

# Make-Ps<sup>®</sup>

## DC/DC CONVERTER

### Single & Dual Output DC/DC Converter

**Series LCD20**  
20Watt | DC-DC Converter



**FEATURES:**

- 20W DIL PACKAGE
- 2:1 WIDE INPUT RANGE
- 100% BURNED IN
- HIGH EFFICIENCY
- UL94V-0 PACKAGE MATERIAL
- CUSTOM SOLUTIONS AVAILABLE
- RoHS COMPLIANT
- Remote Control:On/Off

**APPLICATIONS:**

- Wireless Network
- Telecom/Datacom
- Industry Control System
- Measurement Equipment
- Semiconductor Equipment

**MODEL SELECTION CHART**

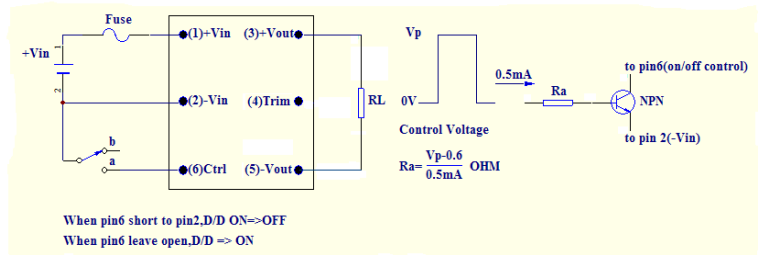
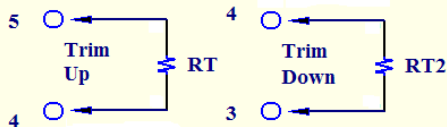
Part Number	Input Voltage Vdc	Input Current		Output Voltage Vdc	Output Current Full Load (mA)	Efficiency %TYP	Capacitor Load uF MAX
		No-Load (mA TYP)	Full Load (mA TYP)				
LCD20-12S3P3	9-18	30	1456	3.3	4500	85	8200
LCD20-12S05	9-18	30	1938	5	4000	86	5600
LCD20-12S12	9-18	30	1920	12	1670	87	960
LCD20-12S15	9-18	30	1911	15	1330	87	680
LCD20-12D12	9-18	30	1915	±12	±833	87	470
LCD20-12D15	9-18	30	1917	±15	±667	87	330
LCD20-24S3P3	18-36	25	719	3.3	4500	86	8200
LCD20-24S05	18-36	25	958	5	4000	87	5600
LCD20-24S12	18-36	25	949	12	1670	88	960
LCD20-24S15	18-36	25	945	15	1330	88	680
LCD20-24D12	18-36	25	947	±12	±833	88	470
LCD20-24D15	18-36	25	947	±15	±667	88	330
LCD20-48S3P3	36-75	20	356	3.3	4500	87	8200
LCD20-48S05	36-75	20	473	5	4000	88	5600
LCD20-48S12	36-75	20	474	12	1670	88	960
LCD20-48S15	36-75	20	472	15	1330	88	680
LCD20-48D12	36-75	20	473	±12	±833	88	470
LCD20-48D15	36-75	20	474	±15	±667	88	330

NOTE: All specifications in this datasheet are measured at an ambient temperature of 25°C, humidity<75%, nominal input voltage and at rated output load unless otherwise specified.

**Output Voltage Adjustment**

**Control Pin Suggest Circuit**

Output can be externally trimmed by using the method shown below.



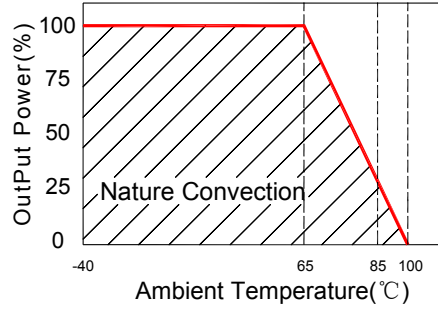
Input Specifications					
Parameters	Conditions	Min	Typ	Max	Units
<b>Voltage Types</b>				2:1	
<b>Start-up voltage / under voltage shut down</b>	12 Vin		8.7/8.3	9	VDC
	24 Vin		16.9/16.2	18	
	48 Vin		33.0/30.5	36	VDC
<b>Surge voltage (100 msec. max.)</b>	12 Vin			25	V
	24 Vin			50	
	48 Vin			100	V
<b>Reflected input ripple current</b>			30		mA
<b>Filter</b>	LC Network				
<b>Protection</b>	Fuse Recommended				

Output Specifications					
Parameters	Conditions	Min	Typ	Max	Units
<b>Voltage Tolerance</b>				±2	%
<b>Output voltage adj. range</b>	only for single output models			±10	%
<b>Line Regulation (Vmin – Vmax)</b>	single output			0.5	%
	dual output			0.5	%
<b>Load Regulation (25 – 100 %)</b>	single output			0.5	%
	dual output models balanced load			1.0	%
<b>Load variation(25%/100%)</b>	dual output models unbalanced load			5.0	%
<b>Minimum load</b>	required	0		10	%
<b>Ripple and noise(20 MHz bandwidth)</b>	with external capacitor (See Note 1)			100	mVp-p
<b>Temperature coefficient</b>			±0.05		%/°C
<b>Output current limitation</b>			at 150 % of Iout max., constant current		
<b>Short circuit protection</b>			Hiccup (automatic recovery)		
<b>Over voltage protection</b>	3.3VDC	3.7		5.4	Vout
	5VDC	5.6		7.0	Vout
	12VDC	13.5		19.6	Vout
	15VDC	16.8		20.5	Vout
<b>Start up time</b>	nominal Vin and constant resistive load		30		ms
<b>Transient response setting time</b>	25% load step change		300		us

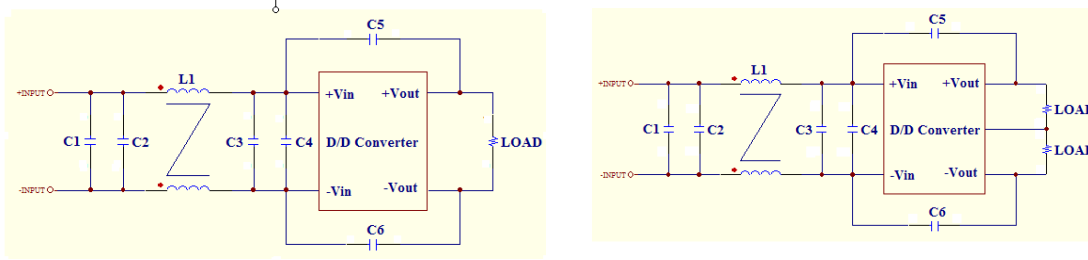
General Specifications					
Parameters	Conditions	Min	Typ	Max	Units
<b>Temperature ranges</b>	Operating(with derating)	-40		+75	°C
	Case temperature			105	°C
	Storage	-55		+125	°C
<b>Humidity</b>	non condensing	5		95	%
<b>Reliability, calculated MTBF</b>	MIL-HDBK-217F, @ +25° C, ground benign	340000			Hours
<b>Isolation voltage</b>	For 60 seconds(Input/Output)			1500	VDC
<b>Isolation capacity</b>	Input/Output		1000		pF
<b>Isolation resistance</b>	Input/Output (500 VDC)	1000			MΩ
<b>Remote On/Off</b>	On	3.0 ~ 15 VDC or open circuit			
	Off	0 ~ 1.2 VDC or short circuit pin 6 and pin 2			
	Off idle current:		2.5		mA
<b>Switching frequency (fixed)</b>			330		KHz
<b>Vibration and thermal shock</b>		MIL-STD-810E			
<b>Safety standards</b>		EN 60950-1, IEC 60950-1			
<b>Case material</b>		nickel coated copper			
<b>Base material</b>		Non-conductive FR4			
<b>Potting material</b>		epoxy (UL 94V-0 rated)			
<b>Weight</b>		15 g (0.53 oz)			
<b>Soldering temperature</b>		max. 265°C / 10sec			
<b>EMI (Conducted&amp;Radiation)</b>		EN55022 Class A			

Note : 1 Ripple & Noise measurement bandwidth is 20 MHz, measured with a 1uF M/C and a 10uF T/C.

Temperature Derating Graph



EMC Considerations



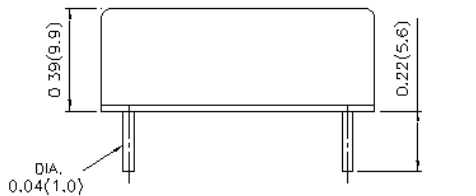
Suggested Schematic to comply with EN55022 Conducted Noise emission Class B

Following components are needed to comply with EN55022 Class B conducted noise:

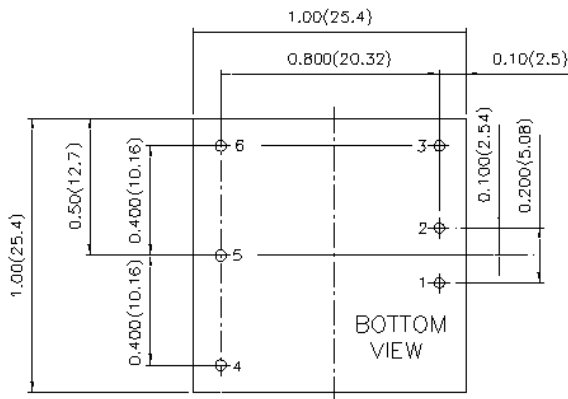
LCD20-12S(D)XXXX LCD20-24S(D)XXXX				LCD20-48S(D)XXXX			
Componet	Value	Voltage	Reference	Componet	Value	Voltage	Reference
C1,C2,C3	6.8uF	50V	1812 MLCC	C1,C2,C3,C4	2.2uF	100V	1812 MLCC
C5,C6	1000pF	2KV	1206 MLCC	C5,C6	1000pF	2KV	1206 MLCC
L1	325uH		Common Mode Choke	L1	260uH		Common Mode Choke

OUTLINE DRAWING

Package Style and Pinning (mm)



- All dimensions in Inches (mm)  
Tolerance: X.XX±0.02 (X.X±0.5)  
X.XXX±0.01 (X.XX±0.25)
- Pin pitch tolerance ±0.01(0.25)
- Pin dimension tolerance ±0.004 (0.1)



PIN CONNECTION		
PIN	SINGLE	DUAL
1	+ INPUT	+ INPUT
2	- INPUT	- INPUT
3	ON/OFF	ON/OFF
4	+VOUT	+VOUT
5	TRIM	COMMON
6	-VOUT	-VOUT

All specifications are typical at nominal input, nominal load and 25° C unless otherwise specified.  
External, low ESR, 10 microfarad (minimum) capacitor across output is recommended for operation.