



Size: 1in x 1in x 0.4in (25.4mm x 25.4mm x 10.2mm)

#### OPTIONS

- Input Voltage Range
- Output Voltage

#### FEATURES

- Wide 2:1 Input Voltage Range (9~18V, 18~36V, 36~75V)
- High Power Density
- Lead Free Design
- Useful where isolated, tightly regulated voltages and compact size are required
- Fixed Switching Frequency
- Custom Designs Available
- Over Load, Short Circuit, and Over Voltage Protection
- Wide Operating Temperature Range: -55°C to +95°C
- Industry Standard Pinout
- Shielded Metal Case with Insulated Baseplate
- RoHS compliant
- Designed to meet IEC/EN60950-1 Safety Standards

#### APPLICATIONS

- Battery Operated Equipment
- Measurement Equipment
- Telecom
- Wireless Network
- Industry Control System

#### DESCRIPTION

The DCMRD5 series of isolated DC DC converters offers 5 watts of output power in a compact 1" x 1" x 0.4" frame. This series consists of single and dual outputs with wide 2:1 input voltage range (9~18V, 18~36V, 36~75V) and output voltages of 5VDC, 12VDC, and  $\pm 15$ VDC. Each model is RoHS compliant and meets IEC/EN60950-1 safety standards. The series is protected against over load, short circuit, and over voltage conditions and has high power density.

MODEL SELECTION TABLE

Model Number	Input Voltage Range	Output Voltage	Output Current		Ripple & Noise	Input Current		Output Power	Maximum Capacitive Load <sup>(3)</sup>	Efficiency <sup>(2)</sup>
			Min Load <sup>(1)</sup>	Max Load		No Load	Full Load			
DCMRD5-12S05	9~18V Nominal: 12VDC	5	0mA	1000mA	75mVp-p Max.	17	555	5 Watts	1000 $\mu$ F	79%
DCMRD5-12S12		12	0mA	416mA		21	527		220 $\mu$ F	83%
DCMRD5-12D15		$\pm 15$	0mA	$\pm 167$ mA		27	543		47 $\mu$ F	81%
DCMRD5-24S05	18~36V Nominal: 24VDC	5	0mA	1000mA	75mVp-p Max.	9	278	5 Watts	1000 $\mu$ F	79%
DCMRD5-24S12		12	0mA	416mA		12	267		200 $\mu$ F	82%
DCMRD5-24D15		$\pm 15$	0mA	$\pm 167$ mA		15	268		47 $\mu$ F	82%
DCMRD5-48S05	36~75V Nominal: 48VDC	5	0mA	1000mA	75mVp-p Max.	5	139	5 Watts	1000 $\mu$ F	79%
DCMRD5-48S12		12	0mA	416mA		7	134		133 $\mu$ F	82%
DCMRD5-48D15		$\pm 15$	0mA	$\pm 167$ mA		8	134		47 $\mu$ F	82%

## SPECIFICATIONS

All specifications are based on 25°C, Nominal Input Voltage, and Maximum Output Current unless otherwise noted.  
We reserve the right to change specifications based on technological advances.

SPECIFICATION		TEST CONDITIONS		Min	Typ	Max	Unit
INPUT SPECIFICATIONS							
Input Voltage Range	12V nominal input		9		18	V	
	24V nominal input		18		36		
	48V nominal input		36		75		
Input Surge Voltage (100ms max.)	12V nominal input			25		V	
	24V nominal input			50			
	48V nominal input			100			
Input Reflected Ripple Current	Nominal Vin and Full Load			70		mAp-p	
Input Filter			Pi Type				
Reverse Voltage Protection					1.0	A	
OUTPUT SPECIFICATIONS							
Output Voltage			See Table				
Voltage Accuracy	Full Load and Nominal Vin		-1		+1	%	
Line Regulation	LL to HL at full load		-0.8		+0.8	%	
Load Regulation	25% load to full load		Single	-1.0	+1.0	%	
	Balanced Load			Dual	-1.0		+1.0
	Unbalanced load 25% to 100% full load			-5	+5		
Output Power					5	W	
Output Current			See Table				
Minimum Load			0			A	
Maximum Capacitive Load			See Table				
Ripple & Noise (20MHz bandwidth)					75	mVp-p	
Transient Response Settling Time	50% load step change			1300		us	
Transient Response Over Shoot	di/dt=0.8A/μs		≤ ±5% of Vo				
Start-Up Time	Nominal Vin and constant resistive load			1300		ms	
Temperature Coefficient			-0.02		+0.02	%/°C	
PROTECTION							
Short Circuit Protection			Continuous, Automatic Recovery				
Over Load Protection	% of Full Load at Nominal Input			150		%	
Over Voltage Protection	Zener Diode Clamp	5Vout		6.2		V	
		12Vout		15			
		15Vout		18			
ENVIRONMENTAL SPECIFICATIONS							
Operating Ambient Temperature	With derating		-55		+95	°C	
Maximum Case Temperature					+100	°C	
Storage Temperature			-55		+125	°C	
Relative Humidity			5		95	% RH	
Reliability, calculated MTBF			1.19 x 10 <sup>6</sup> Hours				
GENERAL SPECIFICATIONS							
Efficiency	Nominal Input		See Table				
Switching Frequency	Pulse width modulation (PWM)			300		kHz	
Isolation Voltage	Input to Output			1500		VDC	
Isolation Resistance	500VDC		10 <sup>9</sup>			Ω	
Isolation Capacitance				580		pF	
PHYSICAL SPECIFICATIONS							
Weight			0.62oz (17.4g) typ.				
Dimensions (L x W x H)			1in x 1in x 0.4in (25.4mm x 25.4mm x 10.2mm)				
Case Material			Nickel-Coated Copper				
Base Material			Non-Conductive Black Plastic				
Potting Material			Silicon rubber (UL94V-0)				
Shielding			Shielded Metal Case with Insulated Baseplate				
SAFETY & EMC CHARACTERISTICS							
Safety Standards			Designed to meet IEC/EN60950-1				

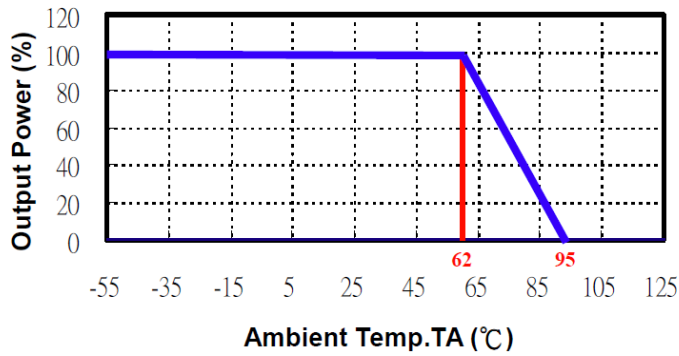
## NOTES

- (1) Lo below this value will not damage these converters, however, they may not meet all listed specification.
- (2) Typical value, tested at nominal input and full load.
- (3) For each output.

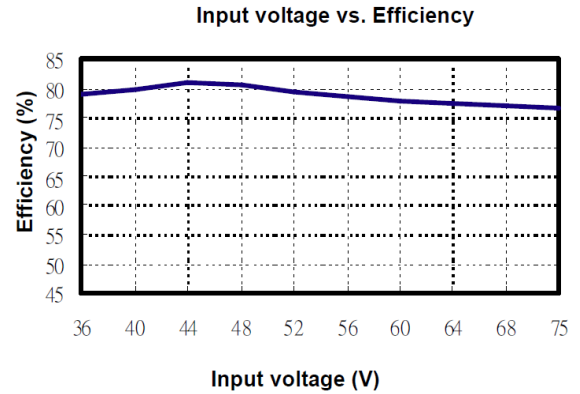
*\*Due to advances in technology, specifications subject to change without notice.*

## DERATING CURVES

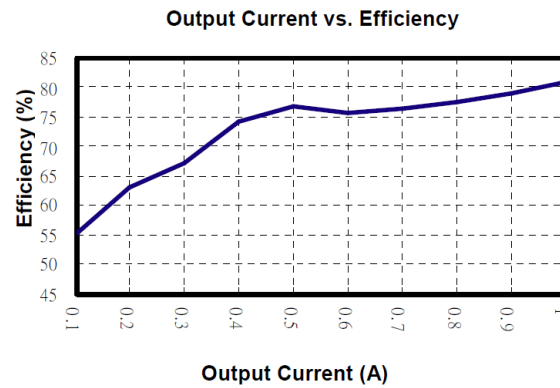
Power Derating



Input Voltage vs. Efficiency DCMRD5-48S1

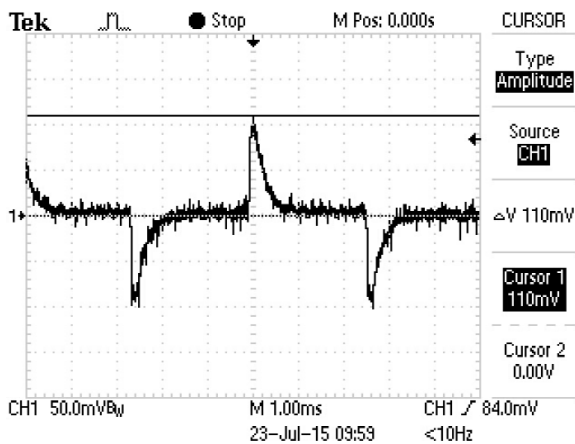


Output Current vs. Efficiency DCMRD5-48S1

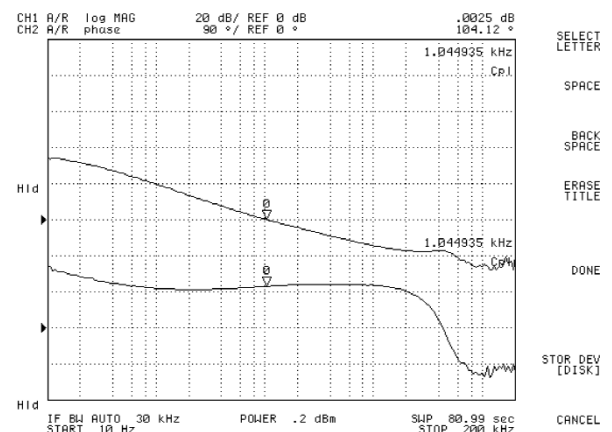


## GRAPHS

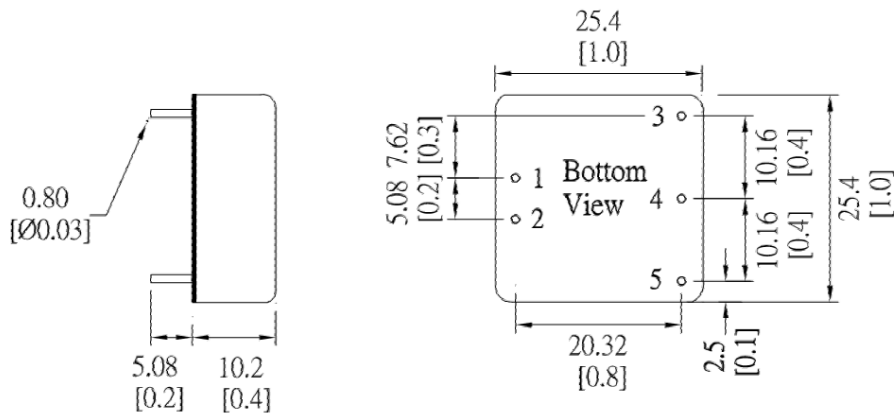
Transient Response at 50%~100% Max Load DCMRD5-48S1



Loop Gain & Phase at Vi=48V, Full Load



MECHANICAL DRAWINGS

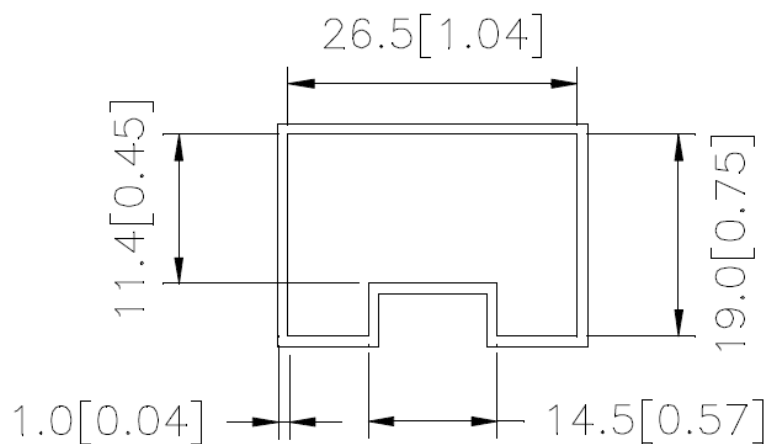


Pin Assignment		
Pin	Single	Dual
1	+Vin	+Vin
2	-Vin	-Vin
3	+Vout	+Vout
4	No Pin	Common
5	-Vout	-Vout

Unit: mm [inch]  
Tolerance:  $\pm 0.5$  [0.02]

\*Specifications subject to change without notice

Package Information

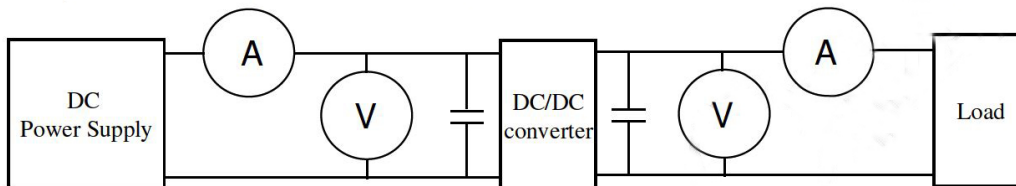


PS:  
Unit: mm [inch]  
L= 285 mm[11.22 inch] ; ONE TUBE = 10 PCS

## APPLICATION NOTE

### Test Configurations

All specifications are based on 25°C, Nominal Input Voltage, and Maximum Output Current unless otherwise noted.  
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DC Power Supply: offers a wide voltage and current range precisely.

Current Meter (A): Accuracy → 200μA~200mA 4 ranges ±(0.2% rdg + 2 digits)  
2000mA~20A 2 ranges ±(0.3% rdg + 2 digits)

Voltage Meter (V): Accuracy → ±(0.3% rdg + 4 digits)

Load: At Full Load

Wires: The resistance of the wires must be small.

#### 1. Input Voltage Range: Narrow input voltage range (±10%); Wide input voltage range (2:1 and 4:1)

Ex: Narrow input voltage range (±10%)

5VDC nominal input → 4.5~5.5VDC  
12VDC nominal input → 10.8~13.2VDC  
24VDC nominal input → 21.6~26.4VDC

Wide input voltage range 2:1

5VDC nominal input → 4.5~9VDC  
12VDC nominal input → 9~18VDC  
24VDC nominal input → 18~36VDC  
48VDC nominal input → 36~75VDC

Wide input voltage range 4:1 (W)

24VDC nominal input → 9~36VDC  
48VDC nominal input → 18~75VDC

#### 2. Input Power:

$$P_{in} = V_{in} \times I_{in}$$

$V_{in}$ : Input voltage  
 $I_{in}$ : Input current

#### 3. Output Power:

$$P_{out} = V_{out} \times I_{out}$$

$V_{out}$ : Output Voltage  
 $I_{out}$ : Output Current

#### 4. Efficiency:

$$\text{Efficiency} = \frac{P_{out}}{P_{in}} \times 100\%$$

$P_{out}$ : Output Power  
 $P_{in}$ : Input Power

#### 5. Voltage Accuracy:

$$\frac{|V_{out} - V_{out(Nominal)}|}{V_{out}} \times 100\%$$

$V_{out}$ : Output Voltage  
 $V_{out (nominal)}$ : Nominal output voltage

#### 6. Line Regulation:

(1) Wide input voltage range and regulated output voltage series

$$\frac{|V_{out(LL)} - V_{out(HL)}|}{V_{out(LL)}} \times 100\%$$

LL: Low Line Input Voltage  
HL: High Line Input Voltage

(2) Narrow input voltage range (±10%) and unregulated output voltage series

$$\text{Line Regulation} = \left| \frac{\Delta V_{out}}{\Delta V_{in}} \right|$$

$$\Delta V_{out} = \frac{V_{in(+10\%)} - V_{in(-10\%)}}{V_{in(Nominal)}} \times 100\%$$

$V_{out(+10\%)}$ : Output Voltage at  $V_{in} = 1.1 \times V_{in(nominal)}$  & Full Load  
 $V_{out(-10\%)}$ : Output Voltage at  $V_{in} = 0.9 \times V_{in(nominal)}$  & Full Load  
 $V_{out}$ : Output Voltage at  $V_{in} = V_{in(nominal)}$  & Full Load

$$\Delta V_{in} = \frac{V_{in(+10\%)} - V_{out(-10\%)}}{V_{in(nominal)}} \times 100\%$$

$V_{in(+10\%)}$ : Input Voltage =  $1.1 \times V_{in(nominal)}$

$V_{in(-10\%)}$ : Input Voltage =  $0.9 \times V_{in(nominal)}$

$V_{in(nominal)}$ : Nominal Input Voltage

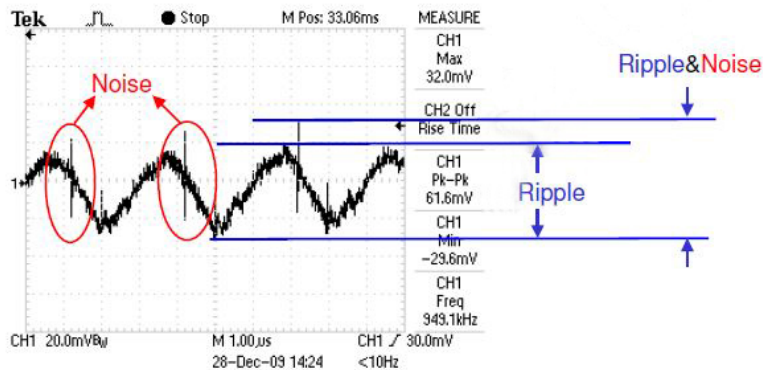
**7. Load Regulation:**

$$\frac{|V_{out(FL)} - V_{out(NL)}|}{V_{out(FL)}} \times 100\%$$

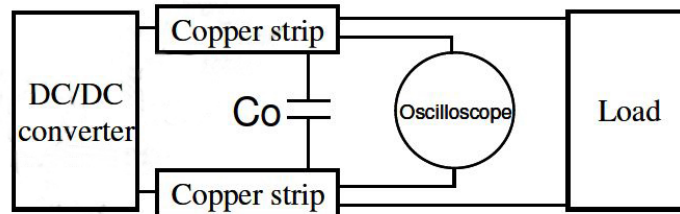
$V_{out(FL)}$ : Output voltage at Full Load

$V_{out(NL)}$ : Output voltage at 25% Full Load or 10% Full Load

**8. Ripple and Noise:** as shown below. The bandwidth is 0-2MHz

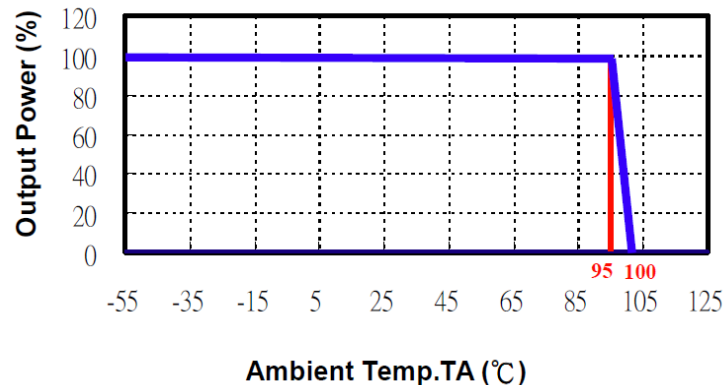


Output Ripple & Noise measurement test circuit: as shown below



$C_o$ : usually 0.47uF.

**9. Temperature Derating Curve:** The DC/DC converter will operate over a wider temperature range if less power is drawn from the output and the device is already running. The temperature derating curve shows the operating power-temperature range. As shown below.



**10. Switching Frequency:** The nominal operating frequency of the DC/DC converters.

**11. Input to Output Isolation:** The dielectric breakdown strength test between input and output circuits. This is the isolation voltage the device is capable of withstanding for a specified time, usually 1 second or 1 minute.

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**COMPANY INFORMATION**

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