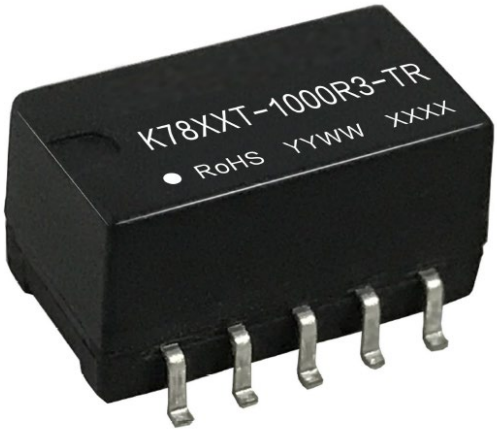
36K78xxT-1000R3-TR DC-DC Converter Series

Up to 12 Watt

Features

- High efficiency up to 95%
- No-load input current as low as 0.2mA
- Operating ambient temperature range -40℃ to +85℃
- Output short-circuit protection
- SMD package
- EN62368 Approved



Ideal Power's 36K78xxT-1000R3-TR 12W Non-Isolated DC/DC Converters in SMD Series are certified to UKCA, CE & RoHS & IEC/UL60950/EN62368 Standards and comply with the relevant Efficiency Regulations. These are primarily used in ITE, Audio & Video Industries and customised solutions are available upon request.

Models

Model No.	Input Voltage (VDC)* Nominal (Range)	Output		Full Load Efficiency (%) Vin Min/Vin Max	Capacitive Load (µF) Max.
		Voltage (VDC)	Current (mA) Max/Min.		
36K7801T-1000R3-TR	12 (4.75-32)	1.5	1000	76/66	680
36K7802T-1000R3-TR	12 (4.75-32)	2.5	1000	86/74	680
36K7803T-1000R3-TR	24 (6.5-36)	3.3	1000	90/80	680
36K7805T-1000R3-TR	24 (8-36)	5	1000	93/85	680
36K78X6T-1000R3-TR	24 (10-36)	6.5	1000	93/86	680
36K7809T-1000R3-TR	24 (13-36)	9	1000	94/89	680
36K7812T-1000R3-TR	24 (16-36)	12	800	95/92	680

Note: *For input voltage exceeding 30 VDC, an input capacitor of 22uF/50V is required.

Input Specifications

Conditions		Min	Typ	Max	Unit
No-load Input Current		--	0.2	1.5	mA
Reverse Polarity at Input		Avoid / Not protected			
Input Filter		Capacitance filter			
Ctrl*	Module on	Open or pulled high (TTL level 3.2-5.5VDC)			
	Module off	Pulled low to GND level (0-0.8VDC)			
	Input current when off	--	0.2	1	µA

Note: *The Ctrl pin voltage is referenced to input GND.

Output Specifications

Parameter	Conditions		Min	Typ	Max	Unit
Voltage Accuracy	Full load, input voltage range	1.5/2.5/3.3VDC output	--	±2	±4	%
		Others	--	±2	±3	
Linear Regulation	Full load, input voltage range	1.5/2.5VDC output	--	±0.3	±0.6	
		Others	--	±0.2	±0.4	
Load Regulation	Nominal input voltage, 10% -100% load	1.5/2.5VDC output	--	0.8	±1.5	
		Others	--	0.3	±0.6	
Ripple & Noise*	20MHz bandwidth		--	30	75	mVp-p
Transient Recovery Time	Nominal input voltage, 25% load step change		--	0.2	1	ms
Transient Response Deviation			--	50	150	mV
Temperature Coefficient	Operating temperature -40℃ to +85℃		--	--	±0.03	%/℃
Short-circuit Protection	Nominal input voltage		Continuous, self-recovery			
Vadj	Input voltage range		--	±10	--	%Vo

Note: *
① The “parallel cable” method is used for ripple and noise test, please refer to DC-DC Converter Application Notes for specific information;
② With light loads at or below 20%, Ripple & Noise increases to 150mVp-p max.

General Specifications

Parameter	Conditions		Min	Typ	Max	Unit
Operating Temperature	see Fig. 1		-40	--	+85	℃
Storage Temperature			-55	--	+125	
Storage Humidity	Non-condensing		5	--	95	%RH
Reflow Soldering Temperature			Peak temperature ≤245℃, duration ≤60s max.over 217℃. Also refer to IPC/JEDEC J-STD-020D.1.			
Switching Frequency	Full load, nominal input	1.5/2.5VDC output	--	370	--	KHz
		3.3/5/6.5VDC output	--	520	--	
		09/12VDC output	--	700	--	
MTBF	MIL-HDBK-217F@25℃		2000	--	--	K hours

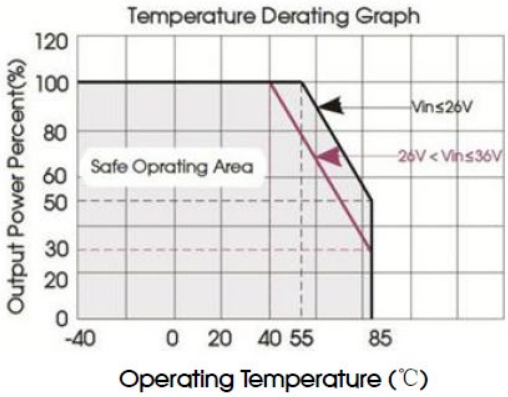
Mechanical Specifications

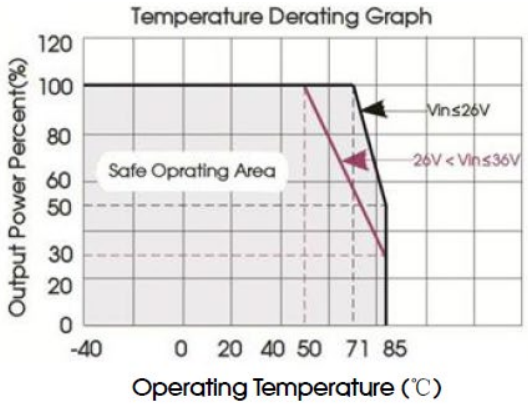
Case material	Black plastic; flame-retardant and heat-resistant (UL94 V-0)
Dimensions	15.24 x11.40 x 8.25mm
Weight	1.7g (Typ.)
Cooling method	Free air convection

Electromagnetic Compatibility (EMC)

Emissions	CE	CISPR32/EN55032	CLASS B (see Fig. 4-② for recommended circuit)	
	RE	CISPR32/EN55032	CLASS B (see Fig. 4-② for recommended circuit)	
Immunity	ESD	IEC/EN 61000-4-2	Contact ±4KV	perf. Criteria B
	RS	IEC/EN 61000-4-3	10V/m	perf. Criteria A
	EFT	IEC/EN 61000-4-4	±1KV (see Fig. 4-① for recommended circuit)	perf. Criteria B
	Surge	IEC/EN 61000-4-5	line to line ±1KV (see Fig. 4-① for recommended circuit)	perf. Criteria B
	CS	IEC/EN 61000-4-6	3Vr.m.s	perf. Criteria A

Characteristic Curve





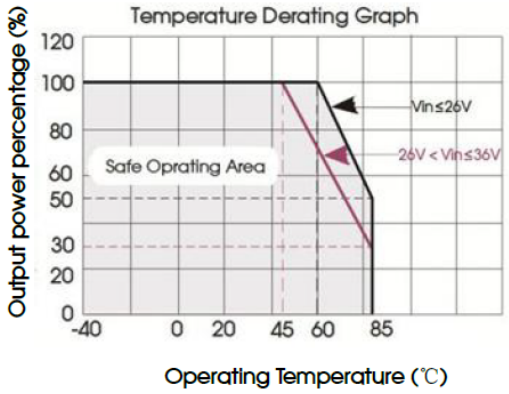
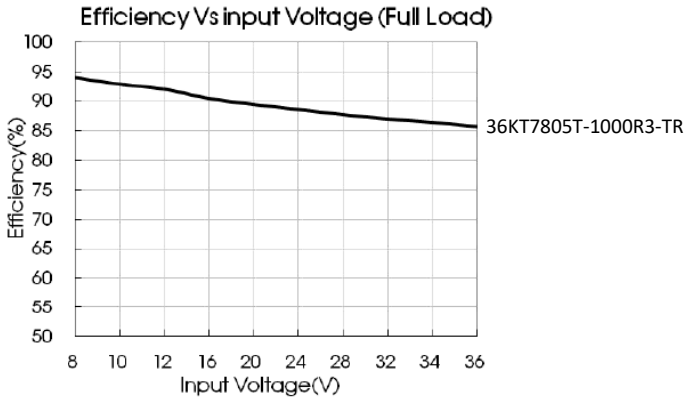
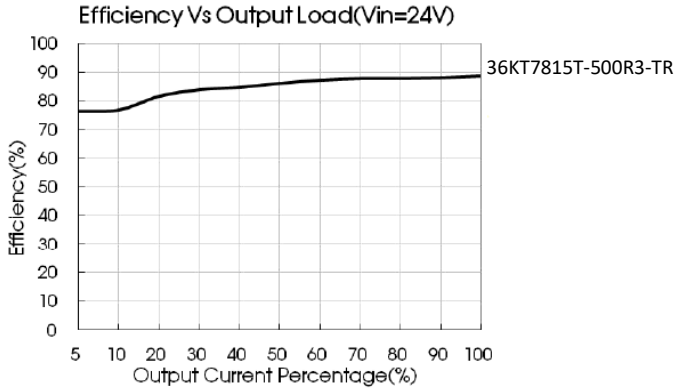


Fig. 1





Design Reference (Figure 1)

1 Typical application

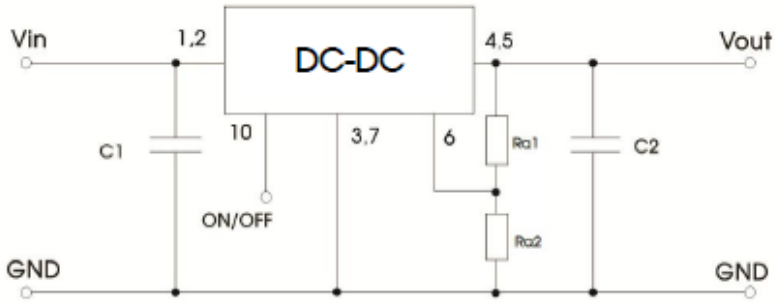


Fig. 2 Typical application circuit

Model No	C1 (Ceramic capacitor)	C2 (Ceramic capacitor)	Ra1/Ra2 (Vadj resistance)
36K7801T-1000R3-TR	10μF/50V	22μF/10V	Refer to Vadj resistance calculation
36K7802T-1000R3-TR		22μF/10V	
36K7803T-1000R3-TR		22μF/10V	
36K7805T-1000R3-TR		22μF/16V	
36K78X6T-1000R3-TR		22μF/16V	
36K7809T-1000R3-TR		22μF/25V	
36K7812T-1000R3-TR		22μF/25V	

Design Reference (Continued)

2 EMC Compliance circuit

Note:
The required C1 and C2 capacitors must be connected as close as possible to the terminals of the module.
Refer to Table 1 for C1 and C2 capacitor values. For certain applications, increased values and/or tantalum or low ESR electrolytic capacitors may also be used instead.
Converter cannot be used for hot swap and with output in parallel.
To further reduce the output ripple and noise, we suggested the use of a "LC" filter at the output terminals, with an inductor value (L) of 10μH-47μH.

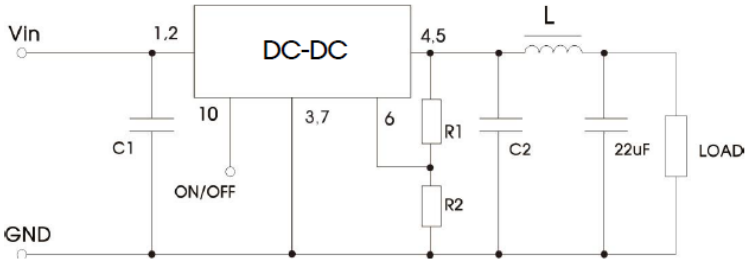


Fig. 3 External "LC" output filter circuit diagram

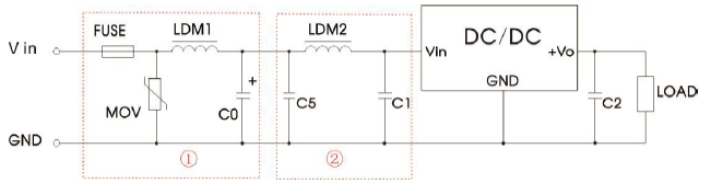
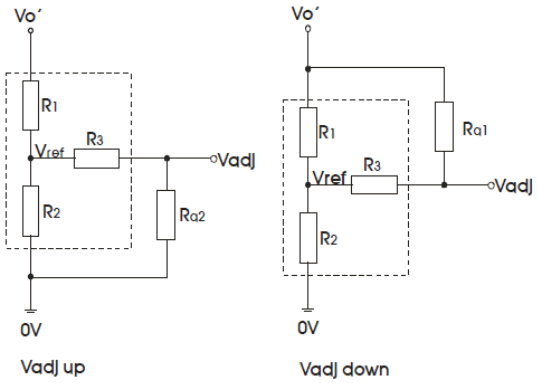


Fig.4 Recommended compliance circuit

FUSE	MOV	LDM1	C0	C2	C1/C5	LDM2
Select fuse value according to actual input current	S20K30	82μH	680μF /50V	Refer to table 1	4.7μF /50V	68μH

Note: Part ① in Fig. 4 shows Immunity compliance filter and part ② filter for Emission compliance; depending on requirement both filters ① and ② can be used in series as shown.
Trim Function for Output Voltage Adjustment (open if unused)

3 Trim Function for Output Voltage Adjustment (open if unused)



Calculating Trim resistor values:

up: $R_{a2}=\frac{aR_2}{R_2-a}-R_3$ $\quad a=\frac{V_{ref}}{V_o'-V_{ref}}\cdot R_1$

down: $R_{a1}=\frac{aR_1}{R_1-a}-R_3$ $\quad a=\frac{V_o'-V_{ref}}{V_{ref}}\cdot R_2$

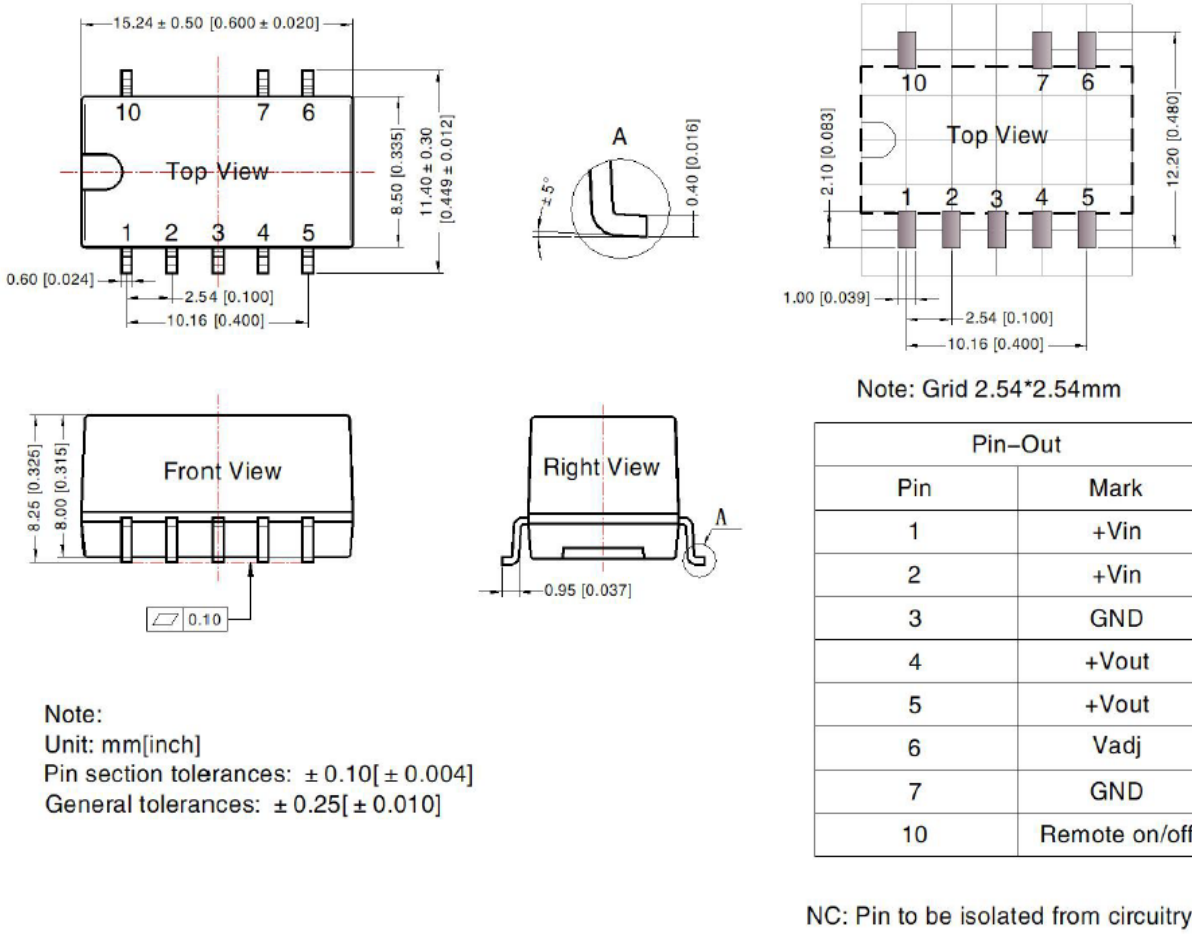
Ra1、Ra2= Trim Resistor value;
a= self-defined parameter;
Vo'=desired output voltage.

Fig.5 Circuit diagram of Vadj up and down (dashed line shows internal part of module)

Vout(V)	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref(V)
1.5	7.5	7.5	15	0.75
2.5	9.1	3.9	8.2	0.75
3.3	75	22	75	0.75
5	43	7.5	33	0.75
6.5	43	5.6	22	0.75
9	43	3.9	22	0.75
12	36	2.4	10	0.75
1.5	7.5	7.5	15	0.75

Note: The 1.5V model's output voltage can only be adjusted up (Vadj up) and cannot be adjusted to a lower voltage (Vadj down is not applicable).

Dimensions and Recommended Layout



Note: Grid 2.54*2.54mm

Pin–Out	
Pin	Mark
1	+Vin
2	+Vin
3	GND
4	+Vout
5	+Vout
6	Vadj
7	GND
10	Remote on/off

NC: Pin to be isolated from circuitry

Note:
Unit: mm[inch]
Pin section tolerances: ± 0.10[± 0.004]
General tolerances: ± 0.25[± 0.010]

Notes:

For additional information on Product Packaging please refer to www.Idealpower.com.
The specified maximum capacitive load is tested under full load condition and over the input voltage range.
All parameters in this datasheet were measured under following conditions: Ta=25℃, relative humidity <75%RH, nominal input voltage and rated output load (unless otherwise specified).
All index testing methods in this data table are based on our Company's corporate standards.
The performance indexes of the product models listed in this manual are as above, but some indexes of non-standard model products will exceed the above-mentioned requirements, and please directly contact with our technician for specific information.
Products are related to laws and regulations: see "Features" and "EMC".
Our products shall be classified according to ISO14001 and related environmental laws and regulations and shall be handled by qualified units.