

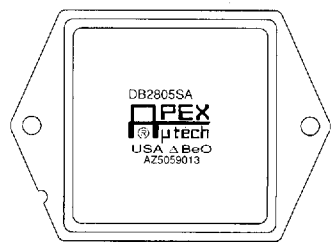
# APEX<sup>®</sup> 20 WATT DC-DC CONVERTER DB2805S • DB2805SA

APEX MICROTECHNOLOGY CORPORATION • TUCSON, ARIZONA • APPLICATIONS HOTLINE (800) 421-1865

T-57-11

## HI-REL DESIGN

- WELDED HERMETIC PACKAGE
- LOW INTERNAL TEMPERATURE GRADIENTS
- LOW COMPONENT COUNT
- ALL CERAMIC CAPACITORS
- WAVE SOLDERABLE PACKAGE



PATENT PENDING

## OTHER FEATURES

- NO DERATING — -55 to +85°C and -55 to +125°C
- WIDE SUPPLY RANGE — 15 to 50V
- HIGH POWER DENSITY — 20W/IN<sup>3</sup>
- HIGH ISOLATION — 500V

## DESCRIPTION

The DB2805S(A) has been created to provide a reliable DC/DC Converter specified over the military temperature range. This has been achieved using a new package, rather than pushing the envelope on existing DC/DC Converter packages. A 12-pin MO-127 High Profile Power Dip™, pioneered by Apex for Power Amplifiers up to 500W, provides very low thermal gradients, rugged hermeticity and high voltage isolation.

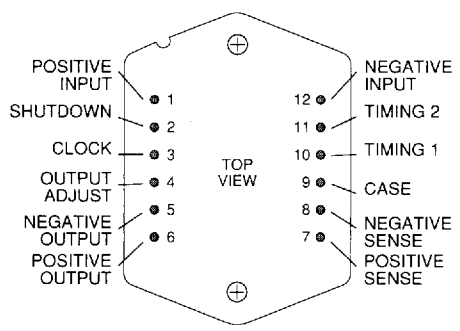
To further enhance reliability, the internal component count has been kept low. What is more, no tantalum or electrolytic capacitors are used in this design, a major cause of low MTBF in DC/DC Converters.

The sophisticated DB 2805S(A) features remote shutdown, kelvin sense, slaveability, and indefinite short circuit protection. It uses a push-pull topology operated in the feed forward, current mode. The typical switching frequency is 500 kHz. A  $\pi$  type input filter is included in order to reduce the peak to peak input ripple current.

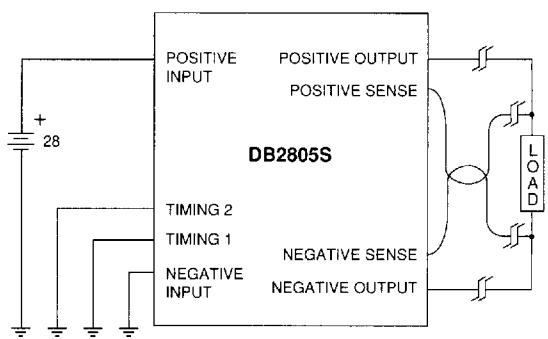
This hybrid converter utilizes thick film (cermet) resistors, ceramic capacitors, miniature magnetics and semiconductor chips to maximize reliability, minimize size and give top performance. Ultrasonically bonded aluminum wires provide reliable interconnections at all operating temperatures.

The 12-pin MO-127 High Profile Power Dip™ package (see Package Outlines) is hermetically sealed and isolated from the internal circuits. Do not use thermally conductive electrical insulators between package and heatsink.

## EXTERNAL CONNECTIONS

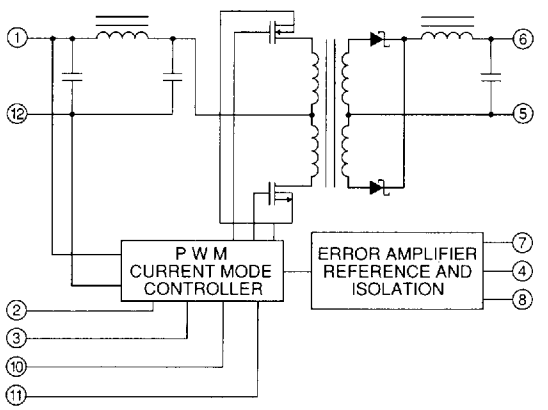


## TYPICAL APPLICATION



The above diagram shows the remote sense feature which reduces  $V_o$  errors due to resistive drops in long power supply lines. This diagram also shows the connection for non-synchronized operation.

## BLOCK DIAGRAM



# DB2805S • DB2805SA

ABSOLUTE MAXIMUM RATINGS  
SPECIFICATIONS

**NOTICE**

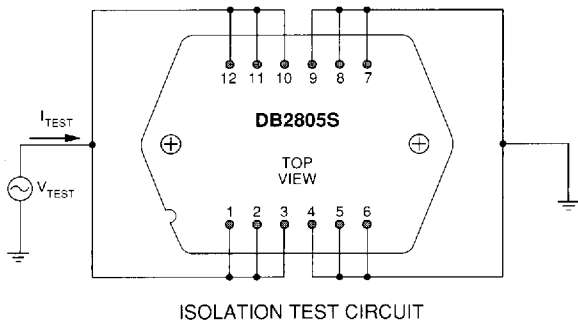
SEE ORDER OF DATA FOR ERRATA INFORMATION

**ABSOLUTE MAXIMUM RATINGS**

INPUT VOLTAGE RANGE	0 - 50V
OUTPUT CURRENT	4A
POWER DISSIPATION	15W
TEMPERATURE, Storage	-65°C, 150°C
TEMPERATURE, Pin Soldering 10s	300°C

**SPECIFICATIONS**

PARAMETER	TEST CONDITIONS <sup>2</sup>	DB2805S			DB2805SA			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	
<b>STEADY STATE CHARACTERISTICS</b>								
OUTPUT VOLTAGE	$V_{IN}$ : 16 - 40 Vdc	5.00	5.05	5.10	*	*	*	Vdc
OUTPUT CURRENT		0.40		4	*	*	*	Amps
EFFICIENCY	$V_{IN}$ : 16-40, $I_{OUT}$ = 4 Amps	64	72	76	66	72	76	%
RIPPLE VOLTAGE	Bandwidth DC → 1MHz	20	60	70	20	50	60	mV
OUTPUT POWER			20	20.8		*	*	Watts
LINE REGULATION	$V_{IN}$ : 16 to 40 Volts		±0.2	±1.0		±0.1	±0.5	%
LOAD REGULATION	$I_{OUT}$ : 400mA to 4 Amps		±2.0	±3.0		±1.0	±2.0	%
INPUT VOLTAGE RANGE	$I_{OUT}$ = 4 Amps	17	28	40	16	28	40	Vdc
INPUT CURRENT	$V_{IN}$ : 16 to 40 Volts	1.78	0.95	0.75	*	*	*	Amps
INPUT RIPPLE CURRENT	$V_{IN}$ : 16 to 40 Volts	20	60	70	*	*	*	mA p-p
JUNCTION TEMPERATURE RISE			10	22		*	*	°C
TEMPERATURE RANGE, case	$I_{OUT}$ = 4.0 Amps	-55	25	85	-55	25	125	°C
QUIESCENT CURRENT	$V_{IN}$ : 16 to 40 Volts; $V_{PIN2}$ : 5V		60	100		*	*	mA
<b>ISOLATION CHARACTERISTICS</b>								
LEAKAGE RESISTANCE	(See Figure 1 DC)	100			*			MΩ
LEAKAGE CAPACITANCE	(See Figure 1, F = 10kHz)	20	35		*	*		pF
<b>DYNAMIC CHARACTERISTICS</b>								
LINE STEP RESPONSE	$V_{IN}$ : Slew Rate = .1V/μs							
OUTPUT VOLTAGE	$V_{IN}$ : 17 → 40 Volts		+700			*		mVpk
RECOVERY TIME	$V_{IN}$ : 17 → 40 Volts		800			*		μsec
OUTPUT VOLTAGE	$V_{IN}$ : 40 → 17 Volts		-800			*		mVpk
RECOVERY TIME	$V_{IN}$ : 40 → 17 Volts		800			*		μsec
LOAD STEP RESPONSE	$I_{OUT}$ : Slew Rate = 1.5A/μs							
OUTPUT VOLTAGE	$I_{O}$ : 2 → 4 Amps		-700			*		mVpk
RECOVERY TIME	$I_{O}$ : 2 → 4 Amps		200			*		μsec
OUTPUT VOLTAGE	$I_{O}$ : 4 → 2 Amps		+800			*		mVpk
RECOVERY TIME	$I_{O}$ : 4 → 2 Amps		200			*		μsec
START-UP OVERSHOOT	$V_{IN}$ : 0 → 28 Volts		0.25			*		Vdc
SHUTDOWN DELAY	$V_{PIN2}$ : 0 → 5 Volts		40			*		μsec
SHUTDOWN RECOVERY	$V_{PIN2}$ : 5 → 0 Volts		10			*		msec



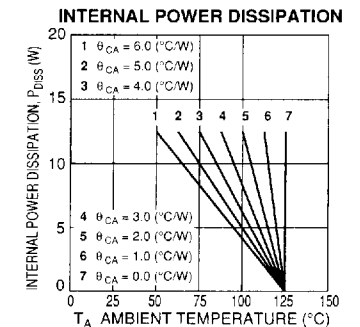
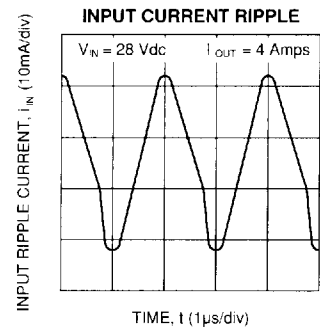
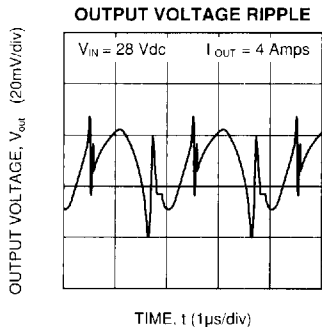
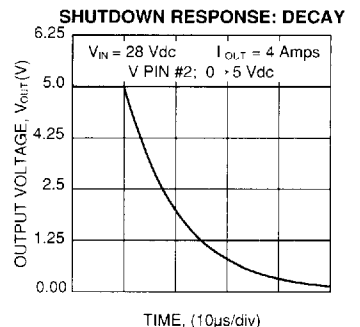
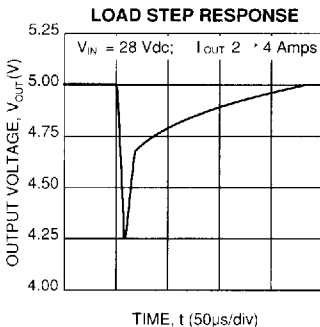
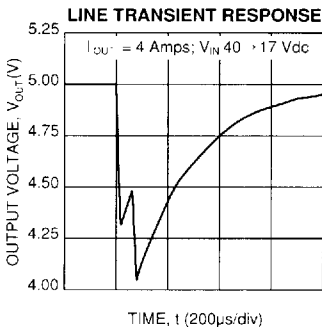
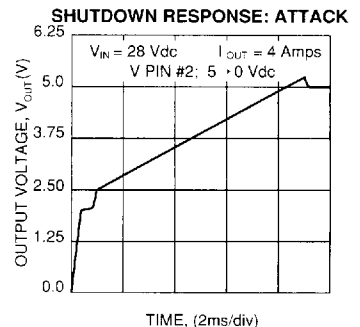
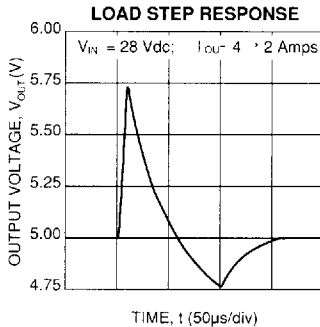
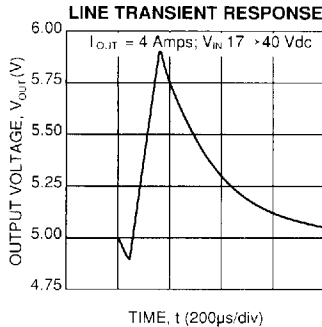
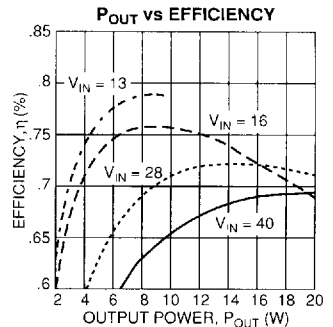
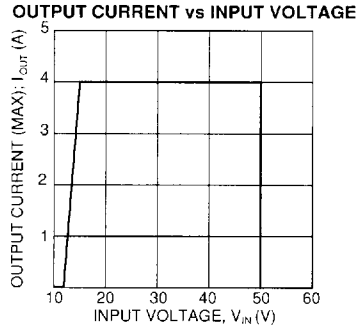
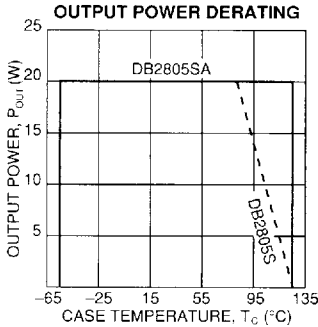
- NOTES:
- \* The specification of DB2805SA is identical to the specification for DB2805S in applicable column to the left.
  - 1. Long term operation at the maximum junction temperature will result in reduced product life. Derate internal power dissipation to achieve high MTBF. For guidance, refer to the heatsink data sheet.
  - 2. Unless otherwise stated  $T_C = 25^\circ$ ,  $V_{IN} = V_{PIN12} - V_{PIN1} = 28V$ ,  $I_{OUT} = 4$  Amps.

**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.

TYPICAL PERFORMANCE GRAPHS

DB2805S • DB2805SA

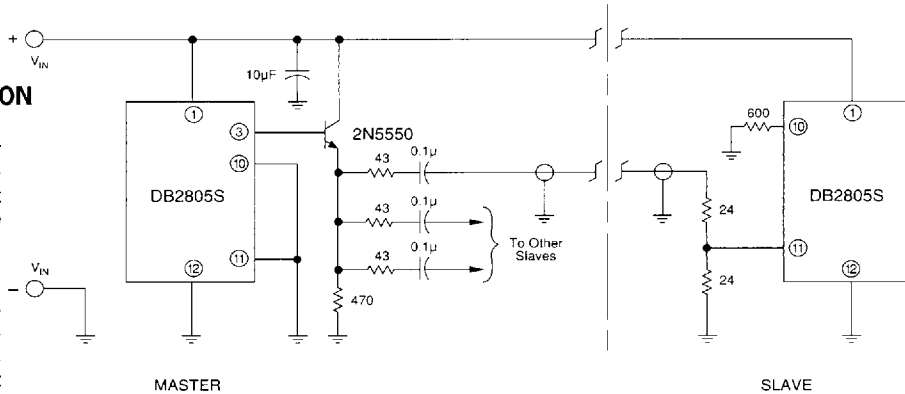


# DB2805S • DB2805SA

APPLICATION  
INFORMATION

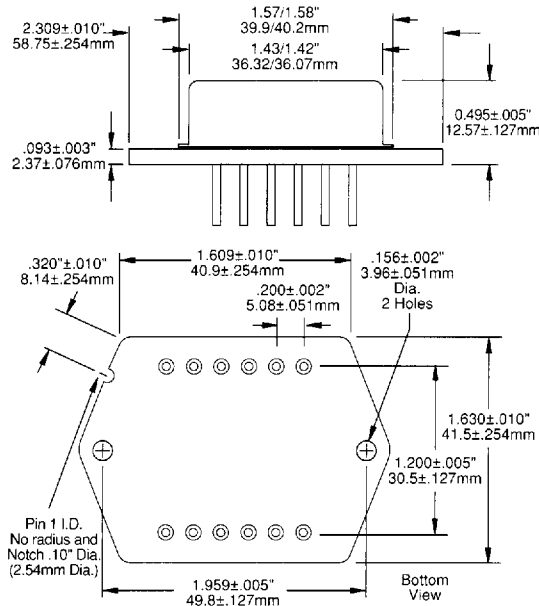
## MULTIPLE CONVERTER SYNCHRONIZATION

Operating two or more DB2805S converters as shown at right will synchronize the units to a common switching frequency. This type of operation will help to eliminate the possibility of additional harmonics being generated as a result of different switching frequencies from multiple converters.



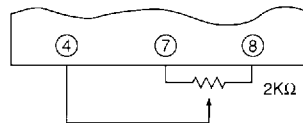
As with all high frequency control systems, great care should be taken in the layout of this circuit. A separate path to ground should be used for the power ground(s) pin 12 and for signal grounds pins 10 and 11. The transistor used to buffer the clock output pin 4 should be mounted as close as possible to the master circuit. The 10µF capacitor should be a good high frequency type and should be mounted as close as possible to the transistor. Shielded cable must be used to distribute the clock information to the slave units to prevent other noise from being coupled into pin 11.

## PACKAGE OUTLINE DIMENSIONS MO-127 HIGH PROFILE



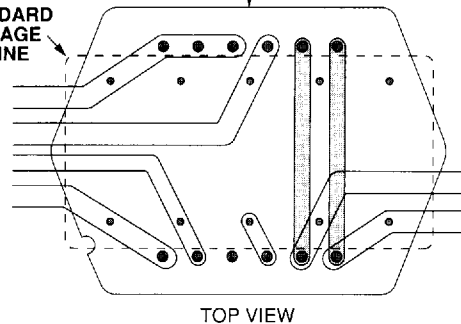
## V<sub>ADJUST</sub>

A 2kΩ potentiometer connected as shown below gives the ability to trim the output voltage between 4.5 and 5.5 volts. The nominal input impedance is 50Ωs measured between pins 4 and 7. An external reference and error amplifier can also provide input to this pin if an even higher degree of output voltage accuracy is desired.



DB2805S PACKAGE OUTLINE

STANDARD  
PACKAGE  
OUTLINE



TOP VIEW

□ Denotes second layer of  
multilayer printed circuit board.

The above diagram shows the form and function adaptability of the DB2805S with the industry standard pinout. The connections shown denote the use of the DB2805S without the synchronization or remote sense features, which are unique to the Apex product.