NSE HT SiC DCDC 28-1.5/600-38mm

NSE-5002-05

Features

- Wide Input range of 200 – 600Vdc
- Operational up to 700Vdc
- 28Vdc Output Voltage
- Up to 42W output
- High temperature – 177degC
- High efficiency design
- Short circuit output protection
- Input overvoltage protection
- CNC Machined aluminum housing
- CAN Bus Interface

Product Photo

Product Description

The NSE HT SiC DCDC 28-1.5/600-38mm is a high performance, high temperature DCDC converter for demanding applications. It is targeted at downhole wireline and drilling tools or other industrial applications where high temperature and large variation in input voltage may occur.

The NSE HT SiC DCDC 28-1.5/600-38mm has a specified input voltage range of 200 – 600Vdc input voltage. Output is 28V and the converter can provide up to 1.5A output current (1A in 177degC ambient temperature).

The NSE HT SiC DCDC 28-1.5/600-38mm can be operated up to 700Vdc input range and have a protective shutdown above this voltage.

The NSE HT SiC DCDC 28-1.5/600-38mm is designed with an output short circuit protection that will protect the converter from failing even if its outputs are directly short circuited.

In order to operate reliably at high temperature, the NSE SIC DCDC has high efficiency, reducing the dissipated power to a minimum.

The NSE HT SiC DCDC 28-1.5/600-38mm PCB layout is made with ruggedness in mind. A CNC machined aluminum chassis provides maximum mechanical support to allow the board to operate in a very high shock and vibration environment. The board has a rugged power input connector and a military type “micro D” output connector.

Revision History

REV	DATE	DESCRIPTION	PREP	APPR
A	29.06.2016	Initial Revision	RFY	GLK
B	02.11.2016	Updated efficiency numbers, and current triggering data and description.	RFY	GLK

1 Product Specification

1.1 Electrical Specifications

Parameter	Conditions / Comments	Min	Typ	Max	Unit
SUPPLY VOLTAGE					
Input Voltage Range	*Specified operational range*	200		600	Vdc
	Absolute maximum range	100		700	Vdc
Overvoltage trig voltage	*Exciding this voltage will enable overvoltage protection*	700	715	730	Vdc
Input Startup Voltage	*The converter will start up when voltage within this window is applied*	100		630	Vdc
Input Voltage Min. Slew Rate	*The minimum slew rate of the input voltage for the converter to start.*	100			V / sec
Input High Voltage	*Survival, 1 sec pulse. Max pulse repetition frequency 5min*			900	Vdc
Negative Voltage Survival	*Maximum applied negative voltage that can be applied to the input*			-500	Vdc
POWER OUTPUT SPECIFICATIONS					
Output Voltage Set Point	*Vout measured internally at output terminals*		28		Vdc
Total Output Voltage Range	*Including thermal drift and load regulations*	27	28	29	Vdc
Operating Output Current Range	*Ambient temperature max 125°C*	0		1.5	A
Operating Output Current Range	*Ambient temperature max 177°C*	0		1	A
Operating Output Power Range	*@28Vdc output and max 125°C*	0		42	W
Operating Output Power Range	*@28Vdc output and max 177°C*	0		28	W
Current triggering limit	*Internally measured peak currents that will start disabling the output switch.*	1.5	1.7	1.8	A
Short circuit protection voltage	*If the output voltage drops below this limit, the output switch will be disabled*		18		Vdc
Maximum Output Capacitance	*Maximum capacitance connected to the output in order to allow startup of the DCDC*			1000	uF

DYNAMIC CHARACTERISTICS					
Maximum Voltage Drop	*0 – 1A load change, 1msec recovery time*			3	V
Maximum Voltage Overshoot	*1 – 0A load change, 1msec recovery time*			3	V
FEATURE CHARACTERISTICS					
Converter switching frequency		45	50	60	kHz
EFFICIENCY					
Converter efficiency	*I_out = 1A, Vin = 200V, Over full temperature range*	88			*%*
Converter efficiency	*I_out = 1A, Vin = 600V, Over full temperature range*	82			*%*
CANBUS INTERFACE					
Baud Rate			125		*kbits/s*
THERMAL					
Ambient temperature	*Max Temperature on the surface of outer housing given that thermal resistance is within the specification*			177	*°C*
Thermal Resistance	*Surface of OUTER HOUSING to NSE UNIT* **Refer to the Section "Thermal properties" for further definition*			0.5	*°C/W*
OPERATIONAL LIFETIME					
Expected Lifetime	*< 125°C Ambient Temperature*	2000			*Hours*
	125 - 150°C (4 x acc. factor)	500			*Hours*
	150- 177°C (8 x acc. factor)	250			*Hours*

1.2 Thermal properties

The NSE High Temperature DCDC is designed to operate in a 177°C environment.

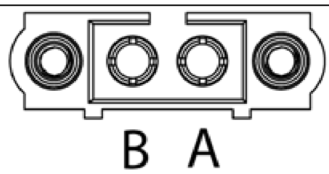
In a typical assembly, the **NSE UNIT** is mounted to a **MOUNTING PROFILE** that is located inside an **OUTER HOUSING**.

The **OUTER HOUSING** surface temperature should not rise above the specified maximum ambient temperature, and the mechanical design and interface between the **OUTER HOUSING, MOUNTING PROFILE** and the **NSE UNIT** should be such that the thermal resistance specification is achieved.

1.3 Connectors

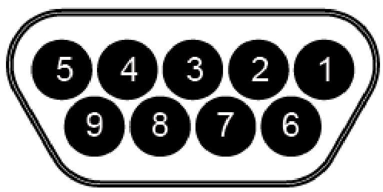
1.3.1 Input

DCDC connector: Harwin M80-5000000M5-02-333-00-000 2 pin connector.
Mating connector: Harwin M80-4000000F1-02-325-00-000

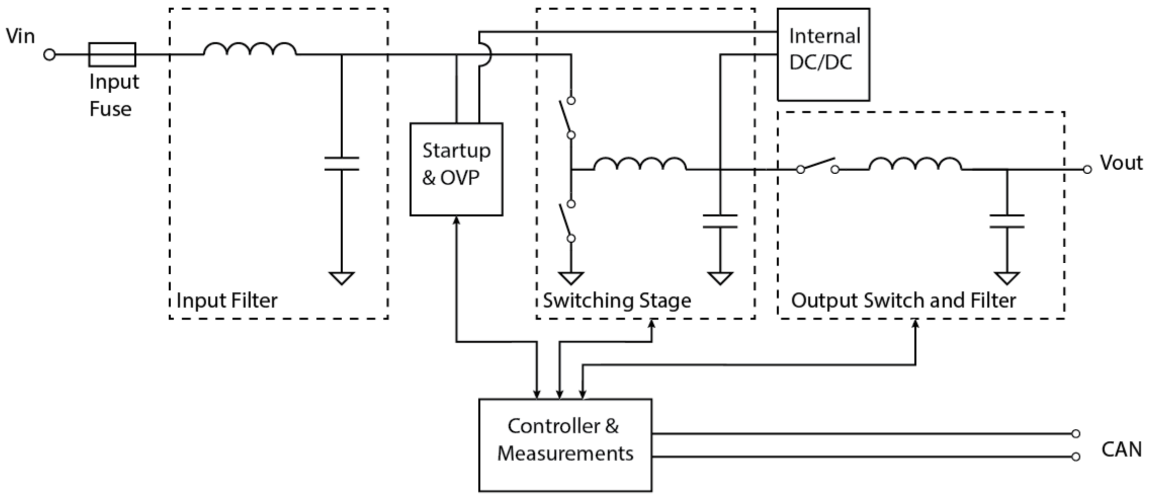
Pin	Signal name	Description / Function	Connector Pinout
A	GND	GROUND	
B	HVin	HV Input Voltage	

1.3.2 Output

DCDC connector: M83513/13-A type - 9 pin connector.
Mating connector: M83513/03-A Type

Pin	Signal name	Description / Function	Connector Pinout
1	VMAIN	Main Output Voltage	
2	CANH	CAN High	
3	GND	GROUND	
4	GND	GROUND	
5	N.C	Not Connected	
6	VMAIN	Main Output Voltage	
7	CANL	CAN Low	
8	GND	GROUND	
9	N.C	Not Connected	

1.4 Functional Block Diagram



1.5 Typical Performance Characteristics

1.5.1 Step response

Room Temperature Test

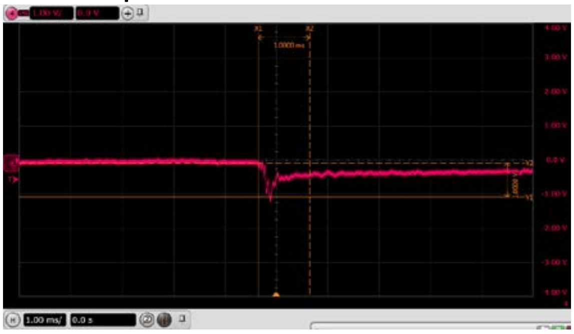


Figure 1 – Step response with 200V input, 0 – 30W load. AC Probe, 1V/div, 1ms/div

177 °C Temperature Test

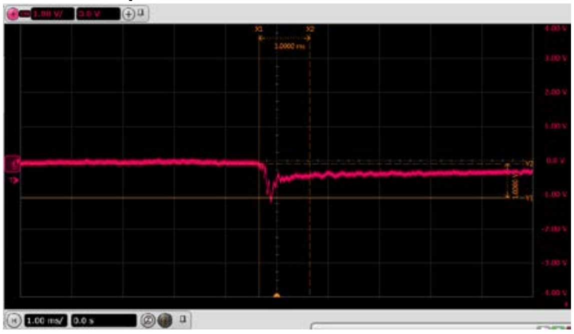


Figure 3 – Step response with 200V input, 0 – 30W load. AC Probe, 1V/div, 1ms/div

Room Temperature Test

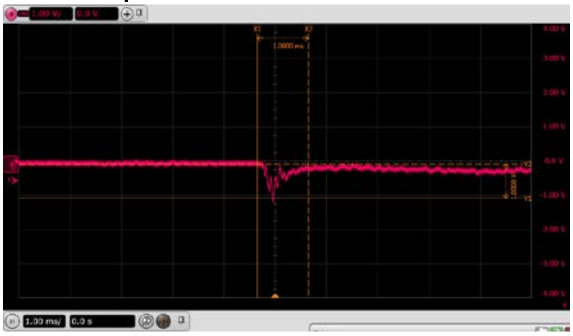


Figure 2– Step response with 600V input, 0 – 30W load. AC Probe, 1V/div, 1ms/div

177 °C Temperature Test

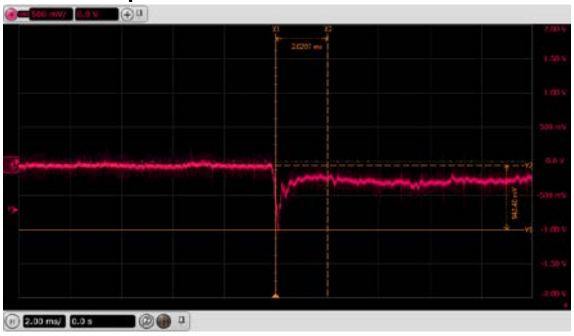


Figure 4 – Step response with 600V input, 0 – 30W load. AC Probe, 1V/div, 1ms/div

1.5.2 Efficiency at room temperature

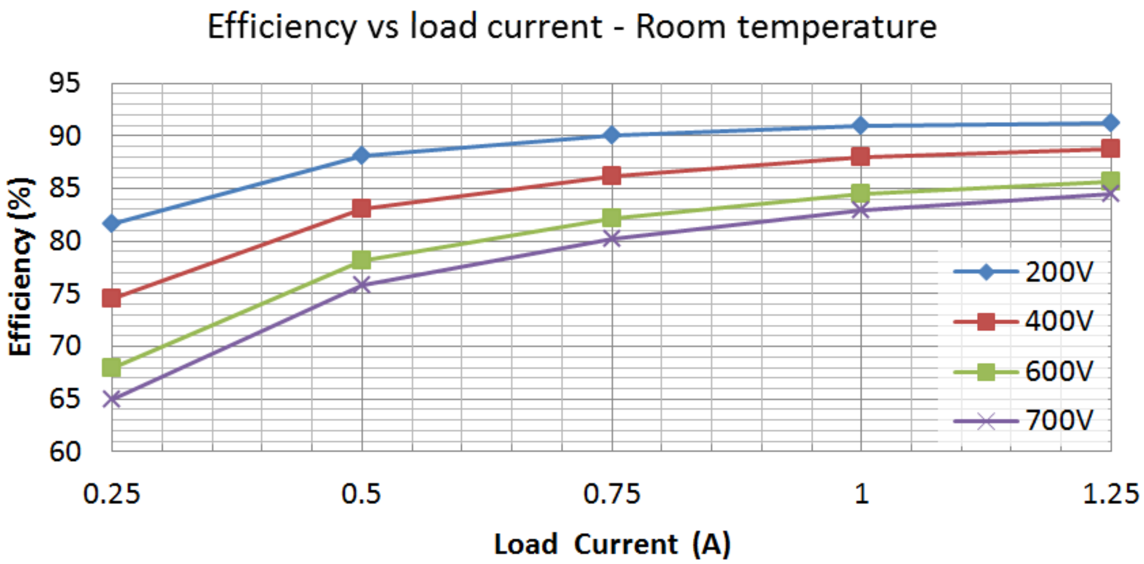


Figure 5 - Measured efficiency (typical numbers) for different input voltages in room temperature

1.5.3 Efficiency at 177degC

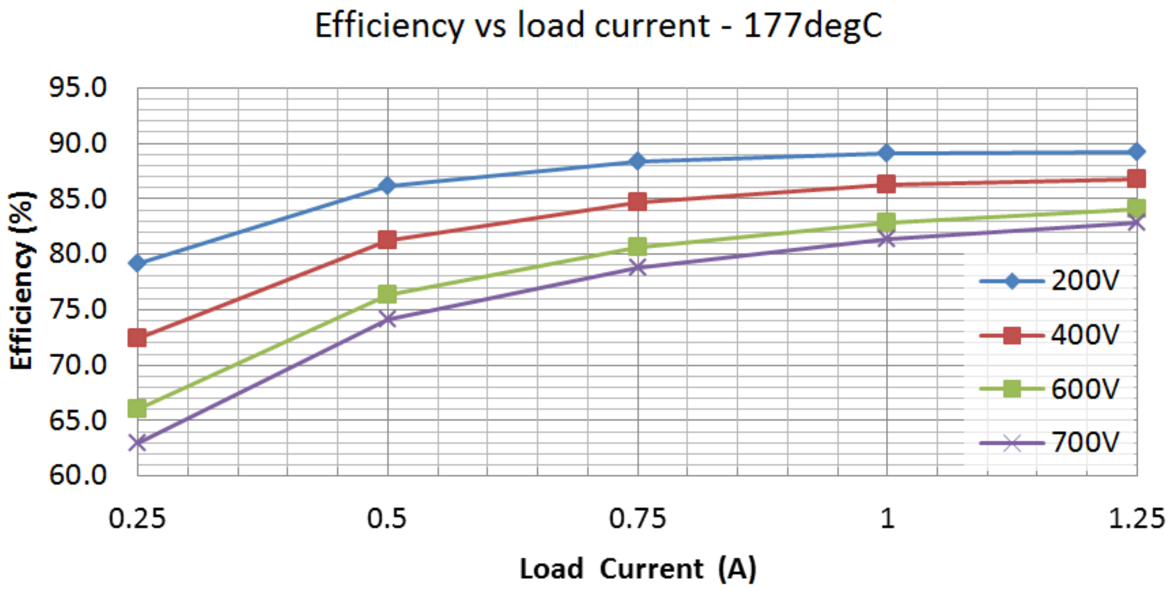


Figure 6 - Measured efficiency (typical numbers) for different input voltages in 177degC

1.5.4 Maximum Output current

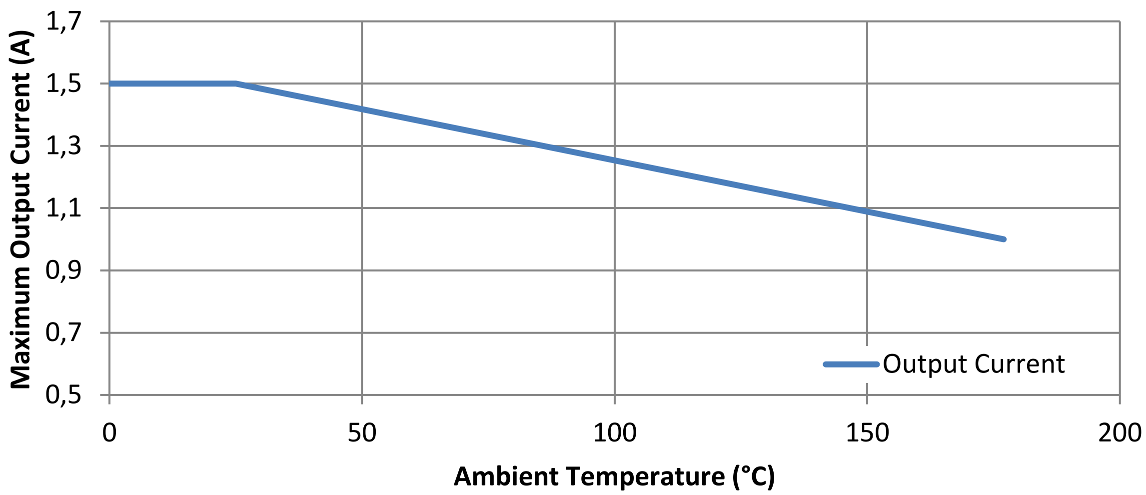


Figure 7 – Maximum Output Current as a function of temperature.

2 Functional Description

2.1 Integrated Sensors

The NSE HT SiC DCDC 28-1.5/600-38mm has the following integrated sensors that is continuously sampled and can be distributed over CAN bus:

1. Temperature Sensor
2. Input Voltage Measurement
3. Output Voltage Measurement
4. Output Current Measurement

2.2 Over Voltage Protection

The over voltage protection will activate if the input voltage goes above the threshold voltage of the over voltage circuit. When the over voltage is activated the circuit will cut off the power to the board and thereby shut it down.

When the board has been shut down by the over voltage circuit, the input power has to decrease into the valid operational voltage range for restart of the power supply.

2.3 Output Power Switch

The NSE HT SiC DCDC 28-1.5/600-38mm has an output switch that will disconnect the output in the case of the following event:

1. Output Over Current
2. Output Short circuit Detection

During startup the switch is held off until the converter has finished powering up internal voltages, before it is turned on.

2.4 CAN bus

The NSE HT SiC DCDC 28-1.5/600-38mm has a CAN bus interface for communications with CAN bus nodes. Typically the DCDC converter will act like a slave on a CAN bus network. It has a defined protocol for reading its internal registers.

2.5 Startup circuit

The NSE HT SiC DCDC 28-1.5/600-38mm has a dedicated start up circuit in order to allow proper powering and protection during startup of the unit.

The circuit is design such that it requires a certain slew rate (specified in the electrical specifications) on the input voltage in order to power up the unit properly. Typically this number is lower than what one will see from normal power supply turn on rise times, but one should be aware if the unit is to be used in applications where the voltage may rise slowly.

If the input voltage rises directly to above the maximum specified startup voltage, the unit will not start up.

2.6 Input Fuse

The converter features an input fuse as protection. This is a surface mounted fuse, only serviceable by NSE.

If one suspect that the fuse has blown, please contact NSE.

2.7 Reverse polarity protection

The NSE HT SiC DCDC 28-1.5/600-38mm is protected from reverse polarity by a high voltage diode on the input.

The negative input voltage must not exceed the maximum specified value provided in the electrical specifications.

2.8 Output Short Circuit Protection

The unit is protected against overload and short circuits with a current limiting feature and a short circuit detect.

If the current rises above the current triggering limit, the converter will turn off its output switch in order to protect its circuitry.

If a short circuit is detected by a drop in the output voltage to below the short circuit triggering level, the output switch will be turned off.

In both cases (current protection and short circuit detection), the unit needs to be powered down and up again in order to enable its output.

2.9 Bootloader

The NSE HT SiC DCDC 28-1.5/600-38mm can be firmware upgraded through its CAN bus interface using the NSE bootloader software.

Consult NSE for further information.

3 Mechanical Dimensions