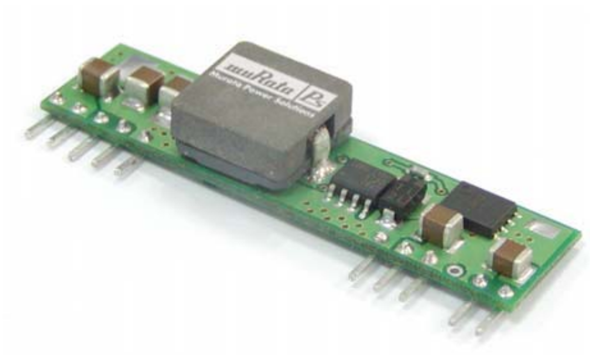
Volant NEA/NEF010 Series

Non-Isolated 10A SIP DC/DC Converters

Murata Power Solutions

NOT RECOMMENDED FOR NEW DESIGNS



Features:

- ✓ Small size, minimal footprint/low profile
- ✓ 10A Output Current (all voltages)
- ✓ High Efficiency: up to 95%
- ✓ High reliability
- ✓ RoHS Compliant
- ✓ Cost efficient open frame design
- ✓ Pre-bias monotonic start-up
- ✓ +ve Enable Logic and –ve Enable Logic models available

Output						Input			Efficiency
Vout (V)	Iout (A)	PARD (mVp-p)		Regulation Max		Vin Nom. (V)	Range (V)	Iin TYP (A)	Full Load
		Typ.	Max.	Line	Load				Typ.
1.0	10	30	50	+/-0.2%	+/-0.5%	12	8.3 – 14	0.992	84%
1.2	10	30	50	+/-0.2%	+/-0.5%	12	8.3 – 14	1.163	86%
1.5	10	30	50	+/-0.2%	+/-0.5%	12	8.3 – 14	1.404	89%
1.8	10	30	50	+/-0.2%	+/-0.5%	12	8.3 – 14	1.666	90%
2.0	10	30	50	+/-0.2%	+/-0.5%	12	8.3 – 14	1.832	91%
2.5	10	30	50	+/-0.2%	+/-0.5%	12	8.3 – 14	2.264	92%
3.3	10	30	50	+/-0.2%	+/-0.5%	12	8.3 – 14	2.956	93%
5.0	10	30	50	+/-0.2%	+/-0.5%	12	8.3 – 14	4.385	95%

RoHS COMPLIANT 2002/95/EC

For full details go to www.murata-ps.com/rohs

Input Characteristics	Notes & Conditions	Min	Typ.	Max	Units
Input Voltage Operating Range		8.3	12	14	Vdc
Input Reflected Ripple Current			200		mA p-p
Inrush Current Transient				0.2	A^2s
Input Filter Type (external)	Low ESR		100		µF
Input Turn ON Threshold			8.5		V
Input Turn OFF Threshold			8.0		V
ON Control	Open Circuit or =Vin				
OFF Control	<0.4VDC				

Output Characteristics	Notes & Conditions	Min	Typ.	Max	Units
Vout Accuracy	100% load	-1.5		+1.5	%
Output Loading		0		10	A
Output Ripple & Noise @ 20Mhz Bandwidth.				50	MVp-p
Maximum Capacitive Load	Low ESR			8000	µF
Vout Trim Range		-10		+10	%
Total Accuracy	Over line/load temperature		<2%		
Current Limit			17		A
Output Line Regulation		-0.2		+0.2	%
Output Load Regulation		+0.5		-0.5	%
Turn-on Overshoot				1	%
SC Protection Technique	Hiccup with auto recovery				
Pre-bias Start-up at output	Unit starts monotonically with pre-bias				

Dynamic Characteristics	Notes & Conditions	Min	Typ.	Max	Units
Load Transient	50% step, 0.1A/µs			100	mV
	Settling Time			200	µs
Frequency			300		KHz
Rise Time	10% Vo to 90% Vo		3.5		ms
Start-Up Time	Vin to Vout and On/Off to Vout Vout rise to monotonic		7		ms

General Specifications	Notes & Conditions	Min	Typ.	Max	Units
MTBF	Calculated (MIL-HDBK-217F)		1.0		$x10^6$ Hrs
Thermal Protection	Hotspot		110		°C
Operating Temperature	Without derating 100LFM	-40		60	°C
Operating Ambient Temperature	See Power derating curve	-40		85	°C
Dimensions	2"Lx0.327"Wx0.512"H (50.8x8.3x13.0mm)				
Pin Dimensions	0.025" (0.64mm) SQUARE		0.64		mm
Pin Material	Matte Sn Finish on component Leads				
Weight			10		g
Flammability Rating	UL94V-0				

Standards Compliance
CSA C22.2, No.60950/UL 60950, Third Edition (2000), File UL E165113

Thermal Considerations

The power module operates in a variety of thermal environments; however, sufficient cooling should be provided to help ensure reliable operation of the unit. Heat is removed by conduction, convection, and radiation to the surrounding environment. The thermal data presented is based on measurements taken in a set-up as shown in fig 1. when the airflow is parallel to the long axis of the module. The de-rating applies accordingly.
The temperature at either location should not exceed 110 °C. The output power of the module should not exceed the rated power for the module (VO, set x IO, max).

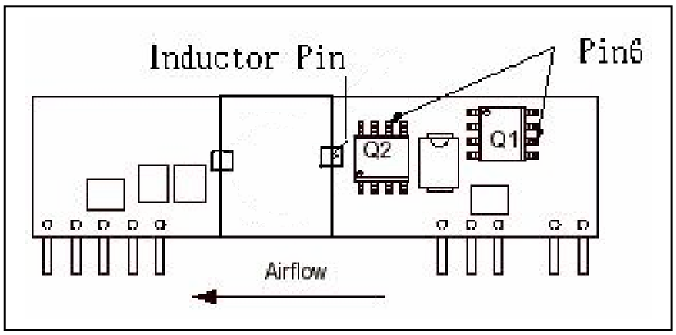


Figure 1: Thermal Measurement Setup

Convection Requirements for Cooling

To predict the approximate cooling needed for the module, refer to the Power Derating Curve in Figure 2 to Figure 9.

These derating curve are approximations of the ambient temperature and airflow required to keep the power module temperature below it's maximum rating. Once the module is assembled in the actual system, the module's temperature should be verified.

Proper cooling can be verified by measuring the power module's temperature at Q1-pin 6 and Q2-pin 6 as shown in Figure 1.

TYPICAL DERATING CURVES

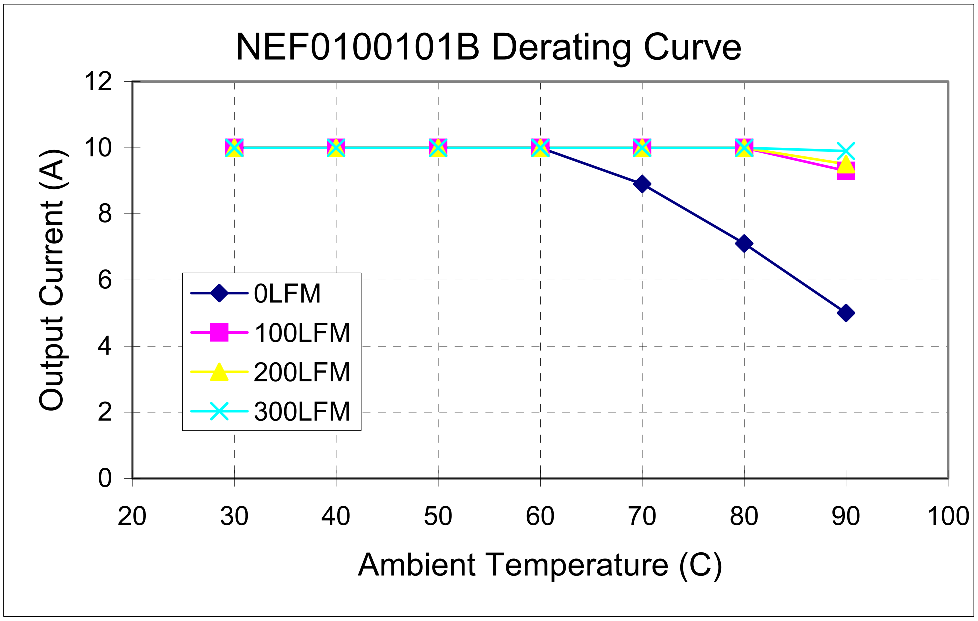


Figure 2. Typical Power Derating vs Output Current for 12Vi and 1.0Vo

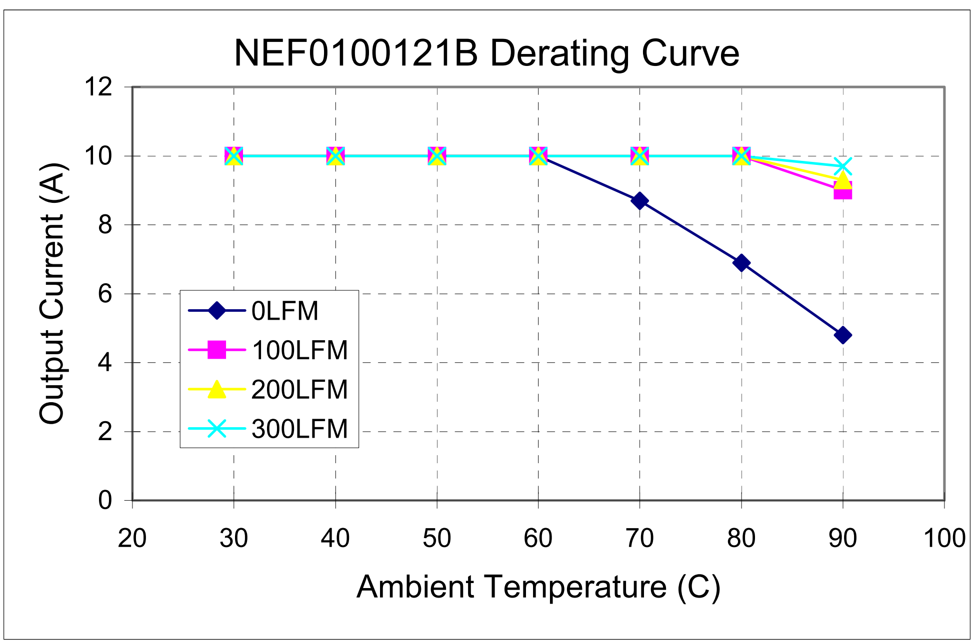


Figure 3. Typical Power Derating vs Output Current for 12Vi and 1.2Vo

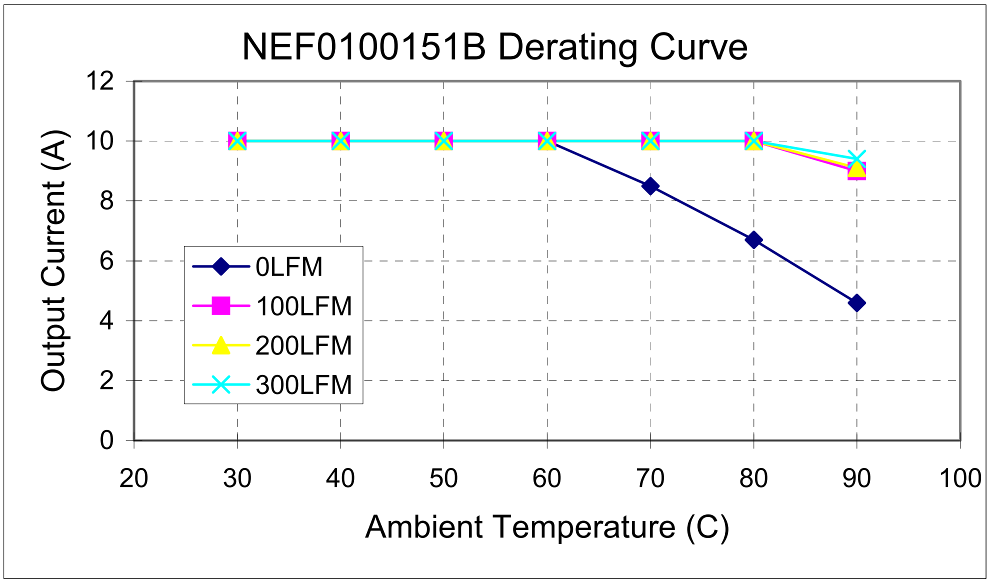


Figure 4. Typical Power Derating vs Output Current for 12Vi and 1.5Vo.

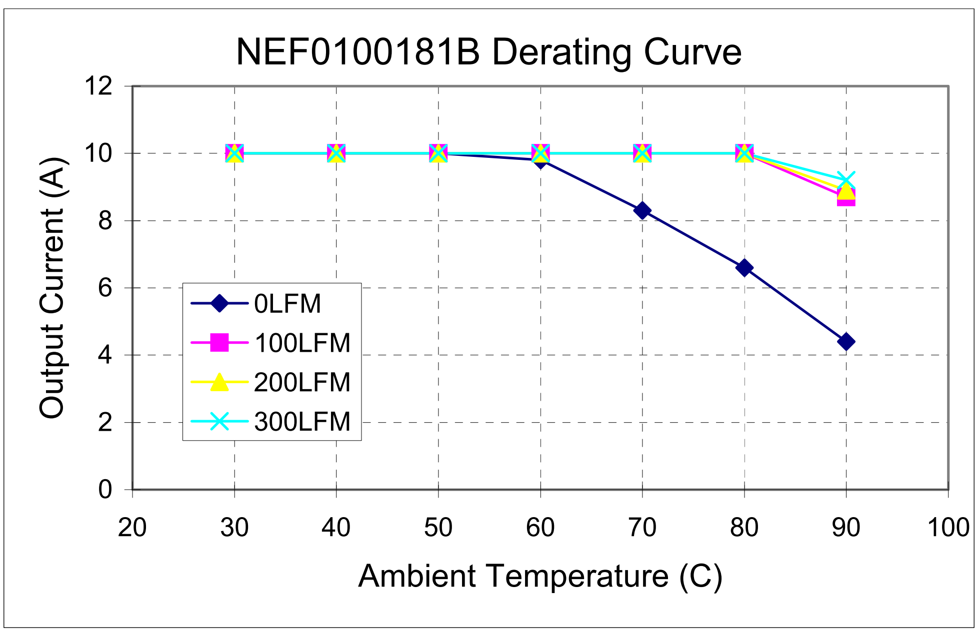


Figure 5. Typical Power Derating vs Output Current for 12Vi and 1.8Vo.

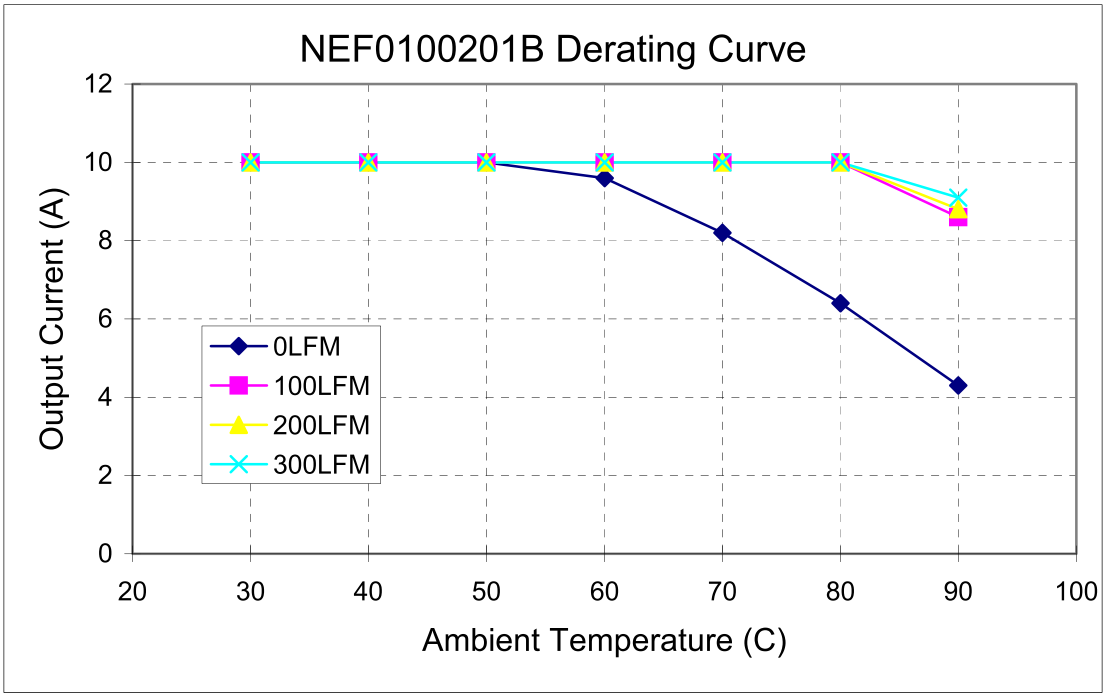


Figure 6. Typical Power Derating vs Output Current for 12Vi and 2.0Vo.

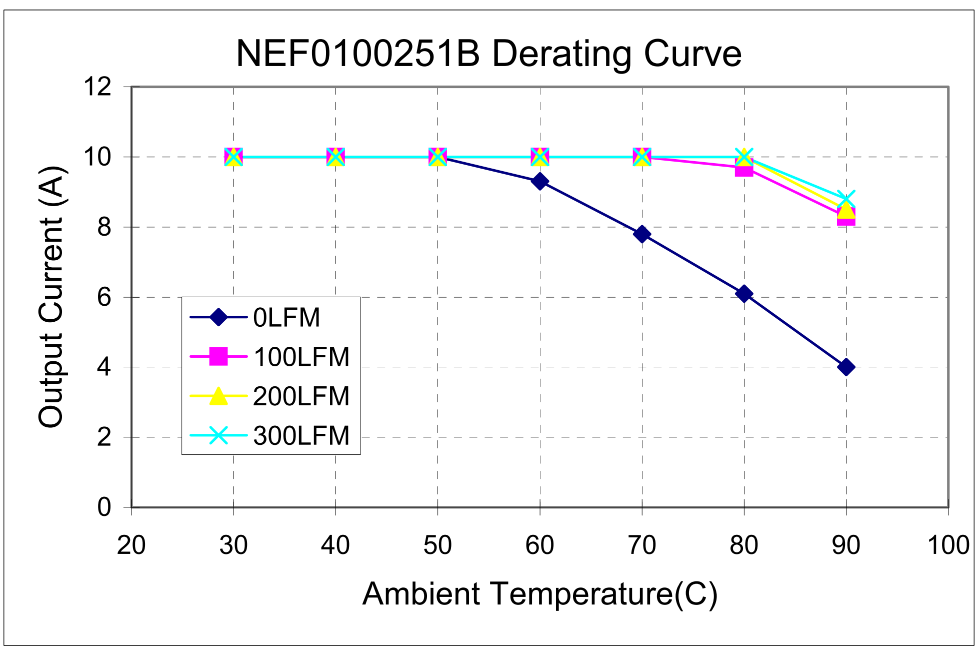


Figure 7. Typical Power Derating vs Output Current for 12Vi and 2.5Vo.

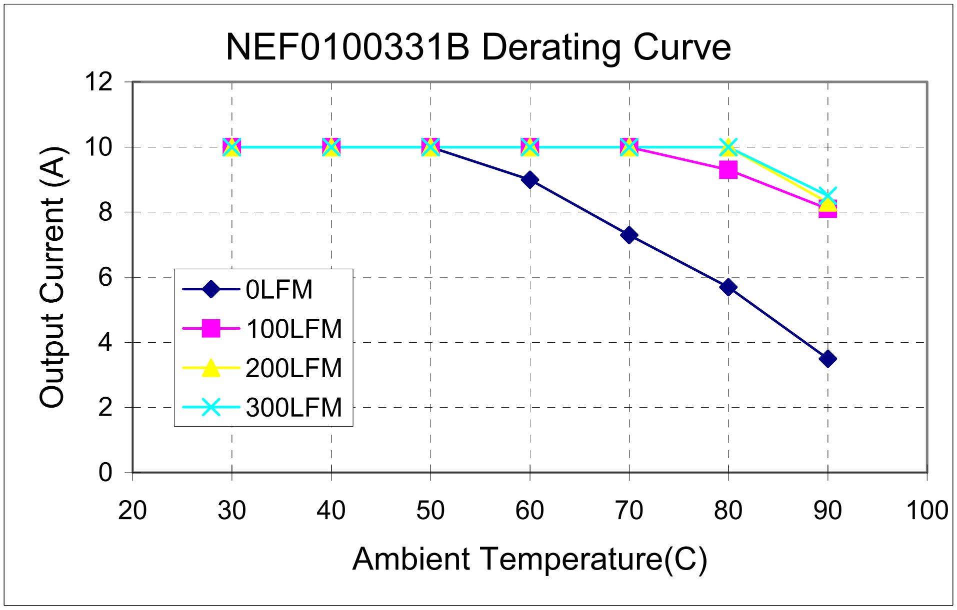


Figure 8. Typical Power Derating vs Output Current for 12Vi and 3.3Vo

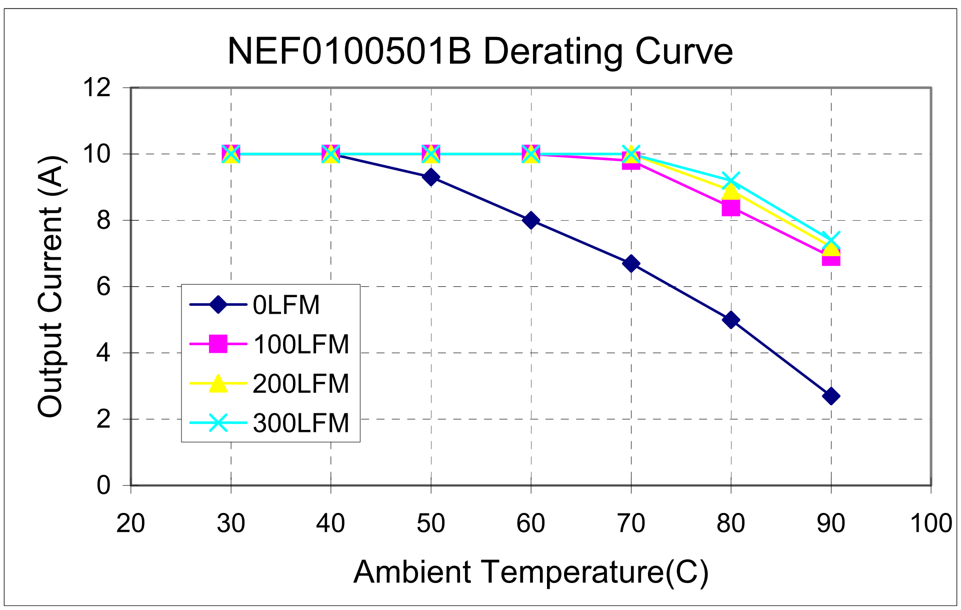


Figure 9. Typical Power Derating vs Output Current for 12Vi and 5.0Vo

TYPICAL EFFICIENCY CURVES

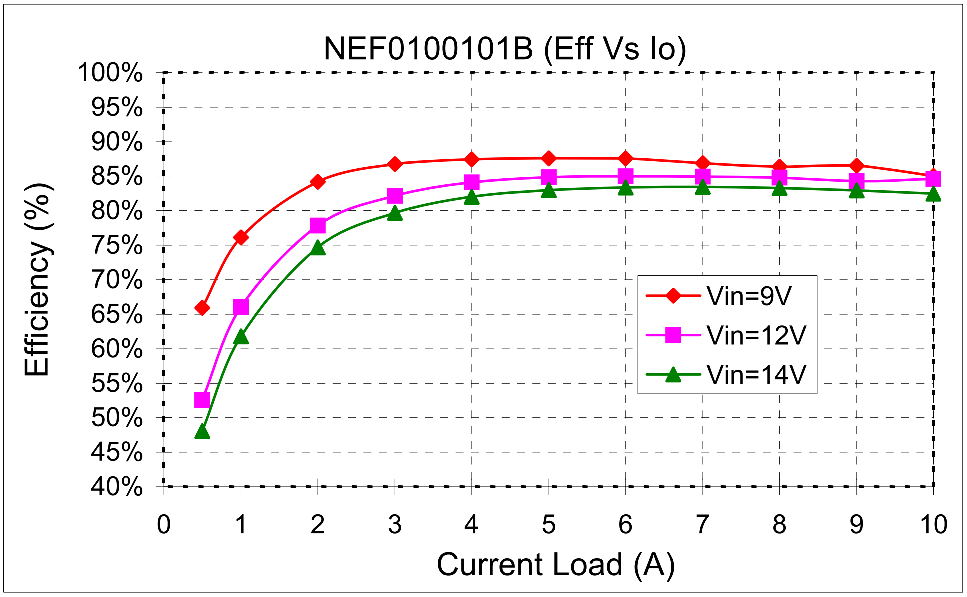


Figure 10. Efficiency Curves for Vout=1.0V (25C)

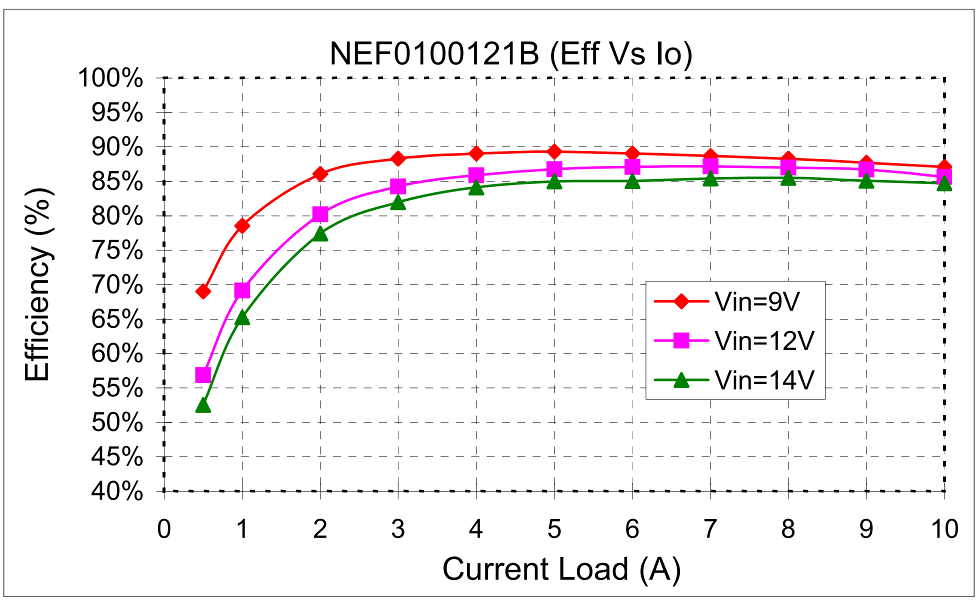


Figure 11. Efficiency Curves for Vout=1.2V (25C)

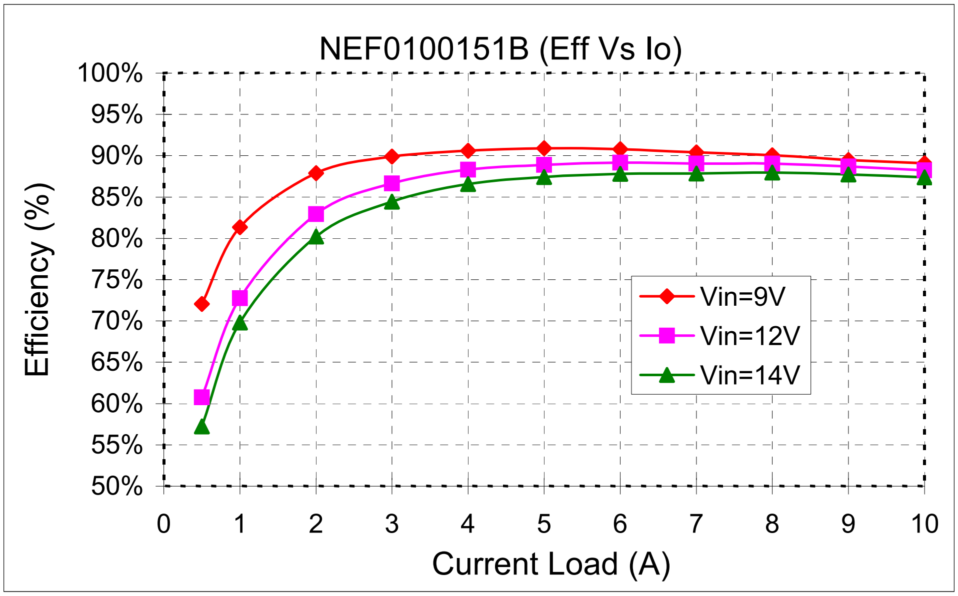


Figure 12. Efficiency Curves for Vout=1.5V (25C)

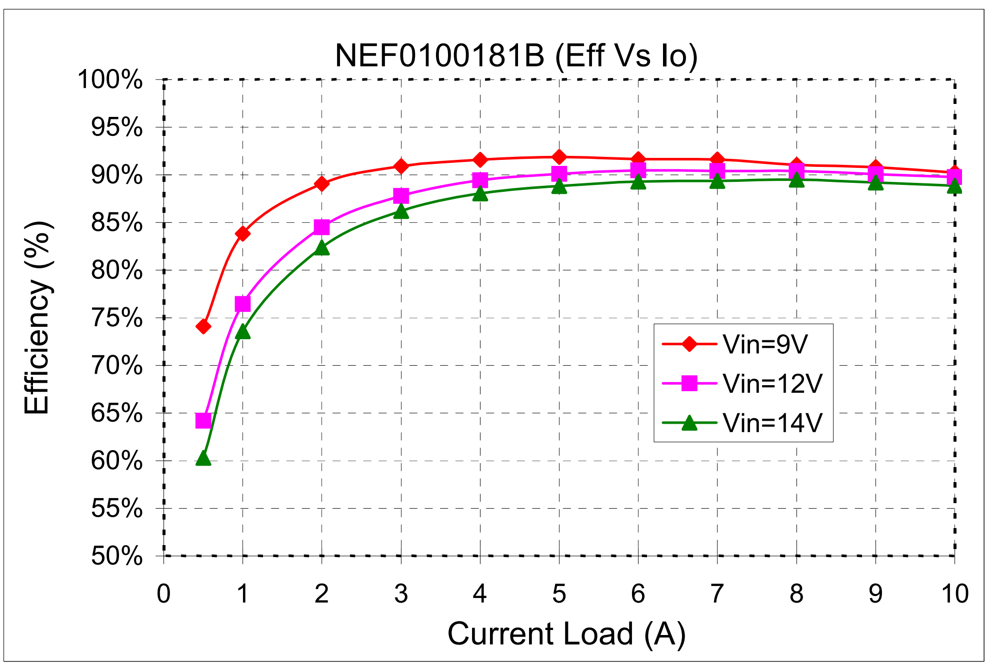


Figure 13. Efficiency Curves for Vout=1.8V (25C)

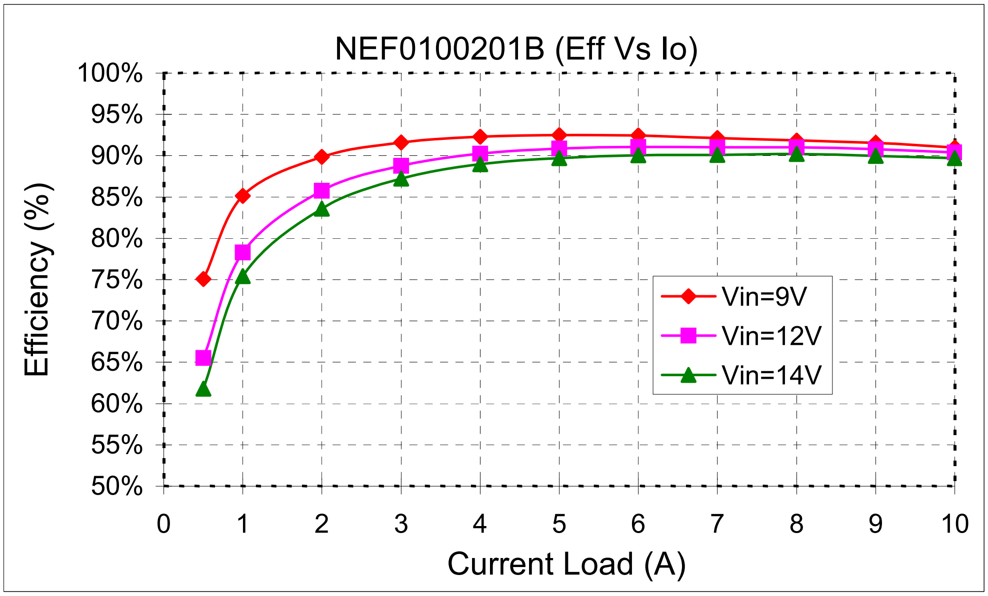


Figure 14. Efficiency Curves for Vout=2.0V (25C)

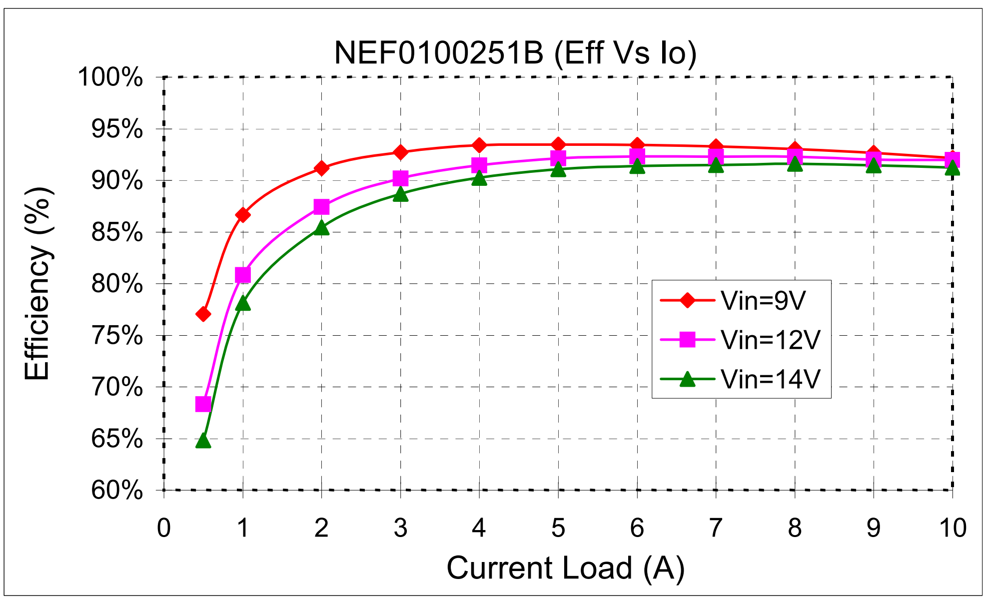


Figure 15. Efficiency Curves for Vout=2.5V (25C)

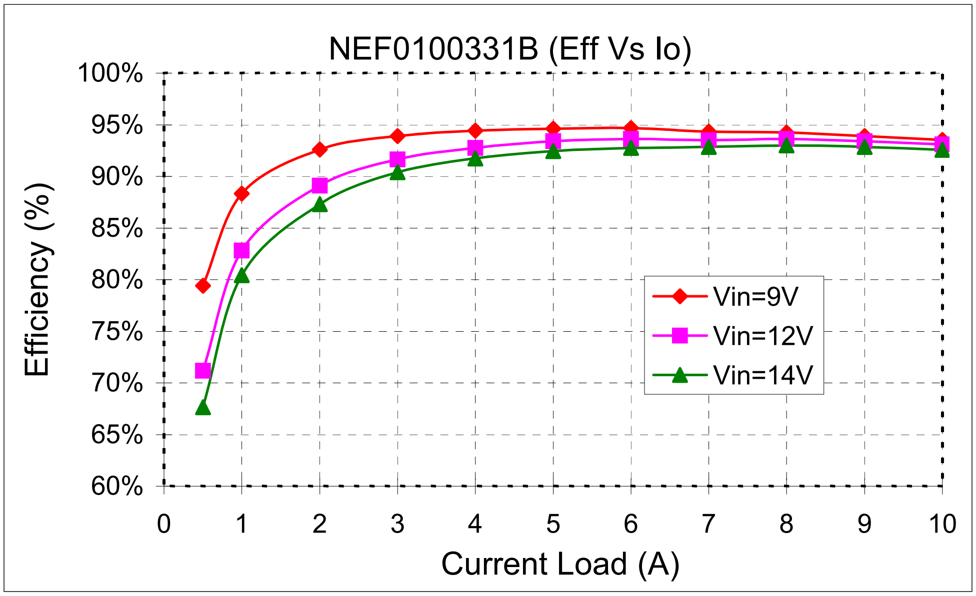


Figure 16. Efficiency Curves for Vout=3.3V (25C)

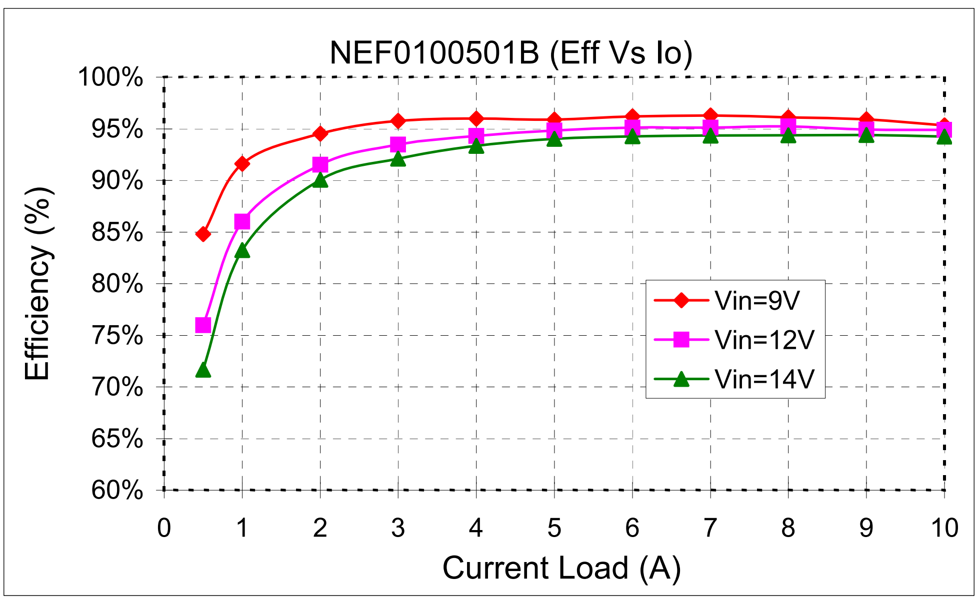
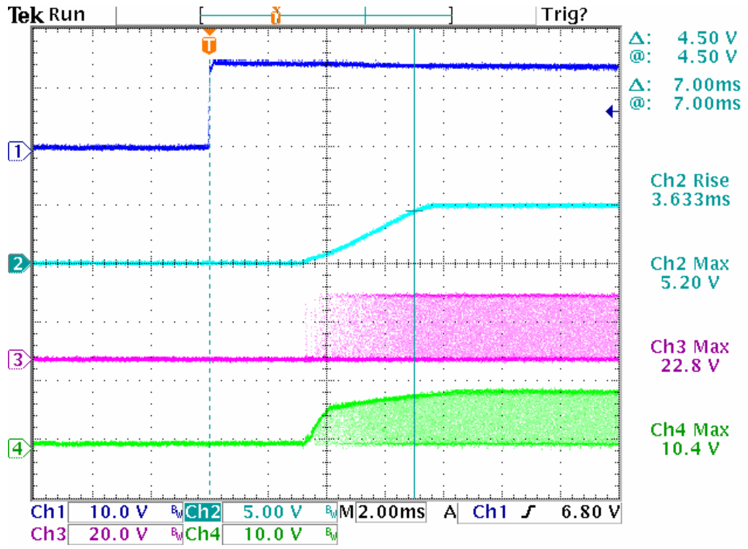


Figure 17. Efficiency Curves for Vout=5.0V (25C)

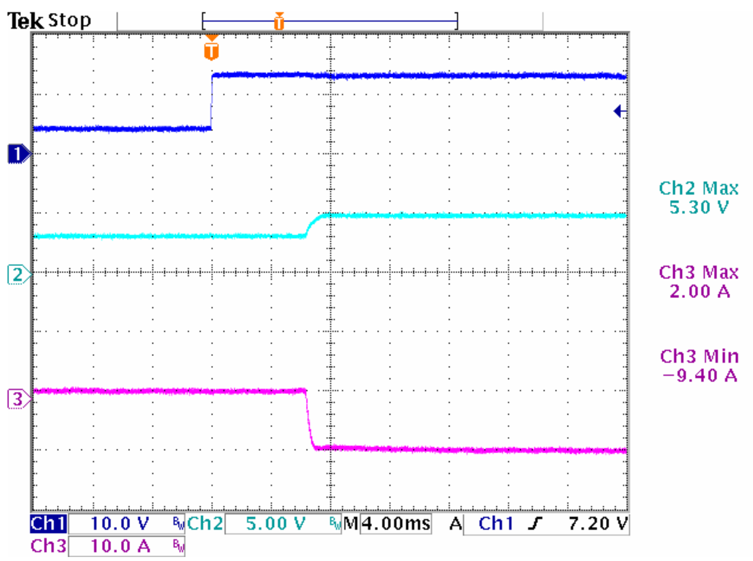
Typical Start Up

Ch1 : Vin
Ch2 : Vout
Ch3.: Top Fet Vg
Ch4 : Bottom Fet Vg



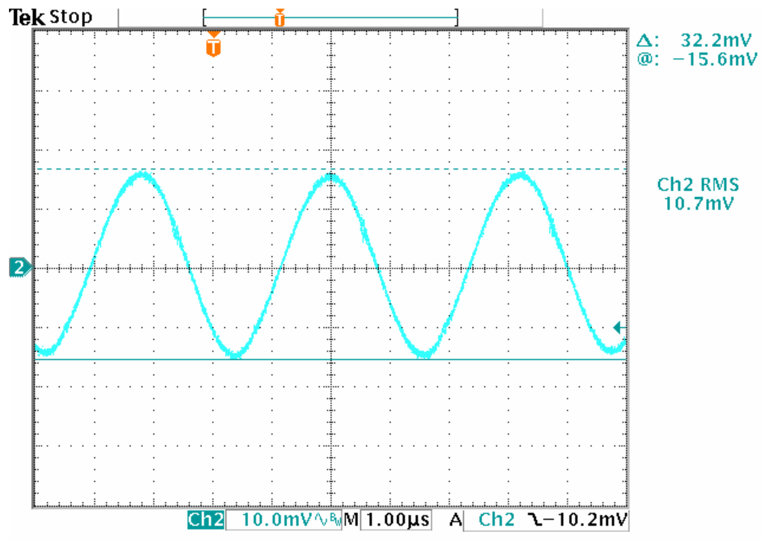
Typical Start Up with pre-bias

Ch1 : Vin
Ch2 : Vout
Ch3 : Output Current



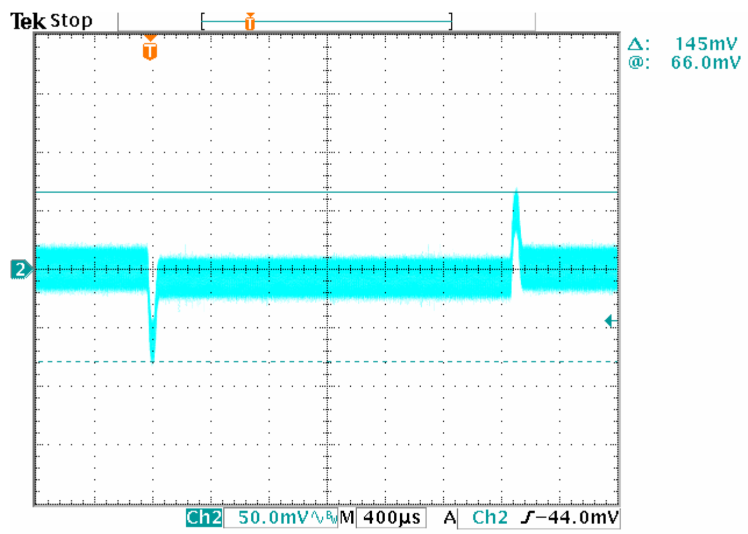
Typical Output Noise and Ripple

Vin = 12Vdc , Vo=5.0V/10A
Output with 1uF ceramic and 10uF tantalum capacitor



Typical Output Transient Response

Vin = 12Vdc , Vo=5.0V , 50% - 100% - 50% Load change , @0.1A/uS



Output Voltage Set point adjustment.

The following relationship establish the calculation of external resistors for the NEF series:

Trim-Up

For trim_Up an external resistor is connected between the TRIM and Ground Pin.

$$R_{trim-up} = \left(\frac{R1 \times 0.7}{Vo - V_{o,\,nom}}\right) - Rt \;\; (\mathrm{K\Omega})$$

Where,

Rt = 1 KΩ
R1 = 15 KΩ
Vo,nom is the nominal output voltage
Vo is the desired output voltage

Trim_Down

For trim down an external resistor is to be connected between TRIM and Vout pins of the module.

The value of Rtrim_Down is calculated from the following relationship.

$$R_{trim-down} = \frac{R1 \times (Vo - 0.7)}{V_{o,\,nom} - Vo} - Rt \;\; (\mathrm{K\Omega})$$

The values of R1 , Rt , Vo,num , Vo are as defined above.

Examples:

Vout = 1.5V Trim_Up required 8% to 1.62V

Vo – Vo,nom = 1.62 – 1.5 = 0.12V

$$R_{trim-up} = \frac{15 \times 0.7}{0.12} - 1 = 86.5\,(\mathrm{K\Omega})$$

Vout = 1.5V Trim_Down required 8% to 1.38V

Vo,nom - Vo = 1.5 – 1.38 = 0.12V

$$R_{trim-down} = \frac{15 \times (1.38 - 0.7)}{0.12} - 1 = 84\,(\mathrm{K\Omega})$$

The following relationship establish the calculation of external resistors for the NEA series:

$$R_{adj} = (\frac{15 \times 0.7}{Vo - 0.7525}) - 1 \ \ (\mathrm{K}\Omega)$$

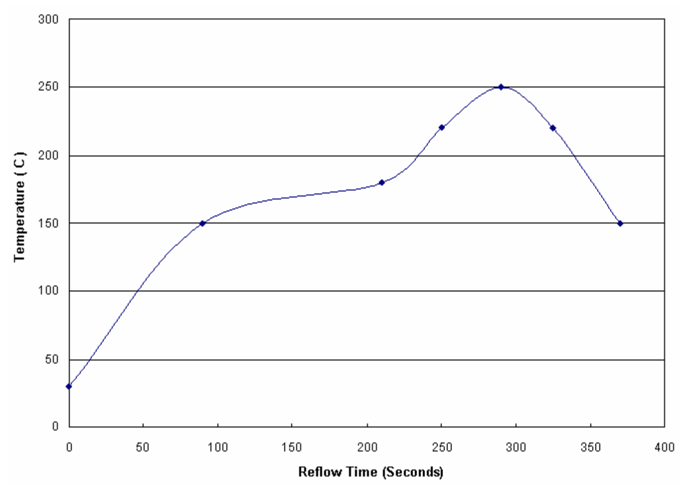
For Vout setting an external resistor is connected between the TRIM and Ground Pin.

Resistor values for different output voltages are calculated as given in the table:

Vo, set (Volts)	RAdj (KΩ)
0.75	Open
1.2	22.46
1.5	13.05
1.8	9.024
2.0	7.417
2.5	5.009
3.3	3.122
5.0	1.472

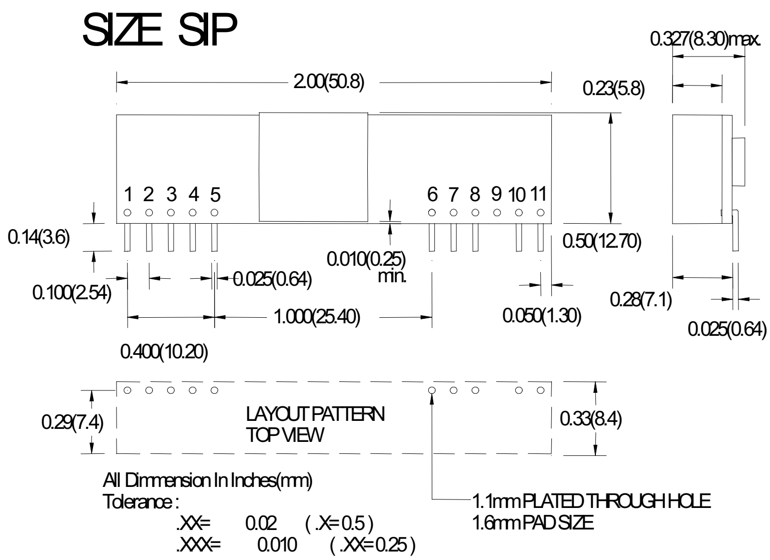
Remote Sense:
All Murata Power Solutions SIP power modules offer an option for remote sense. The remote sense compensates for any distribution drops to accurately control voltage at the point of load. The voltage between the sense pin to Vout pin should not exceed 0.5V.

SMT Lead free Reflow profile



1. Ramp up rate during preheat : 1.33 ℃/Sec (From 30℃ to 150℃)
2. Soaking temperature : 0.29 ℃/Sec (From 150℃ to 180℃)
3. Ramp up rate during reflow : 0.8 ℃/Sec (From 220℃ to 250℃)
4. Peak temperature : 250℃, above 220℃ 40 to 70 Seconds
5. Ramp up rate during cooling : -1.56 ℃/Sec (From 220℃ to 150℃)

Mechanical Information



PIN CONNECTION	
Pin	FUNCTION
1	+Output
2	+Output
3	+Sense
4	+Output
5	Common
6	Common
7	+V Input
8	+V Input
9	No Pin
10	Trim
11	On/Off Control

Safety Considerations

The NEA/NEF series of converters are certified to IEC/EN/CSA/UL 60950. If this product is built into information technology equipment, the installation must comply with the above standard. An external input fuse (no more than 20 Amps, recommended) must be used to meet the above requirements. The output of the converter [Vo(+)/Vo(-)] is considered to remain within SELV limits when the input to the converter meets SELV or TNV-2 requirements.
The converters and materials meet UL 94V-0 flammability ratings.

Ordering Information

Note: SMT versions are also available. See applicable datasheet for details.

Part Number	Vin	Vout	Iout	Enable Logic	Pin Length
NEF0100101B0C	8.3V - 14.0V	1.0V	10A	Positive	0.139"
NEF0100121B0C	8.3V - 14.0V	1.2V	10A	Positive	0.139"
NEF0100151B0C	8.3V - 14.0V	1.5V	10A	Positive	0.139"
NEF0100181B0C	8.3V - 14.0V	1.8V	10A	Positive	0.139"
NEF0100201B0C	8.3V - 14.0V	2.0V	10A	Positive	0.139"
NEF0100251B0C	8.3V - 14.0V	2.5V	10A	Positive	0.139"
NEF0100331B0C	8.3V - 14.0V	3.3V	10A	Positive	0.139"
NEF0100501B0C	8.3V - 14.0V	5.0V	10A	Positive	0.139"
NEF0100101S0C	8.3V - 14.0V	1.0V	10A	Positive	SMT
NEF0100121S0C	8.3V - 14.0V	1.2V	10A	Positive	SMT
NEF0100151S0C	8.3V - 14.0V	1.5V	10A	Positive	SMT
NEF0100181S0C	8.3V - 14.0V	1.8V	10A	Positive	SMT
NEF0100201S0C	8.3V - 14.0V	2.0V	10A	Positive	SMT
NEF0100251S0C	8.3V - 14.0V	2.5V	10A	Positive	SMT
NEF0100331S0C	8.3V - 14.0V	3.3V	10A	Positive	SMT
NEF0100501S0C	8.3V - 14.0V	5.0V	10A	Positive	SMT
NEF0100100B0C	8.3V - 14.0V	1.0V	10A	Negative	0.139"
NEF0100120B0C	8.3V - 14.0V	1.2V	10A	Negative	0.139"
NEF0100150B0C	8.3V - 14.0V	1.5V	10A	Negative	0.139"
NEF0100180B0C	8.3V - 14.0V	1.8V	10A	Negative	0.139"
NEF0100200B0C	8.3V - 14.0V	2.0V	10A	Negative	0.139"
NEF0100250B0C	8.3V - 14.0V	2.5V	10A	Negative	0.139"
NEF0100330B0C	8.3V - 14.0V	3.3V	10A	Negative	0.139"
NEF0100500B0C	8.3V - 14.0V	5.0V	10A	Negative	0.139"
NEF0100100S0C	8.3V - 14.0V	1.0V	10A	Negative	SMT
NEF0100120S0C	8.3V - 14.0V	1.2V	10A	Negative	SMT
NEF0100150S0C	8.3V - 14.0V	1.5V	10A	Negative	SMT
NEF0100180S0C	8.3V - 14.0V	1.8V	10A	Negative	SMT
NEF0100200S0C	8.3V - 14.0V	2.0V	10A	Negative	SMT
NEF0100250S0C	8.3V - 14.0V	2.5V	10A	Negative	SMT
NEF0100330S0C	8.3V - 14.0V	3.3V	10A	Negative	SMT
NEF0100500S0C	8.3V - 14.0V	5.0V	10A	Negative	SMT
NEA0101500B0C	8.3V - 14.0V	0.75V – 5.0V	10A	Negative	0.139"
NEA0101500S0C	8.3V - 14.0V	0.75V – 5.0V	10A	Negative	SMT
NEA0101501B0C	8.3V - 14.0V	0.75V – 5.0V	10A	Positive	0.139"
NEA0101501S0C	8.3V - 14.0V	0.75V – 5.0V	10A	Positive	SMT

NOT RECOMMENDED FOR NEW DESIGNS

Recommended Alternatives:

NEA0101500B0C > OKX-T/10-D12N-C
NEA0101500S0C > OKY-T/10-D12N-C
NEA0101501B0C > OKX-T/10-D12P-C
NEA0101501S0C > OKY-T/10-D12P-C

RoHS COMPLIANT 2002/95/EC

Label Information

N E A 0 1 0 x x x 0 B 0 – X C

C = RoHS Compliant

X = Factory control character
(not required when ordering)

0 = Standard. (No PGood option)
P = Power Good Option

Iout

Vout

Place Holder

Vout Range
F=Fixed
A=Adjustable

Pin Length Option
B=0.139"
S=SMT

Vin (value or range)
C= 3.3V-5.0V
E= 8.3V-14V
F= 6.0V-14V

Enable Logic, 0 for -ve, 1 for +ve

Non-Isolated Family

RoHS Compliant
The NEA/NEF010 series of converters is in compliance with the European Union Directive 2002/95/EC (RoHS) with repsect to the following sustances: lead (Pb), mercury (Hg), cadmium (Cd), hexavalent chromium, polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE).