DHC2803S • DHC2805S

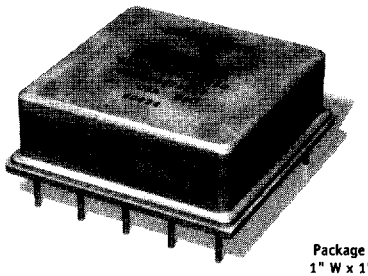
HTTP://WWW.APEXMICROTECH.COM (800) 546-APEX (800) 546-2739

HI-REL DESIGN

- WAVE SOLDERABLE PACKAGE
- ALL CERAMIC CAPACITORS
- SURFACE MOUNT MAGNETICS
- WITHSTANDS 5000G

FEATURES—SINGLE OUTPUT

- NO DERATING — –55°C to +125°C
- WIDE SUPPLY RANGE — 11V to 50V
- HIGH ISOLATION — 500V
- HIGH POWER DENSITY — 17W/IN³
- OUTPUT VOLTAGE ADJUSTMENT STANDARD
- REMOTE SHUTDOWN



Package Dimensions
1" W x 1" L x .35" H

B

DESCRIPTION

The DHC2800S series of DC/DC converters provides the ruggedness, reliability, and features required to meet the advanced design challenges of today's hi-rel market. This is accomplished while retaining a power density of 17 W/in³ and 425 mW/gram of power/package performance. The use of advanced substrate and reflow soldering techniques during construction results in a rugged, cost-effective, and completely solderable package.

DHC2800S hybrid converter series utilizes all ceramic capacitors, surface mount magnetics, and ultrasonically bonded aluminum wires to provide reliable operation at all operating temperatures while surviving very high G forces.

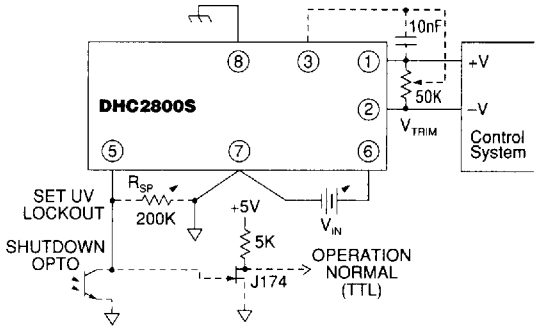
DHC2800S standard features include output fault monitoring and/or turn on voltage point programming via the shutdown pin. All three functions may be implemented simultaneously with a minimum of external components. An output voltage adjustment / load compensation pin is also standard however DHC2800S may be ordered without this feature (/F option).

Fault tolerant design protects these converters from most external circuit faults. The output and output adjust pins will withstand +35 V while the shutdown pin will withstand +50 V protecting the converters from a variety of system or board faults i.e. solder bridges etc. Unique load fault protection circuitry allows this converter to pull up loads having difficult static load line characteristics and allows short term load excursions significantly beyond ratings in most applications.

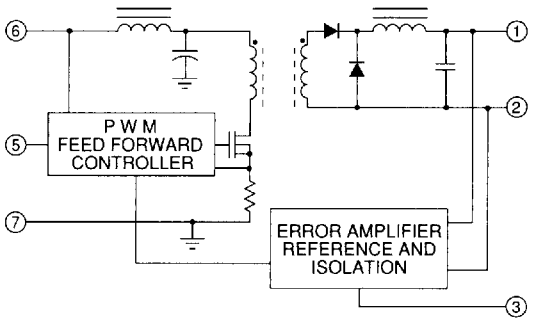
A resonant reset transformer isolated forward converter topology operating at a switching frequency of 400 kHZ allows operation over a wide input voltage range. Internal filtering of both input and output eliminates the need for external capacitors in many applications.

The 8-pin DIP package (see Package Outlines) is hermetically sealed and isolated from the internal circuits. Heat sinking is recommended for full power operation at elevated ambient temperatures.

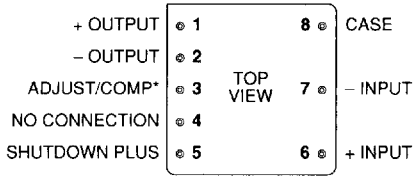
TYPICAL APPLICATION WITH OPTIONS



BLOCK DIAGRAM



EXTERNAL CONNECTIONS



* Optional N/C on DHC2800S/F

ABSOLUTE MAXIMUM RATINGS

	DHC2803S	DHC2805S
INPUT VOLTAGE RANGE (Pin 7 to 6 or 5)	0 – 50Vdc	0-50Vdc
INPUT TRANSIENT (Pin 7 to 6)	80V @ 50ms	80V @ 50ms
OUTPUT WITHSTAND (Pin 2 to 1 or 3)	35Vdc	35Vdc
OUTPUT CURRENT (Continuous)	2Adc[5]	1.2Adc
TEMPERATURE, Storage	–65°C, 150°C	–65°C, 150°C
TEMPERATURE, Pin Soldering 10s	300°C	300°C

SPECIFICATIONS

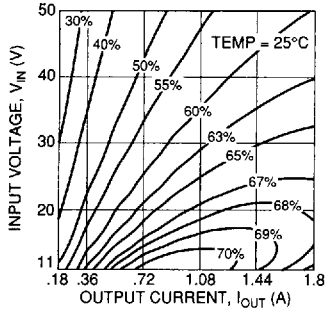
PARAMETER	TEST CONDITIONS[1]	DHC2803S MIN	DHC2803S TYP	DHC2803S MAX	DHC2805S MIN	DHC2805S TYP	DHC2805S MAX	UNITS
STEADY STATE CHARACTERISTICS								
INPUT VOLTAGE RANGE		11	28	50	11	28	50	Vdc
OUTPUT VOLTAGE	V_{IN}; min ↔ max Vdc @ I_{MIN}	3.2	3.3	3.4	5.00	5.05	5.1	Vdc
OUTPUT CURRENT	V_{IN}; min ↔ max Vdc	180		1520	120		1200	mAdc
	V_{IN}; 13 ↔ max Vdc			1820[5]				mAdc
EFFICIENCY		61	66		64	69		%
OUTPUT RIPPLE VOLTAGE	Bandwidth 10kHz ↔ 1MHz		38	80		30	80	mVrms
INPUT RIPPLE CURRENT	Bandwidth 10kHz ↔ 1MHz		30	100		30	100	mArms
OUTPUT POWER[2]		.5		5.0[6]	.6		6.0	W
LINE REGULATION	V_{IN}; min ↔ max[3]		6	15		6	15	mVdc
LOAD REGULATION	I_{OUT}; min ↔ max[3]		10	25		10	25	mVdc
TEMPERATURE COEFFICIENT			.006			.006		%/°C
TEMPERATURE RANGE, case[2]		–55		125	–55		125	°C
QUIESCENT CURRENT	I_{OUT} = 0A		34	40		34	40	mAdc
INHIBITED	Vpin5; < 8Vdc	.09	1.25	2.5	.09	1.25	2.5	mAdc
ISOLATION CHARACTERISTICS (input/output/case)								
LEAKAGE RESISTANCE	V_{TEST} = 500Vdc	100			100			MΩ
LEAKAGE CAPACITANCE	f = 10kHz		55			60		pF
DYNAMIC CHARACTERISTICS								
LINE STEP RESPONSE	V_{IN}; T_R, T_F = 10µs							
VOLTAGE CHANGE	V_{IN}; 16 ↔ 40 Vdc		350			300		mV
RECOVERY TIME (95%)			30			30		µs
LOAD STEP RESPONSE	I_{OUT}; T_R, T_F = 10µs							
VOLTAGE CHANGE	I_{OUT}; 50% ↔ max Adc		700			700		mV
RECOVERY TIME (95%)			30			40		µs
DYNAMIC CHARACTERISTICS								
START-UP OVERSHOOT	V_{IN}; 0-50 Vdc		0	400		0	400	mV
SHUTDOWN DELAY	V_{PIN5}; > 10Vdc → <8Vdc		220	500		220	500	µs
SHUTDOWN RECOVERY TIME[4]	V_{PIN5}; < 8Vdc → > 10Vdc			60			60	ms

NOTES:
1. Unless otherwise stated: T_C = 25°C, V_{IN} = 28V, I_{OUT} = I_{OUT} MAX.
2. Derate power linearly to zero from 125°C to 135°C.
3. Regulation measured between pin 1 and pin 2 1/6" from case.
4. Recovery spec assumes that converter has been OFF for at least 500ms.
5. DHC2803S $I_{OUT\ MAX}$ = 2.0ADC when voltage is adjusted to 3.0Vdc, V_{IN} = 13-50Vdc, AND $C_{LOAD} \geq 100\mu F$.
6. DHC2803S $P_{OUT\ MAX}$ = 6W when V_{IN} = 13-50Vdc

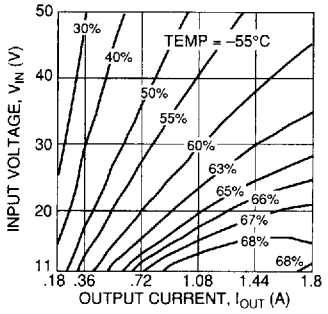
CAUTION The internal substrate contains beryllia (BeO). Do not break the seal. If accidentally broken, do not crush, machine, or subject to temperatures in excess of 850°C to avoid generating toxic fumes.

PACKAGE THERMAL SPECIFICATIONS	MIN	TYP	MAX	UNITS
RESISTANCE, case to air		30		°C/W
TEMPERATURE RISE, junction to case		10	15	°C

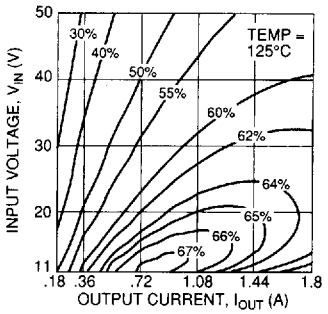
EFFICIENCY CONTOURS



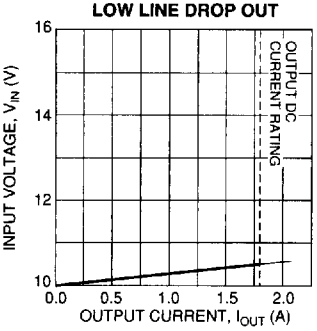
EFFICIENCY CONTOURS



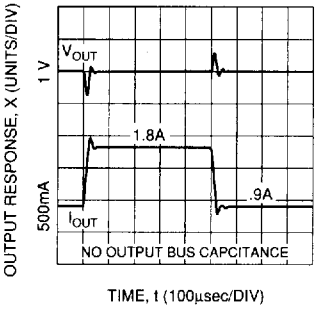
EFFICIENCY CONTOURS



LOW LINE DROP OUT

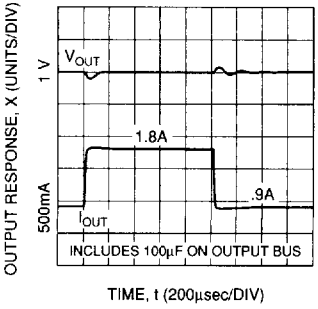


LOAD TRANSIENT RESPONSE



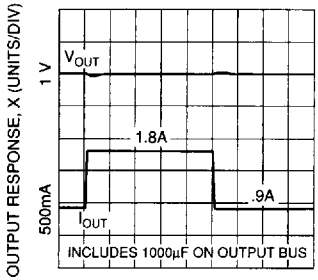
TIME, t (100µsec/DIV)

LOAD TRANSIENT RESPONSE 100µF



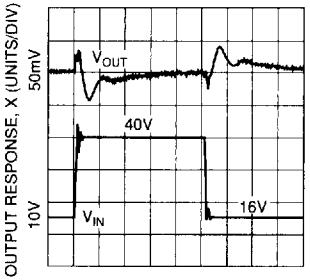
TIME, t (200µsec/DIV)

LOAD TRANSIENT RESPONSE 1000µF



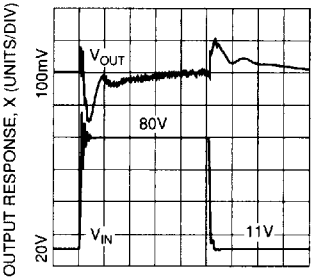
TIME, t (500µsec/DIV)

LINE TRANSIENT RESPONSE



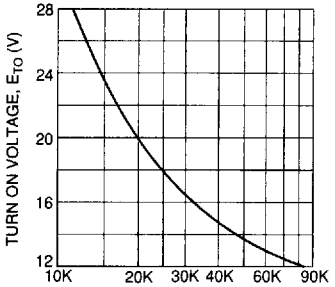
TIME, t (200µsec/DIV)

LINE TRANSIENT RESPONSE

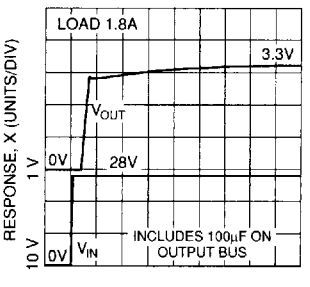


TIME, t (200µsec/DIV)

TURN ON THRESHOLD

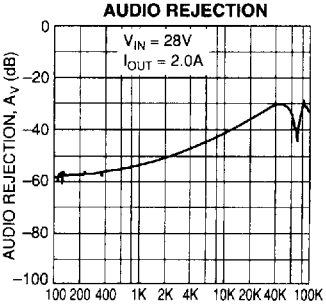


TURN ON RESPONSE

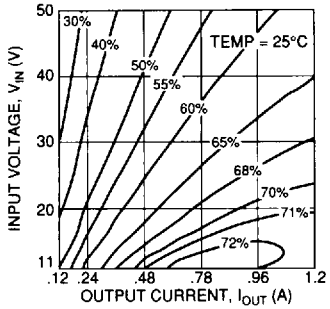


TIME, t (5msec/DIV)

AUDIO REJECTION



EFFICIENCY CONTOURS



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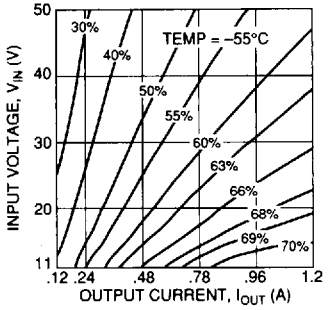
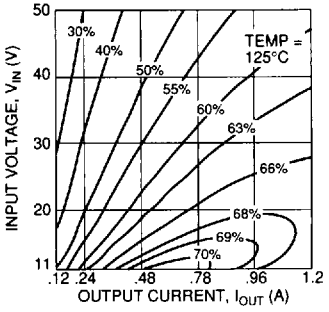
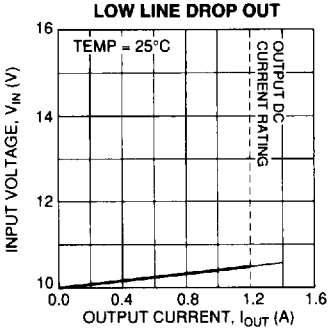


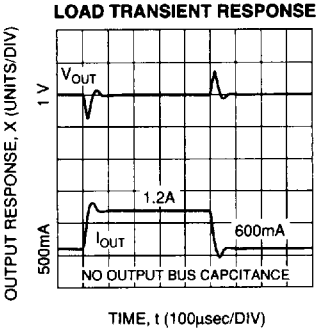
EFFICIENCY CONTOURS



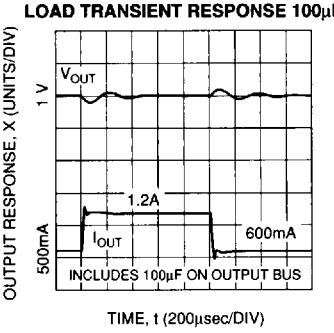
LOW LINE DROP OUT



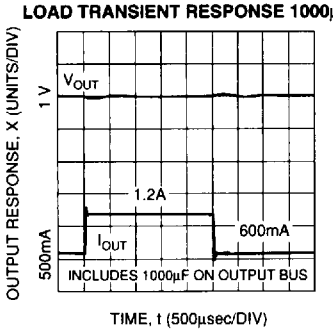
LOAD TRANSIENT RESPONSE



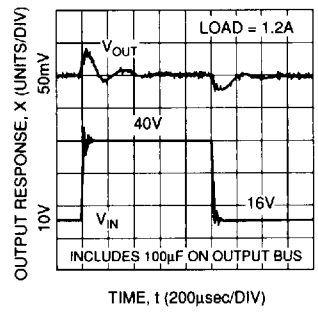
LOAD TRANSIENT RESPONSE 100µF



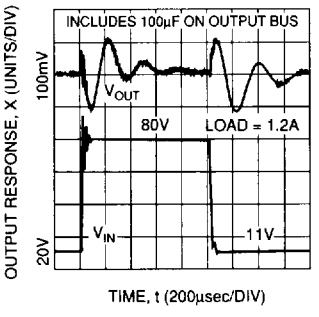
LOAD TRANSIENT RESPONSE 1000µF



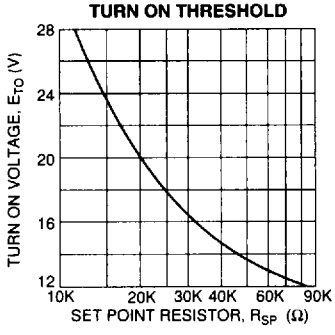
LINE TRANSIENT RESPONSE



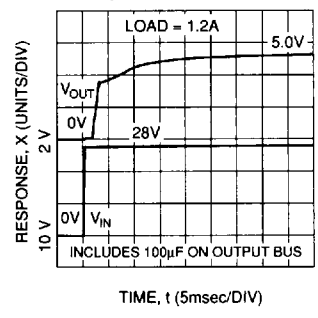
LINE TRANSIENT RESPONSE



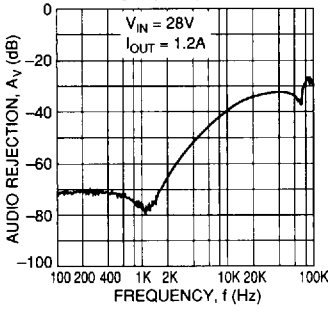
TURN ON THRESHOLD



TURN ON RESPONSE

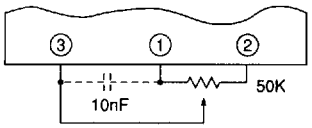


AUDIO REJECTION



OUTPUT ADJUST / COMP

The output voltage of the DHC2800S may be adjusted from 90% to 110% of nominal value by the use of a 50kΩ potentiometer as shown. Adjustment beyond this range is possible however certain characteristics of the converter such as but not limited to input voltage range, efficiency, ripple and temperature performance will change. Characterization by the user is recommended in such applications.



Adjust/comp (pin 3) may be driven by external circuitry referenced to pin 2 (-output) if desired. Grounding pin 3 causes voltage to increase (25% typically) while driving pin 3 above 1.3 V causes output voltage to decrease. Pin 3 may be driven through 10KΩ or more if connection of the comp function is also required.

The comp function of pin 3 allows capacitive loads as large as 1000 µF to be accommodated on the DHC2805S without loss of stability. This feature may be utilized by connecting a 10 nF capacitor between pins 3 and 1. This is generally recommended when low esr load capacitances of 100 µF or greater are used.

SHUTDOWN PLUS

Pin 5 is used for remote shutdown, output fault detection, and/or setting the input voltage point at which the converter will turn on as shown in the typical application diagram. No connection to pin 5 is necessary for normal operation of the converter. Pin 5 is referenced to the –input (pin 7).

Shutdown may be implemented by simply connecting pin 5 to an open collector logic output or switch rated at 2.5 mA, 25 Vdc or higher.

Input voltage turn on point is programmed with a single resistor from pin 5 to 7. An input turn on/off hysteresis (typically 3.5% of Vin) will be observed. This should be considered when making or verifying set point adjustment. The value of the setpoint resistor may be determined by the following:

$$R = \frac{210 \cdot 10^3}{E_{TO} - 9.5} \quad (\pm 10\% \text{ accuracy at } 25°C)$$

Set point temperature coefficient is typically +400ppm/°C.

Output fault monitoring is accomplished by observing pin 5 with a high impedance monitoring circuit. Pin 5 voltage drops from over 10 V to below 1 V when a load fault causes the converters fault protection circuitry to activate. It will remain low for at least 100 ms and return high. If the load fault is still present pin 5 will return low and the cycle will repeat. A resistor > 400 kΩ from pin 5 to 7 provides pull down for pin 5 if there is no input setpoint programming resistor already in place.

