

**DC-DC Converters 1 Watt**

1 or 2 outputs

with input to output isolation

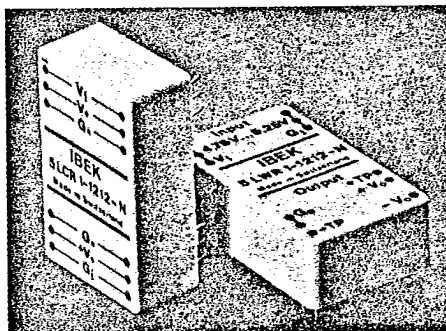
with input-capacitor

**Description**

The DC-DC converters have been developed as a response to the increasing need for decentralised power supply systems. They are especially suitable to power small loads on pcbs. At the same time they are an ideal element to realize redundant systems. The DC-DC converters feature low output ripple, low module height, high quality and reliability. To minimize feedback effects in the supply system, the modules are equipped with an input capacitor.

**Input : 5, 12 V DC****Outputs : 5, 12, 15 V DC**

Combinations of output voltages  
see Block Diagrams page 8  
and Type Survey below

**Features**

- Input capacitor
- High efficiency (typ 58 %)
- High reliability
- Optimal dynamic characteristics
- Height of 10.5 mm only
- No derating

**Benefits**

- low noise level
- low heat generation
- MTBF = 350 000 h ( $T_A = +40^\circ\text{C}$ ,  $G_F$ )
- excellent dynamic load behavior
- compact circuitry and system design
- full load capability over the specified ambient temperature range

**Applications**

Power supply for Op-Amps, A/D- and D/A converters  
Power supply for  $\mu$ Ps, RAMs, PROMs, RS-232 databuses

**Type Designation Key**

Example:

**12 LWR 1-12-12-N**

Operating ambient temperature range  $T_A$   
Nominal output voltage  $U_{O2 \text{ nom}}$   
Nominal output voltage  $U_{O1 \text{ nom}}$   
Nominal output power  
Family  
Nominal input voltage  $U_{I \text{ nom}}$

**Type Survey**

| $U_{I \text{ nom}}$ | Typ                              | $U_{O1 \text{ nom}}$ | $I_{O1 \text{ nom}}$ | $U_{O2 \text{ nom}}$ | $I_{O2 \text{ nom}}$ | Group <sup>4)</sup> |
|---------------------|----------------------------------|----------------------|----------------------|----------------------|----------------------|---------------------|
| 5 V                 | .. LWR 1-05-N <sup>3)</sup>      | 5 V                  | 200 mA               | -                    | -                    | 01                  |
|                     | .. LWR 1-12-N                    | 12 V                 | 80 mA                | -                    | -                    |                     |
|                     | .. LWR 1-15-N                    | 15 V                 | 66 mA                | -                    | -                    |                     |
|                     | .. LWR 1-1212-N <sup>1)</sup>    | $\pm 12$ V           | $\pm 40$ mA          | -                    | -                    | 02                  |
|                     | .. LWR 1-1515-N <sup>1)</sup>    | $\pm 15$ V           | $\pm 33$ mA          | -                    | -                    |                     |
| 12 V                | .. LWR 1-12-12-N <sup>1)</sup>   | 12 V                 | 40 mA                | 12 V                 | 40 mA                | 03                  |
|                     | .. LWR 1-15-15-N <sup>1)</sup>   | 15 V                 | 33 mA                | 15 V                 | 33 mA                |                     |
|                     | .. LCR 1-05-N <sup>3)</sup>      | 5 V                  | 200 mA               | -                    | -                    | 06                  |
|                     | .. LCR 1-12-N                    | 12 V                 | 80 mA                | -                    | -                    |                     |
|                     | .. LCR 1-15-N                    | 15 V                 | 66 mA                | -                    | -                    |                     |
|                     | .. LCR 1-1212-N <sup>1) 2)</sup> | $\pm 12$ V           | $\pm 40$ mA          | -                    | -                    | 07                  |
|                     | .. LCR 1-1515-N <sup>1) 2)</sup> | $\pm 15$ V           | $\pm 33$ mA          | -                    | -                    |                     |
|                     | .. LCR 1-12-12-N                 | 12 V                 | 40 mA                | 12 V                 | 40 mA                | 08                  |
|                     | .. LCR 1-15-15-N                 | 15 V                 | 33 mA                | 15 V                 | 33 mA                |                     |

.. see Type Designation Key above and table Maximum Ratings page 7  
1), 2), 3) see page 3 <sup>4)</sup> see Block Diagrams page 8

## Maximum Ratings

| Characteristic                                                  | 5 L...           | 12 L...          |
|-----------------------------------------------------------------|------------------|------------------|
| Admissible input voltage $U_i$ abs<br>without defect (max 60 s) | 0 V<br>6.25 V    | 0 V<br>15 V      |
| Input voltage $U_i$                                             | 4.75 V<br>5.25 V | 10.8 V<br>13.2 V |
| Storage temperature $T_s$                                       | -40 °C...+85 °C  |                  |
| Operating ambient temperature $T_A$                             | 0 °C...+71 °C    |                  |

## Electrical Data

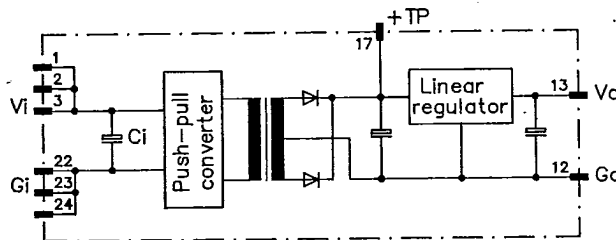
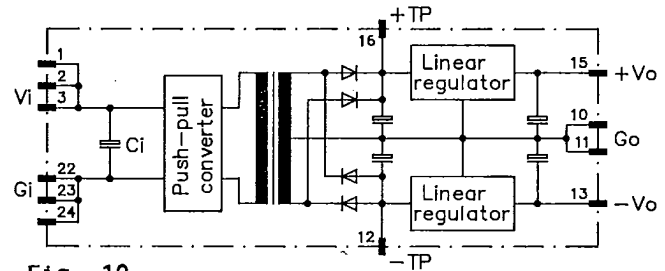
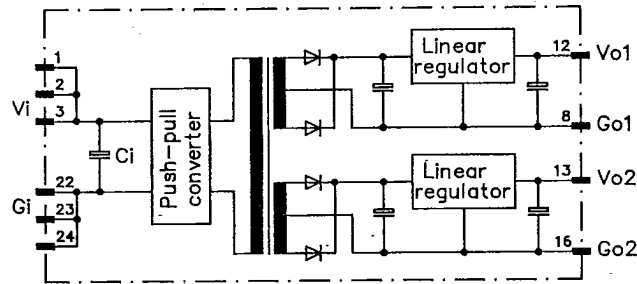
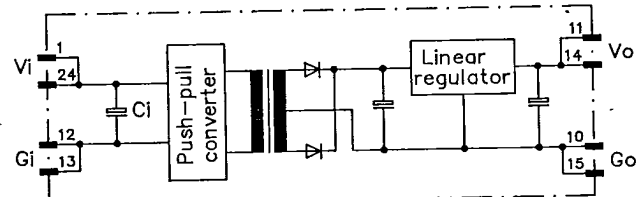
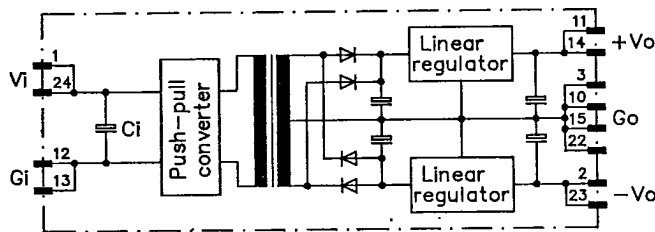
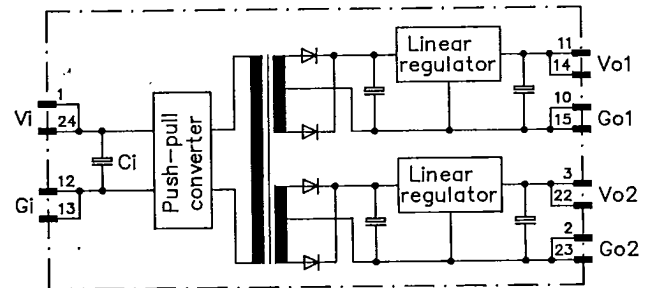
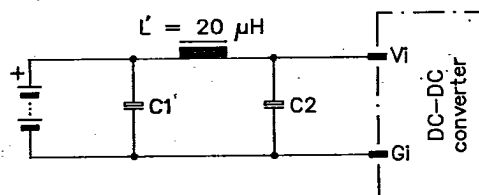
 $T_A = +25\text{ °C}$ 

| Characteristic                                                       | Conditions                                                     | 5 L..                                                                    | 12 L..              |
|----------------------------------------------------------------------|----------------------------------------------------------------|--------------------------------------------------------------------------|---------------------|
| No load input current $I_{i0}$                                       | $U_{i\text{ nom}}, I_o = 0$                                    | 85 mA<br>110 mA                                                          | 35 mA<br>45 mA      |
| Switching freq. $f_s$                                                | $U_{i\text{ nom}}, I_o\text{ nom}$                             | 25 kHz                                                                   |                     |
| Impulse voltage withstand test                                       | IEC 255.4                                                      | LWR Class III: 5 kV (1.2/50; 500Ω)                                       |                     |
|                                                                      | Appendix E                                                     | LCR Class II : 1 kV (1.2/50; 500Ω)                                       |                     |
| Isolation test voltage $U_{is}$<br>input to outputs<br>50 Hz, 1 min  | input short-circuited<br>as well as<br>outputs short-circuited | all LWR                                                                  | 3 kV <sub>pp</sub>  |
|                                                                      |                                                                | all LCR                                                                  | 500 V <sub>pp</sub> |
| Coupling cap. $C_{i0}$                                               | typ                                                            | all LWR 10 pF,                                                           | all LCR 20 pF       |
| Isolation resistance $R_{is}$                                        | 100 V DC<br>after 1 min                                        | 2000 MΩ                                                                  |                     |
| Output voltage $U_o$                                                 | $U_{i\text{ nom}}, I_o\text{ nom}$                             | $U_{o\text{ nom}} -5\%$<br>$U_{o\text{ nom}}$<br>$U_{o\text{ nom}} +5\%$ |                     |
| Temp. coefficient $\alpha_{U_o}$                                     | $U_{i\text{ nom}}, I_o\text{ nom}$                             | $\pm 0.02\%/K$                                                           |                     |
| Static control deviation<br>versus input<br>voltage $\Delta U_{oU}$  | $U_{i\text{ min}} \dots U_{i\text{ max}}$<br>$I_o\text{ nom}$  | $\pm 0.2\% ^1)$                                                          |                     |
| Static control deviation<br>versus output<br>current $\Delta U_{oI}$ | $U_{i\text{ nom}}$<br>$I_o = 0 \dots I_o\text{ nom}$           | $\pm 0.1\% ^2)$                                                          |                     |
| Output ripple<br>(BW = 20 MHz) $u_o$                                 | $U_{i\text{ nom}}$<br>$I_o\text{ nom}$                         | 25 mV <sub>pp</sub>                                                      | 35 mV <sub>pp</sub> |
| Efficiency $\eta$                                                    | min<br>typ                                                     | 50 %<br>58 %                                                             |                     |

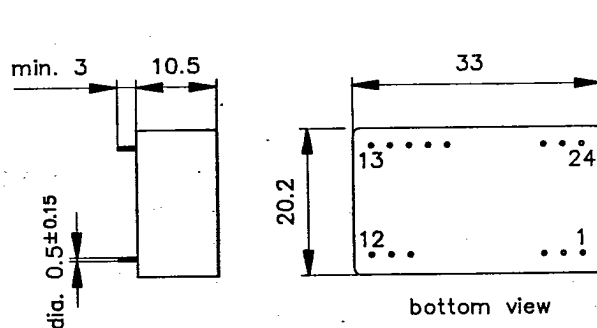
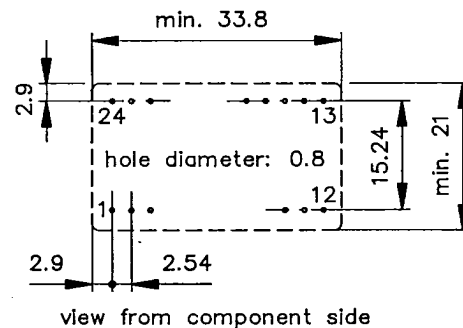
<sup>1)</sup> for 5 V output: typ  $\pm 0.3\%$ <sup>2)</sup> for 5 V output: typ  $\pm 0.8\%$ 

Pin Configuration see page 8 and table below

| Group | 1  | 2   | 3   | 8   | 10  | 11  | 12  | 13  | 14  | 15  | 16  | 17  | 22  | 23  | 24 |
|-------|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|
| 01    | V1 | V1  | V1  | -   | -   | -   | Go  | Vo  | -   | -   | -   | +TP | G1  | G1  | G1 |
| 02    | V1 | V1  | V1  | -   | Go  | Go  | -TP | -Vo | -   | +Vo | +TP | -   | G1  | G1  | G1 |
| 03    | V1 | V1  | V1  | Go1 | -   | -   | Vo1 | Vo2 | -   | -   | Go2 | -   | G1  | G1  | G1 |
| 06    | V1 | -   | -   | -   | Go  | Vo  | G1  | G1  | Vo  | Go  | -   | -   | -   | -   | V1 |
| 07    | V1 | -Vo | Go  | -   | Go  | +Vo | G1  | G1  | +Vo | Go  | -   | -   | Go  | -Vo | V1 |
| 08    | V1 | Go2 | Vo2 | -   | Go1 | Vo1 | G1  | G1  | Vo1 | Go1 | -   | -   | Vo2 | Go2 | V1 |

**Block Diagrams**Fig. 9  
LWR Group 01Fig. 10  
LWR Group 02Fig. 11  
LWR Group 03Fig. 12  
LCR Group 06Fig. 13  
LCR Group 07Fig. 14  
LCR Group 08**Application Note**Fig. 15  
Input filter to reduce the input ripple

| $U_{I \text{ nom}}$ | $C1 = C2$               |
|---------------------|-------------------------|
| 5 V                 | 68 $\mu\text{F}$ , 10 V |
| 12 V                | 47 $\mu\text{F}$ , 16 V |

**Mechanical Data**Dimensions in mm, tolerances  $\pm 0.3$  mm, unless otherwise specified.Fig. 16  
Case DIL 24  
Weight 15 gFig. 17  
Hole location for circuit board mounting  
--- Space reserved for the  
DC-DC converter