

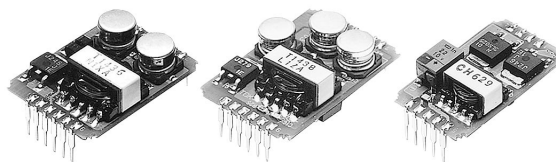
Power Supplies

DEF, DEL, DEM Series

DC to DC Converters

Single/Multi Output, General-Purpose

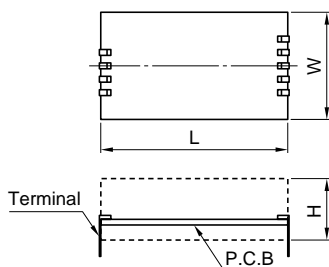
5V input(DEF type), 12V(DEL type) and 24V(DEM type) models are all power-saving, high-performance and high-efficiency DC to DC converters that support a wide range of needs from 2.4W to powerful 15W which are most suited for battery driven devices.



FEATURES

- High efficiency and low power consumption(3.3, 5V products:0.1μA input standby current).
- Overcurrent protection.
- Remote adjustment(about ±10%) of output voltage(except DEM type).
- Remote ON-OFF(except DEM type).
- Small size(1.2W/cm³) and low profile(12.7mm max. height).

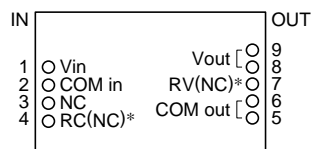
SHAPES AND DIMENSIONS



Dimensions in mm			
Type	H max.	W±1	L±1
A	10	19	25.7
B	11	19	33.3
C	11	25	33.3
D	12.7	25	38.4
E	11	31	38.4

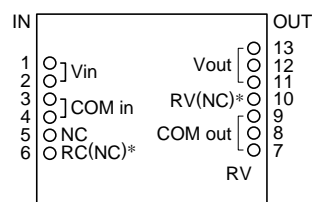
TERMINAL DESIGNATIONS AND FUNCTIONS(Top view)

Type A, B



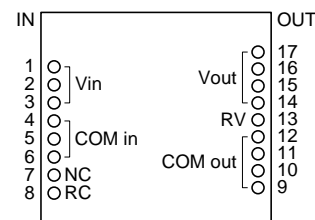
*(): DEM

Type C, D



*(): DEM

Type E



Vin	DC input terminal(+)	Connect to DC input line.
COMin	DC input terminal(COM)	Connect to DC input line.
NC	No connection	Should not be used.
RC	Remote ON-OFF terminal	Output voltage can be switched ON-OFF by applying a prescribed voltage between the RC and input(COM) terminals.
Vout	DC output terminal(+)	Connect to load.
RV	Output voltage set terminal	Output voltage can be adjusted by connecting resistances between (+) output to RV and between RV to (-) output.
COMout	DC output terminal(COM)	Connect to load.

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SPECIFICATIONS

Input voltage	DEL type	+6 to 15V
Edc	DEF type	+4.5 to 7.5V
	DEM type	+21.6 to 26.4V
Temperature range	Operating	-10 to +70°C [With derating over 40 or 50°C]
	Storage	-20 to +70°C

ELECTRICAL CHARACTERISTICS

Part No.	Input voltage Edc(V)	Input current (A)max.	Output voltage (V)	Output current (A)max.	Overcurrent threshold (A)max.	Output voltage setting deviation (%)	Output voltage total variation (%) ^{*1}	Efficiency ^{*2} (%)typ.	Output ripple noise voltage ^{*2} Ep-p(mV)max.	Weight (g)max.	Type
DEF03-1R0P	+4.5 to 7.5 [Rating: 5]	1	+3.3	1	2	±3max.	±2max.	83	80/200	8	B
DEF03-2R0P	+4.5 to 7.5 [Rating: 5]	2.2	+3.3	2	4	±3max.	±2max.	83	80/200	10	C
DEF03-3R0P	+4.5 to 7.5 [Rating: 5]	2.9	+3.3	3	5	±3max.	±2max.	83	100/200	15	D
DEF05-0R6P	+4.5 to 7.5 [Rating: 5]	1	+5	0.6	1.2	±3max.	±2max.	76	500/700	11	D
DEF05-0R6N	+4.5 to 7.5 [Rating: 5]	1	-5	0.6	1.2	±3max.	±2max.	76	500/700	11	D
DEF12-0R5P	+4.5 to 7.5 [Rating: 5]	1.8	+12	0.5	1	±3max.	±2max.	76	400/600	11	D
DEF24-R25P	+4.5 to 7.5 [Rating: 5]	1.8	+24	0.25	0.5	±3max.	±2max.	76	400/600	11	D
DEL03-1R0P	+6 to 15 [Rating: 12]	0.9	+3.3	1	2	±3max.	±2max.	83	80/200	8	B
DEL03-2R0P	+6 to 15 [Rating: 12]	1.5	+3.3	2	4	±3max.	±2max.	83	80/200	10	C
DEL03-3R0P	+6 to 15 [Rating: 12]	2.2	+3.3	3	5	±3max.	±2max.	83	100/200	15	D
DEL05-0R5P	+6 to 15 [Rating: 12]	0.6	+5	0.5	1	±3max.	±2max.	87	80/200	6	A
DEL05-1R0P	+6 to 15 [Rating: 12]	1.2	+5	1	2	±3max.	±2max.	87	80/200	8	B
DEL05-1R0N	+6 to 15 [Rating: 12]	1.1	-5	1	2	±3max.	±2max.	82	600/800	11	D
DEL05-2R0P	+6 to 15 [Rating: 12]	2.4	+5	2	4	±3max.	±2max.	87	80/200	10	C
DEL05-3R0P	+6 to 15 [Rating: 12]	3.6	+5	3	5	±3max.	±2max.	87	100/200	15	D
DEL12-0R2P	+6 to 15 [Rating: 12]	0.5	+12	0.2	0.4	±3max.	±2max.	82	350/700	6	B
DEL12-0R4P	+6 to 15 [Rating: 12]	1	+12	0.4	0.8	±3max.	±2max.	82	550/700	9	C
DEL12-0R6P	+6 to 15 [Rating: 12]	1.2	+12	0.6	1.2	±3max.	±2max.	82	550/700	11	D
DEL12-0R6N	+6 to 15 [Rating: 12]	1.2	-12	0.6	1.2	±3max.	±2max.	82	400/600	11	D
DEL12-0R8P	+6 to 15 [Rating: 12]	1.7	+12	0.8	1.6	±3max.	±2max.	82	150/300	13	E
DEL24-0R1P	+6 to 15 [Rating: 12]	0.5	+24	0.1	0.2	±3max.	±2max.	82	200/600	6	B
DEL24-0R2P	+6 to 15 [Rating: 12]	1	+24	0.2	0.4	±3max.	±2max.	82	300/600	9	C
DEL24-0R3P	+6 to 15 [Rating: 12]	1.2	+24	0.3	0.6	±3max.	±2max.	82	300/600	11	D
DEL24-0R4P	+6 to 15 [Rating: 12]	1.7	+24	0.4	0.8	±3max.	±2max.	82	150/300	13	E
DEM05-1R0P	+21.6 to 26.4 [Rating:24]	0.31	+5	1	—	±3max.	±2max.	82	150/300	8	B
DEM05-2R0P	+21.6 to 26.4 [Rating:24]	0.6	+5	2	—	±3max.	±2max.	83	200/300	10	C
DEM12-1R0P	+21.6 to 26.4 [Rating:24]	0.7	+12	1	—	±3max.	±2max.	90	200/300	10	C

^{*1} Output voltage total variation within the operating range indicated by the derating chart and within the 0 to +50°C temperature range.

^{*2} Unless otherwise noted, specifications were determined using an environment temperature of 25°C and nominal input values.

• Dynamic load variation is ±4% max., the value determined for 50 to 100% sudden load change over a time interval of 1ms max.

Power Supplies

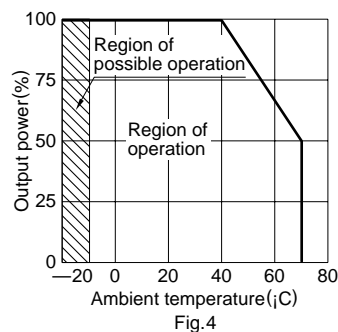
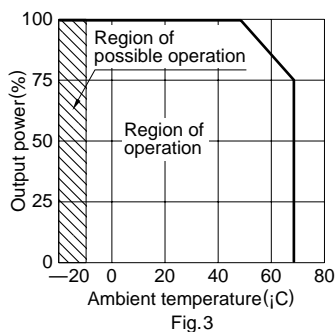
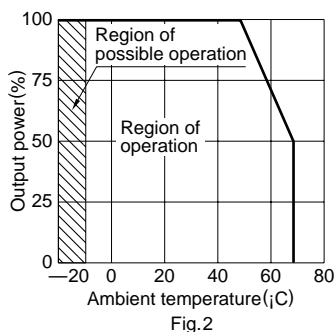
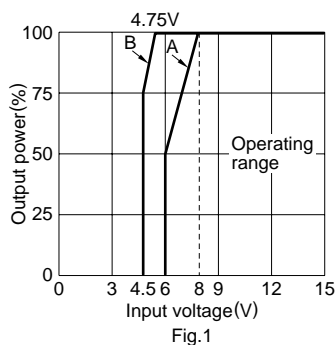
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DERATINGS

OUTPUT POWER vs. INPUT VOLTAGE, TEMPERATURE



DESIGN RECOMMENDATIONS

Part No.	Derating Input voltage/ temperature	Input fuse (A)	External capacitor (μ F)max.
DEF03-1R0P	Fig.1(B)/Fig.2	2.5	2200
DEF03-2R0P	Fig.1(B)/Fig.2	5	4700
DEF03-3R0P	Fig.1(B)/Fig.4	8	8200
DEF05-0R6P	Fig.1(B)/Fig.2	2.5	1500
DEF05-0R6N	Fig.1(B)/Fig.2	2.5	1500
DEF12-0R5P	Fig.1(B)/Fig.4	5	1500
DEF24-R25P	Fig.1(B)/Fig.4	5	330
DEL03-1R0P	None/Fig.2	2.5	2200
DEL03-2R0P	None/Fig.2	4	4700
DEL03-3R0P	None/Fig.4	5	8200
DEL05-0R5P	None/Fig.3	1.6	1500
DEL05-1R0P	None/Fig.3	2.5	2200
DEL05-1R0N	None/Fig.4	2.5	1500
DEL05-2R0P	None/Fig.2	5	4700
DEL05-3R0P	None/Fig.4	8	8200
DEL12-0R2P	Fig.1(A)/Fig.3	1.6	680
DEL12-0R4P	Fig.1(A)/Fig.2	2.5	1500
DEL12-0R6P	Fig.1(A)/Fig.2	3.15	1500
DEL12-0R6N	Fig.1(A)/Fig.4	3.15	1500
DEL12-0R8P	Fig.1(A)/Fig.2	4	2700
DEL24-0R1P	Fig.1(A)/Fig.3	1.6	120
DEL24-0R2P	Fig.1(A)/Fig.2	2.5	220
DEL24-0R3P	Fig.1(A)/Fig.2	3.15	330
DEL24-0R4P	Fig.1(A)/Fig.2	4	820
DEM05-1R0P	None/Fig.2	1.6	1000
DEM05-2R0P	None/Fig.4	2.5	4700
DEM12-1R0P	None/Fig.2	2.5	4700

• SOLDERING CONDITIONS

Dipping: 230 \pm 5°C, 5s

• CLEANING CONDITIONS

Solvent: IPA

PRECAUTIONS

- External capacitor
Ripple and noise can be reduced by connecting an external capacitor to the output. Capacitance should be below the value listed in the Design recommendations table.
- Overcurrent protection
Overcurrent protection is provided to protect the power supply circuit from problems such as load short circuits, etc. Output is shutdown when the load current exceeds the load current rating by 10 to 100% for over roughly 100ms. Shutdown is carried out by lowering the output voltage. The protection circuit will operate even if output decreases due to input voltage falling below the rated input voltage range, unless the input voltage drop occurs for less than roughly 200ms. The input voltage or the remote ON-OFF must be below 0.6V for the shutdown condition to clear.
- Output voltage remote set terminal(RV)
The rated voltage can be varied by roughly \pm 10% by connecting an external resistance.
- Input capacitor
Connection of a 100 to 330 μ F capacitor between the COMin terminals is recommended for stabilization of input voltage.
- Input fuse
Recommended input fuse ratings are listed in the Design recommendations table.
- Series or parallel operation of these DC to DC converters is not possible.