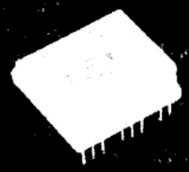
BURR-BROWN®



724

QUAD ISOLATED DC/DC CONVERTER

FEATURES

- QUAD ISOLATED ±8V OUTPUTS
- HIGH BREAKDOWN VOLTAGE: 3000V Test
- LOW LEAKAGE CURRENT: <1μA at 240V/60Hz
- LOW COST PER ISOLATED CHANNEL
- SMALL SIZE: 27.9mm X 27.9mm X 6.6mm (1.1" X 1.1" X 0.26")

APPLICATIONS

- MEDICAL EQUIPMENT
- INDUSTRIAL PROCESS CONTROL
- TEST EQUIPMENT
- DATA ACQUISITION SYSTEMS
- NUCLEAR INSTRUMENTATION

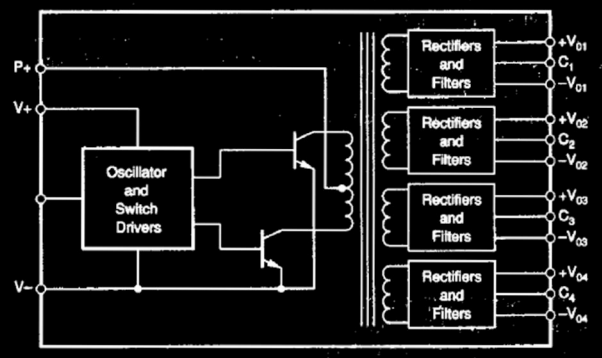
DESCRIPTION

The 724 converts a single 5VDC to 16VDC input into four pairs of bipolar output voltages of approximately half the output voltage. The converter is capable of providing a total output current of 128mA at rated voltage accuracy and up to 500mA without damage.

The four output channels are isolated from the input and from each other. They may be connected independently, in series for higher output voltage, or in parallel for higher output current as a single channel isolated DC/DC converter.

Integrated circuit construction of the 724 reduces size and cost. High isolation breakdown voltages and low leakage currents are assured by special design and construction which includes use of a high dielectric strength, and low leakage coating used on the internal assembly.

A self-contained 800kHz oscillator drives switching circuitry, which is designed to eliminate the common problem of input current spiking due to transformer saturation or crossover switching.



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PDS-405A

BURR-BROWN®

SPECIFICATIONS

ELECTRICAL

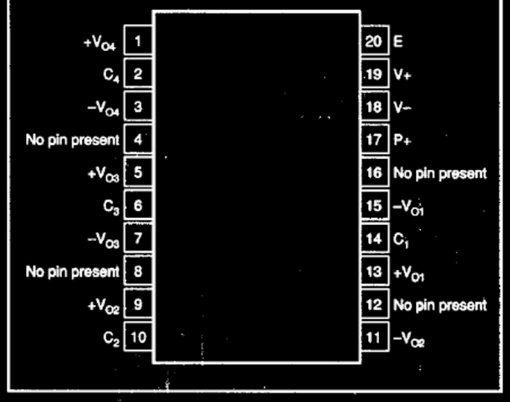
At 25°C with V_{IN} = 15V, R_L = 1.3kΩ, C = 0.47µF, unless otherwise noted.

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
INPUT					
Input Voltage		5	15	16	VDC
Input Current	ΣI_{OUT} = 24mA		50		mA
	ΣI_{OUT} = 128mA, 25°C		110	125	mA
	ΣI_{OUT} = 128mA, 25°C		120		mA
Input Ripple[1, 5]	ΣI_{OUT} = 24mA, C = 0.47µF		10		mA, pk
	ΣI_{OUT} = 128mA, C = 0.47µF			25	mA, pk
ISOLATION					
Test Voltage[2]	Input-to-Output, 5s min			3000	VDC
	Channel-to-Channel, 5s min			3000	VDC
Rated Voltage[2]	Input-to-Output, Continuous			1000	VDC
	Channel-to-Channel, Continuous			1000	VDC
Isolation Impedance	Input-to-Output		10 || 6		GΩ || pF
Leakage Current	Input-to-Output, 240V/60Hz			1.0	µA
OUTPUT					
Voltage[3]	At 15V Input I_L = 3mA	8.0	8.5	9.0	V
	I_L = 16mA	7.5	7.9	8.3	V
Current for Rated Voltage	Total of All Outputs			128	mA
	Any One Output[4]	3			
Total Safe Nondestructive Current	Total of All Outputs			500	mA
	Any One Output			200	mA
Load Regulation[3]			[4]		
Ripple Voltage[5]	I_L = 3mA		35		mV, pk
	I_L = 16mA			200	mV, pk
Difference of $+V_O$ and $-V_O$	$+I_L = -I_L$		±30		mV
Sensitivity to Input Voltage Change			0.63		V/V
Output Voltage Change Over Temperature	–25°C to +85°C		2		%
TEMPERATURE RANGE					
Operating		–25		+85	°C
Storage		–55		+125	°C

NOTES: (1) 0.47µF external capacitor across "P+" to "V–" pins and 12" of #24 wire to V_{IN}. (2) See "Isolation Voltage Ratings" on page 5. The input to output and channel to channel continuous AC rating is 700Vrms. (3) See "Typical Performance Curves." (4) A minimum output current of 3mA at each output is recommended to maintain output voltage accuracy. (5) Test bandwidth 10MHz, max.

CONNECTION DIAGRAMS

Top View



PACKAGE INFORMATION[1]

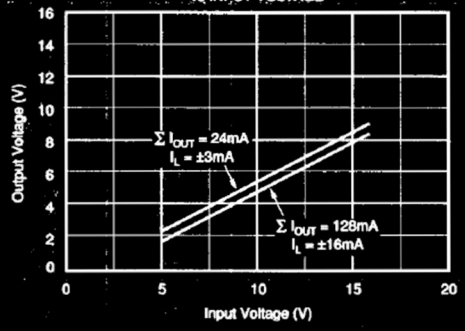
MODEL	PACKAGE	PACKAGE DRAWING NUMBER
724	20-Pin	102A

NOTE: (1) For detailed drawing and dimension table, please see end of data sheet, or Appendix D of Burr-Brown IC Data Book.

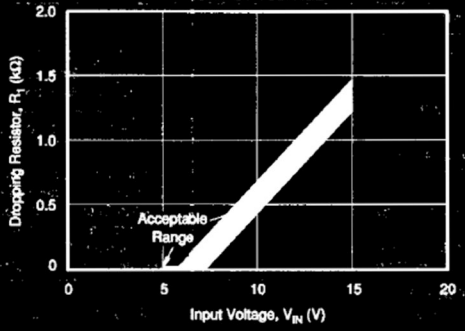
TYPICAL PERFORMANCE CURVES

All specifications typical at 25°C, unless otherwise noted.

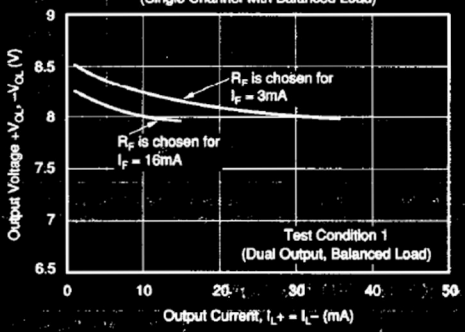
OUTPUT VOLTAGE vs INPUT VOLTAGE



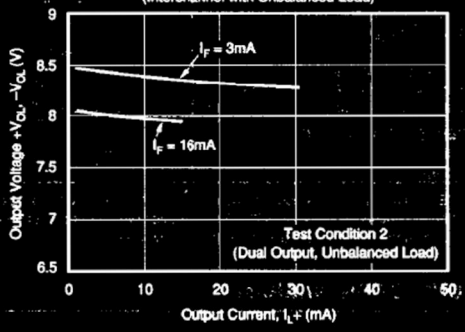
DROPPING RESISTOR R_1 vs INPUT VOLTAGE



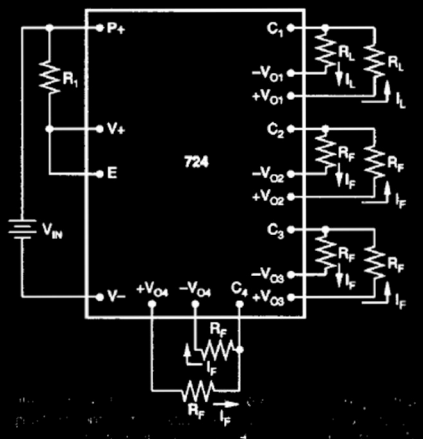
LOAD REGULATION (Single Channel with Balanced Load)



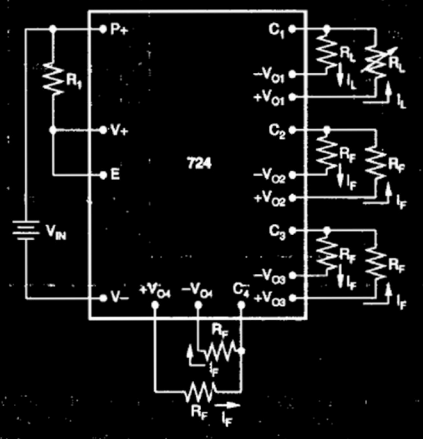
LOAD REGULATION (Interchannel with Unbalanced Load)



TEST CONDITION 1 (Balanced Load)



TEST CONDITION 2 (Unbalanced Load)



INSTALLATION AND OPERATING INSTRUCTIONS

Typical application connections for the 724 are shown in Figures 1 and 2. Primary power (V_{IN}) is applied at the "P+" and "V–" terminals. The common or ground for V_{IN} may be connected to either "P+" or "V–", the only requirement is that "P+" and "V+" must be positive with respect to "V–".

Power for the internal oscillator and switch drivers is derived from the primary power by a voltage dropping resistor, R_1. The value of R_1 as a function of V_{IN} is shown in the "Typical Performance Curves" section. Alternately, voltage for the "V+" terminal may be obtained from a separate source. "V+" should be +5VDC to +7.5VDC positive with respect to "V–". If a separate source is used, the V+ input must be applied before the "P+" input to avoid possible damage to the unit. P+ and V+ must remain positive with respect to "V–" at all times (including transients). If necessary, diode clamps should be put across these inputs.

The "E" pin enables the converter when connected to "V+" and disables it when connected to "V–".

An external capacitor, "C" (0.47μF ceramic), is used to reduce input ripple. It should be connected as close to the "P+" and "V–" pins as practical. Input leads to these terminals should also be kept as short as possible. Since the 724 is not internally shielded, external shielding may be appropriate in applications where RFI at the 800kHz nominal oscillator frequency is a problem.

Each output is filtered with an internal 0.047μF capacitor. Output ripple voltage can be reduced below the specified value by adding external capacitors up to 10μF between each output and its common.

DISCUSSION

OUTPUT CURRENT RATINGS

At rated output voltage accuracy, the 724 is capable of providing 128mA divided among its eight outputs[1]. A minimum average output current of 3mA is recommended at each output to maintain voltage accuracy.

Outputs channels[2] may be connected in series or parallel for higher output voltage or current.

ISOLATION CONFIGURATIONS

The fact that the four outputs of the 724 are isolated from the input and from each other allows both two-port and three-port isolation connections.

Figure 1 shows two 3650 optically coupled isolation amplifiers connected in three-port configuration. Two of the 724 channels provide power to the 3650's inputs. The other channels supply power to both 3650's outputs. Each amplifier's input and output are isolated from each other and the system's power supply common. Isolation specification applies to the amplifier input-to-output voltage isolation specification.

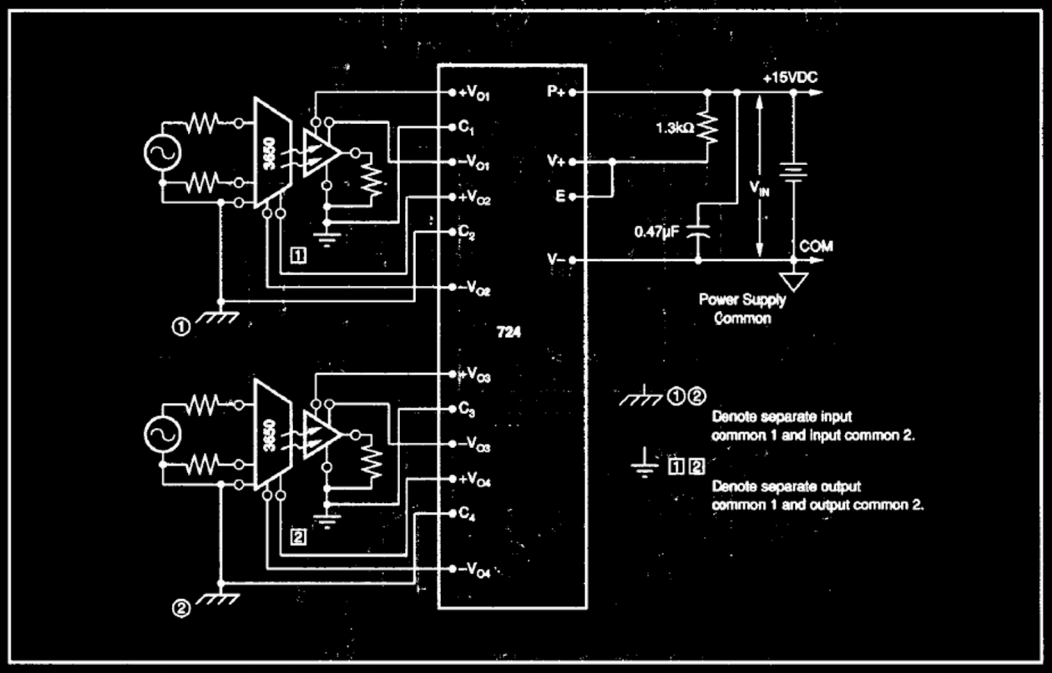


FIGURE 1. Three-Port Isolation.

Figure 2 illustrates how the 724 may provide isolated input power to the input stage of four 3650s connected in the two-port configuration. Power for the four output stages is provided by the system +15VDC and –15VDC supplies. Input stages are isolated from each other and from the system supply. In this situation, the 724's isolation specification applies to amplifier's input-to-output voltage and to the voltage existing between any two I/P COM terminals.

ISOLATION VOLTAGE RATINGS

Since a "continuous" test is impractical in a product manufacturing situation (implies infinite test duration), it is generally accepted practice to perform a production test at a higher voltage (i.e., higher than the continuous rating) for some shorter length of time.

The important consideration is then "what is the relationship between actual test conditions and the continuous derated maximum specification?" There are several rules of thumb used throughout the industry to establish this relationship. Burr-Brown has chosen a very conservative one: $V_{TEST} = (2 \times V_{CONTINUOUS\ RATING}) + 1000V$. This relationship is appropriate for conditions where the system transient voltages are not well defined.[3] Where the real voltages are well defined or where the isolation voltage is not continuous the user may choose to use a less conservative derating to establish a specification from the test voltage.

SHORT CIRCUIT PROTECTION

The circuit in Figure 3 may be added to the input of the 724 to protect it from damage in situations where too much current is demanded from the outputs—such as a short circuit from an output to its common. The circuit limits input current to approximately 150mA for an input voltage of 15VDC (for β of 2N2219 of 50).

NOTES: (1) "Output" denotes a single output terminal (+V or –V) and its associated common. (2) "Channel" denotes a pair of outputs (+V and –V) and their associated common. (3) Reference National Electrical Manufacturers Association (NEMA) Standards Parts ICS 1-109 and ICS 1-111.

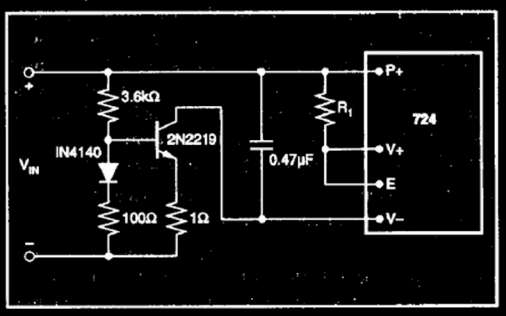


FIGURE 3. Short Circuit Protection.

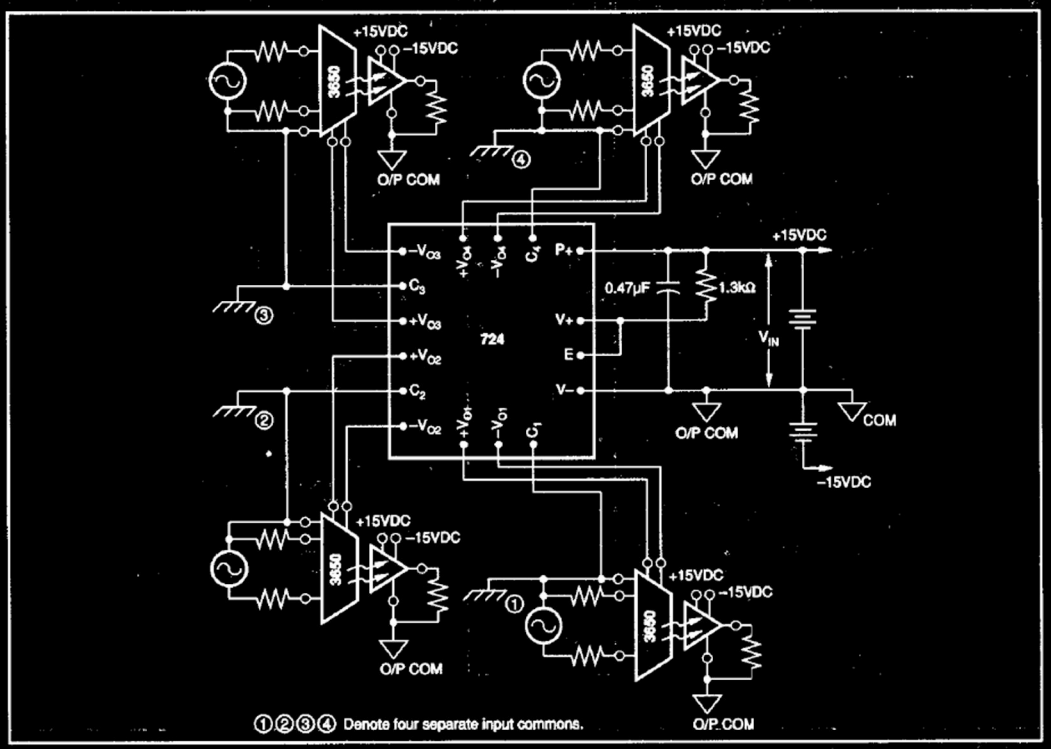


FIGURE 2. Two-Port Isolation with Four 3650s.