



Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!



Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

Email & Skype: info@chipsmall.com Web: www.chipsmall.com

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



NCV8872SEPGVB

NCV887200 Automotive Grade High-Frequency SEPIC Controller Board Evaluation Board User's Manual



ON Semiconductor®

<http://onsemi.com>

EVAL BOARD USER'S MANUAL

Description

This NCV887200 evaluation board provides a convenient way to evaluate a high-frequency current-mode control SEPIC converter design. The topology uses two inductors. No additional components are required, other than dc supplies for the input and enable voltages. An external clock can be used to synchronize the switching frequency. The output is rated 12 V / 1.5 A with a 675 kHz switching frequency over the typical 6 V to 18 V automotive input voltage range.

Key Features

- 12 V / 1.5 A Output
- 675 kHz Switching Frequency (NCV887200)
- Input Undervoltage Lockout
- Internal Soft-Start
- Wide Input Voltage of 6 V to 40 V
- Regulates through 45 V Load Dump Conditions
- External Clock Synchronization up to 1.1 MHz
- Automotive Grade

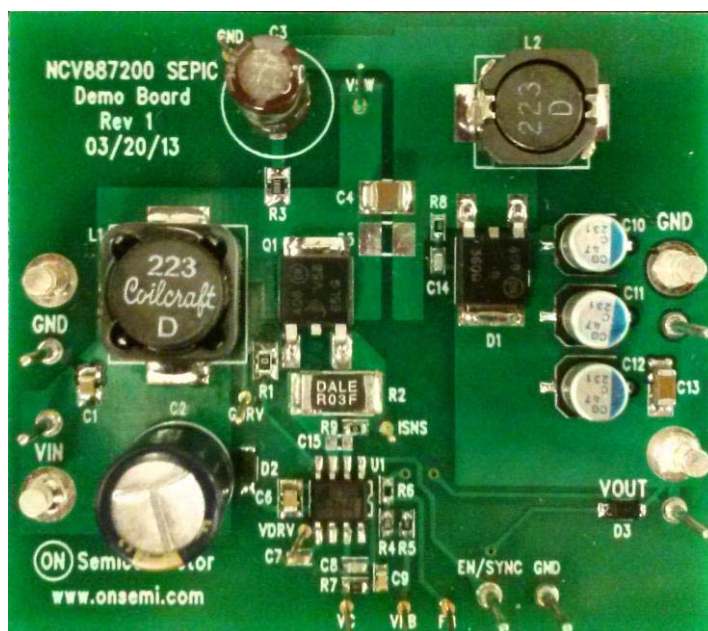


Figure 1. NCV887200 SEPIC Evaluation Board

NCV8872SEPGVVB

Table 1. EVALUATION BOARD TERMINALS

| Terminal | Function |
|----------|----------------------------------|
| VIN | Positive DC input voltage |
| GND | Common DC return |
| VOUT | Regulated DC output voltage |
| EN/SYNC | Enable and synchronization input |

Table 2. ABSOLUTE MAXIMUM RATINGS (Voltages are with respect to GND)

| Rating | Value | Unit |
|---|------------|------|
| DC Supply Voltage (VIN) | -0.3 to 40 | V |
| DC Supply Voltage (EN, SYNC) | -0.3 to 6 | V |
| Peak Transient Voltage (Load Dump on VIN) | 45 | V |
| Junction temperature | -40 to 150 | °C |
| Ambient temperature (evaluation board) | -40 to 105 | °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.

Table 3. ELECTRICAL CHARACTERISTICS

(TA = 25°C, 4.5 ≤ VIN ≤ 40 V, VEN = 2 V, VOUT = 3.3 V, 0 ≤ IOUT ≤ 1.2 A, unless otherwise specified)

| Characteristic | Conditions | Typical Value | Unit |
|------------------------------------|--|---------------|------|
| SWITCHING | | | |
| Switching Frequency | - | 675 | kHz |
| Soft-start Time | - | 1.9 | ms |
| SYNC Frequency range | - | 675 – 1025 | kHz |
| CURRENT LIMIT | | | |
| Cycle-by-cycle Current Limit (FET) | R _{sense} = 40 mΩ | 5 | A |
| PROTECTIONS | | | |
| Input Undervoltage Lockout (UVLO) | V _{IN} decreasing | < 4.75* | V |
| Input Undervoltage Lockout (UVLO) | V _{IN} increasing | 5.23 | V |
| Thermal Shutdown | T _A increasing | 170 | °C |
| Short Circuit Threshold Voltage | V _{FB} as % of V _{ref} | 67 | % |

*See Note 3 from Operating Guidelines

NCV8872SEPGVB

OPERATIONAL GUIDELINES

1. Connect a DC input voltage, within the 6 V to 40 V range, between VIN and GND.
2. Connect a DC enable voltage, within the 2.0 V to 5.0 V range, between EN/SYNC and GND.
3. The evaluation board feedback components were selected to for continuous operation at rated 12 V / 1.5 A output power at a minimum input voltage of 6 V. The NCV887200 V_{IN} has its operational voltage diode-ored between the converter output (12 V) and input voltages. The converter turns-on typically at 6.7 V. Once energized, the output voltage supplies power to the IC when the battery voltage is below (approximately) 11.5 V. The power supply will enter a hiccup soft-start mode if

4. Optionally for external clock synchronization, connect a pulse source between EN/SYNC and GND. The high state level should be within the 2 to 5 V range, and the low state level within the -0.3 V to 0.8 V range, with a minimum pulse width of 40 ns and a frequency within the 675 and 1100 kHz range.

NOTE: The converter was designed for 675 kHz 12 V / 1.5 A continuous mode operation. Operation beyond 675 kHz and/or at a different output voltage may require modifications of feedback loop component and inductor values.

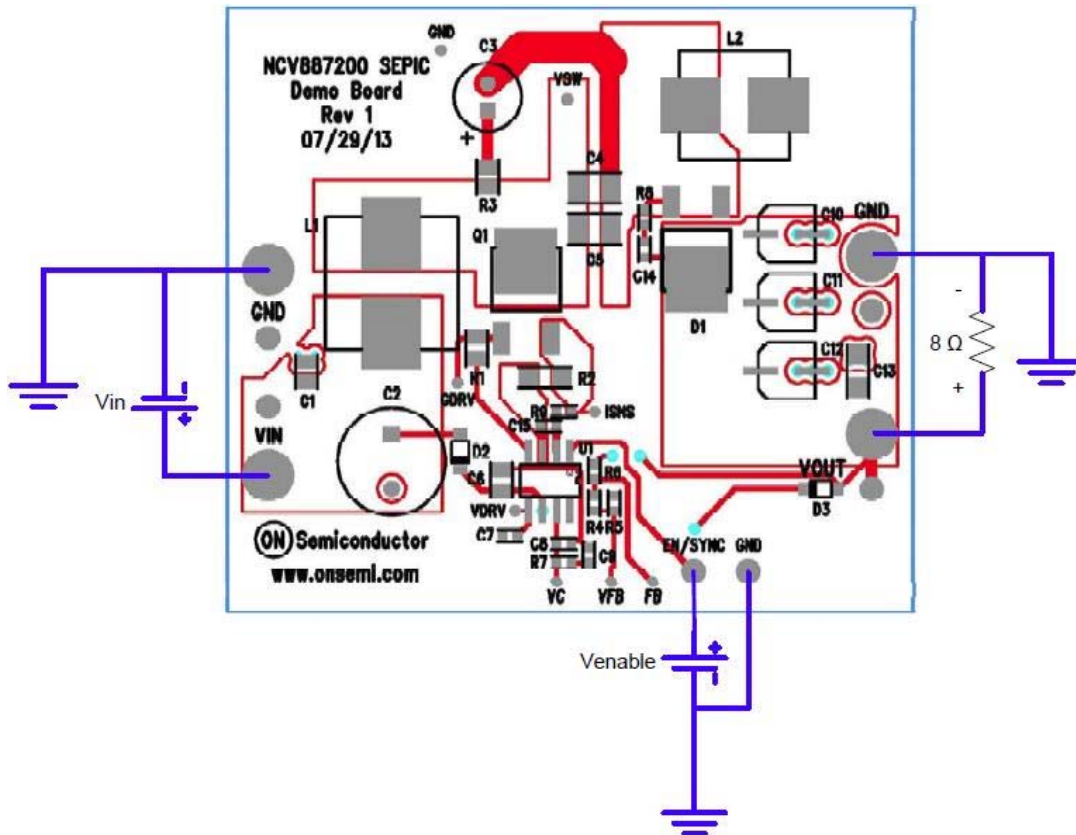


Figure 2. Evaluation Board Connections

NCV8872SEPGVB

TYPICAL PERFORMANCE

Start-up

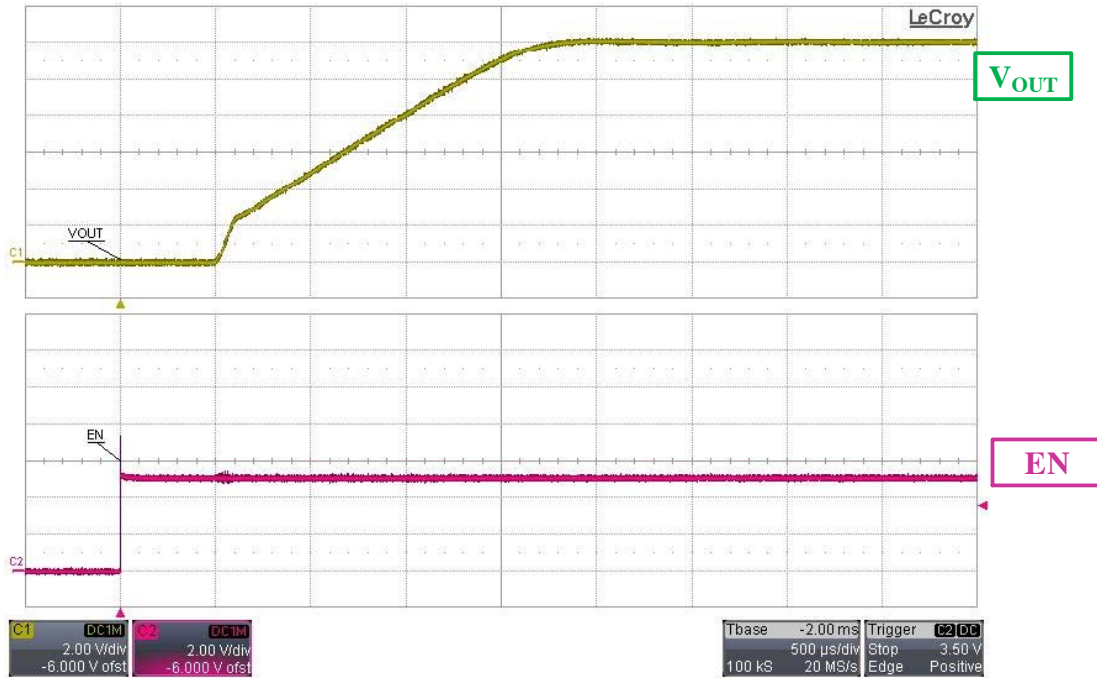


Figure 3. Typical Start-up with $V_{IN} = 12\text{ V}$, $I_{OUT} = 1\text{ A}$

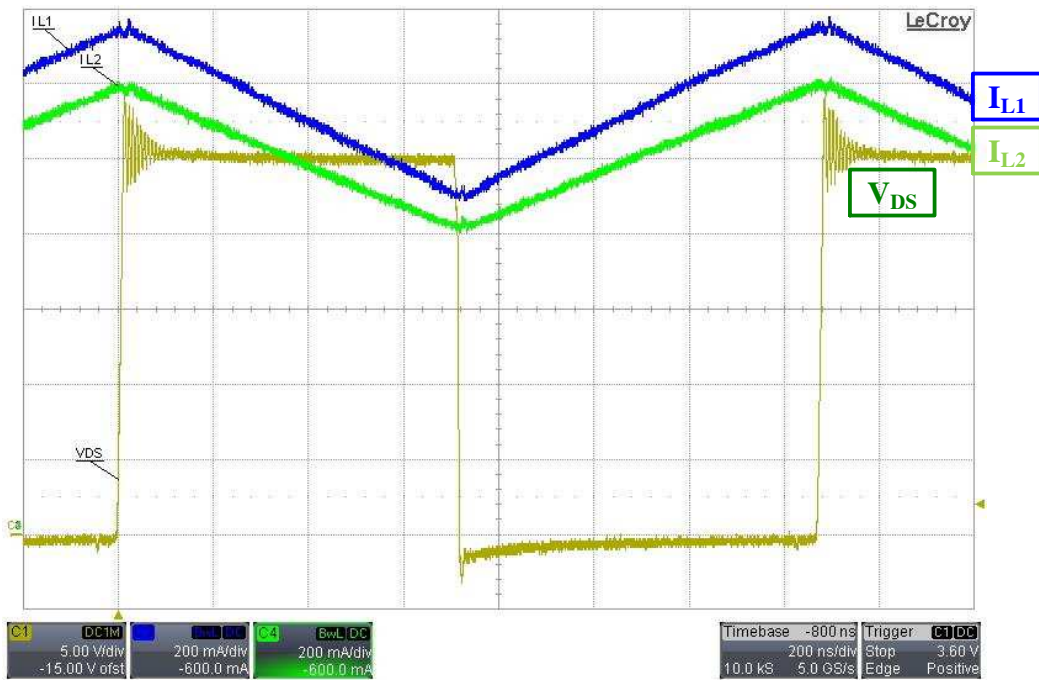


Figure 4. Operational Waveforms, $V_{IN} = 12\text{ V}$, $I_{OUT} = 1\text{ A}$

NCV8872SEPGVB

SCHEMATIC

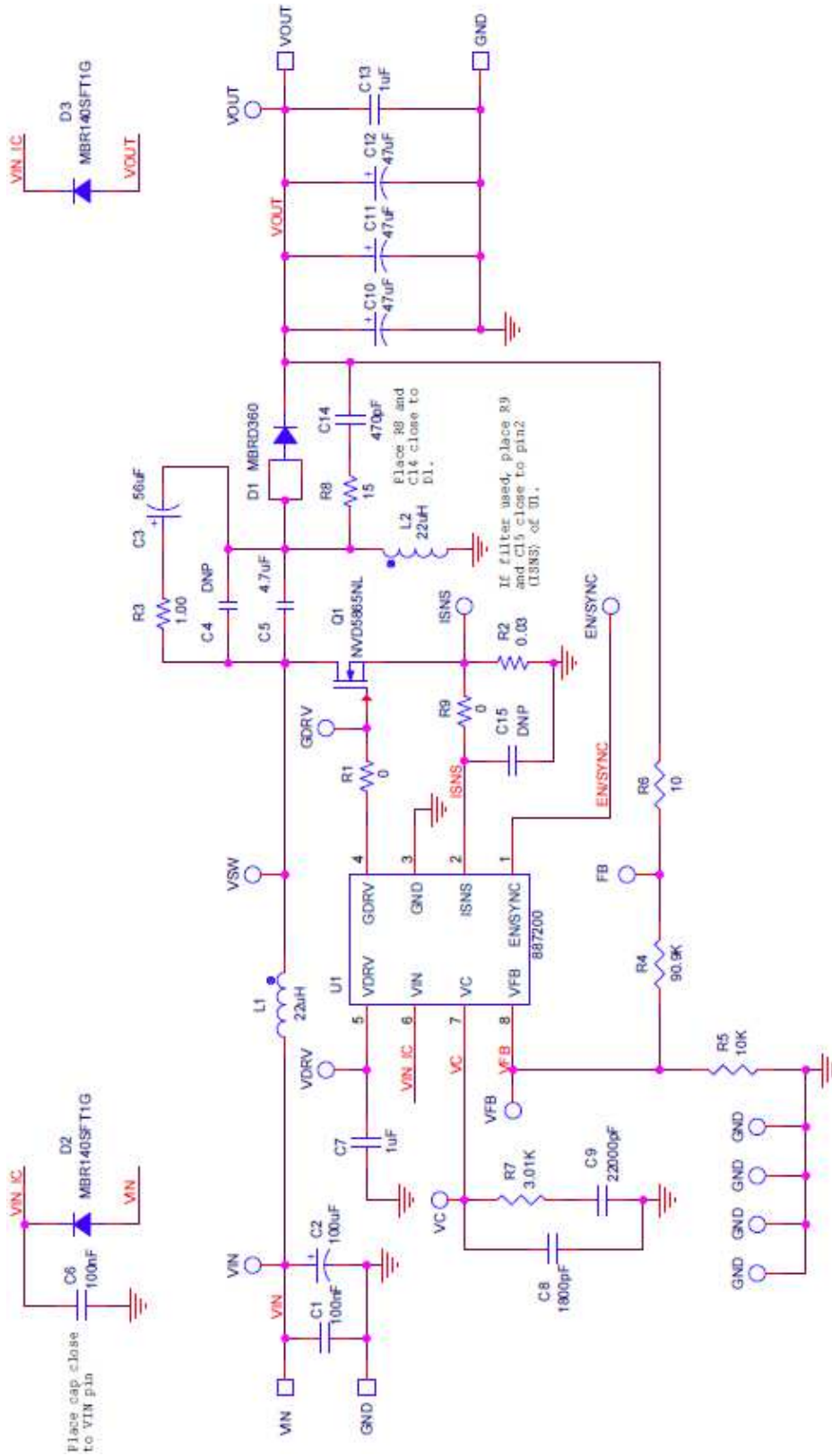


Figure 5. NCV887200 SEPIC Evaluation Board Schematic

NCV8872SEPGVB

PCB LAYOUT

NCV887200 SEP Demo Board Rev 1

03/05/13

TOP Layer

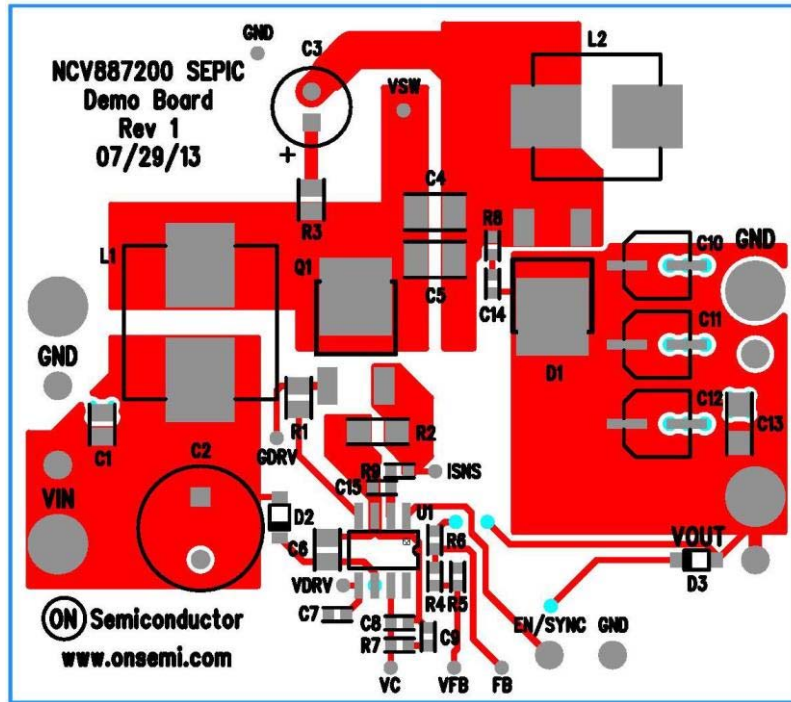


Figure 6. Top View

NCV887200 SEP Demo Board Rev 1

03/05/13

BOTTOM Layer (mirrored)

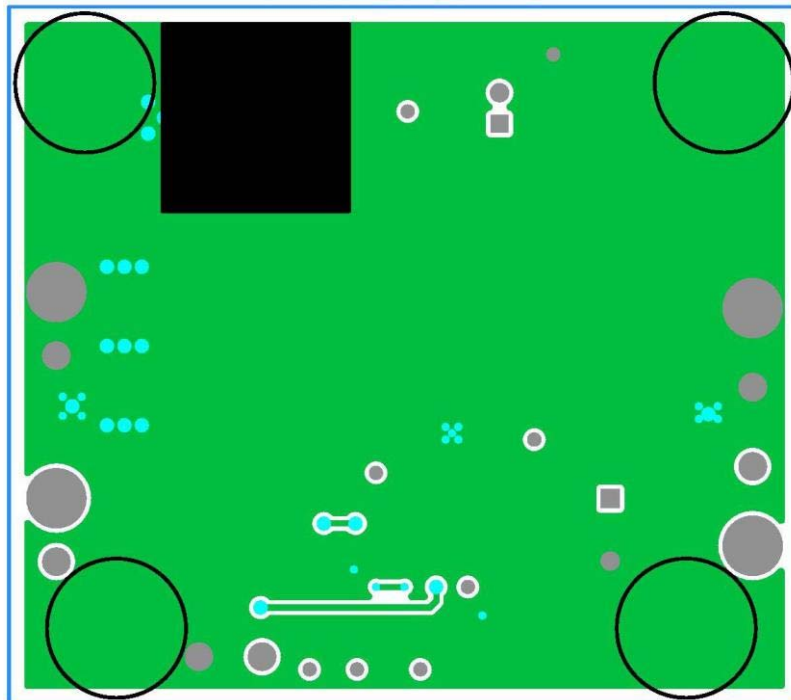


Figure 7. Bottom View

NCV8872SEPGVB

BILL OF MATERIALS


Table 4. BILL OF MATERIALS

| Reference Designator(s) | Qty | Description | Value | Tolerance | Footprint | Manufacturer | Manufacturer's Part Number | Substitution Allowed | RoHS Compliant |
|-------------------------|-----|-------------------------------------|--------------|-----------|----------------|----------------------------------|----------------------------|----------------------|----------------|
| C1, C6 | 2 | CAP CER 0.1UF 50V 10% X7R 0805 | 100 nF | 10% | 805 | TDK Corporation | CGA4J2X7R1H104K125AA | Yes | Yes |
| C2 | 1 | CAP 100UF 50V ELECT FC RADIAL | 100 uF | 20% | FCA_CAP10X12p5 | Panasonic - ECG | EEU-FC1H101 | No | Yes |
| C3 | 1 | CAP ALUM 56UF 50V 20% RADIAL | 56 uF | 20% | FCA_CAP6P3X11 | Chem-Con | EKZE500ELL560MF11D | No | Yes |
| C4 | 1 | CAP CER 4.7UF 50V 10% X7R 1210 | 4.7 uF | 10% | 1210 | Murata Electronics North America | GRM32ER71H475KA88L | Yes | Yes |
| C5 | DNP | | | | 1210 | | | Yes | Yes |
| C7 | 1 | CAP CER 1UF 16V X7R 10% 0603 | 1 uF | 10% | 603 | Murata Electronics North America | GCM188R71C105KA64D | Yes | Yes |
| C8 | 1 | CAP CER 1800PF 50V 5% NP0 0603 | 1800 pF | 5% | 603 | TDK Corporation | CGA3E2C0G1H182J080AA | Yes | Yes |
| C9 | 1 | CAP CER 0.022UF 16V 10% X7R 0603 | 22000 pF | 10% | 603 | Murata Electronics North America | GRM188R71C223KA01D | Yes | Yes |
| C10, C11, C12 | 3 | CAP POLY ALUM 47UF 16V SMD | 47 uF | 20% | CG_CAP5X6 | Nichicon | PCG1C470MCL1GS | No | Yes |
| C13 | 1 | CAP CER 1UF 50V X7R 1206 | 1 uF | 10% | 1206 | Murata Electronics North America | GCM31MR71H105KA55L | Yes | Yes |
| C14 | 1 | CAP CER 470PF 50V 5% NP0 0603 | 470 pF | 5% | 603 | Murata Electronics North America | GCM1885C1H471JA16D | Yes | Yes |
| C15 | DNP | | | | 603 | | | Yes | Yes |
| D1 | 1 | 60 V, 3.0 A Schottky Rectifier DPAK | 60 V / 3 A | N/A | DPAK3_DMD | ON Semiconductor | MBRD360G | No | Yes |
| D2, D3 | 2 | DIODE SCHOTTKY 40V 1A SOD123FL | 40 V / 1 A | N/A | SOD_123 | ON Semiconductor | MBR140SFT1G | No | Yes |
| L1 | 1 | High Temp SMT Power Inductor 2.3A | 22 uH, 2.3 A | 20% | COIL_MSS1260 | Coilcraft Inc | MSS1246T-223ML | No | Yes |
| L2 | 1 | High Temp SMT Power Inductor 1.9A | 22 uH, 1.9 A | 20% | COIL_MSS1038 | Coilcraft Inc | MSS1038T-223ML | No | Yes |
| Q1 | 1 | MOSFET N CH 60V DPAK-4 | 60 V / 38 A | N/A | DPAK3_DMD | ON Semiconductor | NVD5865NLT1G | No | Yes |
| R1 | 1 | RES 0.0 OHM 1/8W JUMP 0805 SMD | 0 | N/A | 805 | Vishay/Dale | CRCW08050000Z0EA | Yes | Yes |
| R2 | 1 | RES .03 OHM 1W 1% 1206 SMD | 0.03 | 1% | 1206 | TT Electronics/Welwyn | LRMAM1206-R03FT5 | Yes | Yes |
| R3 | 1 | RES 1.00 OHM 1/8W 1% 0805 SMD | 1 | 1% | 805 | Vishay/Dale | CRCW08051R00FKEA | Yes | Yes |
| R4 | 1 | RES 90.9K OHM 1/10W 1% 0603 SMD | 90.0 K | 1% | 603 | Yageo | RC0603FR-0790K9L | Yes | Yes |
| R5 | 1 | RES 10.0K OHM 1/10W 1% 0603 SMD | 10.0 K | 1% | 603 | Rohm Semiconductor | MCR03EZPFX1002 | Yes | Yes |
| R6 | 1 | RES 10.0 OHM 1/10W 1% 0603 SMD | 10 | 1% | 603 | Yageo | RC0603FR-0710RL | Yes | Yes |
| R7 | 1 | RES 3.01K OHM 1/10W 1% 0603 SMD | 3.01 K | 1% | 603 | Vishay/Dale | CRCW06033K01FKEA | Yes | Yes |
| R8 | 1 | RES 15.0 OHM 1/10W 1% 0603 SMD | 15 | 1% | 603 | Vishay/Dale | CRCW060315R0FKEA | Yes | Yes |
| R9 | 1 | RES 0.0 OHM 1/10W JUMP 0603 SMD | 0 | N/A | 603 | Vishay/Dale | CRCW06030000Z0EA | Yes | Yes |
| TP1, 7, 14, 16, 17, 20 | 6 | PIN INBOARD .042" HOLE 1000/PKG | N/A | N/A | TP | Vector Electronics | K24C/M | Yes | Yes |

NCV8872SEPGVVB

Table 4. BILL OF MATERIALS

| Reference Designator(s) | Qty | Description | Value | Tolerance | Footprint | Manufacturer | Manufacturer's Part Number | Substitution Allowed | RoHS Compliant |
|----------------------------|-----|--------------------------------------|-------|-----------|------------------|------------------------------|----------------------------|----------------------|----------------|
| TP2, 3, 5, 6, 8, 9, 15, 18 | DNP | CIRCUIT PIN PRNTD .020"D .425"L | N/A | N/A | SMALLTP | Mill-Max Manufacturing Corp. | 3128-2-00-15-00-00-08-0 | Yes | Yes |
| TP10, 11, 12, 13 | 4 | TERM SOLDER TURRET .219" .109"L | N/A | N/A | TURRET | Mill-Max Manufacturing Corp. | 2501-2-00-44-00-00-07-0 | Yes | Yes |
| U1 | 1 | Automotive Non-Sync Boost Controller | N/A | N/A | SOIC8_N_ADJ | ON Semiconductor | NCV887200 | No | Yes |
| Mounting Feet | 4 | BUMPON HEMISPHERE .44X.20 BLACK | N/A | N/A | 0.44 inch circle | 3M | SJ-5003 (BLACK) | Yes | Yes |

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 Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81-3-5817-1050

ON Semiconductor Website: www.onsemi.com
Order Literature: <http://www.onsemi.com/orderlit>
For additional information, please contact your local Sales Representative