SERIES: P78-2000-S | **DESCRIPTION:** NON-ISOLATED SWITCHING REGULATOR

FEATURES

- 2 A of output current
- high efficiency up to 95%
- no-load input current as low as 0.1 mA
- wide temperature range: -40°C ~ +85°C
- output short circuit protection
- pin-out compatible with linear regulators
- designed to meet EN/BS EN 62368



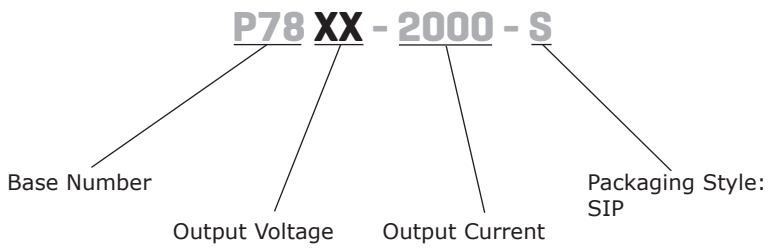
RoHS

MODEL

MODEL	input voltage typ (Vdc)	input voltage range (Vdc)	output voltage (Vdc)	output current max (mA)	output power max (W)	ripple and noise[1,2] max (mVp-p)	efficiency typ (%)
P78X2-2000-S	24	4.5~28	1.8	2000	3.6	75	83
P7802-2000-S	24	4.5~36	2.5	2000	5	75	89
	12	8~32	-2.5	1000	-2.5	150	84
P7803-2000-S	24	6~36	3.3	2000	6.6	75	89
	12	8~31	-3.3	1000	-3.3	150	83
P7805-2000-S	24	8~36	5	2000	10	75	92
	12	8~30	-5	1000	-5	150	84
P7806-2000-S	24	10~36	6.5	2000	13	75	92
	12	8~29	-6.5	1000	-6.5	150	85
P7809-2000-S	24	13~36	9	2000	18	75	95
	12	8~26	-9	1000	-9	150	84
P7812-2000-S	24	16~36	12	2000	24	75	96
	12	8~23	-12	1000	-12	150	85
P7815-2000-S	24	18~36	15	2000	30	75	96
	12	8~20	-15	1000	-15	150	85

Notes: 1. Ripple and noise are measured at 20 MHz BW, nominal input, full load by "parallel cable" method with 1 µF ceramic and 10 µF electrolytic capacitors on the output.
2. 20~100% load ripple & noise ≤ 100 mVp-p. 0~20% load ripple & noise ≤ 180 mVp-p

PART NUMBER KEY



Please read our datasheet & drawing disclaimer here.

INPUT

parameter	conditions/description		min	typ	max	units
operating input voltage	1.8 Vdc output model		4.5	24	28	Vdc
	2.5 Vdc output model		4.5	24	36	Vdc
	3.3 Vdc output model		6	24	36	Vdc
	5.0 Vdc output model		8	24	36	Vdc
	6.5 Vdc output model		10	24	36	Vdc
	9 Vdc output model		13	24	36	Vdc
	12 Vdc output model		16	24	36	Vdc
	15 Vdc output model		19	24	36	Vdc
no load input current	positive output, nominal Vin	1.8 & 2.5 Vdc output		0.2	0.5	mA
		all other outputs		0.1	1	mA
	negative output, nominal Vin	-2.5, -3.3, -5, -6.5 Vdc output			1	mA
		all other outputs			2	mA
filter	capacitance filter					

OUTPUT

parameter	conditions/description	min	typ	max	units
capacitive load	1.8 & 2.5 Vdc output models			2000	µF
	3.3 Vdc output model			1800	µF
	5 & 6.5 Vdc output models			1000	µF
	9 Vdc output model			680	µF
	12 & 15 Vdc output models			470	µF
line regulation	input voltage range, full load		±0.4	±0.8	%
load regulation	from 10% to 100% load		±0.5	±1.5	%
voltage accuracy	100% load, input voltage range				
	1.8, 2.5, 3.3 Vdc output models		±2	±4	%
	all other models		±2	±3	%
switching frequency	100% load, nominal input				
	5 Vdc output model		200		kHz
	12 Vdc output model		270		kHz
	15 Vdc output model		300		kHz
	all other models		400		kHz
transient recovery time	25% load step change		0.2	1	mS
transient response deviation	25% load step change				
	1.8 & 2.5 Vdc output models		80	150	mV
	positive output: all other models		50	150	mV
	negative output: all other models		100	150	mV
temperature coefficient	-40°C ~ 85°C			±0.03	%/°C

PROTECTIONS

parameter	conditions/description	min	typ	max	units
short circuit protection	continuous, automatic recovery				

SAFETY AND COMPLIANCE

parameter	conditions/description	min	typ	max	units
safeties approval	designed to meet 62368: EN, BS EN				
conducted emissions	CISPR32/EN55032 class B (see fig. 4-② for recommended circuit)				
radiated emissions	CISPR32/EN55032 class B (see fig. 4-② for recommended circuit)				
ESD	IEC/EN 61000-4-2, contact ± 6kV, perf. Criteria B				
radiated immunity	IEC/EN 61000-4-3, 10V/m, perf. Criteria A				
EFT/burst	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				
conducted immunity	IEC/EN 61000-4-6, 3 Vr.ms, perf. Criteria A				

SAFETY AND COMPLIANCE

parameter	conditions/description	min	typ	max	units
MTBF	as per MIL-HDBK-217F @ 25°C	2,000			K hours
RoHS	2011/65/EU				

ENVIRONMENTAL

parameter	conditions/description	min	typ	max	units
operating temperature	see derating curve	-40		85	°C
storage temperature		-55		125	°C
storage humidity	non-condensing	5		95	%

SOLDERABILITY

parameter	conditions/description	min	typ	max	units
hand soldering	1.5mm from case for 10 seconds			260	°C

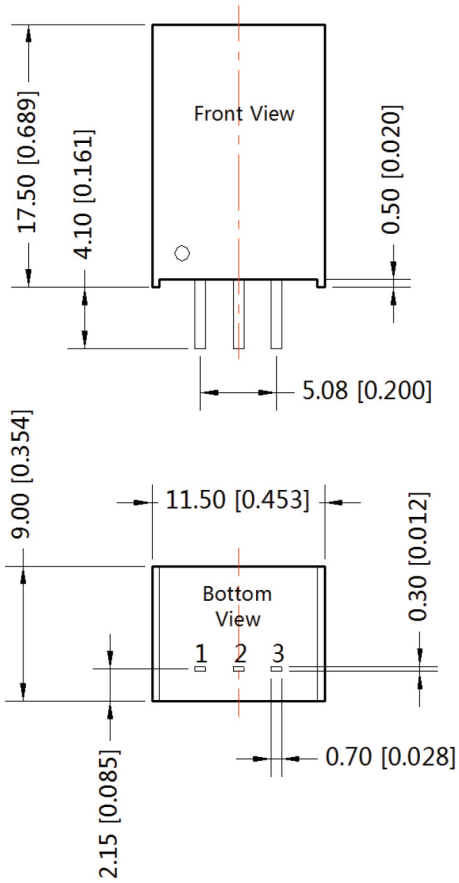
MECHANICAL

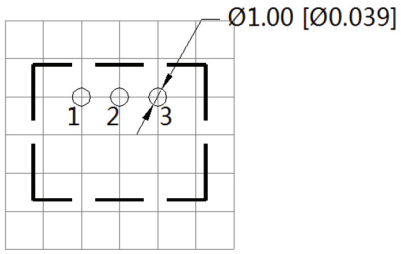
parameter	conditions/description	min	typ	max	units
dimensions	11.50 x 9.00 x 17.50 (0.453 x 0.354 x 0.689 inch)				mm
case material	Black flame-retardant and heat-resistant plastic (UL94-V0)				
weight			3.8		g

MECHANICAL DRAWING

units: mm [inches]
tolerance: ±0.25 [±0.010]
pin section tolerance: ±0.10 [±0.004]

PIN CONNECTIONS		
Pin	Function (positive output)	Function (negative output)
1	+Vin	+Vin
2	GND	-Vo
3	+Vo	GND



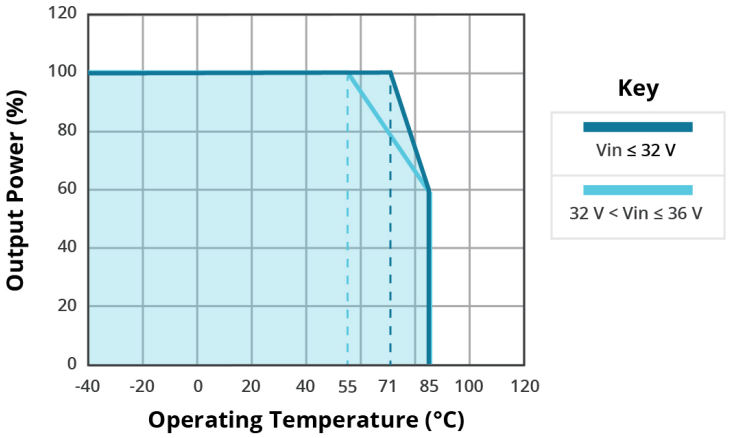


Note : Grid 2.54*2.54mm

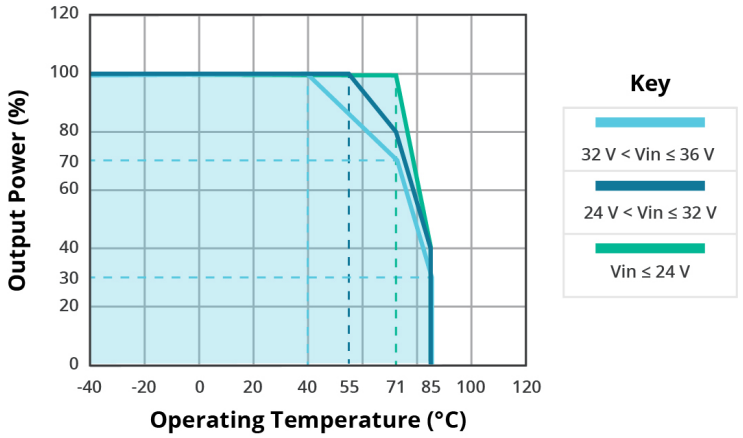
DERATING CURVES

Figure 1

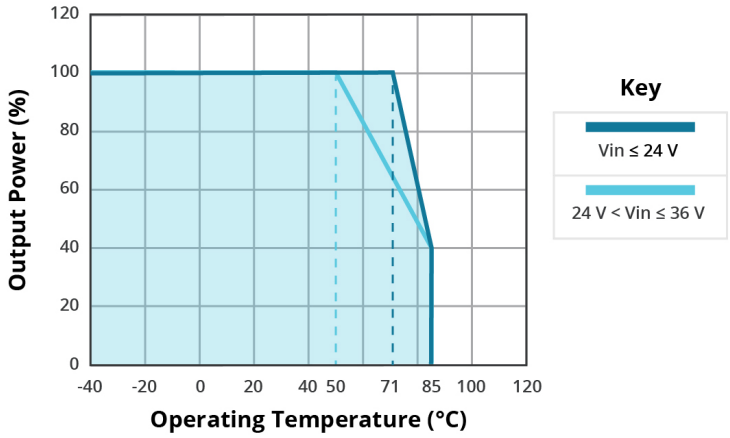
TEMPERATURE DERATING CURVE
1.8, 2.5, 3.3, 5V output
(Forced air - 0.6 m/s)



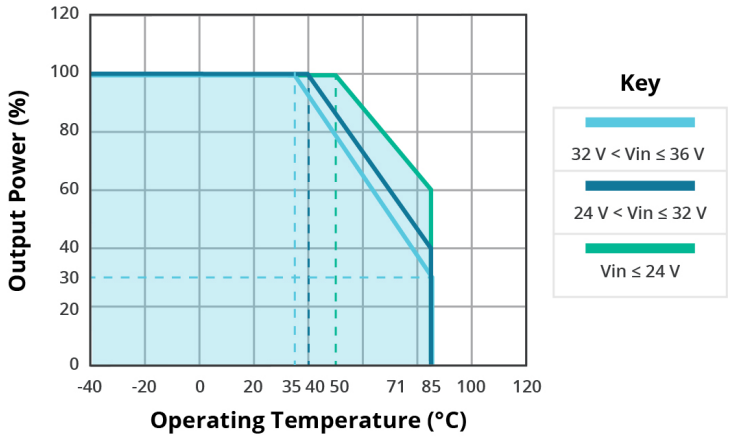
TEMPERATURE DERATING CURVE
6.5, 9, 12, 15 V output
(Forced air - 1.7 m/s)



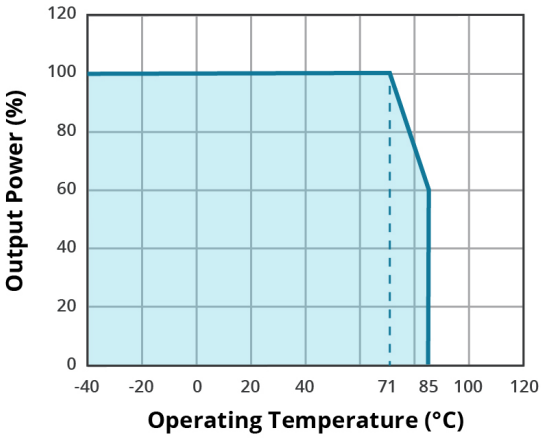
TEMPERATURE DERATING CURVE
1.8, 2.5, 3.3, 5, 6.5V output
(Natural convection)



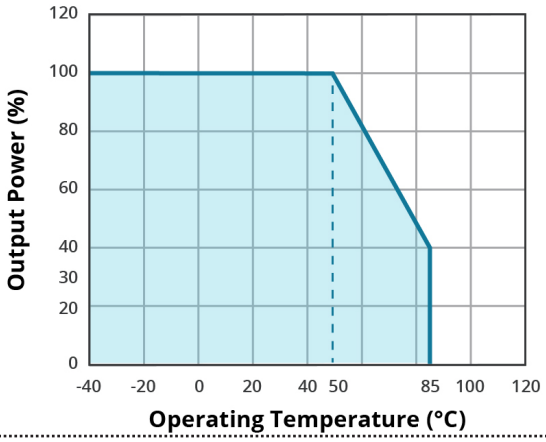
TEMPERATURE DERATING CURVE
9, 12, 15 V output
(Natural convection)



TEMPERATURE DERATING CURVE
-2.5, -3.3, -5, -6.5V output
(Natural convection)

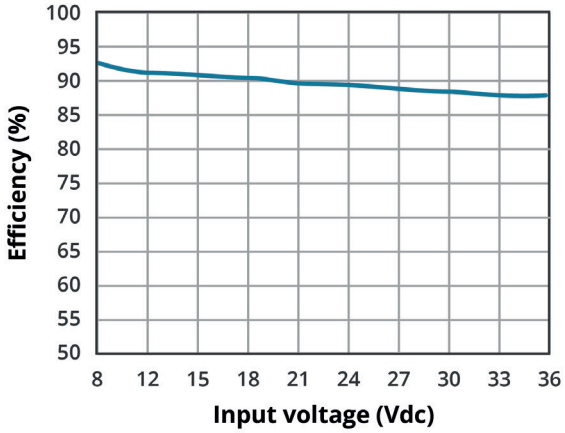


TEMPERATURE DERATING CURVE
-9, -12, -15 V output
(Natural convection)

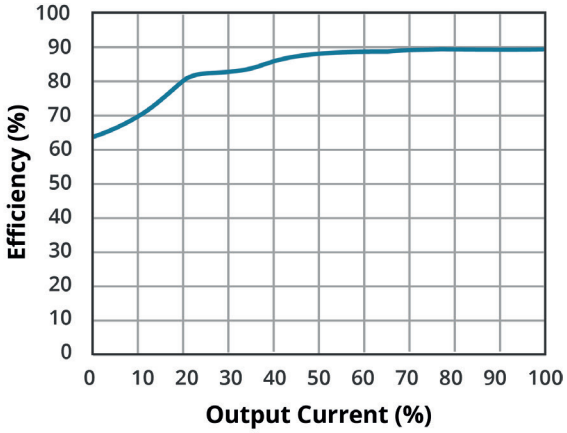


EFFICIENCY CURVES

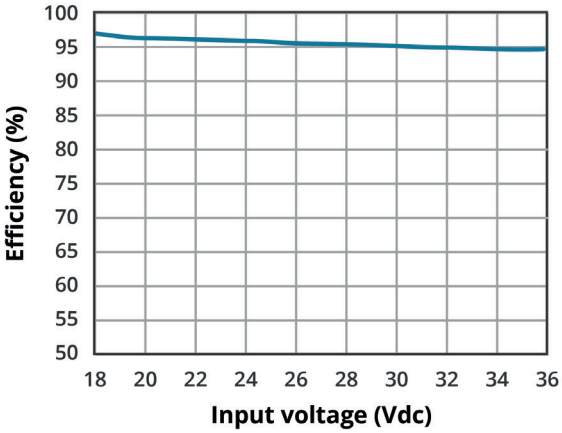
EFFICIENCY VS INTPUT LOAD
P7805-2000-S (full load)



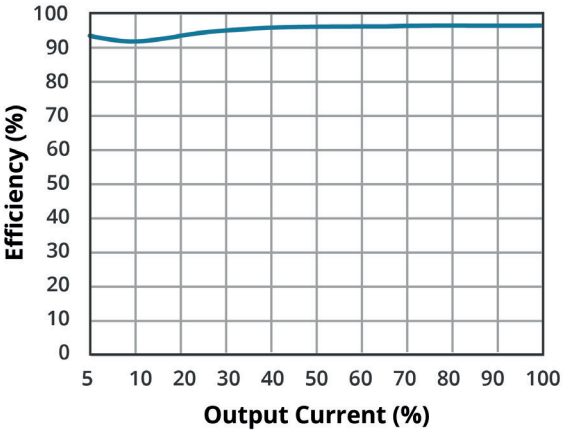
EFFICIENCY VS OUTPUT LOAD
P7805-2000-S (Vin = 24 V)



EFFICIENCY VS INTPUT LOAD
P7815-2000-S (full load)



EFFICIENCY VS OUTPUT LOAD
P7815-2000-S (Vin = 24 V)



TYPICAL APPLICATION CIRCUIT

Figure 2
positive output

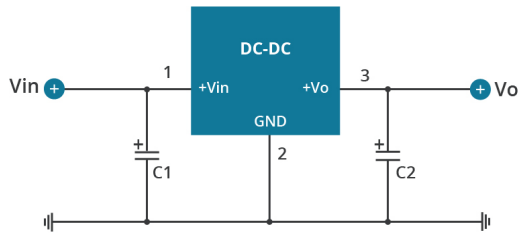


Figure 2
negative output

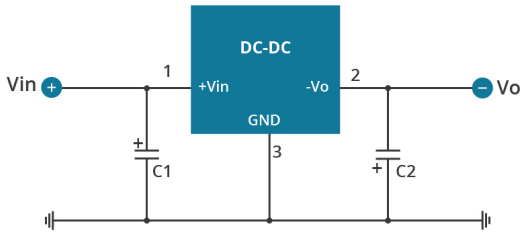


Table 1

Part No.	C1 (ceramic capacitor)	C2 (ceramic capacitor)
P78X2-2000-S	22μF/50V	22μF/10V
P7802-2000-S	22μF/50V	22μF/10V
P7803-2000-S	22μF/50V	22μF/10V
P7805-2000-S	22μF/50V	22μF/10V
P7806-2000-S	22μF/50V	22μF/10V
P7809-2000-S	22μF/50V	22μF/16V
P7812-2000-S	22μF/50V	22μF/25V
P7815-2000-S	22μF/50V	22μF/25V

Note:
1. C1 and C2 are required and should be connected close to the pin terminal of the module.
2. The capacitance of C1 and C2 refer to Sheet 1.
3. To reduce the output ripple furtherly, C2 can be increased properly if required, tantalum capacitor and aluminum electrolytic capacitor of low ESR may also suffice.
4. Cannot be used in parallel to enlarge the power for output and hot swap.

EMC RECOMMENDED CIRCUIT

Figure 3

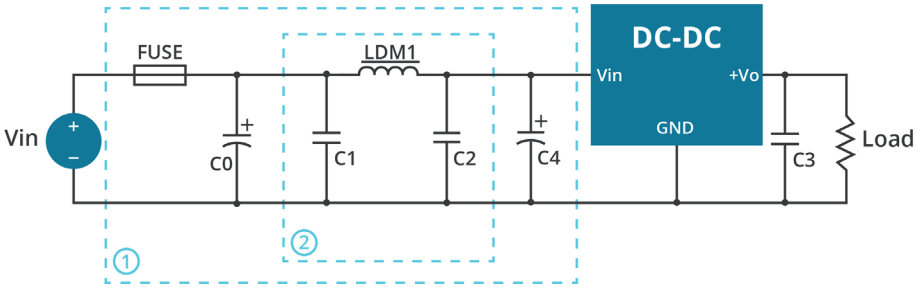


Table 2

Recommended external circuit components	
FUSE	choose according to practical input current
C0	100μF /100V
LDM1	22μH
C4	680μF /50V
C1/C2	10μF /50V
C3	22μF/25V

Note: Part ① in the Fig. 4 is for EMS test, part ② is for EMI filtering; parts ① and ② can be added based on actual requirement.

REVISION HISTORY

rev.	description	date
1.0	initial release	01/22/2020
1.01	logo update	02/21/2020
1.02	derating curve, efficiency curves and circuit figures updated	09/23/2021
1.03	datasheet updated	05/24/2022
1.04	CE certification removed	11/02/2022
1.05	1.8V, 2.5V & 6.5V input model added	09/22/2023

The revision history provided is for informational purposes only and is believed to be accurate.

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