

FEATURES

- UL60950 reinforced insulation
- ANSI/AAMI ES60601-1, 1 MOPP/2 MOOP's recognised
- 4:1 wide range voltage input³
- Operating temperature range -40°C to 85°C
- 5.2kVDC isolation 'Hi Pot Test'
- Typical efficiency to 88%
- 5V, 12V & 48V nominal inputs
- Power density 0.94W/cm³
- 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 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.

NCM6 Series

Isolated 6W Wide Input Single & Dual Output DC-DC Converters

SELECTION GUIDE

Order Code ¹	Input Voltage	Output Voltage	Output Current	Efficiency		Efficiency		Isolation Capacitance	MTTF ²
	Nom.			5V/12V/48V Input		24V Input			
V	V	A	Min. %	Typ. %	Min. %	Typ. %	pF	Hrs	
Recommended In Production									
NCM6D0505EC	5	±5	±0.6	78	80			10	492,600
NCM6D0512C	5	±12	±0.25	81	83			15	537,754
NCM6D0512EC	5	±12	±0.25	81	83			15	537,754
NCM6D0515C	5	±15	±0.2	81	83			15	462,042
NCM6D0515EC	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
NCM6D1205EC	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
NCM6S1203EC	12	3.3	1.52	75	79	74	77	12	685,045
NCM6S1205C	12	5	1.2	81	82	79	80	15	475,352
NCM6S1205EC	12	5	1.2	81	82	79	80	15	475,352
NCM6S1212C	12	12	0.5	84	86	81	83	25	490,876
NCM6S1212EC	12	12	0.5	84	86	81	83	25	490,876
NCM6S1215C	12	15	0.4	85	87	82	84	25	457,651
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



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 T_A=25°C, nominal input voltage and rated output current unless otherwise specified.

SELECTION GUIDE (Continued)

Order Code ¹	Input Voltage	Output Voltage	Output Current	Efficiency		Efficiency		Isolation Capacitance	MTTF ²	Recommended Alternative			
	Nom.			5V/12V/48V Input		24V Input							
	V			V	A	Min.	Typ.		Min.		Typ.	pF	Hrs
	%			%	%	%							
To be discontinued													
NCM6D0505C	5	±5	±0.6	78	80			10	492,600	NCM6D0505EC			
NCM6D1205C	12	±5	±0.6	81	83	79	80	15	285,466	NCM6D1205EC			
NCM6D1212EC	12	±12	±0.25	86	88	81	84	25	412,808	NCM6D1212C			
NCM6D1215EC	12	±15	±0.2	85	87	82	84	25	366,356	NCM6D1215C			
NCM6D4805C	48	±5	±0.6	77	80	79	81	10	393,923	NCS6D4805C			
NCM6D4805EC	48	±5	±0.6	77	80	79	81	10	393,923	NCS6D4805C			
NCM6D4812C	48	±12	±0.25	78	82	82	84	22	444,419	NCS6D4812C			
NCM6D4812EC	48	±12	±0.25	78	82	82	84	22	444,419	NCS6D4812C			
NCM6D4815C	48	±15	±0.2	81	83	84	86	25	409,328	NCS6D4815C			
NCM6D4815EC	48	±15	±0.2	81	83	84	86	25	409,328	NCS6D4815C			
NCM6S0503EC	5	3.3	1.52	73	75			15	548,686	NCM6S0503C			
NCM6S0505EC	5	5	1.2	77	80			15	576,445	NCM6S0505C			
NCM6S0512EC	5	12	0.5	80	82			20	608,806	NCM6S0512C			
NCM6S0515EC	5	15	0.4	80	82			15	566,572	NCM6S0515C			
NCM6S1215EC	12	15	0.4	85	87	82	84	25	457,651	NCM6S1215C			
NCM6S4803EC	48	3.3	1.52	71	74	71	76	12	552,818	NCM6S4803C			
NCM6S4805EC	48	5	1.2	74	78	75	80	15	467,793	NCM6S4805C			
NCM6S4812EC	48	12	0.5	79	82	83	84	20	520,610	NCM6S4812C			
NCM6S4815EC	48	15	0.4	81	83	85	86	25	499,288	NCM6S4815C			

SELECTION GUIDE (Continued)

Order Code	Input Current				Ripple & Noise	Recommended Alternative
	0% Load	100% Load	0% Load	100% Load		
	Typ. 5V, 12V or 48V Input		Typ. 24V Input			
	mA	mA	mA	mA		
Recommended In Production						
NCM6D0505EC	20	1500			20	
NCM6D0512C	25	1450			20	
NCM6D0512EC	25	1450			20	
NCM6D0515C	30	1450			15	
NCM6D0515EC	30	1450			15	
NCM6S0503C	8	1300			10	
NCM6S0505C	20	1500			20	
NCM6S0512C	25	1500			90	
NCM6S0515C	30	1500			90	
NCM6D1205EC	11	600	9	310	100	
NCM6D1212C	13	560	12	300	100	
NCM6D1215C	15	570	13	300	100	
NCM6S1203C	10	525	9	270	60	
NCM6S1203EC	10	525	9	270	60	
NCM6S1205C	10	610	9	315	25	
NCM6S1205EC	10	610	9	315	25	
NCM6S1212C	15	575	12	300	70	
NCM6S1212EC	15	575	12	300	70	
NCM6S1215C	15	575	13	300	105	
NCM6S4803C	10	140	7	275	30	
NCM6S4805C	10	160	7	300	25	
NCM6S4812C	10	150	9	300	70	
NCM6S4815C	10	150	10	300	95	
To be discontinued						
NCM6D0505C	20	1500			20	NCM6D0505EC
NCM6D1205C	11	600	9	310	100	NCM6D1205EC
NCM6D1212EC	13	560	12	300	100	NCM6D1212C
NCM6D1215EC	15	570	13	300	100	NCM6D1215C
NCM6D4805C	6	160	7	310	150	NCS6D4805C
NCM6D4805EC	6	160	7	310	150	NCS6D4805C
NCM6D4812C	8	150	9	300	100	NCS6D4812C
NCM6D4812EC	8	150	9	300	100	NCS6D4812C
NCM6D4815C	8	150	10	300	150	NCS6D4815C
NCM6D4815EC	8	150	10	300	150	NCS6D4815C
NCM6S0503EC	8	1300			10	NCM6S0503C
NCM6S0505EC	20	1500			20	NCM6S0505C
NCM6S0512EC	25	1500			90	NCM6S0512C
NCM6S0515EC	30	1500			90	NCM6S0515C
NCM6S1215EC	15	575	13	300	105	NCM6S1215C
NCM6S4803EC	10	140	7	275	30	NCM6S4803C
NCM6S4805EC	10	160	7	300	25	NCM6S4805C
NCM6S4812EC	10	150	9	300	70	NCM6S4812C
NCM6S4815EC	10	150	10	300	95	NCM6S4815C

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

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	
		Negative			±3	
Line regulation	Low line to high line	Single		0.1	0.5	%
		Dual		0.1	0.75	
Load Regulation	10% total load to 100% total load	NCM6xxx03C, D0512C & D0515C		0.5	1	%
		NCM6xxx05C		0.3	1	
		NCM6Sxx12C, NCM6Sxx15C, D1212C, D1215C, D4812C & D4815C		0.06	0.5	
Cross Regulation	% voltage change on negative output when positive load varies from 12.5% to 37.5% with negative load fixed at 50%	5V			5	%
		12V & 15V			3	
Minimum output load for specification (see application notes)	10% of rated load					
Transient Response	Peak deviation - Single Output (25-75% & 75-25% swing) - 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		

ISOLATION CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Isolation test voltage	Flash tested	5200			VDC
Resistance	Viso = 1kVDC	1			GΩ
Safety standard	UL60950-1	Reinforced		250	Vrms
	ANSI/AAMI ES60601-1	1 MOPP/ 2 MOOP		250	

GENERAL CHARACTERISTICS ¹					
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	Please refer to derating graphs	-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		

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
Wave Solder	Wave Solder profile not to exceed the profile recommended in IEC 61760-1 Section 6.1.3. Please refer to application notes for further information.
Input voltage, NCM6X05	10V
Input voltage, NCM6X12	40V
Input voltage, NCM6X48	80V
Control pin input voltage	±20V

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 recognised 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
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Input Voltage, 48V	1A
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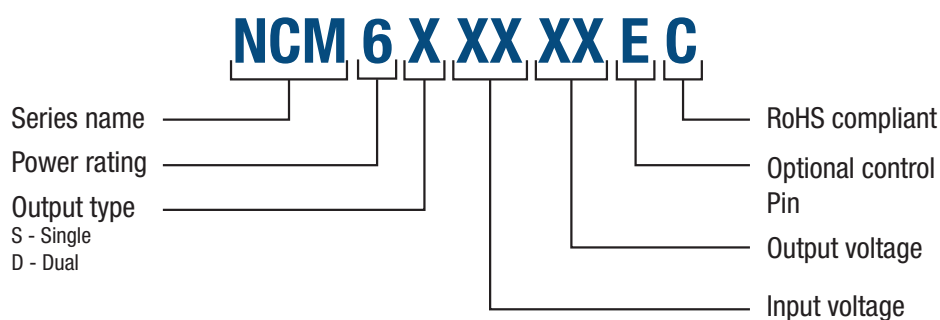
All fuses should be UL recognised and rated to at least the maximum allowable DC input voltage.

RoHS COMPLIANCE INFORMATION



This series is compatible with RoHS soldering systems with a peak wave solder temperature of 260°C for 10 seconds. Please refer to [application notes](#) for further information. 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

PART NUMBER STRUCTURE



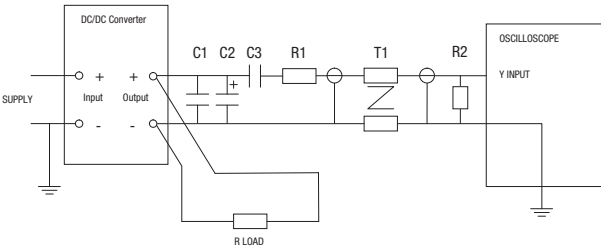
CHARACTERISATION TEST METHODS

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



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.	Maximum 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 unconnected or less than 1V the converter is ON

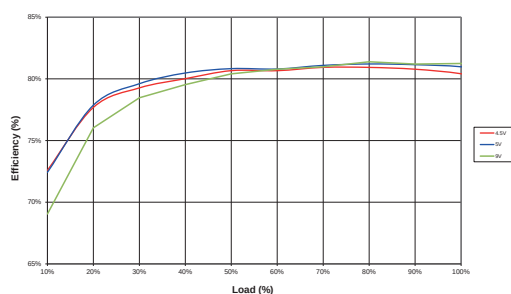
Minimum Load

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

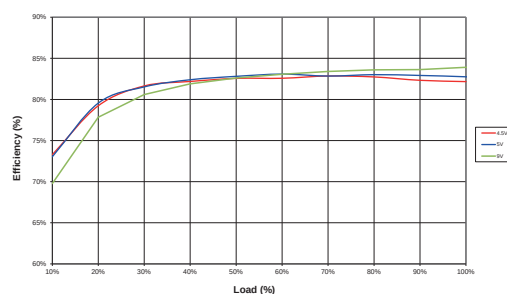
Between 0% and 10% output loading, the output voltage will remain within data sheet specification however, output ripple and noise may increase but will still be below 150mV p-p.

EFFICIENCY VS LOAD

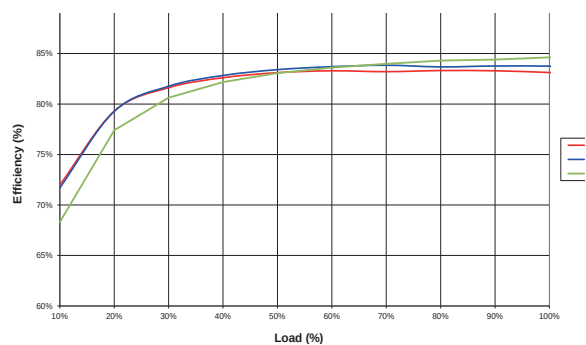
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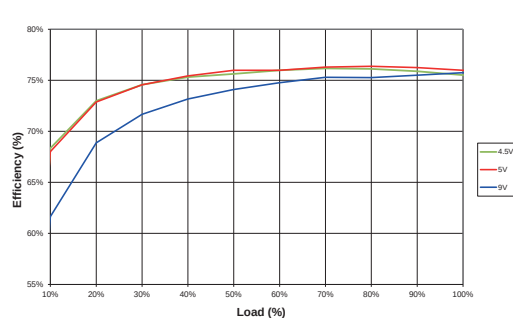
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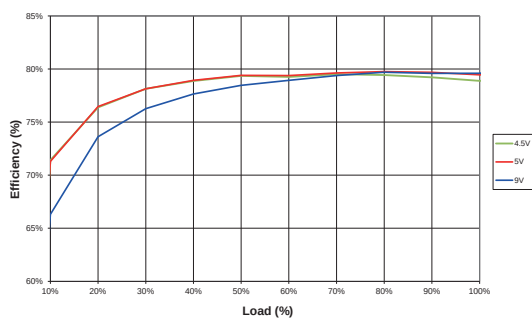
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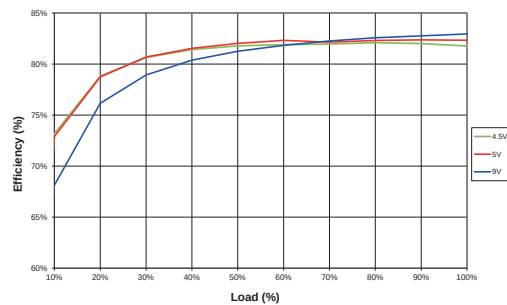
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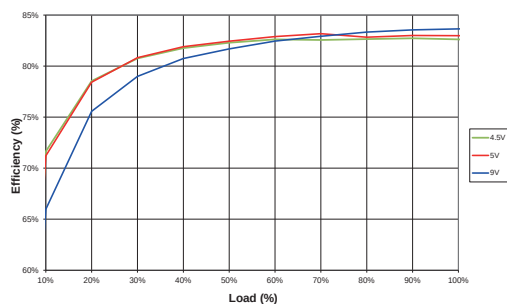
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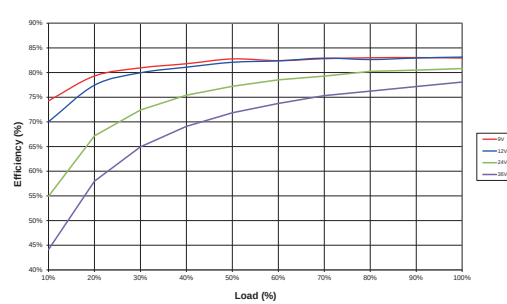
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NCM6S0515C

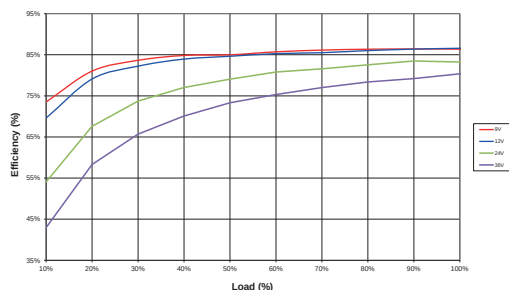


NCM6D1205C

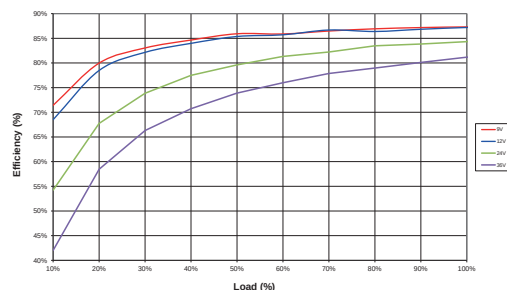


EFFICIENCY VS LOAD (Continued)

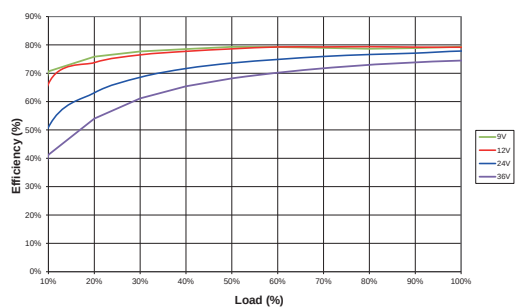
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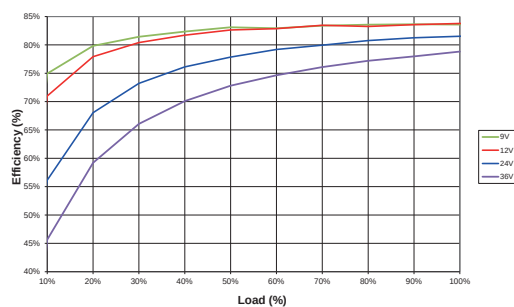
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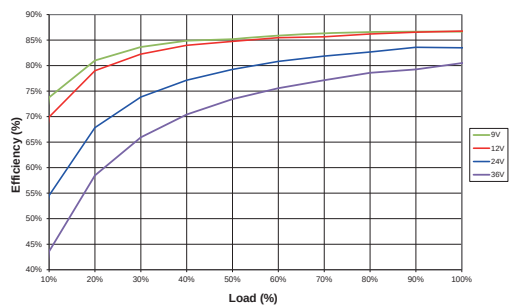
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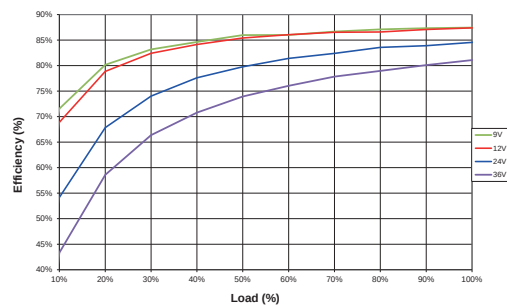
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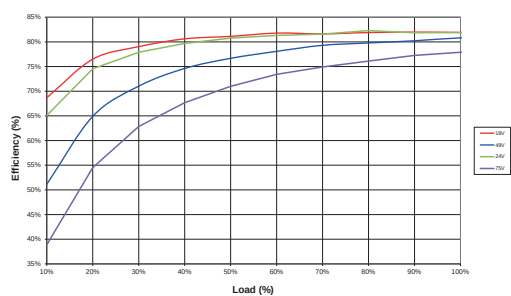
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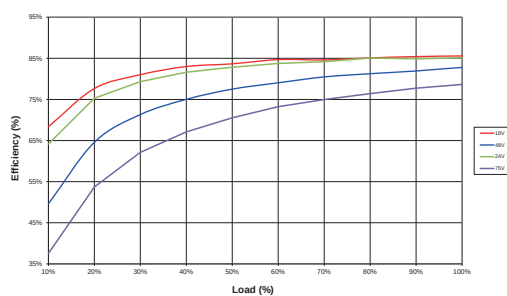
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NCM6D4805C

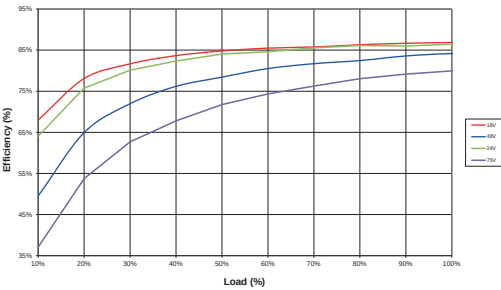


NCM6D4812C

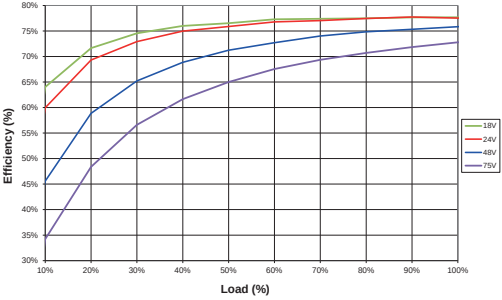


EFFICIENCY VS LOAD (Continued)

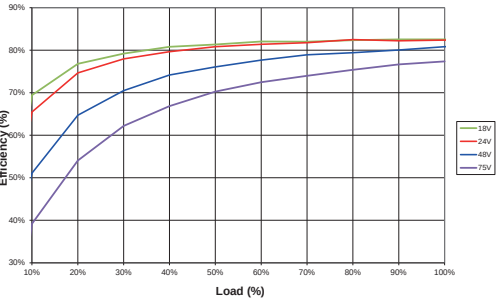
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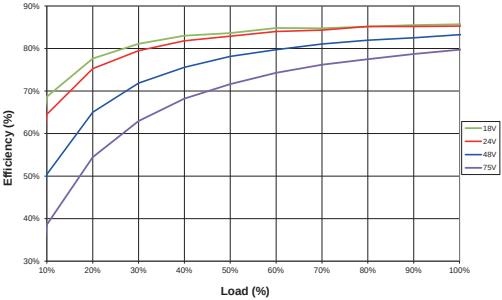
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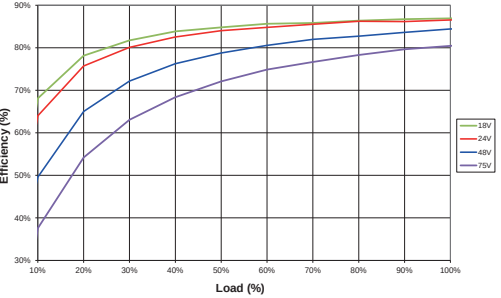
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NCM6S4812C

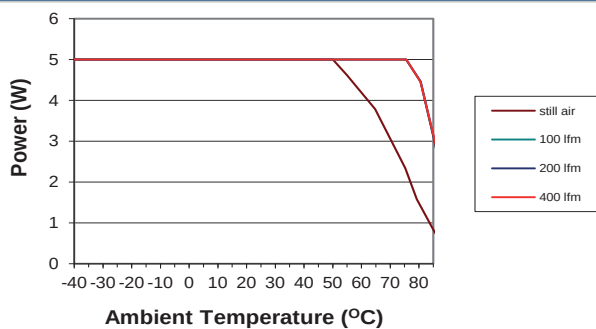


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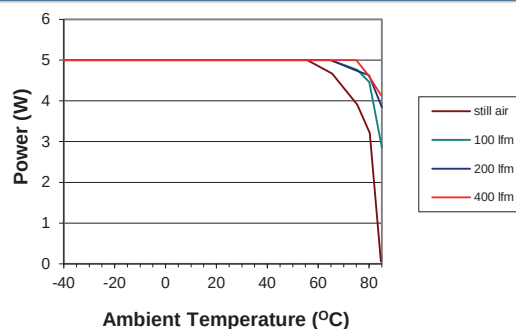


TEMPERATURE DERATING (Continued)

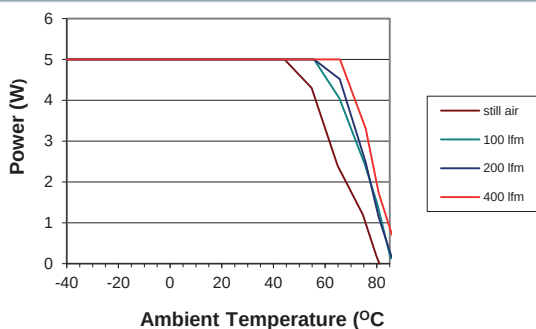
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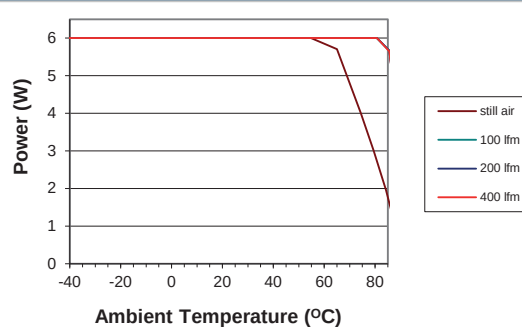
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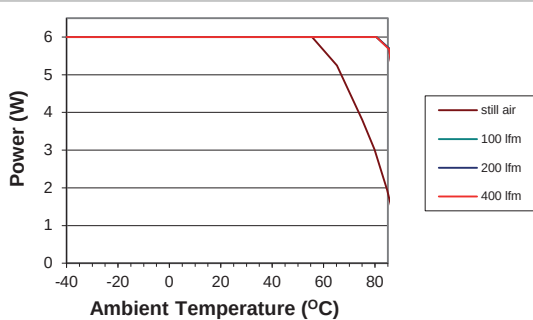
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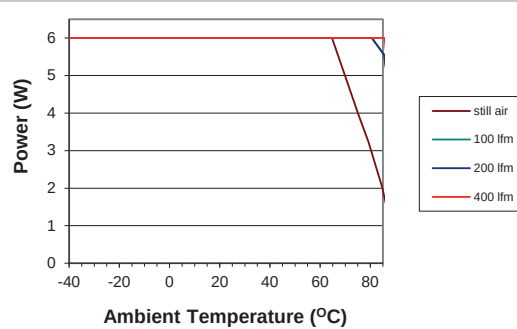
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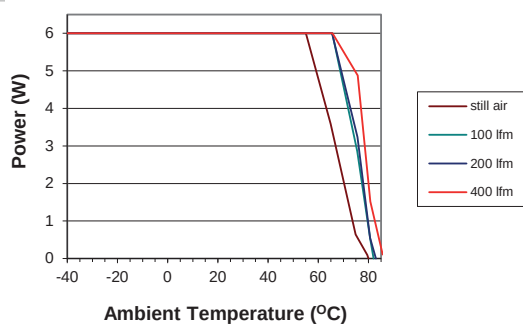
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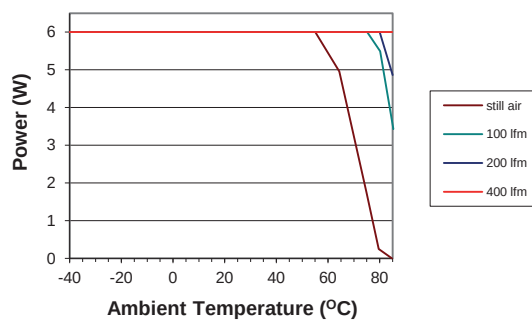
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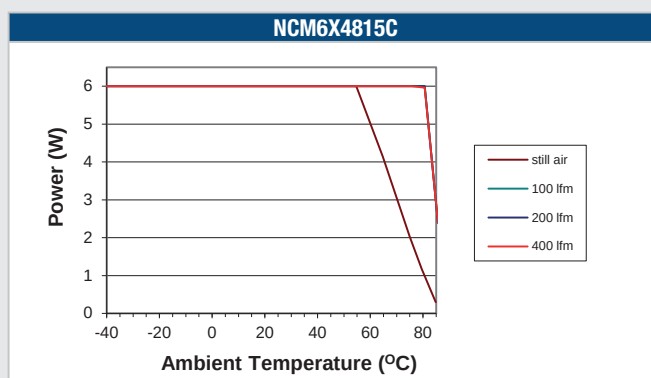
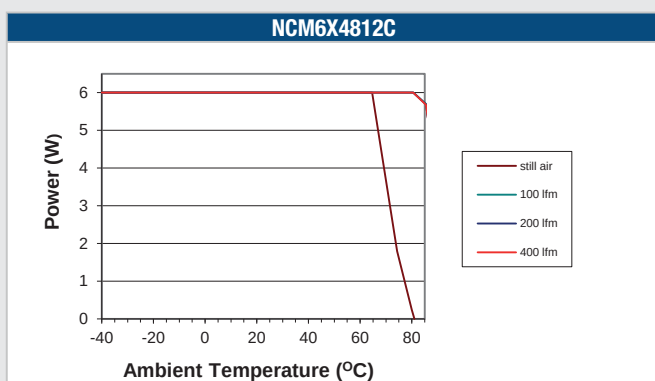
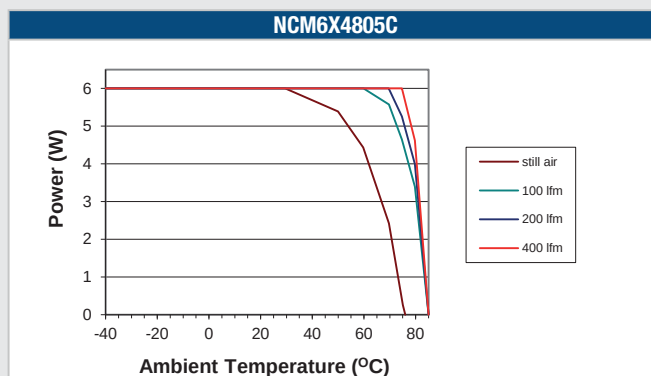
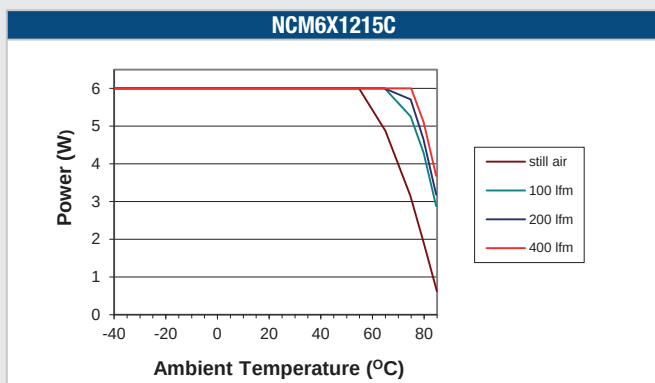
NCM6X1205C



NCM6X1212C



TEMPERATURE DERATING (Continued)



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.

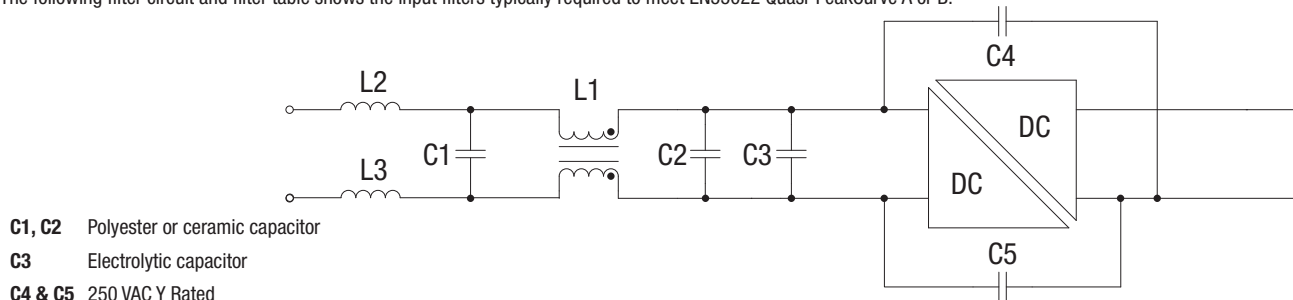
If no filtering is required, the inductance of long supply wiring could also cause a problem, requiring an input decoupling capacitor for stability. An electrolytic will perform well in these situations. The input-output filtering is performed by the common-mode choke on the primary. This could be placed 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 (Continued)

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.



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

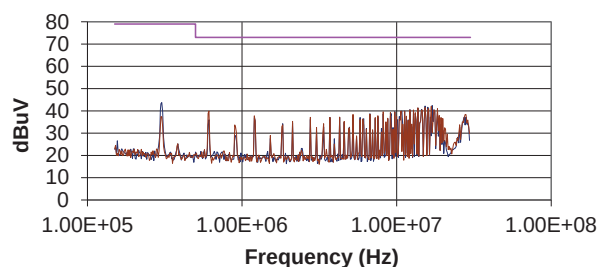
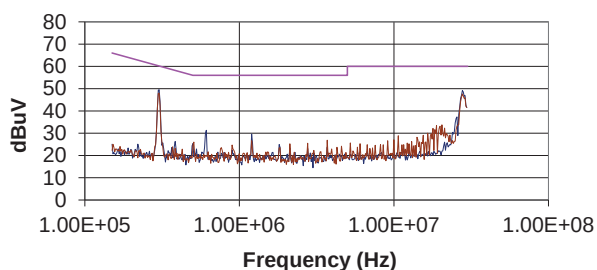
EMC FILTERING AND SPECTRA (Continued)

TO MEET CURVE A

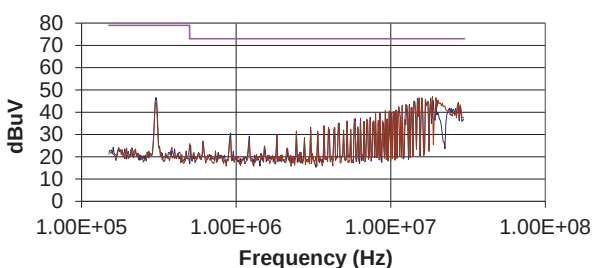
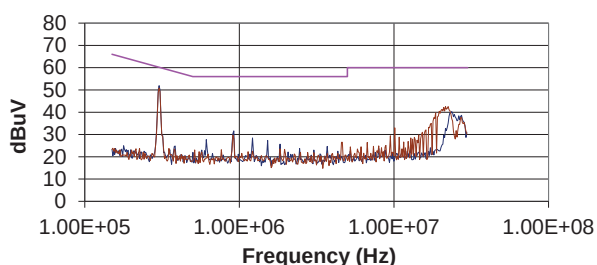
Part Number	C1	C2	C3	C4	C5	L1	L2	L3
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NCM6S0505C	1 μ F	1 μ F	1000 μ F	Not required	Not required	51105C	60 μ H	60 μ H
NCM6S0512C	1 μ F	1 μ F	1000 μ F	Not required	Not required	51305C	60 μ H	60 μ H
NCM6S0515C	1 μ F	1 μ F	1000 μ F	Not required	Not required	51305C	60 μ H	60 μ H
NCM6D0505C	1 μ F	1 μ F	1000 μ F	Not required	Not required	51105C	60 μ H	60 μ H
NCM6D0512C	1 μ F	1 μ F	1000 μ F	Not required	Not required	51105C	60 μ H	60 μ H
NCM6D0515C	1 μ F	1 μ F	1000 μ F	Not required	Not required	51105C	60 μ H	60 μ H
NCM6S1203C	1 μ F	1 μ F	47 μ F	Not required	Not required	51105C	60 μ H	60 μ H
NCM6S1205C	1 μ F	1 μ F	47 μ F	Not required	Not required	51105C	60 μ H	60 μ H
NCM6S1212C	1 μ F	1 μ F	47 μ F	Not required	Not required	51105C	60 μ H	60 μ H
NCM6S1215C	1 μ F	1 μ F	47 μ F	Not required	Not required	51105C	60 μ H	60 μ H
NCM6D1205C	1 μ F	1 μ F	47 μ F	Not required	Not required	51105C	60 μ H	60 μ H
NCM6D1212C	1 μ F	1 μ F	47 μ F	Not required	Not required	51105C	60 μ H	60 μ H
NCM6D1215C	1 μ F	1 μ F	47 μ F	Not required	Not required	51105C	60 μ H	60 μ H
NCM6S4803C	1 μ F	1 μ F	47 μ F	Not required	Not required	51105C	60 μ H	60 μ H
NCM6S4805C	1 μ F	1 μ F	47 μ F	Not required	Not required	51505C	60 μ H	60 μ H
NCM6S4812C	1 μ F	1 μ F	47 μ F	Not required	Not required	51505C	60 μ H	60 μ H
NCM6S4815C	1 μ F	1 μ F	47 μ F	Not required	Not required	51505C	60 μ H	60 μ H
NCM6D4805C	1 μ F	1 μ F	47 μ F	Not required	Not required	51505C	60 μ H	60 μ H
NCM6D4812C	1 μ F	1 μ F	47 μ F	Not required	Not required	51505C	60 μ H	60 μ H
NCM6D4815C	1 μ F	1 μ F	47 μ F	Not required	Not required	51505C	60 μ H	60 μ H

EMC FILTERING AND SPECTRA (Continued)

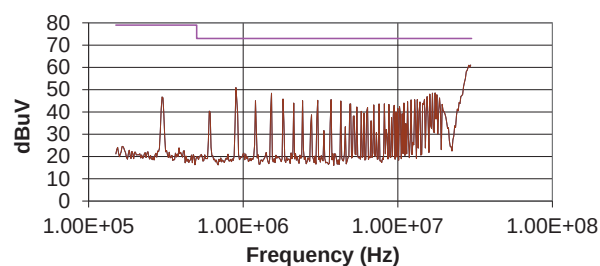
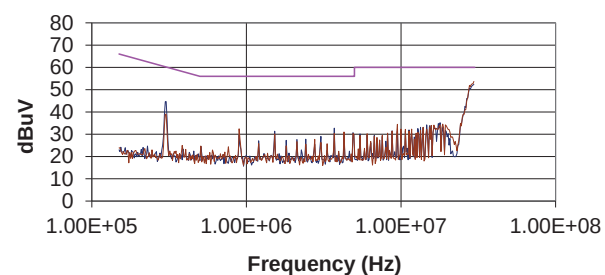
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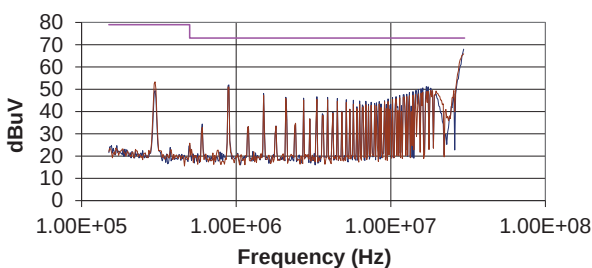
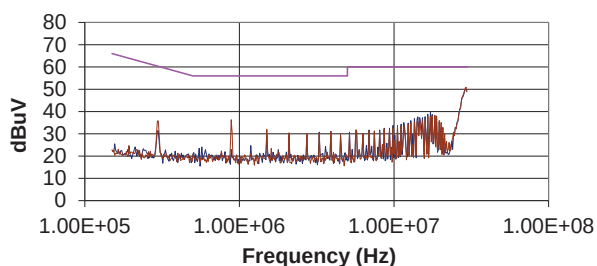
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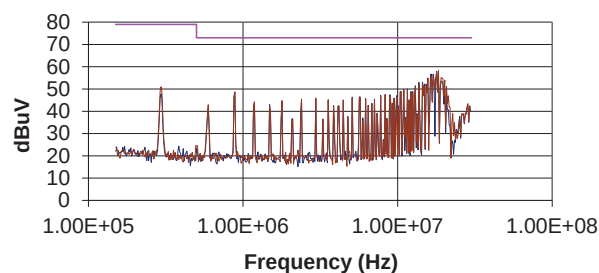
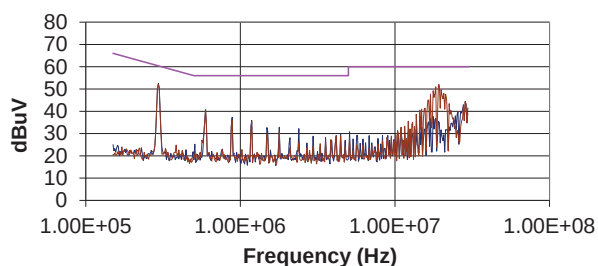


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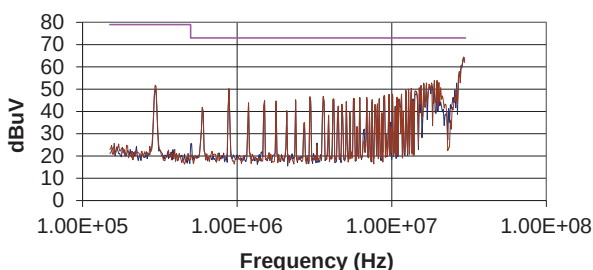
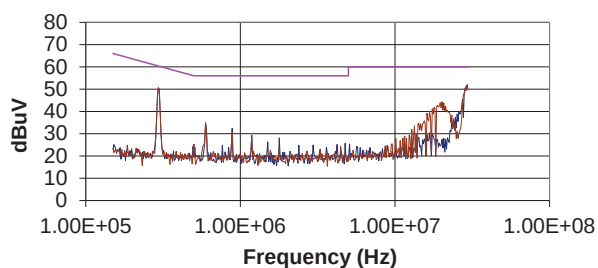


EMC FILTERING AND SPECTRA (Continued)

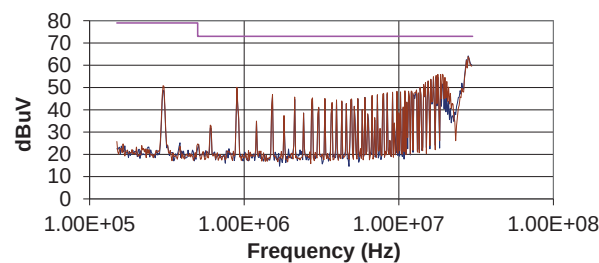
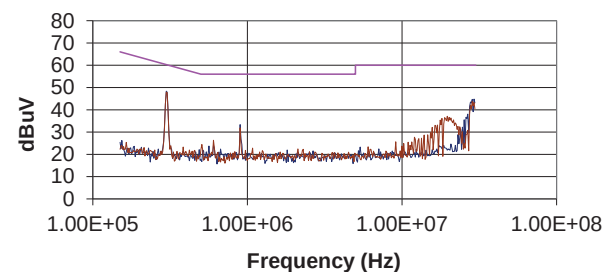
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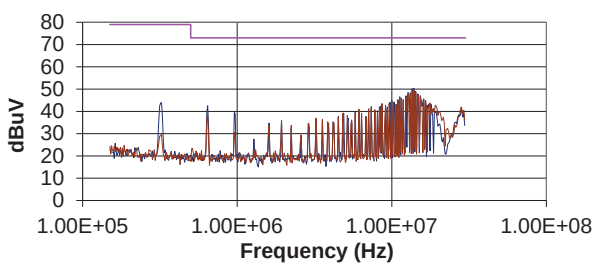
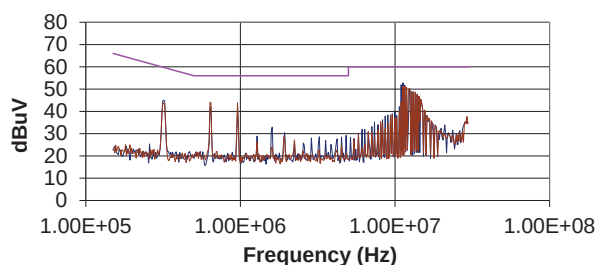
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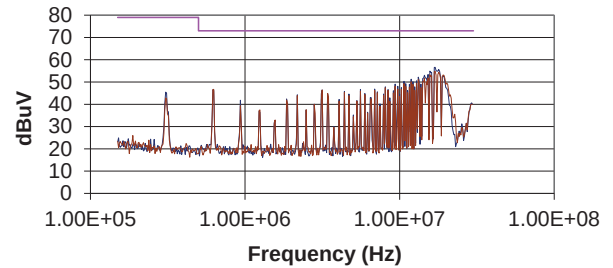
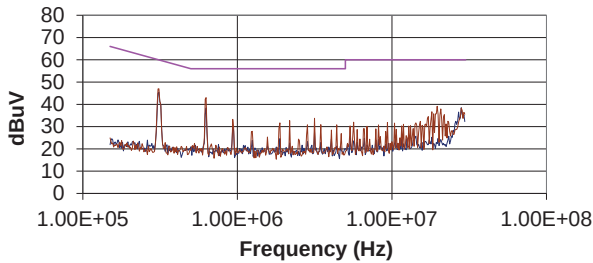


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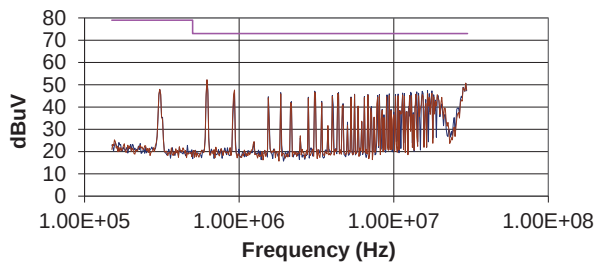
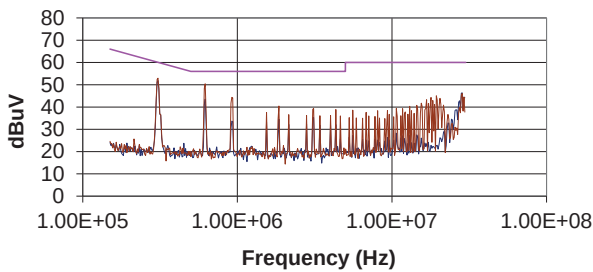


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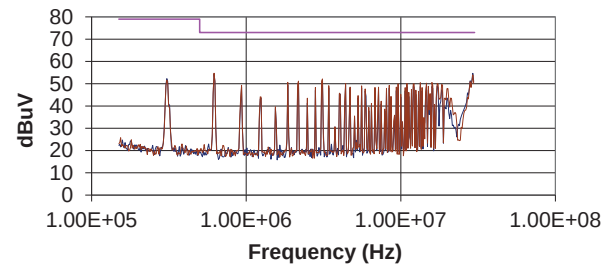
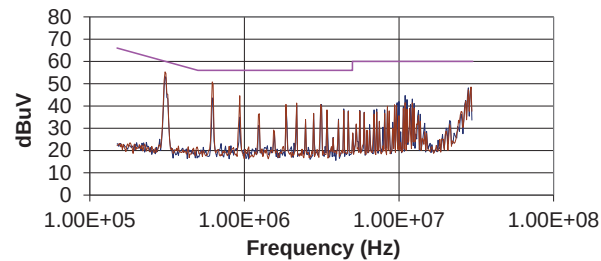
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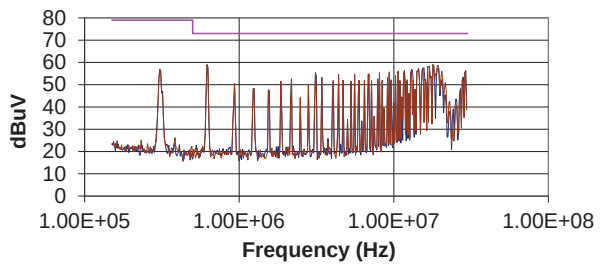
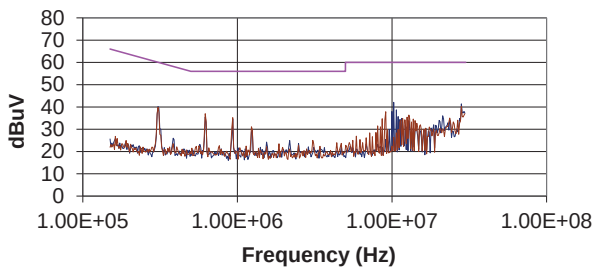
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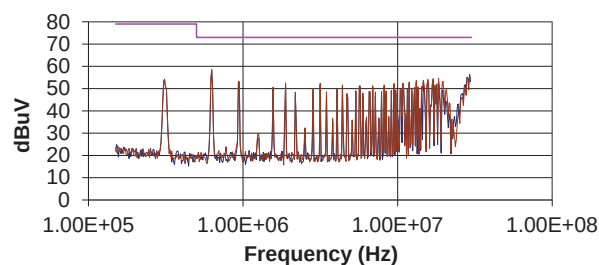
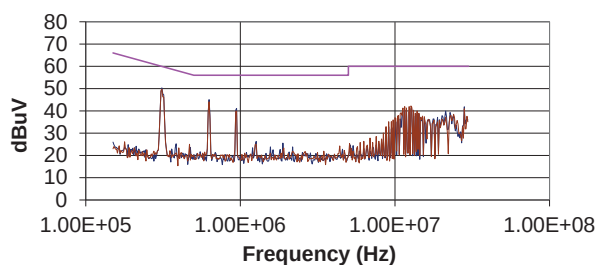


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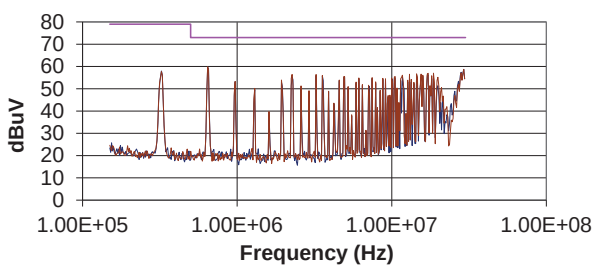
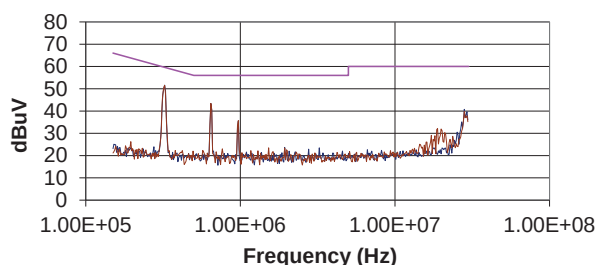


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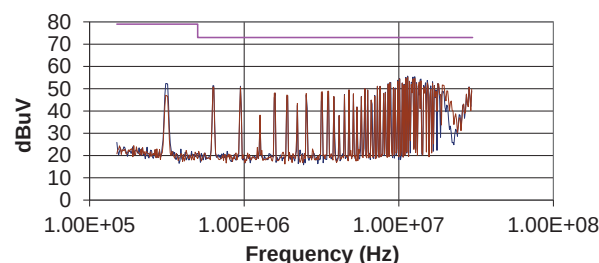
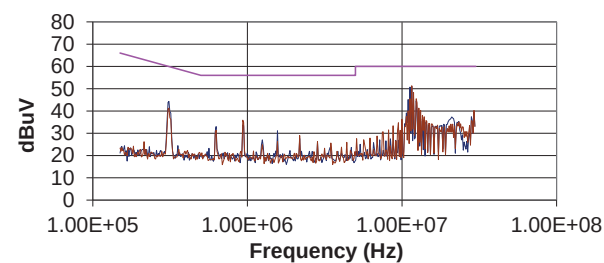
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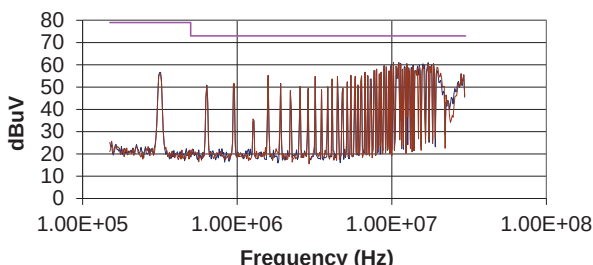
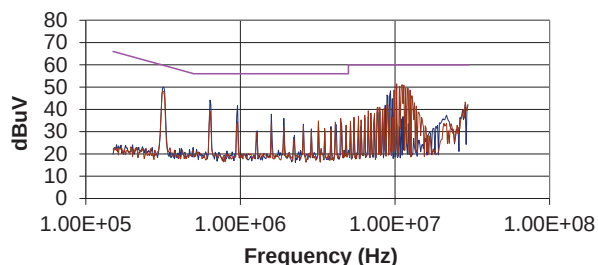
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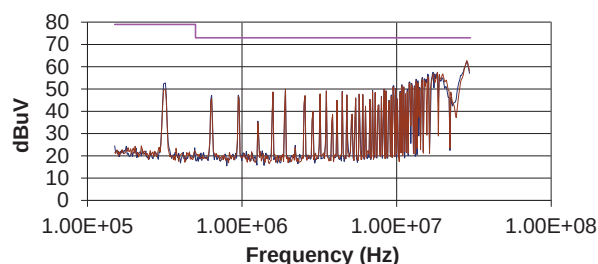
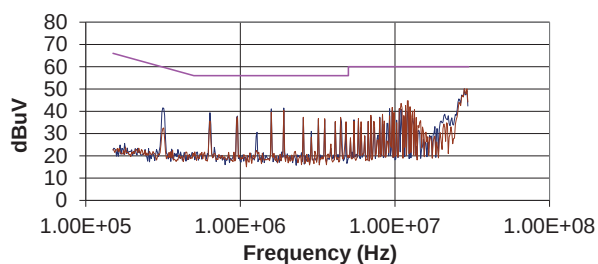


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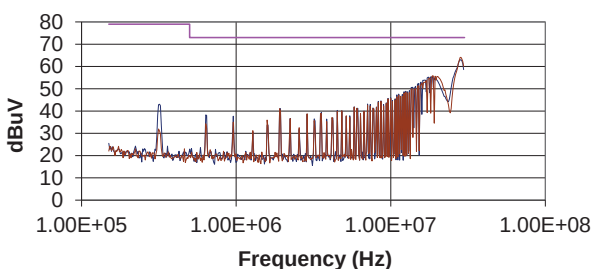
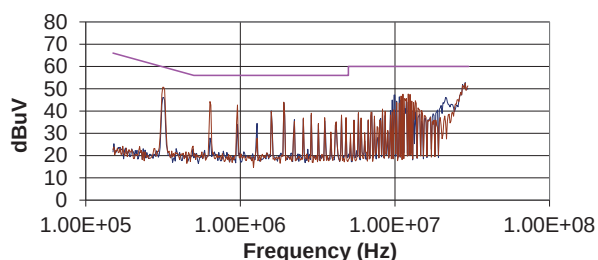


EMC FILTERING AND SPECTRA (Continued)

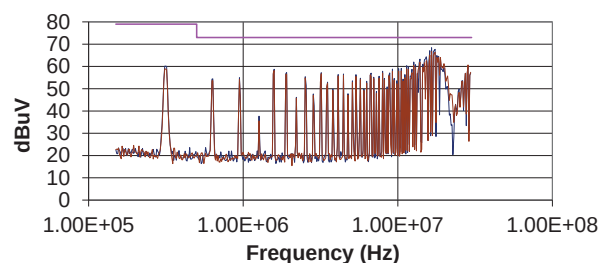
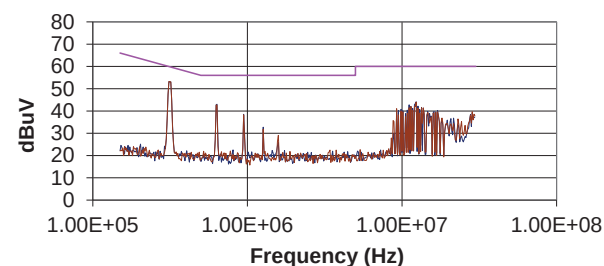
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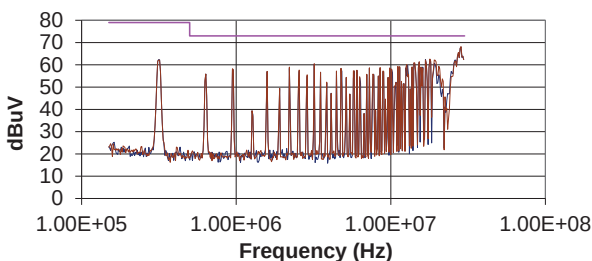
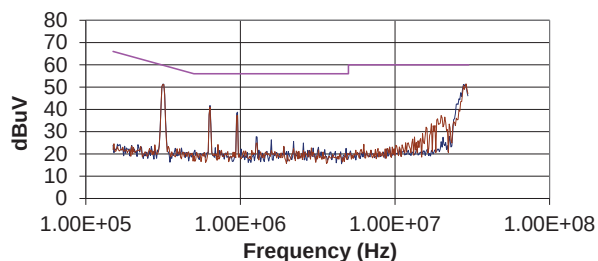
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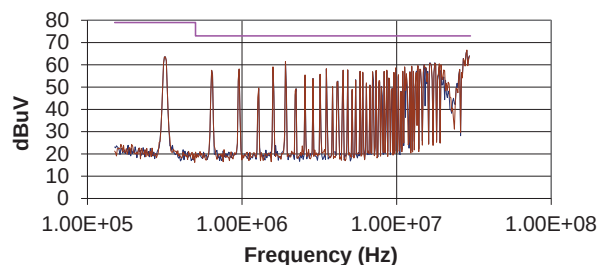
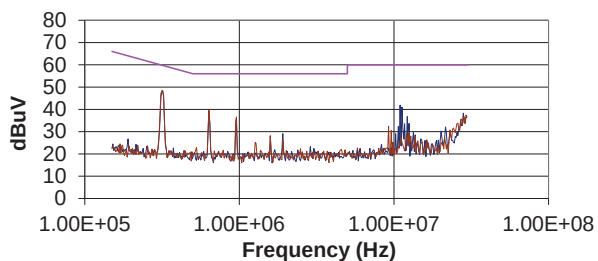


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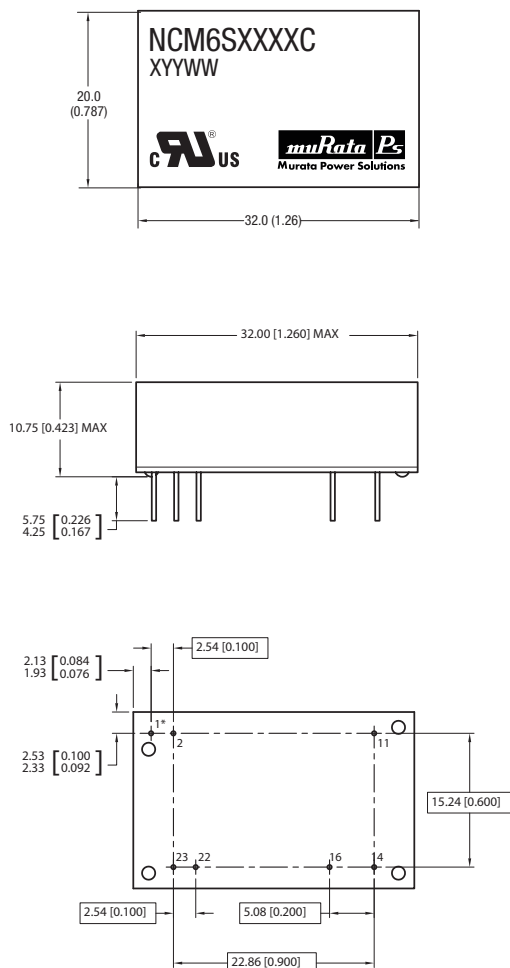
EMC FILTERING AND SPECTRA (Continued)

NCM6D4815C



PACKAGE SPECIFICATIONS

MECHANICAL DIMENSIONS



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

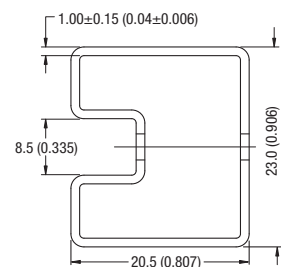
Case material: plastic.

Weight: 10.61g

PIN CONNECTIONS

Pin	Function	
	Single	Dual
1*	ON/OFF	ON/OFF
2	-V _{IN}	-V _{IN}
11	N/C	-V _{OUT}
14	+V _{OUT}	+V _{OUT}
16	-V _{OUT}	OV
22	+V _{IN}	+V _{IN}
23	+V _{IN}	+V _{IN}

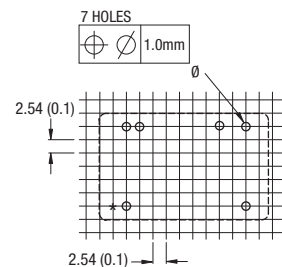
TUBE OUTLINE DIMENSIONS



Tube length 20.47 (520)

All dimensions in inches ± 0.010 (mm 0.25mm). Quantity: 15

RECOMMENDED FOOTPRINT DETAILS



All dimensions in millimeters ± 0.25 (± 0.010 inches).

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- Traffic signal equipment
- Disaster prevention / crime prevention equipment
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