

## FEATURES

- UL60950 Reinforced Insulation
- ANSI/AAMI ES60601-1, 1 MOOPP/2 MOOP's recognised
- 4:1 Wide range voltage input<sup>3</sup>
- Operating temperature range -40°C to 85°C
- 5.2kVDC isolation 'Hi Pot Test'
- Typical efficiency to 88%
- 5V, 12V & 48V Nominal input
- Power density 0.94W/cm<sup>3</sup>
- 5mm creepage guaranteed
- Under voltage lock out
- Control pin option

## PRODUCT OVERVIEW

The NCM6 series of DC/DC converters offers single & dual output voltages from wide input voltage ranges ranges of 4.5-9, 9-36V & 18-75V.. The NCM6 is housed in an industry standard package with a standard pinout. The NCM6 is encapsulated for superior thermal performance.

Applications include medical, telecommunication battery powered systems, process control and distributed power systems.



## SELECTION GUIDE

| Order Code <sup>1</sup> | Input Voltage | Output Voltage | Output Current | Efficiency       |        | Efficiency |        | Isolation Capacitance | MTTF <sup>2</sup> |
|-------------------------|---------------|----------------|----------------|------------------|--------|------------|--------|-----------------------|-------------------|
|                         | Nom.          |                |                | 5V/12V/48V Input |        | 24V Input  |        |                       |                   |
|                         | V             | V              | A              | Min. %           | Typ. % | Min. %     | Typ. % | pF                    | Hrs               |
| NCM6D0505C              | 5             | ±5             | ±0.6           | 78               | 80     |            |        | 10                    | 492,600           |
| NCM6D0512C              | 5             | ±12            | ±0.25          | 81               | 83     |            |        | 15                    | 537,754           |
| NCM6D0515C              | 5             | ±15            | ±0.2           | 81               | 83     |            |        | 15                    | 462,042           |
| NCM6S0503C              | 5             | 3.3            | 1.52           | 73               | 75     |            |        | 15                    | 548,686           |
| NCM6S0505C              | 5             | 5              | 1.2            | 77               | 80     |            |        | 15                    | 576,445           |
| NCM6S0512C              | 5             | 12             | 0.5            | 80               | 82     |            |        | 20                    | 608,806           |
| NCM6S0515C              | 5             | 15             | 0.4            | 80               | 82     |            |        | 15                    | 566,572           |
| NCM6D1205C              | 12            | ±5             | ±0.6           | 81               | 83     | 79         | 80     | 15                    | 285,466           |
| NCM6D1212C              | 12            | ±12            | ±0.25          | 86               | 88     | 81         | 84     | 25                    | 412,808           |
| NCM6D1215C              | 12            | ±15            | ±0.2           | 85               | 87     | 82         | 84     | 25                    | 366,356           |
| NCM6S1203C              | 12            | 3.3            | 1.52           | 75               | 79     | 74         | 77     | 12                    | 685,045           |
| NCM6S1205C              | 12            | 5              | 1.2            | 81               | 82     | 79         | 80     | 15                    | 475,352           |
| NCM6S1212C              | 12            | 12             | 0.5            | 84               | 86     | 81         | 83     | 25                    | 490,876           |
| NCM6S1215C              | 12            | 15             | 0.4            | 85               | 87     | 82         | 84     | 25                    | 457,651           |
| NCM6D4805C              | 48            | ±5             | ±0.6           | 77               | 80     | 79         | 81     | 10                    | 393,923           |
| NCM6D4812C              | 48            | ±12            | ±0.25          | 78               | 82     | 82         | 84     | 22                    | 444,419           |
| NCM6D4815C              | 48            | ±15            | ±0.2           | 81               | 83     | 84         | 86     | 25                    | 409,328           |
| NCM6S4803C              | 48            | 3.3            | 1.52           | 71               | 74     | 71         | 76     | 12                    | 552,818           |
| NCM6S4805C              | 48            | 5              | 1.2            | 74               | 78     | 75         | 80     | 15                    | 467,793           |
| NCM6S4812C              | 48            | 12             | 0.5            | 79               | 82     | 83         | 84     | 20                    | 520,610           |
| NCM6S4815C              | 48            | 15             | 0.4            | 81               | 83     | 85         | 86     | 25                    | 499,288           |

## SELECTION GUIDE (Continued)

| Order Code | Input Current                |                              |                   |                   | Ripple & Noise |
|------------|------------------------------|------------------------------|-------------------|-------------------|----------------|
|            | 0% Load                      | 100% Load                    | 0% Load           | 100% Load         |                |
|            | Typ. 5V, 12V or 48V Input mA | Typ. 5V, 12V or 48V Input mA | Typ. 24V Input mA | Typ. 24V Input mA | Typ. mVp/p     |
| NCM6D0505C | 20                           | 1500                         |                   |                   | 20             |
| NCM6D0512C | 25                           | 1450                         |                   |                   | 20             |
| NCM6D0515C | 30                           | 1450                         |                   |                   | 15             |
| NCM6S0503C | 8                            | 1300                         |                   |                   | 10             |
| NCM6S0505C | 20                           | 1500                         |                   |                   | 20             |
| NCM6S0512C | 25                           | 1500                         |                   |                   | 90             |
| NCM6S0515C | 30                           | 1500                         |                   |                   | 90             |
| NCM6D1205C | 11                           | 600                          | 9                 | 310               | 100            |
| NCM6D1212C | 13                           | 560                          | 12                | 300               | 100            |
| NCM6D1215C | 15                           | 570                          | 13                | 300               | 100            |
| NCM6S1203C | 10                           | 525                          | 9                 | 270               | 60             |
| NCM6S1205C | 10                           | 610                          | 9                 | 315               | 25             |
| NCM6S1212C | 15                           | 575                          | 12                | 300               | 70             |
| NCM6S1215C | 15                           | 575                          | 13                | 300               | 105            |
| NCM6D4805C | 6                            | 160                          | 7                 | 310               | 150            |
| NCM6D4812C | 8                            | 150                          | 9                 | 300               | 100            |
| NCM6D4815C | 8                            | 150                          | 10                | 300               | 150            |
| NCM6S4803C | 10                           | 140                          | 7                 | 275               | 30             |
| NCM6S4805C | 10                           | 160                          | 7                 | 300               | 25             |
| NCM6S4812C | 10                           | 150                          | 9                 | 300               | 70             |
| NCM6S4815C | 10                           | 150                          | 10                | 300               | 95             |

1 To order with optional control pin insert an 'E' prior to the suffix C, i.e. NCM6S1205EC.

2 Calculated using MIL-HDBK-217F FN2, parts stress method with nominal input voltage at full load.

3. 5V inputs have a 2:1 input range.

All specifications typical at TA=25°C, nominal input voltage and rated output current unless otherwise specified.

| INPUT CHARACTERISTICS    |                            |      |      |      |        |
|--------------------------|----------------------------|------|------|------|--------|
| Parameter                | Conditions                 | Min. | Typ. | Max. | Units  |
| Voltage range            | NCM6X05                    | 4.5  | 5    | 9    | V      |
|                          | NCM6X12                    | 9    | 12   | 36   |        |
|                          | NCM6X48                    | 18   | 48   | 75   |        |
| Under voltage lock out   | Turn on threshold NCM6X05  |      | 4.2  |      | V      |
|                          | Turn off threshold NCM6X05 |      | 3.6  |      |        |
|                          | Turn on threshold NCM6X12  |      | 8.2  |      |        |
|                          | Turn off threshold NCM6X12 |      | 6.5  |      |        |
|                          | Turn on threshold NCM6X48  |      | 14   |      |        |
|                          | Turn off threshold NCM6X48 |      | 13.7 |      |        |
| Reflected ripple current | All variants               |      | 10   |      | mA p-p |

| ISOLATION CHARACTERISTICS |              |      |      |      |       |
|---------------------------|--------------|------|------|------|-------|
| Parameter                 | Conditions   | Min. | Typ. | Max. | Units |
| Isolation test voltage    | Flash tested | 5200 |      |      | VDC   |
| Resistance                | Viso = 1kVDC | 1    |      |      | GΩ    |

| OUTPUT CHARACTERISTICS  |   |          |      |   |       |      |
|---|---|----------|------|---|-------|------|
| Parameter   | Conditions  | Min.     | Typ. | Max.  | Units |      |
| Rated power   | 5V, 12V & 15V output types  |          |      | 6   | W     |      |
|   | 3.3V output types   |          |      | 5   |       |      |
| Voltage set point accuracy                                    | D4812C & D4815C, SXX03C, SXX12C & SXX15C  |          |      | ±2  | %     |      |
|   | SXX05C  |          |      | ±2.5  |       |      |
|   | D1212C & D1215C   |          |      | ±3  |       |      |
|   | D0505C, D0512C, D0515C, D1205C & D4805C   | Positive |      | ±2  |       |      |
| Line regulation   | Low line to high line   |          |      | Negative  | ±3    |      |
|   |   |          |      | Single  | 0.1   | 0.5  |
| Load Regulation   | 10% total load to 100% total load   |          |      | Dual  | 0.1   | 0.75 |
|   |   |          |      | NCM6xxx03C, D0512C & D0515C                             | 0.5   | 1    |
| Cross Regulation  | % voltage change on negative output when positive load varies from 12.5% to 37.5% with negative load fixed at 50% |          |      | NCM6xxx05C  | 0.3   | 1    |
|   |   |          |      | NCM6Sxx12C, NCM6Sxx15C, D1212C, D1215C, D4812C & D4815C | 0.06  | 0.5  |
|   |   |          |      | 5V  |       | 5    |
| Minimum output load for specification (see application notes) | 10% of rated load   |          |      | 12V & 15V   |       | 3    |
|   |   |          |      |   |       |      |
| Transient Response  | Peak deviation - Single Output (25-75% & 75-25% swing)<br>- Dual Output (12.5-37.5% & 37.5-12.5% swing)           |          |      |   | %Vout |      |
|   | SXX03C  |          | 10   |   |       |      |
|   | SXX05C  |          | 8    |   |       |      |
|   | S4815   |          | 2    |   |       |      |
|   | D0505, S0512 & S0515  |          | 5    |   |       |      |
|   | D0512 & D0515   |          | 2    |   |       |      |
|   | D1205   |          | 6    |   |       |      |
|   | D1212, D1215 & S4812  |          | 3    |   |       |      |
|   | D4805 & D4815   |          | 9    |   |       |      |
|   | D4812   |          | 1    |   |       |      |
|   | S1212 & S1215   |          | 4    |   |       |      |
|   | Settling time (within 1% Vout Nom.)   |          | 250  |   |       | μs   |

### ABSOLUTE MAXIMUM RATINGS

|  |            |
|--|------------|
| Short-circuit protection (for SELV input voltages)                           | Continuous |
| Lead temperature 1.0mm from case for 10 seconds (to JEDEC JESD22-B106 ISS C) | 260°C      |
| Input voltage, NCM6X05   | 10V        |
| Input voltage, NCM6X12   | 40V        |
| Input voltage, NCM6X48   | 80V        |
| Control pin input voltage  | ±20V       |

### GENERAL CHARACTERISTICS<sup>1</sup>

| Parameter           | Conditions                     | Min. | Typ. | Max. | Units |
|---------------------|--------------------------------|------|------|------|-------|
| Switching frequency |                                |      | 300  |      | kHz   |
| Control pin input   | Module on (or pin unconnected) |      |      | 1.0  | V     |
|                     | Module off                     | 3.0  |      |      |       |

### TEMPERATURE CHARACTERISTICS

| Parameter                           | Conditions   | Min. | Typ. | Max. | Units |
|-------------------------------------|--|------|------|------|-------|
| Operation                           |  | -40  |      | 85   | °C    |
| Storage                             |  | -50  |      | 125  |       |
| Case temperature rise above ambient | D0515, D1212, D1215, D4815, S1212, S1215, S4812, S4815 |      | 35   |      |       |
|                                     | D0512, D4812, S1203, S1205                             |      | 40   |      |       |
|                                     | D0505, D1205, D4805, S0503, S0512, 0515, 4803, 4805    |      | 45   |      |       |
|                                     | S0505C   |      | 47   |      |       |
| Thermal shutdown                    | Case Temperature                                       |      | +105 |      |       |

### RoHS COMPLIANCE INFORMATION



This series is compatible with RoHS soldering systems with a peak wave solder temperature of 260°C for 10 seconds. The pin termination finish on this product series is a Gold flash (0.05-0.10 micron) over Nickel Preplate. The series is backward compatible with Sn/Pb soldering systems. For further information, please visit [www.murata-ps.com/rohs](http://www.murata-ps.com/rohs)

### APPLICATION NOTES

#### Output Capacitance and start-up times

The NCM6 series does not require output capacitors to meet datasheet specification. To meet datasheet specification, output capacitance should not exceed:

| Part No.   | Maximun Load Capacitance (per output) | Start-up times |
|------------|---------------------------------------|----------------|
|            | µF                                    | ms             |
| NCM6D0505C | 220                                   | 6              |
| NCM6D0512C | 100                                   | 12             |
| NCM6D0515C | 100                                   | 18             |
| NCM6S0503C | 470                                   | 4              |
| NCM6S0505C | 220                                   | 7              |
| NCM6S0512C | 100                                   | 12             |
| NCM6S0515C | 100                                   | 17             |
| NCM6D1205C | 220                                   | 5              |
| NCM6D1212C | 100                                   | 12             |
| NCM6D1215C | 100                                   | 17             |
| NCM6S1203C | 470                                   | 2              |
| NCM6S1205C | 220                                   | 6              |
| NCM6S1212C | 100                                   | 14             |
| NCM6S1215C | 100                                   | 17             |
| NCM6D4805C | 220                                   | 10             |
| NCM6D4812C | 100                                   | 40             |
| NCM6D4815C | 100                                   | 60             |
| NCM6S4803C | 470                                   | 2              |
| NCM6S4805C | 220                                   | 5              |
| NCM6S4812C | 100                                   | 15             |
| NCM6S4815C | 100                                   | 20             |

#### Control Pin

This provides an OFF function which puts the converter into a low power mode when >3V is applied to the pin. When the control pin is left un-connected or less than 1V the converter is ON

#### Minimum Load

The minimum load to meet full datasheet specification is 10% of the full rated load across the specified input voltage range.

Between 0% and 10% output loading, the output voltage will remain within data sheet specification however, output ripple and noise may increase but will still be below 150mV p-p.

### TECHNICAL NOTES

#### ISOLATION VOLTAGE

'Hi Pot Test', 'Flash Tested', 'Withstand Voltage', 'Proof Voltage', 'Dielectric Withstand Voltage' & 'Isolation Test Voltage' are all terms that relate to the same thing, a test voltage, applied for a specified time, across a component designed to provide electrical isolation, to verify the integrity of that isolation.

Murata Power Solutions NCM6 series of DC/DC converters are all 100% production tested at their stated isolation voltage. This is 5.2kVDC for 1 second.

A question commonly asked is, "What is the continuous voltage that can be applied across the part in normal operation?"

The NCM6 series has been recognized by Underwriters Laboratory to 250Vrms for Reinforced Insulation.

#### REPEATED HIGH-VOLTAGE ISOLATION TESTING

It is well known that repeated high-voltage isolation testing of a barrier component can actually degrade isolation capability, to a lesser or greater degree depending on materials, construction and environment. We therefore strongly advise against repeated high voltage isolation testing, but if it is absolutely required, that the voltage be reduced by 20% from specified test voltage.

**SAFETY APPROVAL**

**ANSI/AAMI ES60601-1**

The NCM6 series has been recognised by Underwriters Laboratory (UL) to ANSI/AAMI ES60601-1 and provides 1 MOPP (Means Of Patient Protection) and 2 MOOP (Means Of Operator Protection) based upon a working voltage of 250 Vrms max., between Primary and Secondary. File number E202895 applies.

**UL 60950**

The NCM6 series has been recognised by Underwriters Laboratory (UL) to UL 60950 for reinforced insulation to a working voltage of 250Vrms. File number E151252 applies.

**FUSING**

The NCM6 Series of converters are not internally fused so to meet the requirements of UL an anti-surge input line fuse should always be used with ratings as defined below.

Input Voltage, 5V 3A

Input Voltage, 12V 2A

Input Voltage, 48V 1A

All fuses should be UL recognised and rated to at least the maximum allowable DC input voltage.

**CHARACTERISATION TEST METHODS**

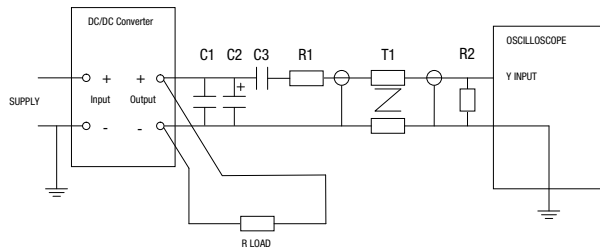
**Ripple & Noise Characterisation Method**

Ripple and noise measurements are performed with the following test configuration.

|       |  |
|-------|--|
| C1    | 1µF X7R multilayer ceramic capacitor, voltage rating to be a minimum of 3 times the output voltage of the DC/DC converter                                |
| C2    | 10µF tantalum capacitor, voltage rating to be a minimum of 1.5 times the output voltage of the DC/DC converter with an ESR of less than 100mΩ at 100 kHz |
| C3    | 100nF multilayer ceramic capacitor, general purpose  |
| R1    | 450Ω resistor, carbon film, ±1% tolerance  |
| R2    | 50Ω BNC termination  |
| T1    | 3T of the coax cable through a ferrite toroid  |
| RLOAD | Resistive load to the maximum power rating of the DC/DC converter. Connections should be made via twisted wires  |

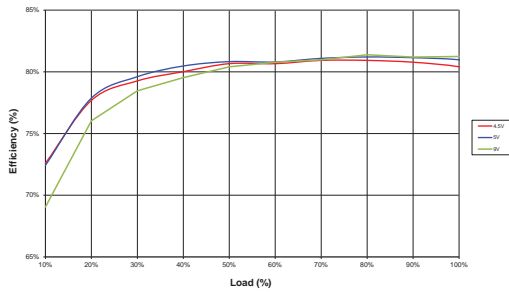
Measured values are multiplied by 10 to obtain the specified values.

**Differential Mode Noise Test Schematic**

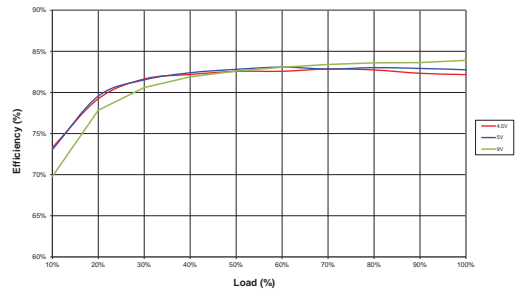


**EFFICIENCY VS LOAD**

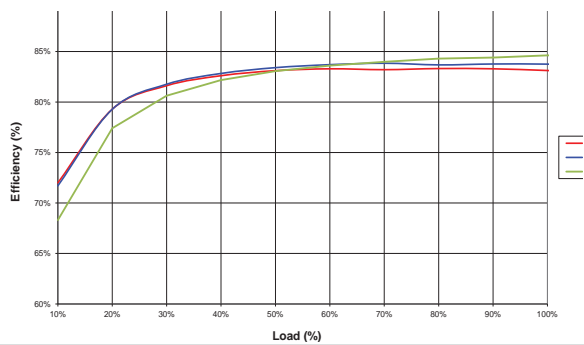
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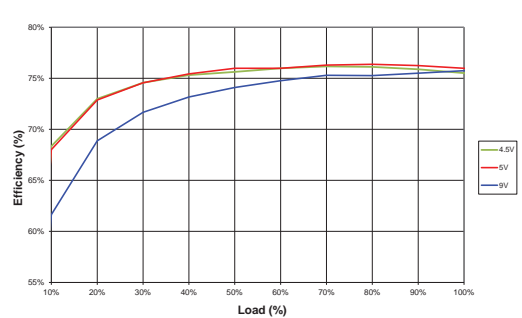
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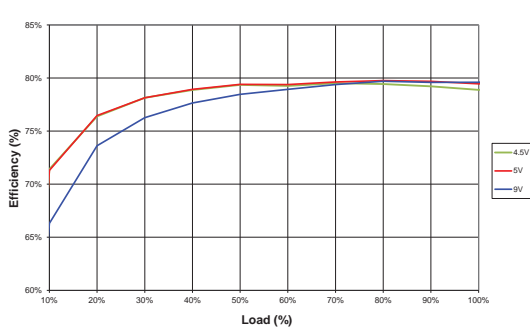
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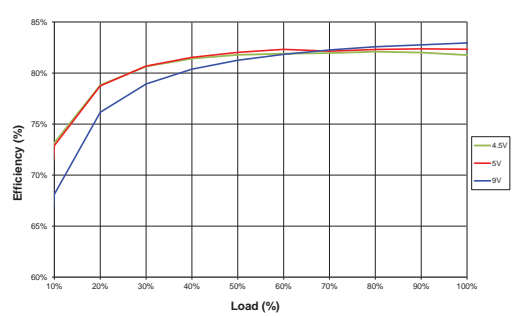
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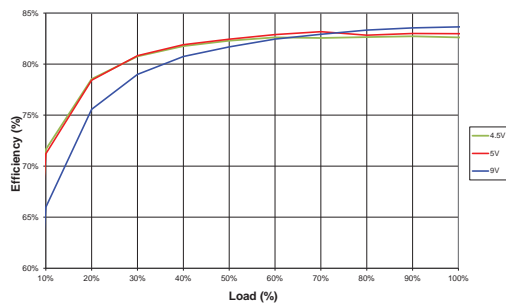
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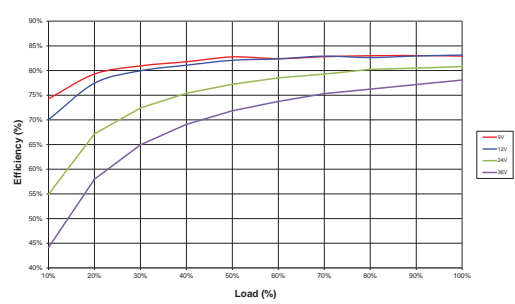
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**NCM6S0515C**

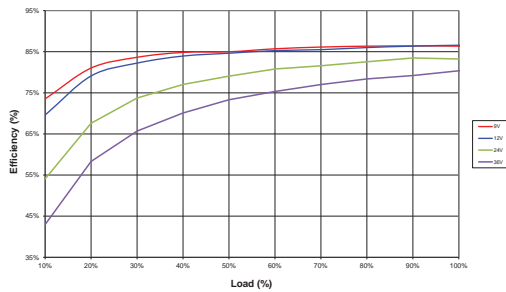


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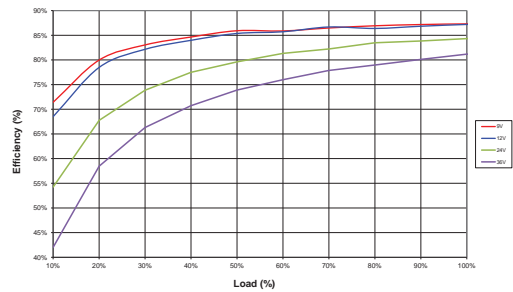


**EFFICIENCY VS LOAD**

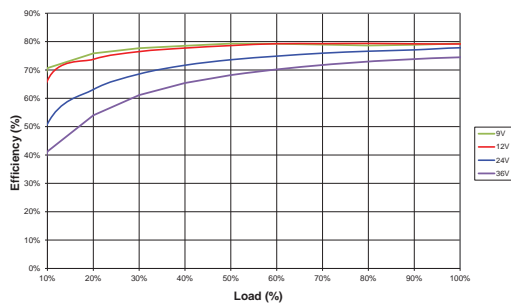
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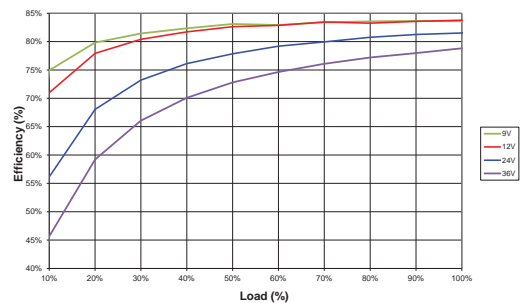
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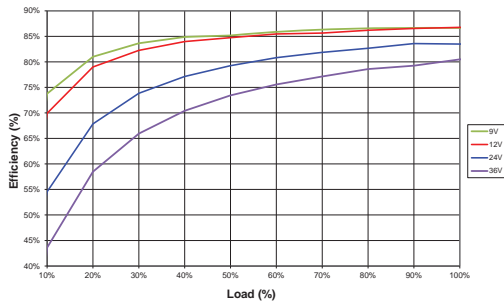
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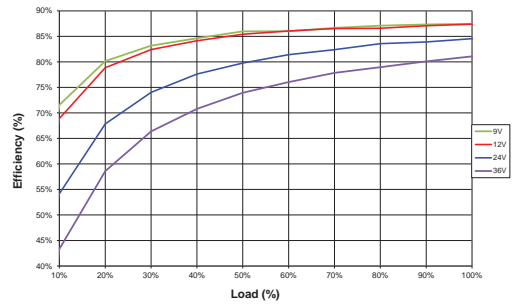
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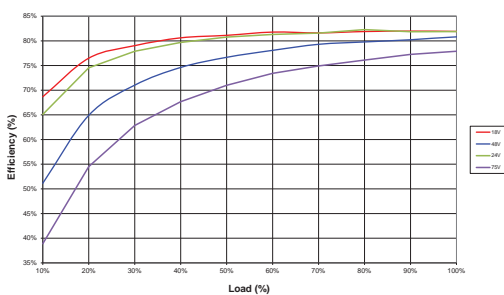
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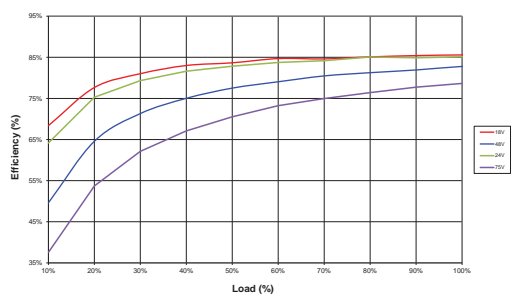
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**NCM6D4805C**

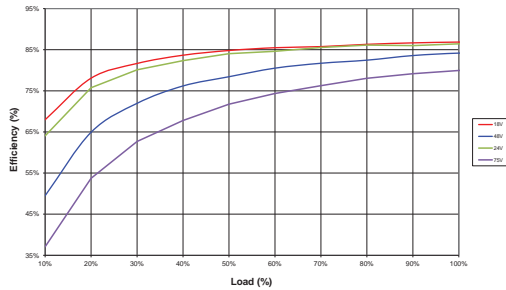


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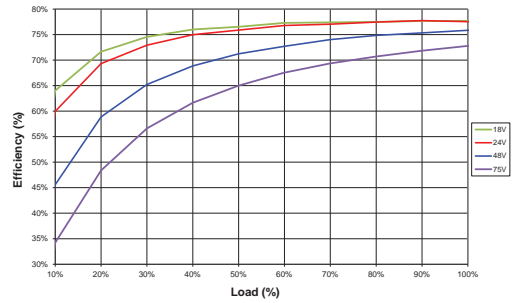


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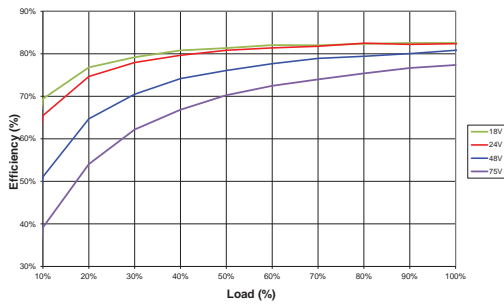
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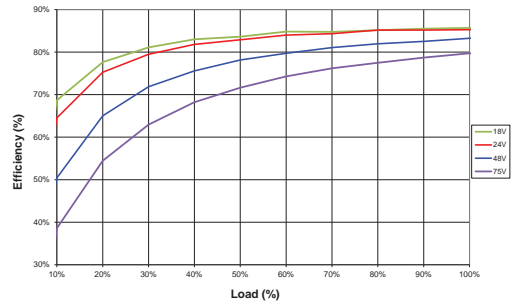
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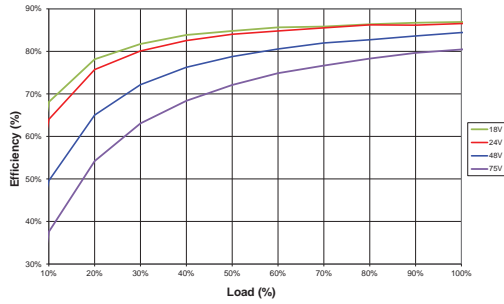
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**NCM6S4812C**



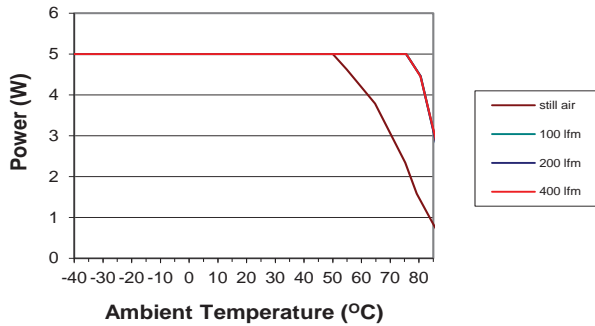
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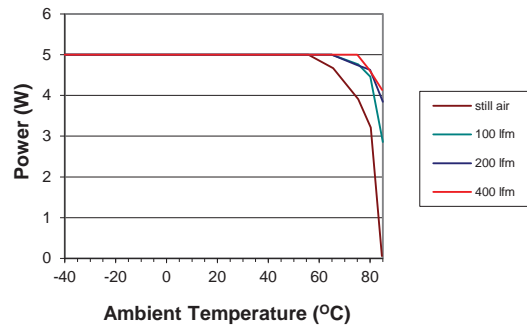


**TEMPERATURE DERATING**

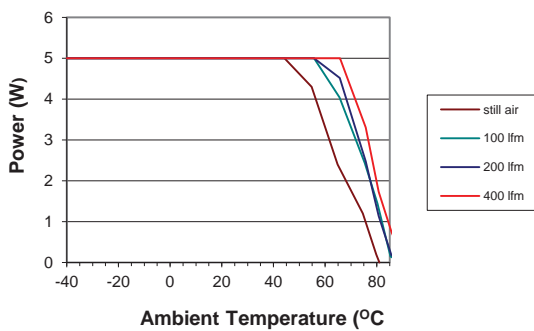
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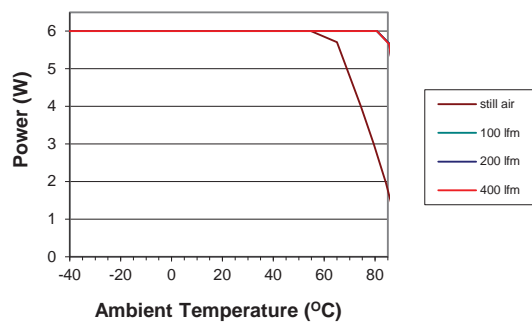
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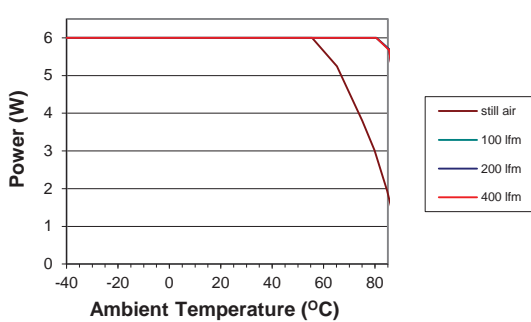
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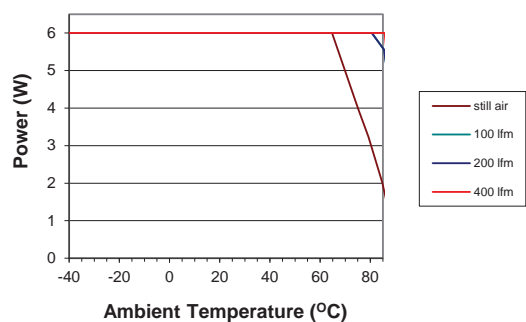
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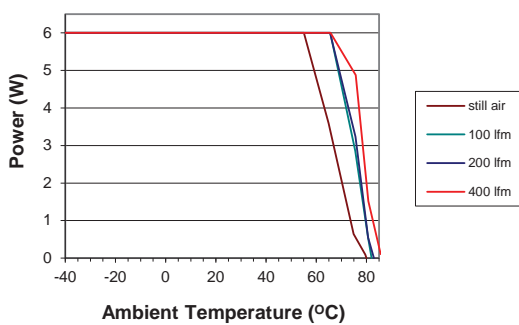
**NCM6X0512C**



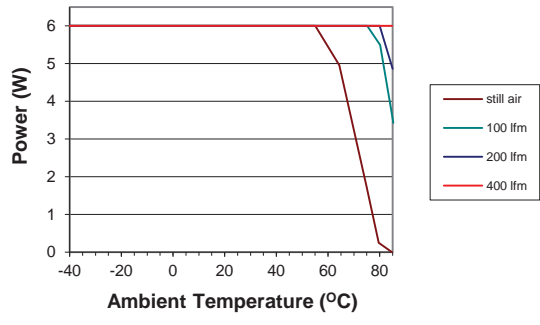
**NCM6X0515C**



**NCM6X1205C**

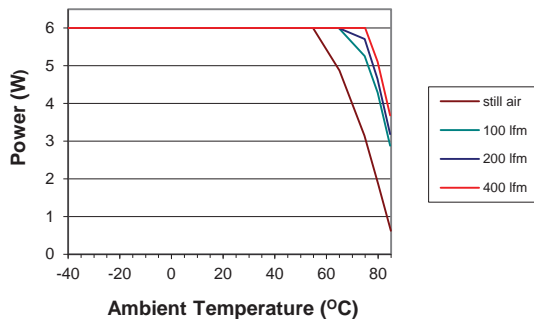


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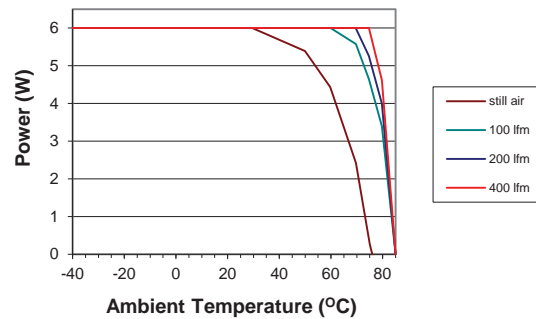


**TEMPERATURE DERATING**

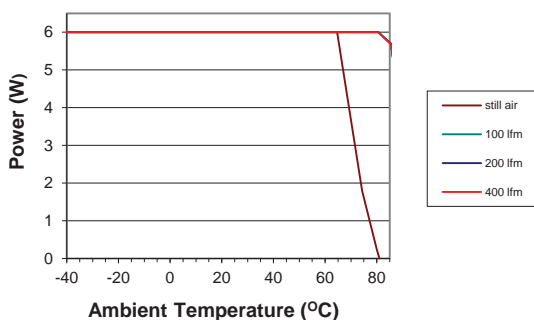
**NCM6X1215C**



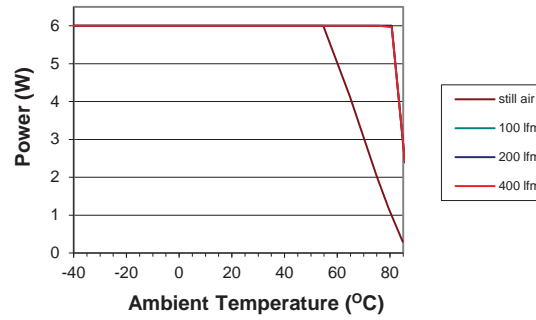
**NCM6X4805C**



**NCM6X4812C**



**NCM6X4815C**



**EMC FILTERING AND SPECTRA**

**FILTERING**

The module includes a basic level of filtering, sufficient for many applications. Where lower noise levels are desired, filters can easily be added to achieve any required noise performance.

A DC/DC converter generates noise in two principle forms: that which is radiated from its body and that conducted on its external connections. There are three separate modes of conducted noise: input differential, output differential and input-output.

This last appears as common mode at the input and the output, and cannot therefore be removed by filtering at the input or output alone. The first level of filtering is to connect capacitors between input and output returns, to reduce this form of noise. It typically contains high harmonics of the switching frequency, which tend to appear as spikes on surrounding circuits. The voltage rating of this capacitor must match the required isolation voltage. (Due to the great variety in isolation voltage and required noise performance, this capacitor has not been included within the converter.)

Input ripple is a voltage developed across the internal Input decoupling capacitor. It is therefore measured with a defined supply source impedance. Although simple series inductance will provide filtering, on its own it can degrade the stability. A shunt capacitor is therefore recommended across the converter input terminals, so that it is fed from a low impedance.

If no filtering is required, the inductance of long supply wiring could also cause a problem, requiring an input decoupling capacitor for stability. An electrolytic will perform well in these situations. The input-output filtering is performed by the common-mode choke on the primary. This could be placed on the output, but would then degrade the regulation and produce less benefit for a given size, cost, and power loss.

Radiated noise is present in magnetic and electrostatic forms. Thanks to the small size of these units, neither form of noise will be radiated "efficiently", so will not normally cause a problem. Any question of this kind usually better repays attention to conducted signals.

**EMC FILTERING AND SPECTRA**

**EMC FILTER AND VALUES TO OBTAIN SPECTRA AS SHOWN**

The following filter circuit and filter table shows the input filters typically required to meet EN55022 Quasi-Peak Curve A or B.



- C1, C2** Polyester or ceramic capacitor
- C3** Electrolytic capacitor
- C4 & C5** 250 VAC Y Rated

**TO MEET CURVE B**

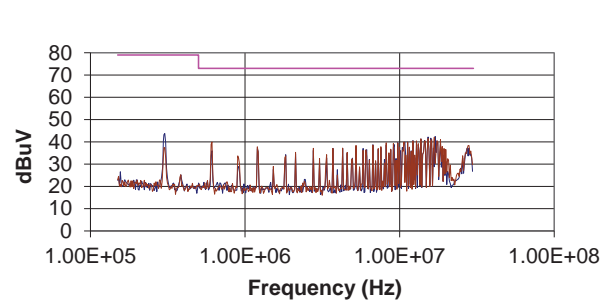
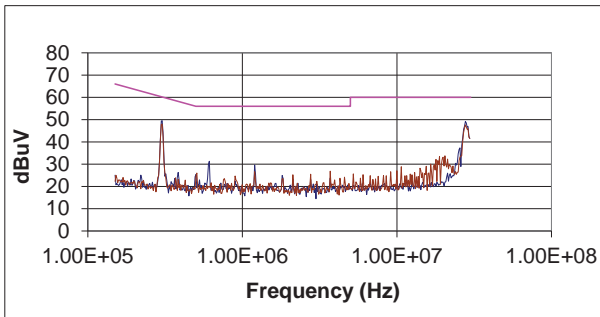
| Part Number | C1  | C2  | C3     | C4   | C5   | L1     | L2           | L3           |
|-------------|-----|-----|--------|------|------|--------|--------------|--------------|
| NCM6S0503C  | 1µF | 1µF | 1000µF | 10nF | 10nF | 51105C | 20µH         | Not required |
| NCM6S0505C  | 1µF | 1µF | 1000µF | 10nF | 10nF | 51105C | 60µH         | Not required |
| NCM6S0512C  | 1µF | 1µF | 1000µF | 15nF | 15nF | 51305C | 60µH         | 60µH         |
| NCM6S0515C  | 1µF | 1µF | 1000µF | 15nF | 15nF | 51305C | 60µH         | 60µH         |
| NCM6D0505C  | 1µF | 1µF | 1000µF | 10nF | 10nF | 51105C | 20µH         | Not required |
| NCM6D0512C  | 1µF | 1µF | 1000µF | 10nF | 10nF | 51105C | 20µH         | Not required |
| NCM6D0515C  | 1µF | 1µF | 1000µF | 10nF | 10nF | 51105C | 20µH         | Not required |
| NCM6S1203C  | 1µF | 1µF | 47µF   | 10nF | 10nF | 51105C | Not required | Not required |
| NCM6S1205C  | 1µF | 1µF | 47µF   | 10nF | 10nF | 51105C | 60µH         | Not required |
| NCM6S1212C  | 1µF | 1µF | 47µF   | 10nF | 10nF | 51105C | 20µH         | Not required |
| NCM6S1215C  | 1µF | 1µF | 47µF   | 10nF | 10nF | 51105C | 20µH         | Not required |
| NCM6D1205C  | 1µF | 1µF | 47µF   | 10nF | 10nF | 51105C | Not required | Not required |
| NCM6D1212C  | 1µF | 1µF | 47µF   | 10nF | 10nF | 51105C | Not required | Not required |
| NCM6D1215C  | 1µF | 1µF | 47µF   | 10nF | 10nF | 51105C | 20µH         | Not required |
| NCM6S4803C  | 1µF | 1µF | 47µF   | 10nF | 10nF | 51105C | Not required | Not required |
| NCM6S4805C  | 1µF | 1µF | 47µF   | 10nF | 10nF | 51505C | Not required | Not required |
| NCM6S4812C  | 1µF | 1µF | 47µF   | 10nF | 10nF | 51505C | Not required | Not required |
| NCM6S4815C  | 1µF | 1µF | 47µF   | 10nF | 10nF | 51505C | Not required | Not required |
| NCM6D4805C  | 1µF | 1µF | 47µF   | 10nF | 10nF | 51505C | Not required | Not required |
| NCM6D4812C  | 1µF | 1µF | 47µF   | 10nF | 10nF | 51505C | 60µH         | Not required |
| NCM6D4815C  | 1µF | 1µF | 47µF   | 10nF | 10nF | 51505C | Not required | Not required |

## EMC FILTERING AND SPECTRA

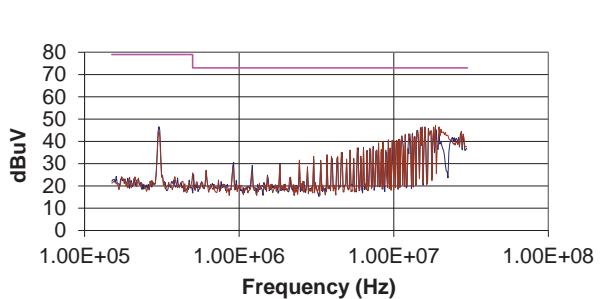
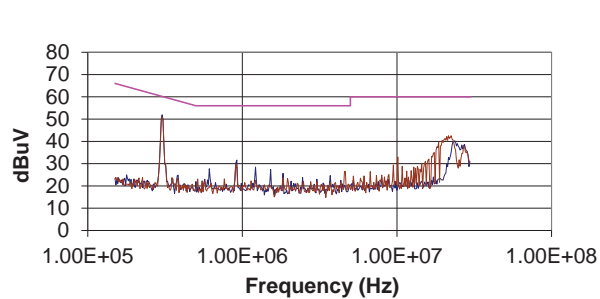
| TO MEET CURVE A |     |     |        |              |              |        |      |      |
|-----------------|-----|-----|--------|--------------|--------------|--------|------|------|
| Part Number     | C1  | C2  | C3     | C4           | C5           | L1     | L2   | L3   |
| NCM6S0503C      | 1µF | 1µF | 1000µF | Not required | Not required | 51105C | 60µH | 60µH |
| NCM6S0505C      | 1µF | 1µF | 1000µF | Not required | Not required | 51105C | 60µH | 60µH |
| NCM6S0512C      | 1µF | 1µF | 1000µF | Not required | Not required | 51305C | 60µH | 60µH |
| NCM6S0515C      | 1µF | 1µF | 1000µF | Not required | Not required | 51305C | 60µH | 60µH |
| NCM6D0505C      | 1µF | 1µF | 1000µF | Not required | Not required | 51105C | 60µH | 60µH |
| NCM6D0512C      | 1µF | 1µF | 1000µF | Not required | Not required | 51105C | 60µH | 60µH |
| NCM6D0515C      | 1µF | 1µF | 1000µF | Not required | Not required | 51105C | 60µH | 60µH |
| NCM6S1203C      | 1µF | 1µF | 47µF   | Not required | Not required | 51105C | 60µH | 60µH |
| NCM6S1205C      | 1µF | 1µF | 47µF   | Not required | Not required | 51105C | 60µH | 60µH |
| NCM6S1212C      | 1µF | 1µF | 47µF   | Not required | Not required | 51105C | 60µH | 60µH |
| NCM6S1215C      | 1µF | 1µF | 47µF   | Not required | Not required | 51105C | 60µH | 60µH |
| NCM6D1205C      | 1µF | 1µF | 47µF   | Not required | Not required | 51105C | 60µH | 60µH |
| NCM6D1212C      | 1µF | 1µF | 47µF   | Not required | Not required | 51105C | 60µH | 60µH |
| NCM6D1215C      | 1µF | 1µF | 47µF   | Not required | Not required | 51105C | 60µH | 60µH |
| NCM6S4803C      | 1µF | 1µF | 47µF   | Not required | Not required | 51105C | 60µH | 60µH |
| NCM6S4805C      | 1µF | 1µF | 47µF   | Not required | Not required | 51505C | 60µH | 60µH |
| NCM6S4812C      | 1µF | 1µF | 47µF   | Not required | Not required | 51505C | 60µH | 60µH |
| NCM6S4815C      | 1µF | 1µF | 47µF   | Not required | Not required | 51505C | 60µH | 60µH |
| NCM6D4805C      | 1µF | 1µF | 47µF   | Not required | Not required | 51505C | 60µH | 60µH |
| NCM6D4812C      | 1µF | 1µF | 47µF   | Not required | Not required | 51505C | 60µH | 60µH |
| NCM6D4815C      | 1µF | 1µF | 47µF   | Not required | Not required | 51505C | 60µH | 60µH |

**EMC FILTERING AND SPECTRA**

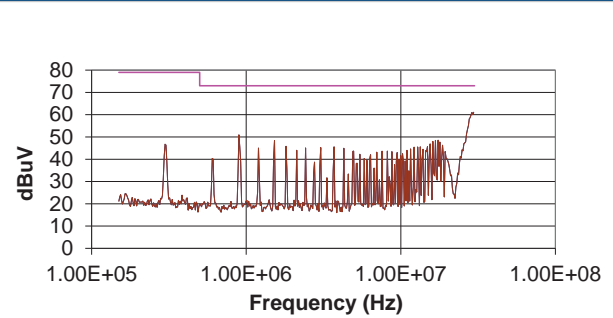
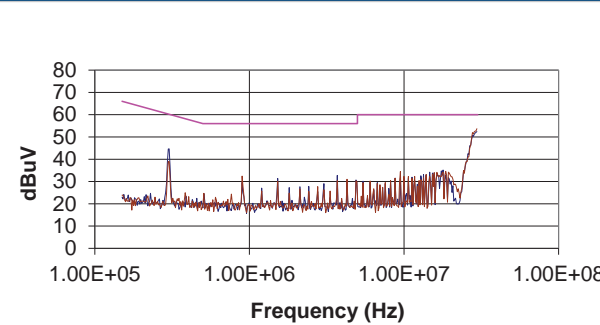
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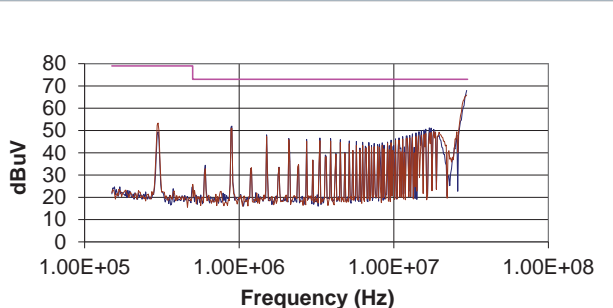
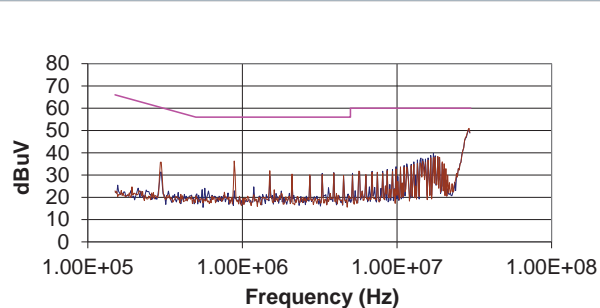
**NCM6S0505C**



**NCM6S0512C**

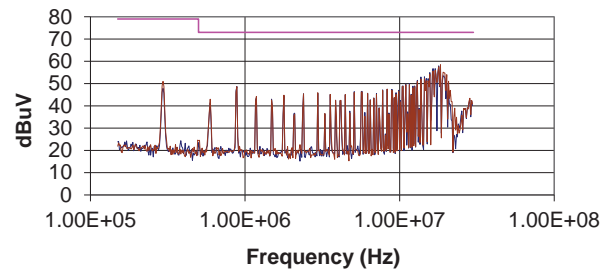
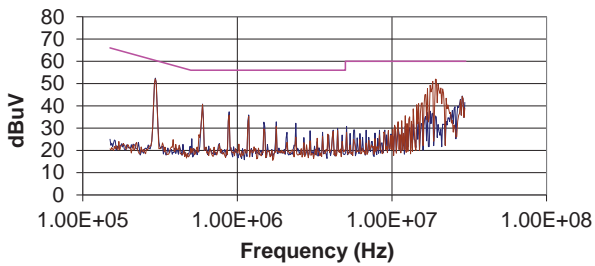


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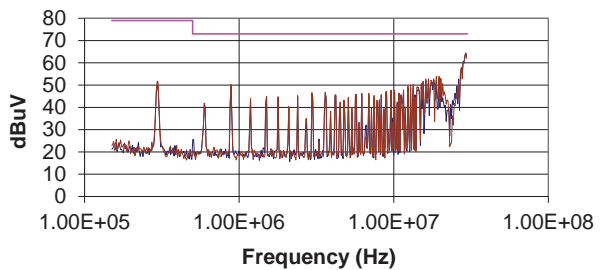
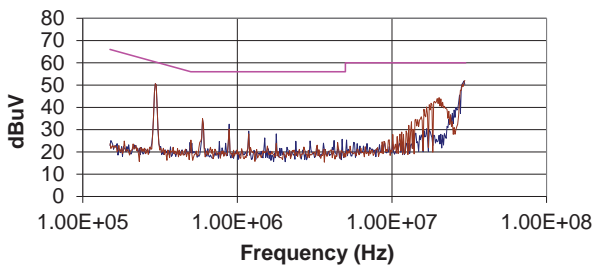


**EMC FILTERING AND SPECTRA**

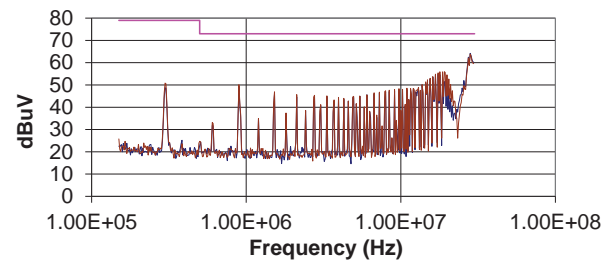
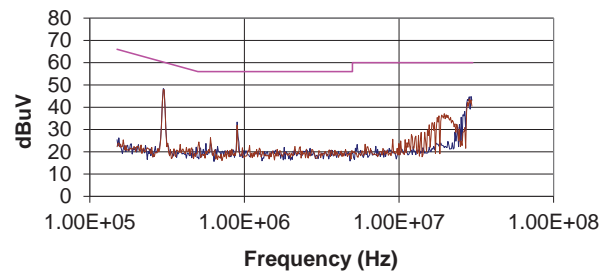
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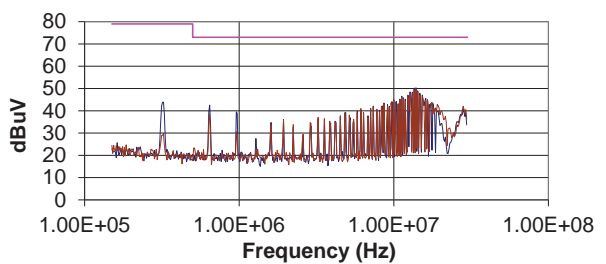
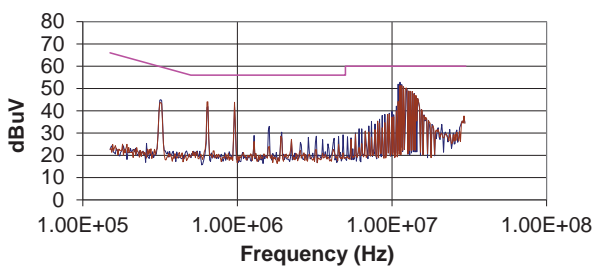
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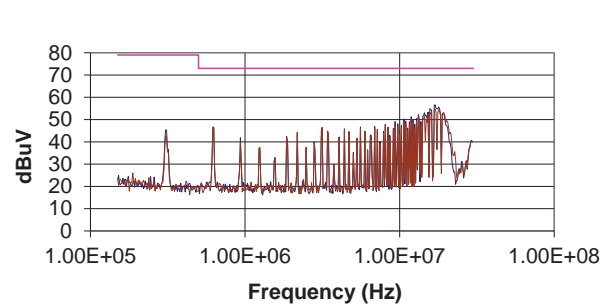
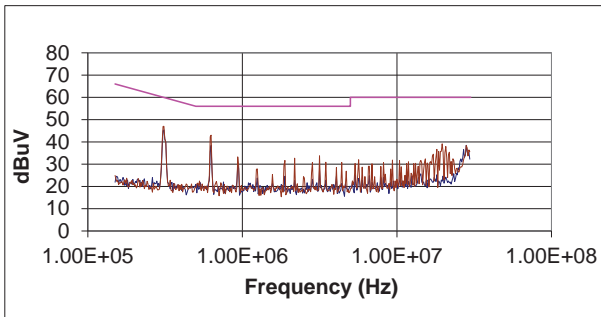


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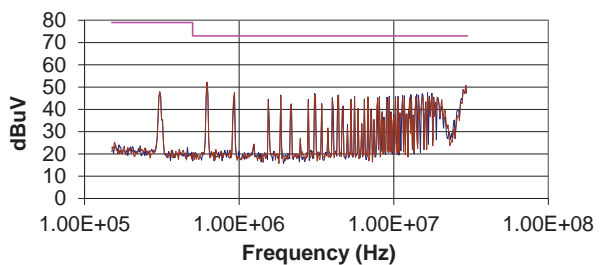
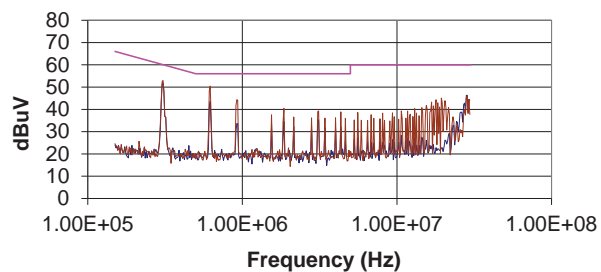


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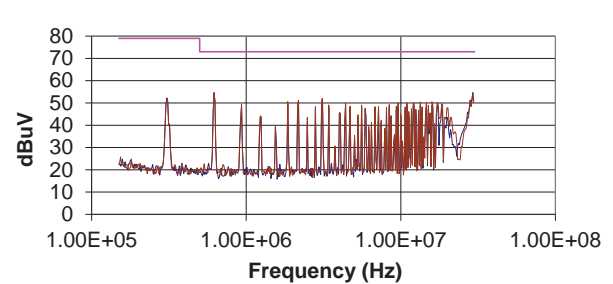
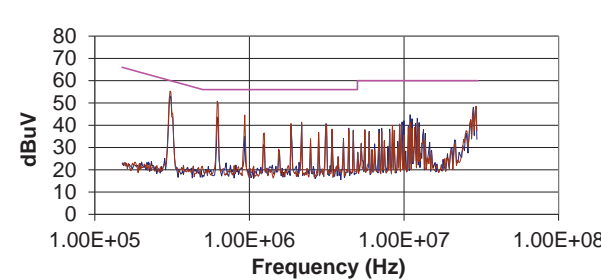
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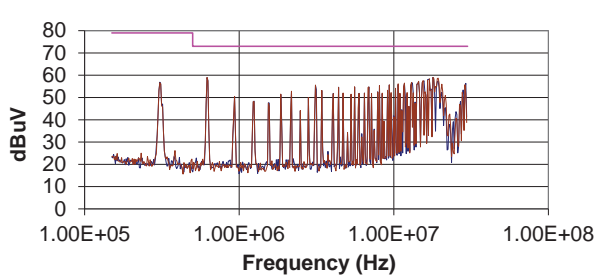
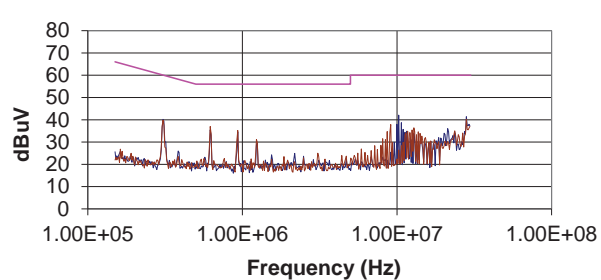
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**NCM6S1215C**

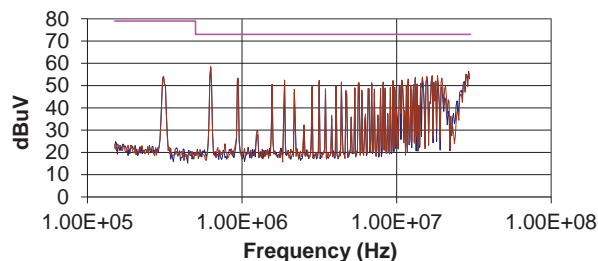
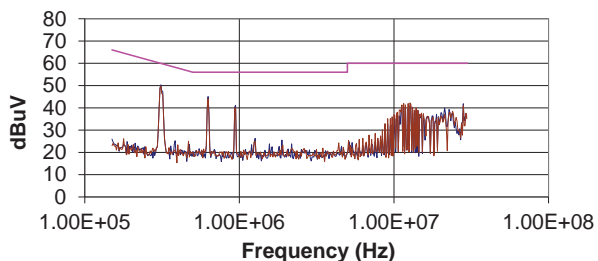


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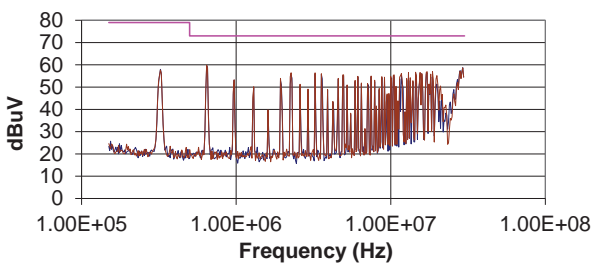
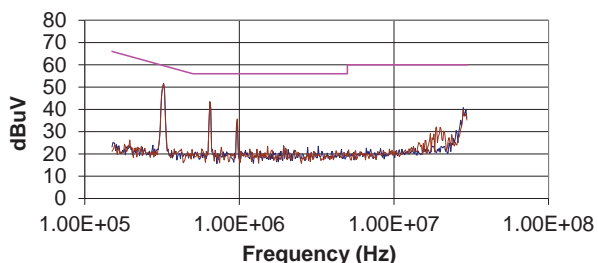


**EMC FILTERING AND SPECTRA**

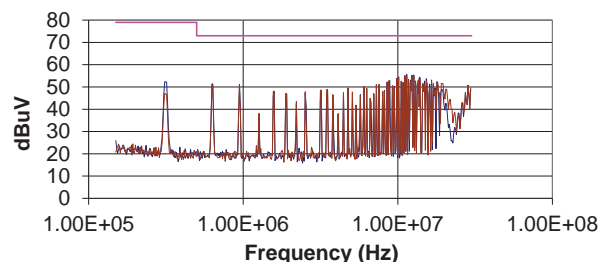
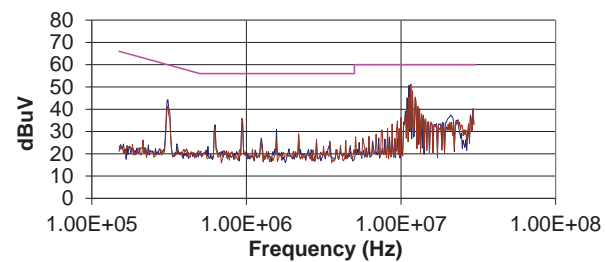
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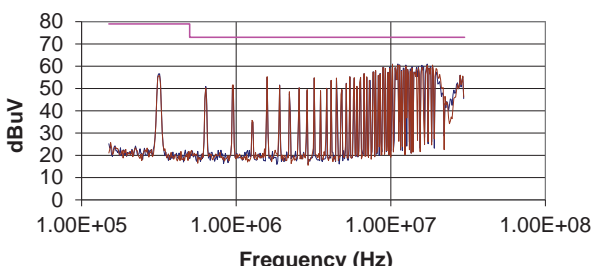
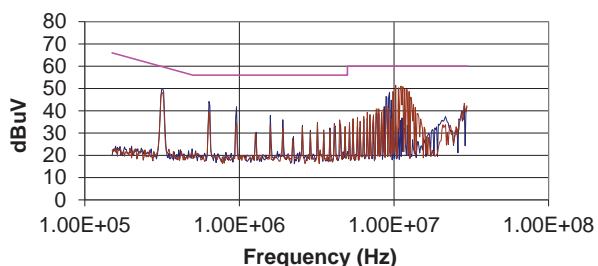
**NCM6D1215C**



**NCM6S4803C**



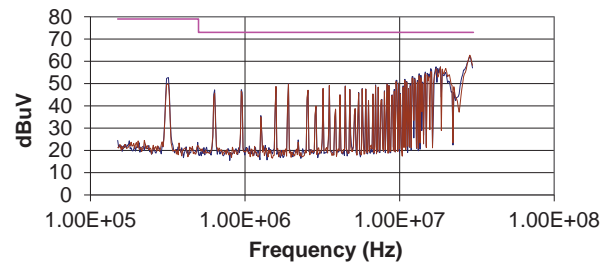
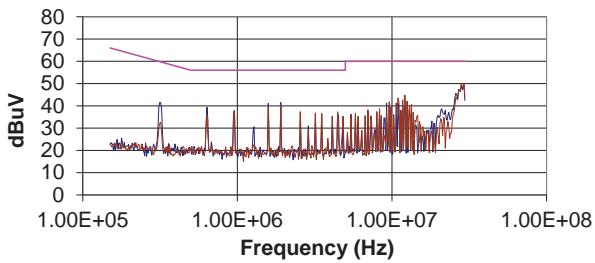
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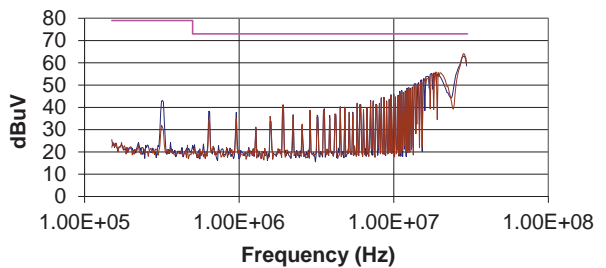
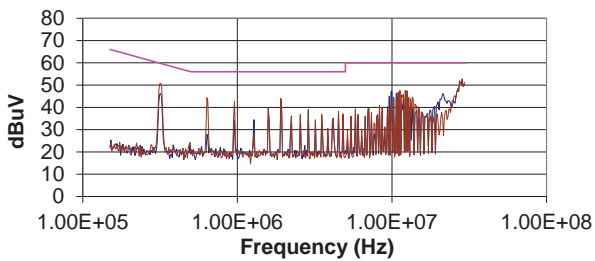


**EMC FILTERING AND SPECTRA**

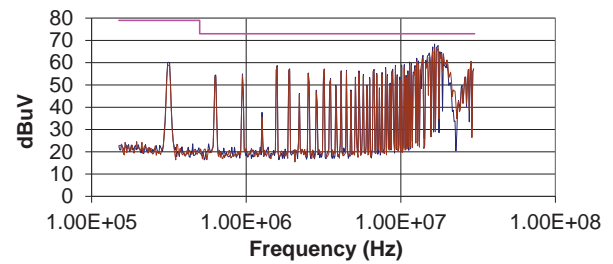
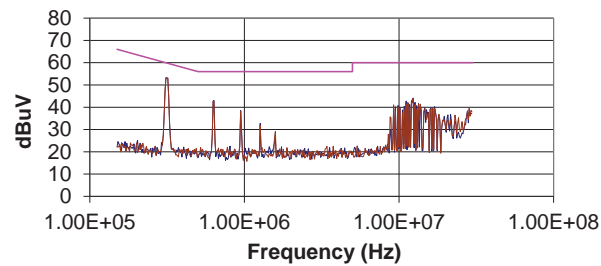
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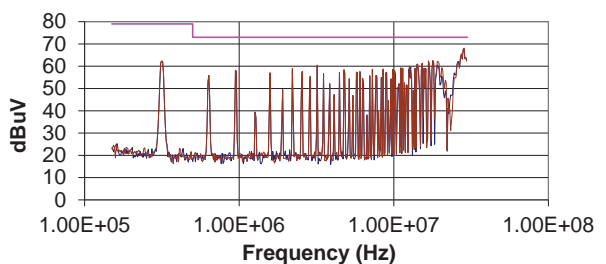
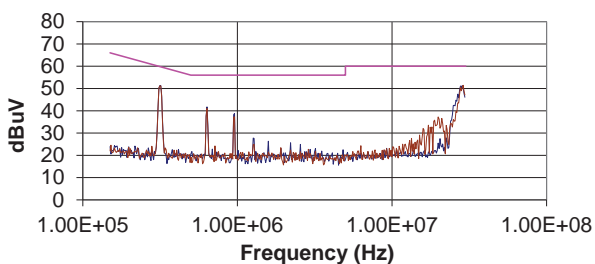
**NCM6S4815C**



**NCM6D4805C**

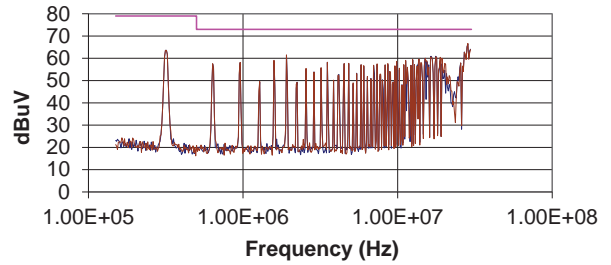
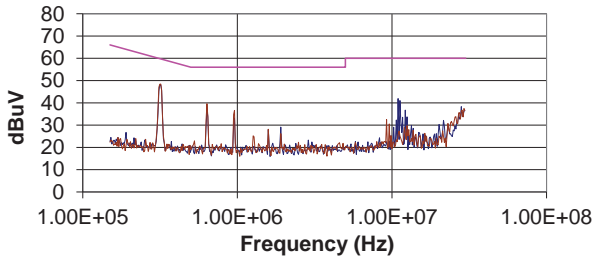


**NCM6D4812C**



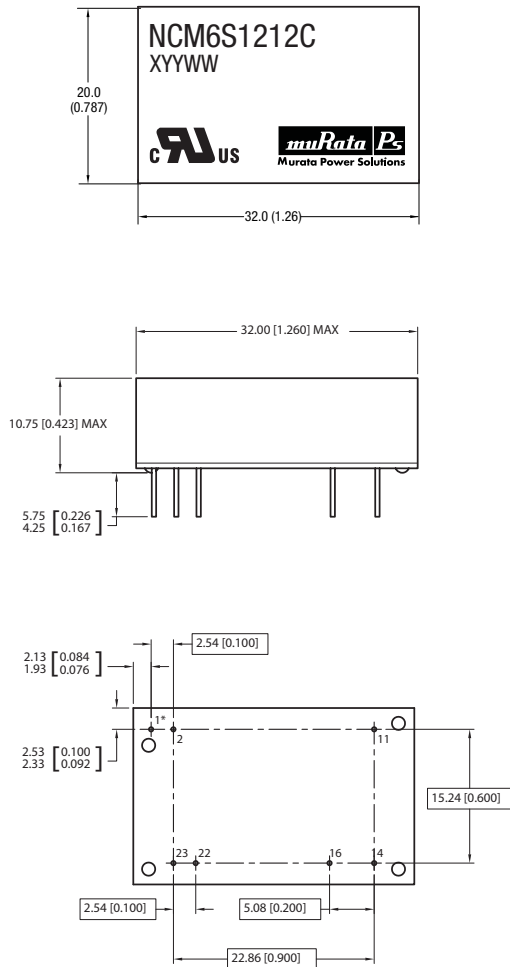
**EMC FILTERING AND SPECTRA**

**NCM6D4815C**



**PACKAGE SPECIFICATIONS**

**MECHANICAL DIMENSIONS**



\* Optional control pin.  
 All dimensions in millimetres (inches)  $\pm 0.5$  (0.020) except pin to pin tolerance  $\pm 0.25$  (0.010).  
 All pins on a 2.54 (0.100) pitch and within 0.25 (0.010) of true position.

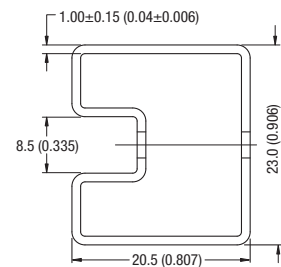
Case material: plastic.

Weight: 10.61g

**PIN CONNECTIONS**

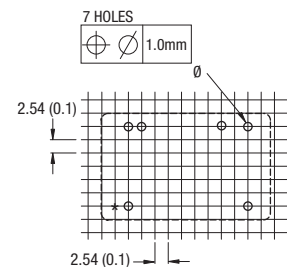
| Pin | Function |        |
|-----|----------|--------|
|     | Single   | Dual   |
| 1*  | ON/OFF   | ON/OFF |
| 2   | -VIN     | -VIN   |
| 11  | N/C      | -VOUT  |
| 14  | +VOUT    | +VOUT  |
| 16  | -VOUT    | OV     |
| 22  | +VIN     | +VIN   |
| 23  | +VIN     | +VIN   |

**TUBE OUTLINE DIMENSIONS**



Tube length 20.47 (520)  
 All dimensions in inches  $\pm 0.010$  (mm 0.25mm). Quantity: 15

**RECOMMENDED FOOTPRINT DETAILS**



All dimensions in millimetres  $\pm 0.25$  ( $\pm 0.010$  inches).

Murata Power Solutions, Inc.  
 11 Cabot Boulevard, Mansfield, MA 02048-1151 U.S.A.  
 ISO 9001 and 14001 REGISTERED



This product is subject to the following **operating requirements** and the **Life and Safety Critical Application Sales Policy**:  
 Refer to: <http://www.murata-ps.com/requirements/>

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