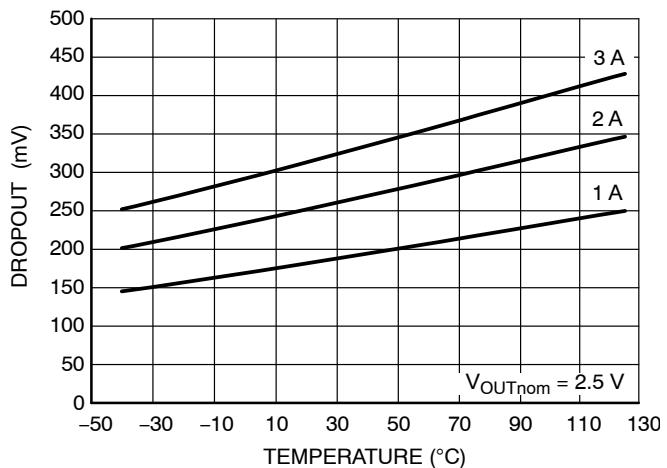


Figure 5. Dropout Voltage vs. Temperature

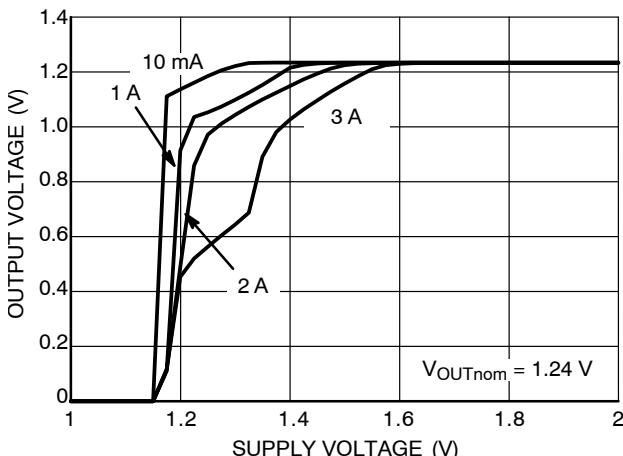


Figure 6. Dropout Characteristics

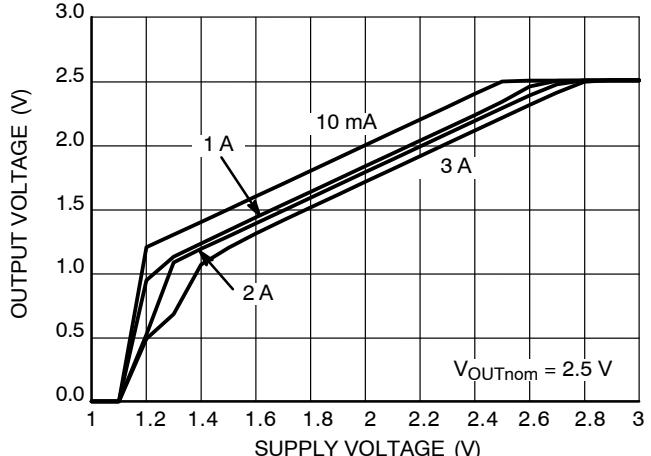
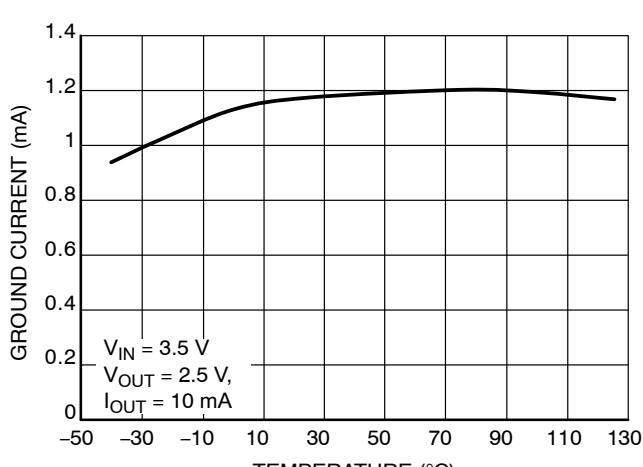
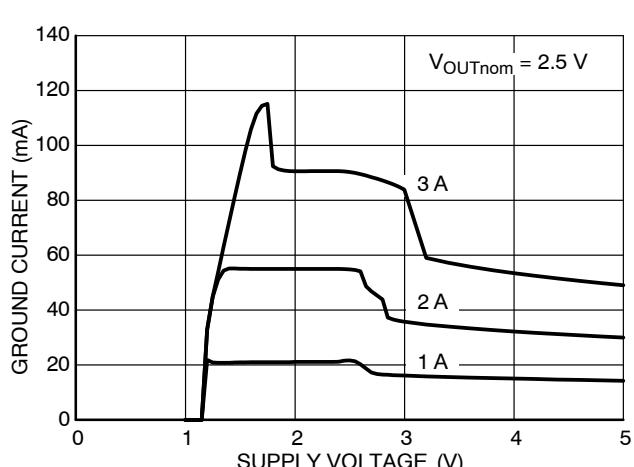
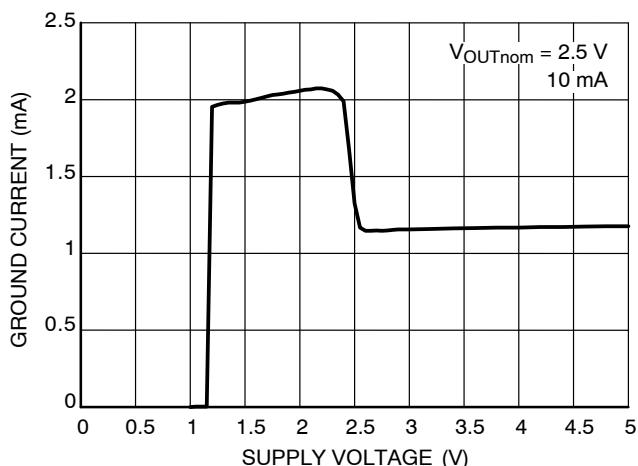
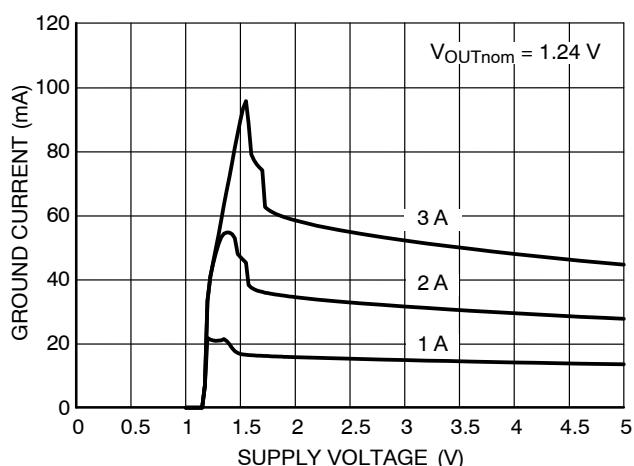
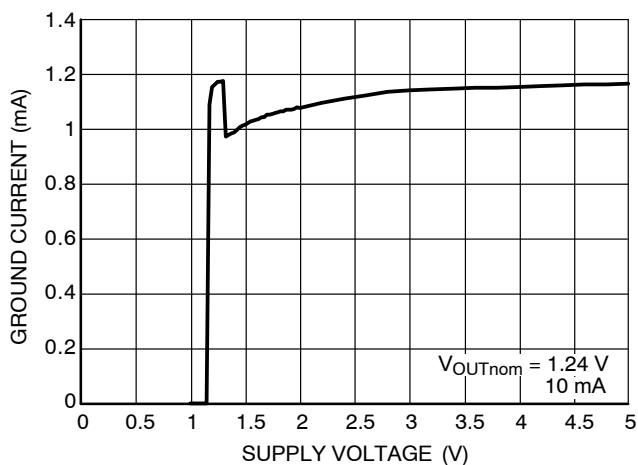
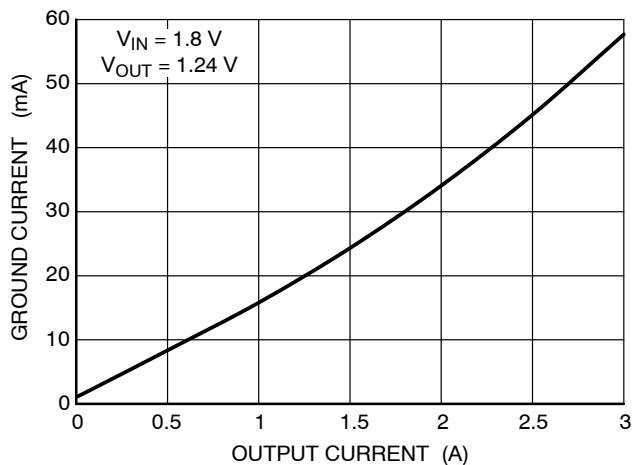


Figure 7. Dropout Characteristics

TYPICAL CHARACTERISTICS

$T_J = 25^\circ\text{C}$ if not otherwise noted



NCP57302, NCV57302

TYPICAL CHARACTERISTICS

$T_J = 25^\circ\text{C}$ if not otherwise noted

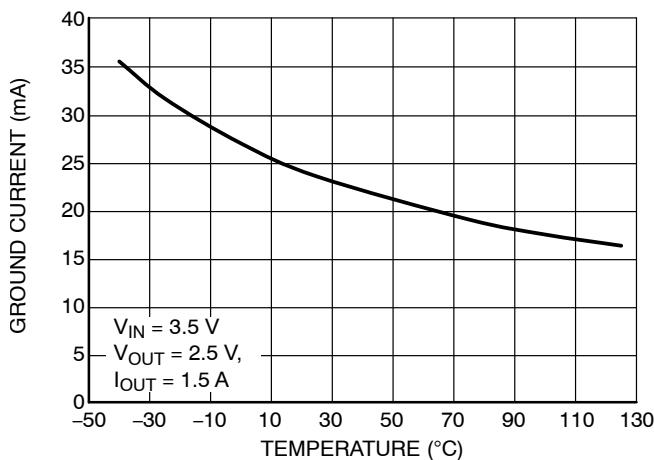


Figure 14. Ground Current vs. Temperature

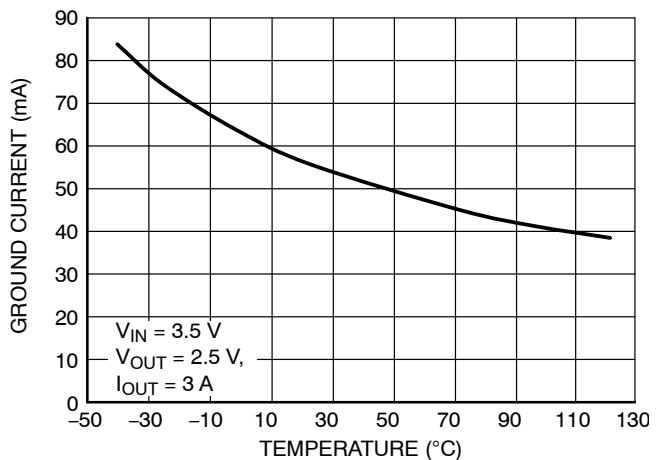


Figure 15. Ground Current vs. Temperature

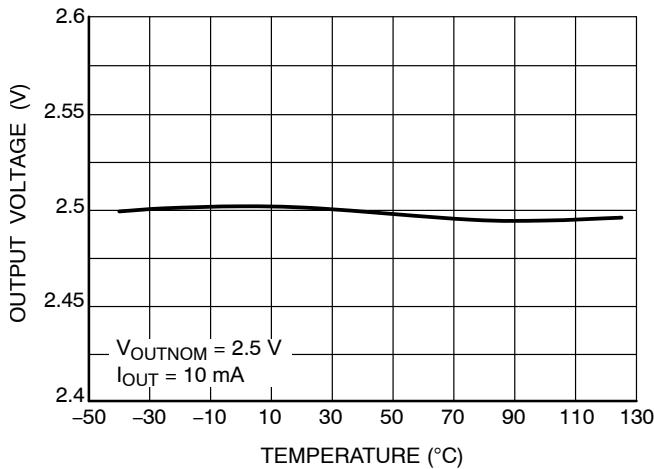


Figure 16. Output Voltage vs. Temperature

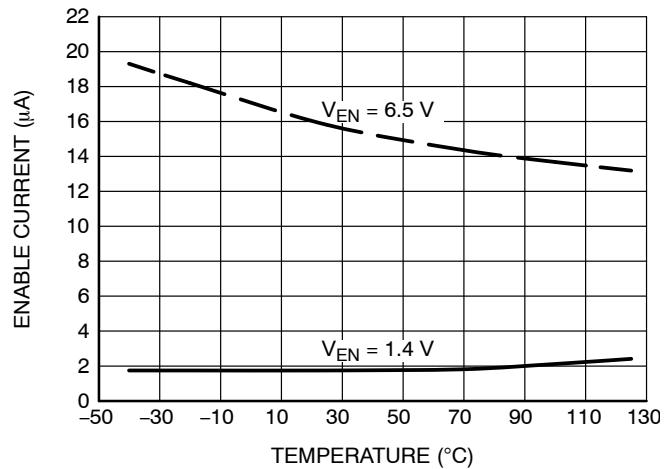


Figure 17. Enable Pin Input Current vs. Temperature

NCP57302, NCV57302

FUNCTIONAL CHARACTERISTICS

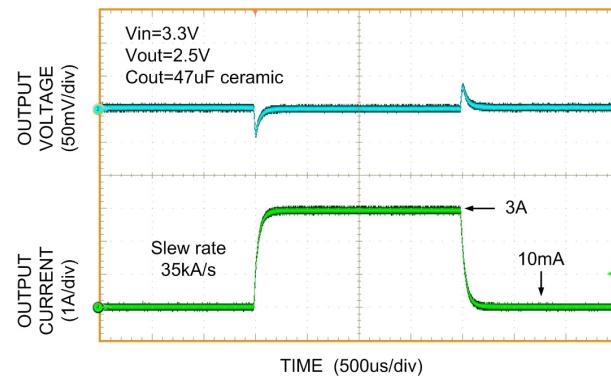


Figure 18. Load Transient Response

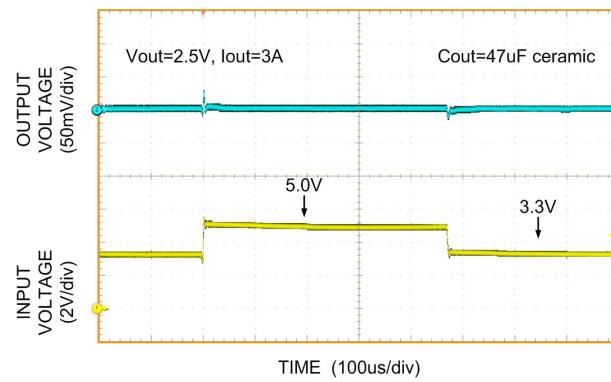


Figure 19. Line Transient Response

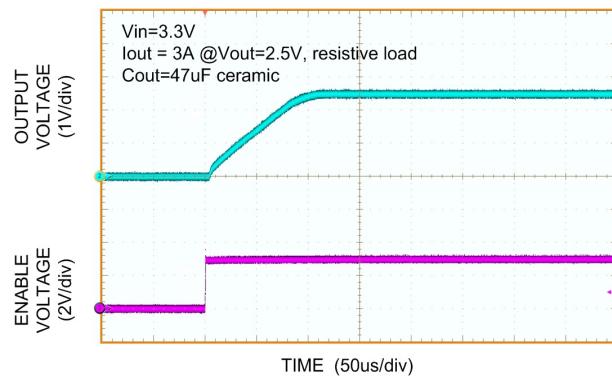


Figure 20. Enable Transient Response

APPLICATIONS INFORMATION

Output Capacitor and Stability

The NCP57302 device requires an output capacitor for stable operation. The NCP57302 is designed to operate with ceramic output capacitors. The recommended output capacitance value is 47 μ F or greater. Such capacitors help to improve transient response and noise reduction at high frequency.

Input Capacitor

An input capacitor of 1.0 μ F or greater is recommended when the device is more than 4 inches away from the bulk supply capacitance, or when the supply is a battery. Small, surface-mount chip capacitors can be used for the bypassing. The capacitor should be placed within 1 inch of the device for optimal performance. Larger values will help to improve ripple rejection by bypassing the input of the regulator, further improving the integrity of the output voltage.

Minimum Load Current

The NCP57302 regulator is specified between finite loads. A 10 mA minimum load current is necessary for proper operation.

Enable Input

NCP57302 regulators also feature an enable input for on/off control of the device. Its shutdown state draws “zero” current from input voltage supply (only microamperes of leakage). The enable input is TTL/CMOS compatible for simple logic interface, but can be connected up to V_{IN} .

Overcurrent and Reverse Output Current Protection

The NCP57302 regulator is fully protected from damage due to output current overload and output short conditions. When NCP57302 output is overloaded, Output Current limiting is provided. This limiting is linear; output current during overload or output short conditions is constant. These features are advantageous for powering FPGAs and other ICs having current consumption higher than nominal during their startup.

Thermal shutdown disables the NCP57302 device when the die temperature exceeds the maximum safe operating temperature.

When NCP57302 is disabled and $(V_{OUT} - V_{IN})$ voltage difference is less than 6.5 V in the application, the output structure of these regulators is able to withstand output voltage (backup battery as example) to be applied without reverse current flow.

Adjustable Voltage Design

The NCP/NCV57302 Adjustable voltage Device Output voltage is set by the ratio of two external resistors as shown in Figure 21.

The device maintains the voltage at the ADJ pin at 1.24 V referenced to ground. The current in R_2 is then equal to $1.24 \text{ V} / R_2$, and the current in R_1 is the current in R_2 plus the ADJ pin bias current. The ADJ pin bias current flows from V_{OUT} through R_1 into the ADJ pin.

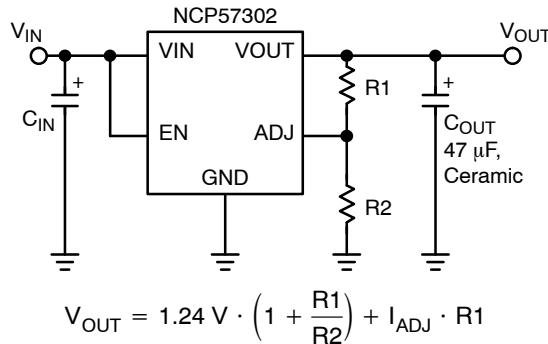


Figure 21. Adjustable Voltage Operation

For the R_2 resistor value up to 15 k Ω the I_{ADJ} current impact can be neglected and the R_1 resistor value can be calculated y:

$$R_1 = R_2 \times \left(\frac{V_{OUT}}{1.24} - 1 \right) \quad (\text{eq. 1})$$

Where V_{OUT} is the desired nominal output voltage.

Thermal Considerations

The power handling capability of the device is limited by the maximum rated junction temperature (125°C). The P_D total power dissipated by the device has two components, Input to output voltage differential multiplied by Output current and Input voltage multiplied by GND pin current.

$$P_D = (V_{IN} - V_{OUT}) \cdot I_{OUT} + V_{IN} \cdot I_{GND} \quad (\text{eq. 2})$$

The GND pin current value can be found in Electrical Characteristics table and in Typical Characteristics graphs. The Junction temperature T_J is

$$T_J = T_A + P_D \cdot R_{\theta JA} \quad (\text{eq. 3})$$

where T_A is ambient temperature and $R_{\theta JA}$ is the Junction to Ambient Thermal Resistance of the NCP/NCV57302 device mounted on the specific PCB.

To maximize efficiency of the application and minimize thermal power dissipation of the device it is convenient to use the Input to output voltage differential as low as possible.

The static typical dropout characteristics for various output voltage and output current can be found in the Typical Characteristics graphs.

NCP57302, NCV57302

ORDERING INFORMATION

Device	Output Current	Output Voltage	Junction Temp. Range	Package	Shipping [†]
NCP57302DSADJR4G	3.0 A	ADJ	–40°C to +125°C	D2PAK-5 (Pb-Free)	800 / Tape & Reel
NCV57302DSADJR4G*	3.0 A	ADJ	–40°C to +125°C	D2PAK-5 (Pb-Free)	800 / Tape & Reel

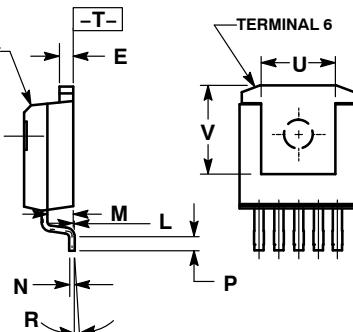
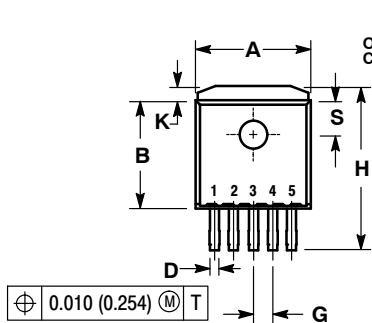
[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

*NCV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable.

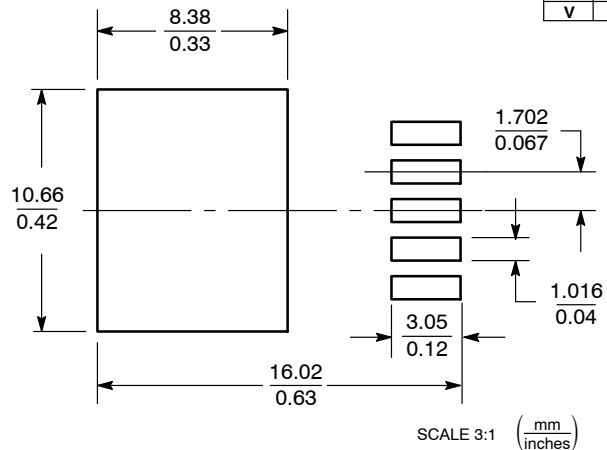
NCP57302, NCV57302

PACKAGE DIMENSIONS

D²PAK 5
CASE 936A-02
ISSUE C



SOLDERING FOOTPRINT



5-LEAD D²PAK

ON Semiconductor and  are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of SCILLC's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC 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 special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC 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. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC 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 SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC 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 SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800-282-9855 Toll Free

USA/Canada

Europe, Middle East and Africa

Phone: 421 33 790 2910

Japan Customer Focus C

ON Semiconductor Website: www.onsemi.com

For additional information, please contact your local

Данный компонент на территории Российской Федерации**Вы можете приобрести в компании MosChip.**

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

<http://moschip.ru/get-element>

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибуторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ Р В 0015-002 и ЭС РД 009

Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:

moschip.ru
moschip.ru_4

moschip.ru_6
moschip.ru_9