DVFL2800S Series

HIGH RELIABILITY HYBRID DC-DC CONVERTERS

DESCRIPTION

The DVFL series of high reliability DC-DC converters is operable over the full military (-55 °C to +125 °C) temperature range with no power derating. Unique to the DVFL series is a magnetic feedback circuit that is radiation immune. Operating at a nominal fixed frequency of 500 kHz, these regulated, isolated units utilize well-controlled undervoltage lockout circuitry to eliminate slow start-up problems. The current sharing function allows a maximum of five units to be connected in parallel to boost the total output power to 5 times. The output voltage is trimmable up to +10% or down –20%.

These converters are designed and manufactured in a facility qualified to ISO9001, compliant to AS9000, and certified to MIL-PRF-38534 and MIL-STD-883.

FEATURES

- High Reliability
- Parallel Up to 5 Units With Current Sharing
- Output Voltage Trim Up +10% or Down –20%
- Wide Input Voltage Range: 16 to 40 Volts per MIL-STD-704
- Up to 120 Watts Output Power
- Radiation Immune Magnetic Feedback Circuit
- NO Use of Optoisolators
- Undervoltage Lockout
- Industry Standard Pinout
- Input Transient Voltage: 50 Volts for 1 second
- Radiation Hardened Version Available
- Precision Seam Welded Hermetic Package
- High Power Density: > 80 W/in^3
- Custom Versions Available
- Additional Environmental Screening Available
- Meets MIL-STD-461C and MIL-STD-461D EMC Requirements When Used With a DVME28 EMI Filter
- MIL-PRF-38534 Element Evaluated Components

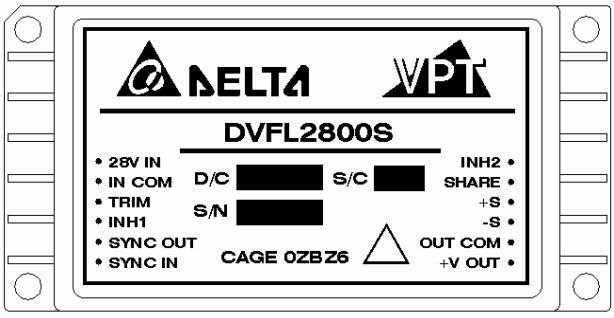


Figure 1 – DVFL2800S DC-DC Converter
(Not To Scale)

17921 Bothell-Everett
Highway, Suite 108
Bothell, WA 98012
http://www.vpt-inc.com

Sales Information:
Phone: (425) 487-4850
Fax: (425) 487-4802
E-mail: sales@vpt-inc.com

SPECIFICATIONS (T_{CASE} = -55°C to +125°C, V_{IN} = +28V ± 5%, Full Load, Unless Otherwise Specified)

ABSOLUTE MAXIMUM RATINGS			
Input Voltage (Continuous)	40 V_{DC}	Junction Temperature Rise to Case	+15°C
Input Voltage (Transient, 1 second)	50 Volts	Storage Temperature	-65°C to +150°C
Output Power[1]	120 Watts	Lead Solder Temperature (10 seconds)	270°C
Power Dissipation (Full Load, T_{CASE} = +125°C)	41 Watts	Weight	100 grams

Parameter		Conditions	DVFL283R3S			DVFL2805S			Units
			Min	Typ	Max	Min	Typ	Max	
STATIC									
INPUT Voltage[4]		Continuous	16	28	40	16	28	40	V
		Transient, 1 sec	-	-	50	-	-	50	V
Current		Inhibited 1	-	-	3	-	-	3	mA
		Inhibited 2	-	-	70	-	-	70	mA
		No Load	-	-	120	-	-	120	mA
Ripple Current		Full Load, 20Hz to 10MHz	-	-	80	-	-	80	mA_{p-p}
INH1 Pin Input[4]			0	-	1.5	0	-	1.5	V
INH2 Pin Input[4]			0	-	1.0	0	-	1.0	V
INH1 Pin Open Circuit Voltage[4]			10.5	-	13.5	10.5	-	13.5	V
INH2 Pin Open Circuit Voltage[4]			5.0	-	8.0	5.0	-	8.0	V
UVLO Turn On			14.5	-	16.0	14.5	-	16.0	V
UVLO Turn Off[4]			14.0	-	15.5	14.0	-	15.5	V
OUTPUT Voltage	V_{OUT}	T_{CASE} = 25°C	3.267	3.30	3.333	4.95	5.00	5.05	V
	V_{OUT}	T_{CASE} = -55°C to +125°C	3.25	3.30	3.35	4.925	5.00	5.075	V
Power			0	-	66	0	-	100	W
Current	V_{OUT}		-	-	20	-	-	20	A
Ripple Voltage	V_{OUT}	Full Load, 20Hz to 10MHz	-	-	80	-	-	80	mV_{p-p}
Line Regulation	V_{OUT}	V_{IN} = 16V to 40V	-	-	20	-	-	20	mV
Load Regulation	V_{OUT}	No Load to Full Load	-	-	80	-	-	100	mV
Voltage Trim[4]	V_{OUT}	Full Load	-10	-	10	-20	-	10	%
Share Pin Voltage[4]			2.0	-	3.0	2.0	-	3.0	V
EFFICIENCY			68	-	-	72	-	-	%
LOAD FAULT POWER DISSIPATION		Overload[4]	-	-	80	-	-	80	W
		Short Circuit	-	-	80	-	-	80	W
CAPACITIVE LOAD[4]			-	-	1000	-	-	1000	µF
SWITCHING FREQUENCY			450	500	600	450	500	600	kHz
SYNC FREQUENCY RANGE		$V_H - V_L$ = 5V Duty Cycle = 20% - 80%	500	-	600	500	-	600	kHz
ISOLATION		500 V_{DC}	100	-	-	100	-	-	MΩ
THERMAL RESISTANCE		Case to Ambient (θCA)	-	12	-	-	12	-	°C/W
MTBF (MIL-HDBK-217F)		AIF @ T_C = 55°C	-	400	-	-	400	-	kHrs

Notes: 1. Dependant on output voltage.
2. Time for output voltage to settle within 1% of its nominal value.
3. Derate linearly to 0 at 135°C.
4. Verified by qualification testing.

SPECIFICATIONS (T_{CASE} = -55°C to +125°C, V_{IN} = +28V ± 5%, Full Load, Unless Otherwise Specified)

ABSOLUTE MAXIMUM RATINGS			
Input Voltage (Continuous)	40 V_{DC}	Junction Temperature Rise to Case	+15°C
Input Voltage (Transient, 1 second)	50 Volts	Storage Temperature	-65°C to +150°C
Output Power[1]	120 Watts	Lead Solder Temperature (10 seconds)	270°C
Power Dissipation (Full Load, T_{CASE} = +125°C)	41 Watts	Weight	100 grams

Parameter		Conditions	DVFL283R3S			DVFL2805S			Units
			Min	Typ	Max	Min	Typ	Max	
DYNAMIC									
Load Step Output Transient	V_{OUT}	Half Load to Full Load	-	-	400	-	-	400	mV_{PK}
Load Step Recovery[2]			-	-	500	-	-	500	µSec
Line Step Output Transient[4]	V_{OUT}	V_{IN} = 16V to 40V	-	300	600	-	300	600	mV_{PK}
Line Step Recovery[2, 4]			-	300	500	-	300	500	µSec
Turn On Delay	V_{OUT}	V_{IN} = 0V to 28V	-	-	20	-	-	20	mSec
Turn On Overshoot[2]			-	-	15	-	-	25	mV_{PK}

Notes: 1. Dependant on output voltage. 2. Time for output voltage to settle within 1% of its nominal value.
3. Derate linearly to 0 at 135°C. 4. Verified by qualification testing.

SPECIFICATIONS (T_{CASE} = -55°C to +125°C, V_{IN} = +28V ± 5%, Full Load, Unless Otherwise Specified)

ABSOLUTE MAXIMUM RATINGS			
Input Voltage (Continuous)	40 V_{DC}	Junction Temperature Rise to Case	+15°C
Input Voltage (Transient, 1 second)	50 Volts	Storage Temperature	-65°C to +150°C
Output Power[1]	120 Watts	Lead Solder Temperature (10 seconds)	270°C
Power Dissipation (Full Load, T_{CASE} = +125°C)	41 Watts	Weight	100 grams

Parameter		Conditions	DVFL2812S			DVFL2815S			Units
			Min	Typ	Max	Min	Typ	Max	
STATIC									
INPUT Voltage[4]		Continuous	16	28	40	16	28	40	V
		Transient, 1 sec	-	-	50	-	-	50	V
Current		Inhibited 1	-	-	3	-	-	3	mA
		Inhibited 2	-	-	70	-	-	70	mA
		No Load	-	-	120	-	-	120	mA
Ripple Current		Full Load, 20Hz to 10MHz	-	-	80	-	-	80	mA_{p-p}
INH1 Pin Input[4]			0	-	1.5	0	-	1.5	V
INH2 Pin Input[4]			0	-	1.0	0	-	1.0	V
INH1 Pin Open Circuit Voltage[4]			10.5	-	13.5	10.5	-	13.5	V
INH2 Pin Open Circuit Voltage[4]			5.0	-	8.0	5.0	-	8.0	V
UVLO Turn On			14.0	-	16.0	14.0	-	16.0	V
UVLO Turn Off[4]			14.0	-	15.5	14.0	-	15.5	V
OUTPUT Voltage	V_{OUT}	T_{CASE} = 25°C	11.88	12.00	12.12	14.85	15.00	15.15	V
	V_{OUT}	T_{CASE} = -55°C to +125°C	11.82	12.00	12.18	14.775	15.00	15.225	V
Power			-	-	110	-	-	120	W
Current	V_{OUT}		-	-	9.2	-	-	8.0	A
Ripple Voltage	V_{OUT}	Full Load, 20Hz to 10MHz	-	-	80	-	-	80	mV_{p-p}
Line Regulation	V_{OUT}	V_{IN} = 16V to 40V	-	-	20	-	-	20	mV
Load Regulation	V_{OUT}	No Load to Full Load	-	-	120	-	-	150	mV
Voltage Trim[4]	V_{OUT}	Full Load	-20	-	10	-20	-	10	%
Share Pin Voltage[4]			2.0	-	3.0	2.0	-	3.0	V
EFFICIENCY			79	-	-	80	-	-	%
LOAD FAULT POWER DISSIPATION		Overload[4]	-	-	80	-	-	80	W
		Short Circuit	-	-	80	-	-	80	W
CAPACITIVE LOAD[4]			-	-	500	-	-	500	µF
SWITCHING FREQUENCY			450	500	600	450	500	600	kHz
SYNC FREQUENCY RANGE		$V_H - V_L$ = 5V Duty Cycle = 20% - 80%	500	-	600	500	-	600	kHz
ISOLATION		500 V_{DC}	100	-	-	100	-	-	MΩ
THERMAL RESISTANCE		Case to Ambient (θCA)	-	12	-	-	12	-	°C/W
MTBF (MIL-HDBK-217F)		AIF @ T_C = 55°C	-	400	-	-	400	-	kHrs

Notes: 1. Dependant on output voltage.
2. Time for output voltage to settle within 1% of its nominal value.
3. Derate linearly to 0 at 135°C.
4. Verified by qualification testing.

SPECIFICATIONS (T_{CASE} = -55°C to +125°C, V_{IN} = +28V ± 5%, Full Load, Unless Otherwise Specified)

ABSOLUTE MAXIMUM RATINGS			
Input Voltage (Continuous)	40 V_{DC}	Junction Temperature Rise to Case	+15°C
Input Voltage (Transient, 1 second)	50 Volts	Storage Temperature	-65°C to +150°C
Output Power[1]	120 Watts	Lead Solder Temperature (10 seconds)	270°C
Power Dissipation (Full Load, T_{CASE} = +125°C)	41 Watts	Weight	100 grams

Parameter		Conditions	DVFL2812S			DVFL2815S			Units
			Min	Typ	Max	Min	Typ	Max	
DYNAMIC									
Load Step Output Transient	V_{OUT}	Half Load to Full Load	-	-	800	-	-	800	mV_{PK}
Load Step Recovery[2]			-	-	500	-	-	500	µSec
Line Step Output Transient[4]	V_{OUT}	V_{IN} = 16V to 40V	-	600	1200	-	600	1200	mV_{PK}
Line Step Recovery[2, 4]			-	300	500	-	300	500	µSec
Turn On Delay	V_{OUT}	V_{IN} = 0V to 28V	-	-	20	-	-	20	mSec
Turn On Overshoot[2]			-	-	50	-	-	50	mV_{PK}

Notes: 1. Dependant on output voltage.
2. Time for output voltage to settle within 1% of its nominal value.
3. Derate linearly to 0 at 135°C.
4. Verified by qualification testing.

SPECIFICATIONS (T_{CASE} = -55°C to +125°C, V_{IN} = +28V ± 5%, Full Load, Unless Otherwise Specified)

ABSOLUTE MAXIMUM RATINGS			
Input Voltage (Continuous)	40 V_{DC}	Junction Temperature Rise to Case	+15°C
Input Voltage (Transient, 1 second)	50 Volts	Storage Temperature	-65°C to +150°C
Output Power[1]	120 Watts	Lead Solder Temperature (10 seconds)	270°C
Power Dissipation (Full Load, T_{CASE} = +125°C)	41 Watts	Weight	100 grams

Parameter		Conditions	DVFL285R2S			Units
			Min	Typ	Max	
STATIC						
INPUT Voltage[4]		Continuous	16	28	40	V
		Transient, 1 sec	-	-	50	V
Current		Inhibited 1	-	-	3	mA
		Inhibited 2	-	-	70	mA
		No Load	-	-	120	mA
Ripple Current		Full Load, 20Hz to 10MHz	-	-	80	mA_{p-p}
INH1 Pin Input[4]			0	-	1.5	V
INH2 Pin Input[4]			0	-	1.0	V
INH1 Pin Open Circuit Voltage[4]			10.5	-	13.5	V
INH2 Pin Open Circuit Voltage[4]			5.0	-	8.0	V
UVLO Turn On			14.5	-	16.0	V
UVLO Turn Off[4]			14.0	-	15.5	V
OUTPUT Voltage	V_{OUT}	T_{CASE} = 25°C	5.148	5.20	5.252	V
	V_{OUT}	T_{CASE} = -55°C to +125°C	5.122	5.20	5.278	V
Power			-	-	100	W
Current	V_{OUT}		-	-	19.2	A
Ripple Voltage	V_{OUT}	Full Load, 20Hz to 10MHz	-	-	80	mV_{p-p}
Line Regulation	V_{OUT}	V_{IN} = 16V to 40V	-	-	20	mV
Load Regulation	V_{OUT}	No Load to Full Load	-	-	100	mV
Voltage Trim[4]	V_{OUT}	Full Load	-20	-	10	%
Share Pin Voltage[4]			2.0	-	3.0	V
EFFICIENCY			72	-	-	%
LOAD FAULT POWER DISSIPATION		Overload[4]	-	-	80	W
		Short Circuit	-	-	80	W
CAPACITIVE LOAD[4]			-	-	1000	µF
SWITCHING FREQUENCY			450	500	600	kHz
SYNC FREQUENCY RANGE		$V_H - V_L$ = 5V Duty Cycle = 20% - 80%	500	-	600	kHz
ISOLATION		500 V_{DC}	100	-	-	MΩ
THERMAL RESISTANCE		Case to Ambient (θCA)	-	12	-	°C/W
MTBF (MIL-HDBK-217F)		AIF @ T_C = 55°C	-	400	-	kHrs

Notes: 1. Dependant on output voltage.
2. Time for output voltage to settle within 1% of its nominal value.
3. Derate linearly to 0 at 135°C.
4. Verified by qualification testing.

SPECIFICATIONS (T_{CASE} = -55°C to +125°C, V_{IN} = +28V ± 5%, Full Load, Unless Otherwise Specified)

ABSOLUTE MAXIMUM RATINGS			
Input Voltage (Continuous)	40 V_{DC}	Junction Temperature Rise to Case	+15°C
Input Voltage (Transient, 1 second)	50 Volts	Storage Temperature	-65°C to +150°C
Output Power[1]	120 Watts	Lead Solder Temperature (10 seconds)	270°C
Power Dissipation (Full Load, T_{CASE} = +125°C)	41 Watts	Weight	100 grams

Parameter		Conditions	DVFL285R2S			Units
			Min	Typ	Max	
DYNAMIC						
Load Step Output Transient	V_{OUT}	Half Load to Full Load	-	-	400	mV_{PK}
Load Step Recovery[2]			-	-	500	µSec
Line Step Output Transient[4]	V_{OUT}	V_{IN} = 16V to 40V	-	300	600	mV_{PK}
Line Step Recovery[2, 4]			-	300	500	µSec
Turn On Delay	V_{OUT}	V_{IN} = 0V to 28V	-	-	20	mSec
Turn On Overshoot[2]			-	-	25	mV_{PK}

Notes: 1. Dependant on output voltage.
2. Time for output voltage to settle within 1% of its nominal value.
3. Derate linearly to 0 at 135°C.
4. Verified by qualification testing.

BLOCK DIAGRAM

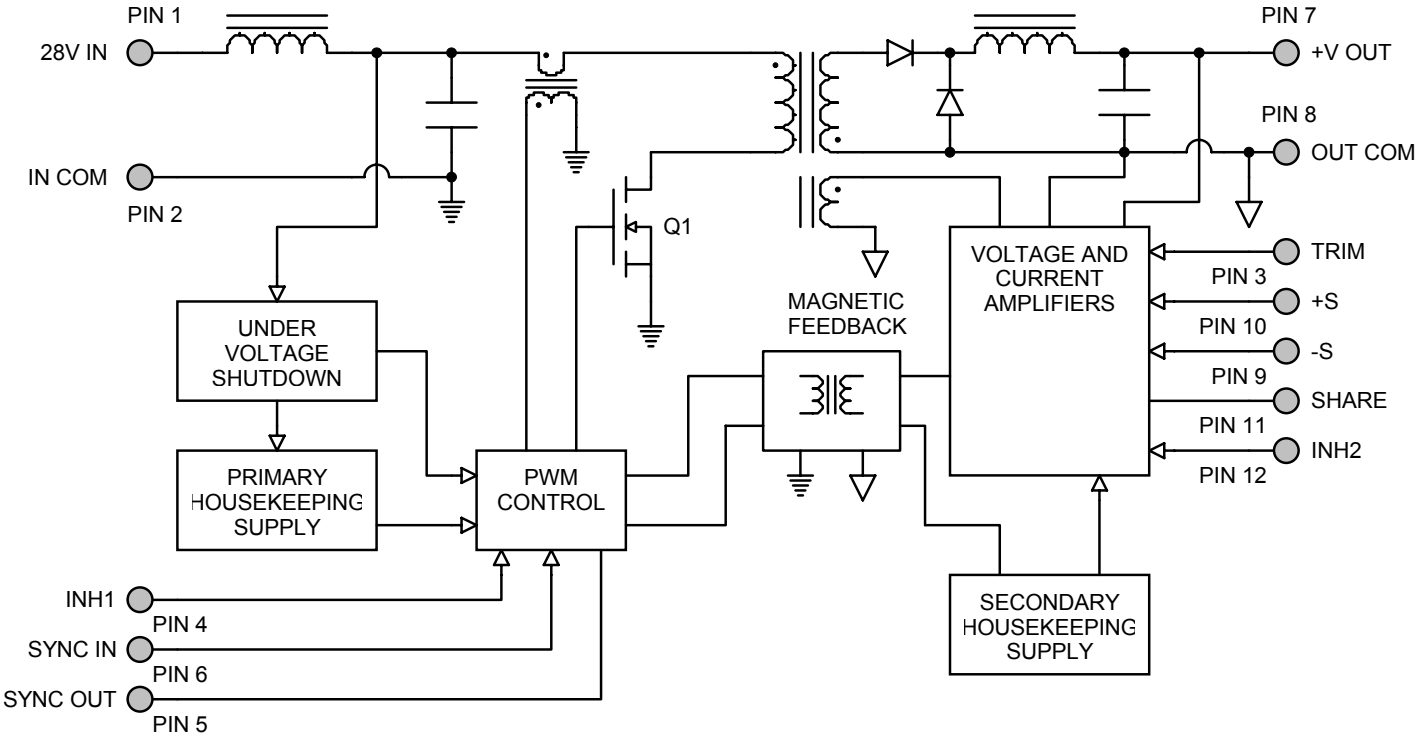


Figure 2

CONNECTION DIAGRAM

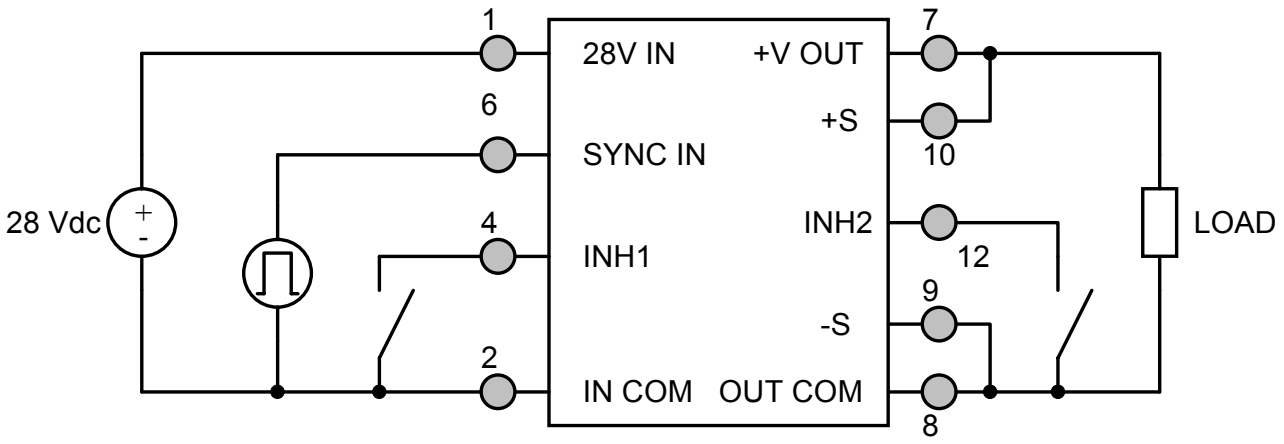


Figure 3

INHIBIT DRIVE CONNECTION DIAGRAM

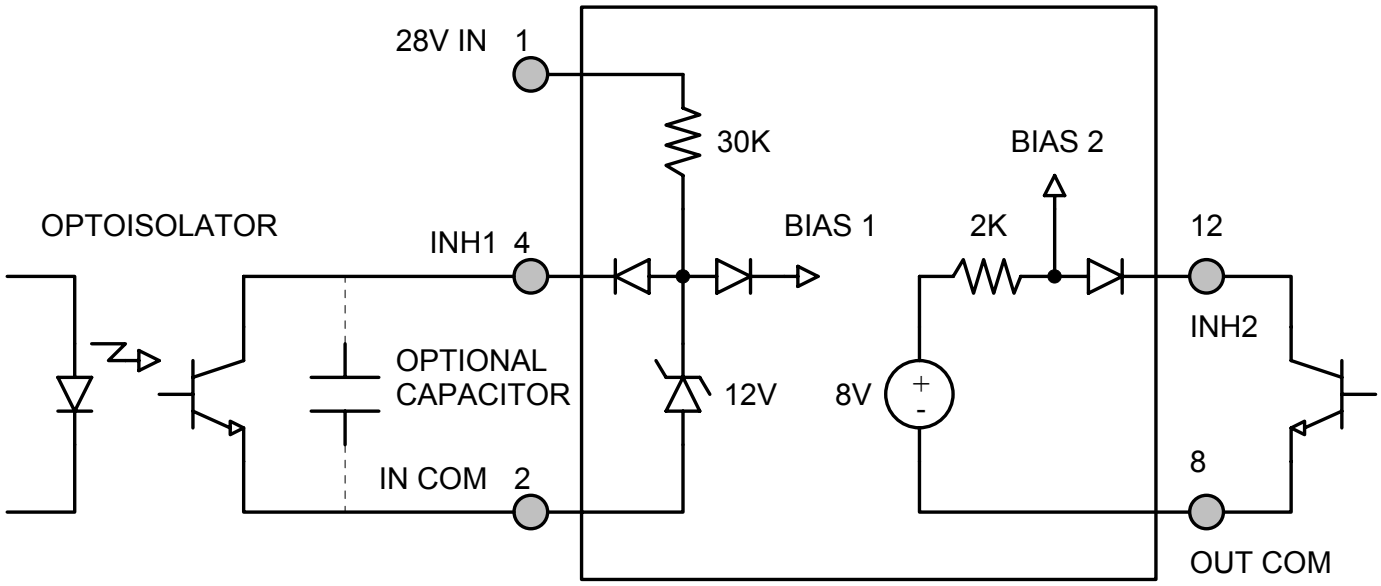


Figure 4 – Isolated Inhibit Drive and Internal Equivalent Circuit
(Shown with optional capacitor for turn-on delay)

EMI FILTER HOOKUP DIAGRAM

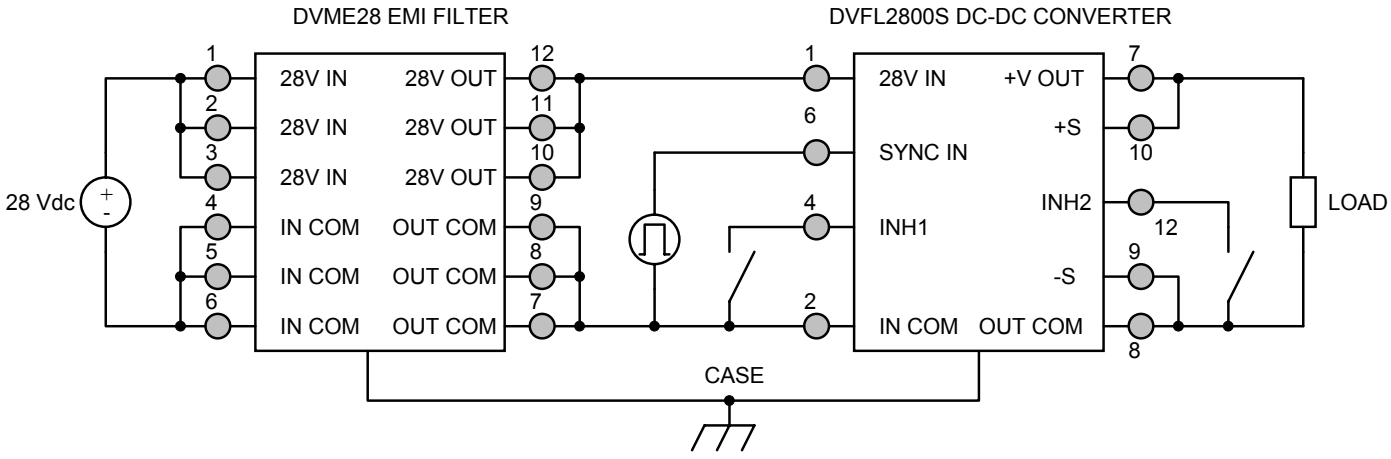


Figure 5 – Converter with EMI Filter

PARALLEL CONNECTION DIAGRAMS

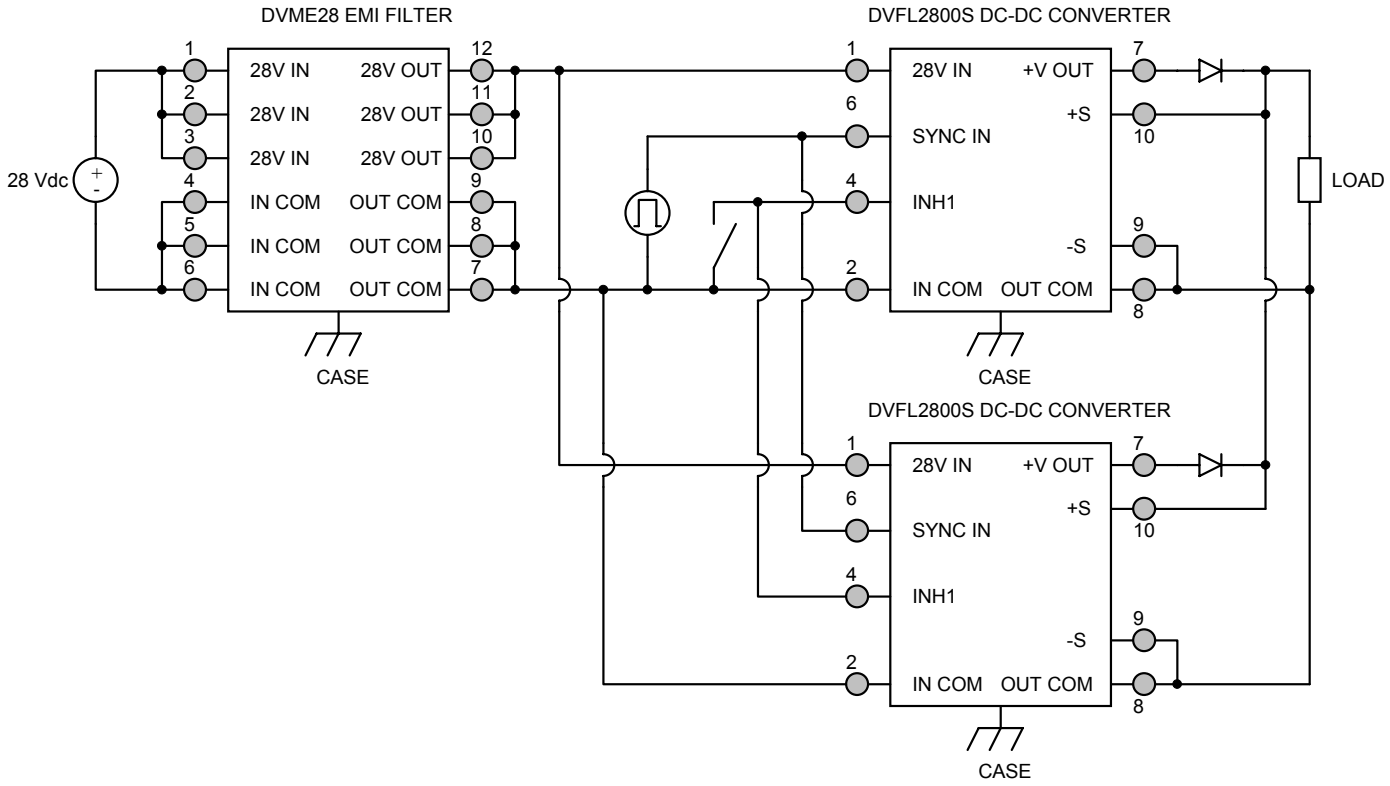


Figure 6 – Parallel Connection without Current Sharing

PARALLEL CONNECTION DIAGRAMS

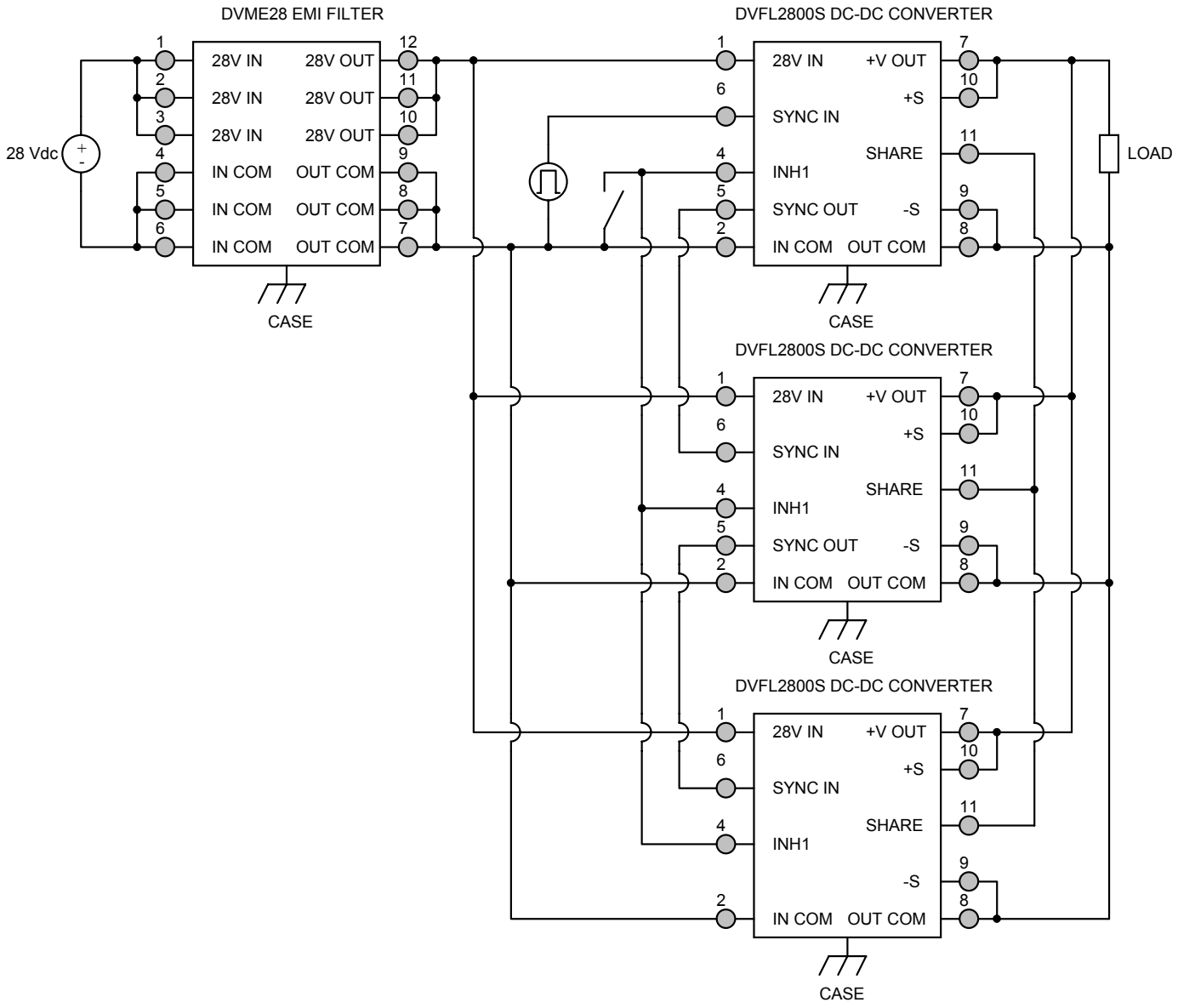
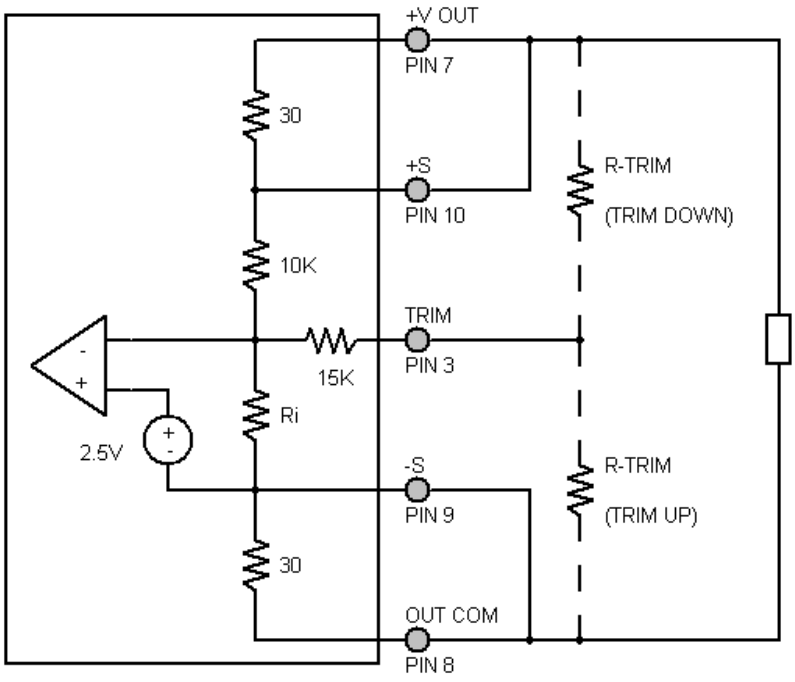


Figure 7 – Current Sharing Parallel Connection for Multiple Converters

OUTPUT VOLTAGE TRIM



The output voltage can be trimmed down by connecting a resistor between the TRIM pin (PIN 3) and the +V OUT pin (PIN 7), or can be trimmed up by connecting a resistor between the TRIM pin (PIN 3) and the OUT COM pin (PIN 8). The maximum trim range is +10% up and –20% down. The appropriate resistor values versus the output voltage are given in the trim table below.

Figure 8 – Output Voltage Trim

DVFL283R3S		DVFL2805S		DVFL285R2S		DVFL2812S		DVFL2815S	
$+V_{OUT}$ (V)	R_{TRIM} (Ω)	$+V_{OUT}$ (V)	R_{TRIM} (Ω)	$+V_{OUT}$ (V)	R_{TRIM} (Ω)	$+V_{OUT}$ (V)	R_{TRIM} (Ω)	$+V_{OUT}$ (V)	R_{TRIM} (Ω)
3.60	68.3k	5.5	35k	5.7	35k	13.2	5.8k	16.50	1.7k
3.55	85k	5.4	47.5k	5.6	47.5k	13.0	10k	16.25	5k
3.50	110k	5.3	68.3k	5.5	68.3k	12.8	16.2k	16.00	10k
3.45	151.7k	5.2	110k	5.4	110k	12.6	26.6k	15.75	18.3k
3.40	235k	5.1	235k	5.3	235k	12.4	47.3k	15.50	35k
3.35	485k	5.0	-	5.2	-	12.2	109k	15.25	85k
3.30	-	4.9	225k	5.1	245k	12.0	-	15.00	-
3.25	135k	4.8	100k	5.0	110k	11.8	454k	14.75	475k
3.20	55k	4.7	58.3k	4.9	65k	11.6	213k	14.50	225k
3.15	28.3k	4.6	37.5k	4.8	42.5k	11.4	134k	14.25	142k
3.10	15k	4.5	25k	4.7	29k	11.2	94k	14.00	100k
3.05	7k	4.4	16.7k	4.6	20k	11.0	70.1k	13.75	75k
3.00	1.7k	4.3	10.7k	4.5	13.6k	10.8	54.3k	13.50	58.3k
		4.2	6.3k	4.4	8.8k	10.6	42.9k	13.25	46.4k
		4.1	2.8k	4.3	5k	10.4	34.4k	13.00	37.5k
		4.0	0	4.2	2k	10.2	27.8k	12.75	30.6k
						10.0	22.5k	12.50	25k
						9.8	18.2k	12.25	20.5k
						9.6	14.6k	12.00	16.7k

EFFICIENCY PERFORMANCE CURVES (T_{CASE} = 25°C, Full Load, Unless Otherwise Specified)

------- V_{IN} = 16V	——— V_{IN} = 28V	– – – – – V_{IN} = 40V

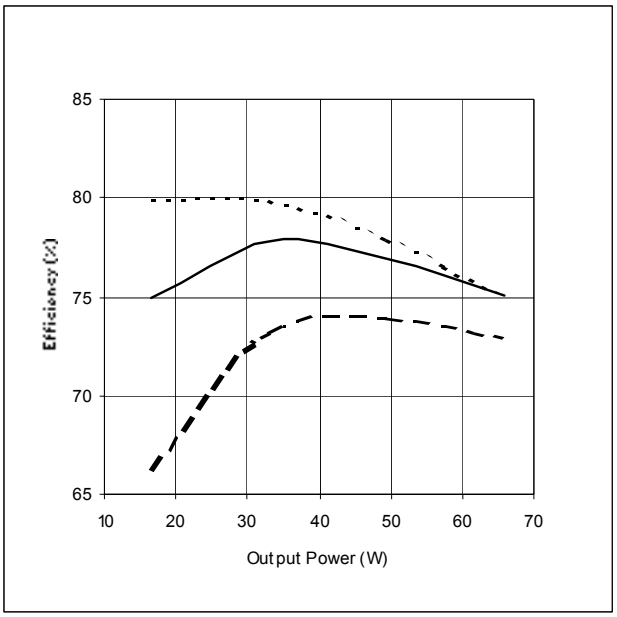


Figure 9 – DVFL283R3S
Efficiency (%) vs. Output Power (W)

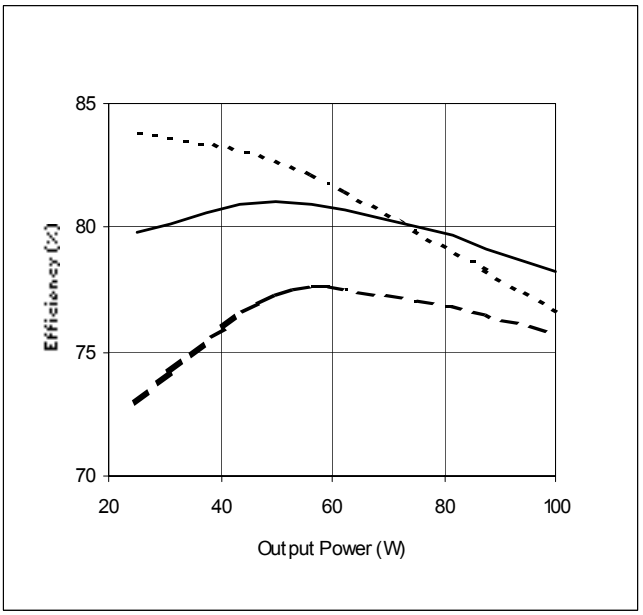


Figure 10 – DVFL2805S / DVFL285R2S
Efficiency (%) vs. Output Power (W)

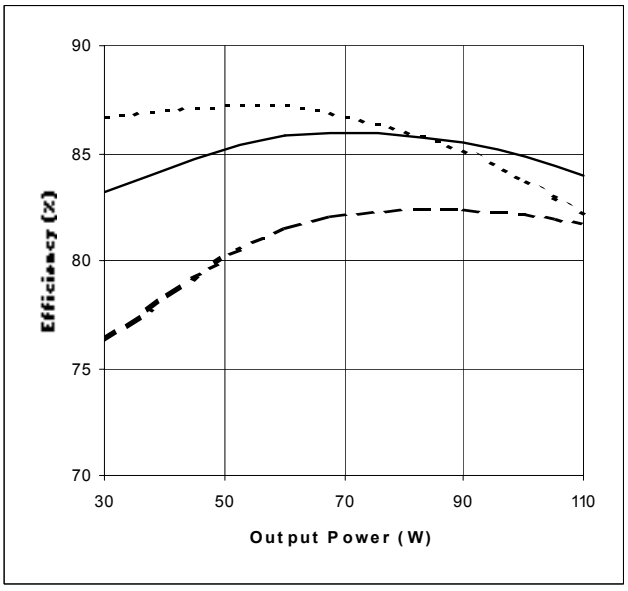


Figure 11 – DVFL2812S
Efficiency (%) vs. Output Power (W)

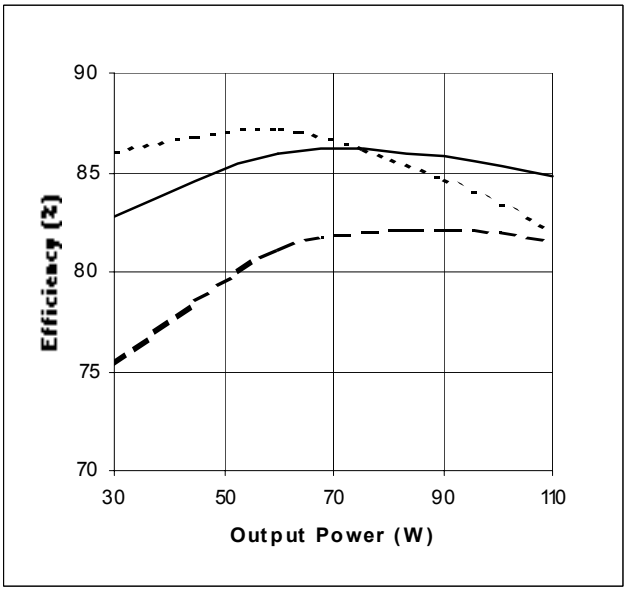


Figure 12 – DVFL2815S
Efficiency (%) vs. Output Power (W)

EMI PERFORMANCE CURVES

(T_{CASE} = 25°C, V_{IN} = +28V ± 5%, Full Load, Unless Otherwise Specified)

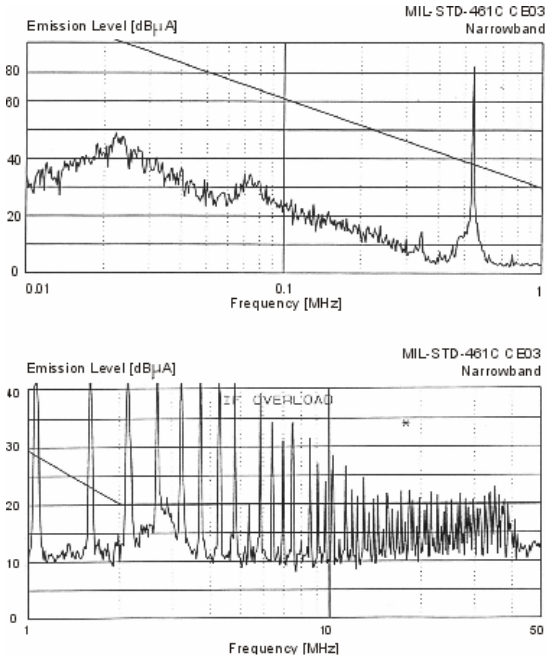


Figure 13 – DVFL2800S without EMI Filter

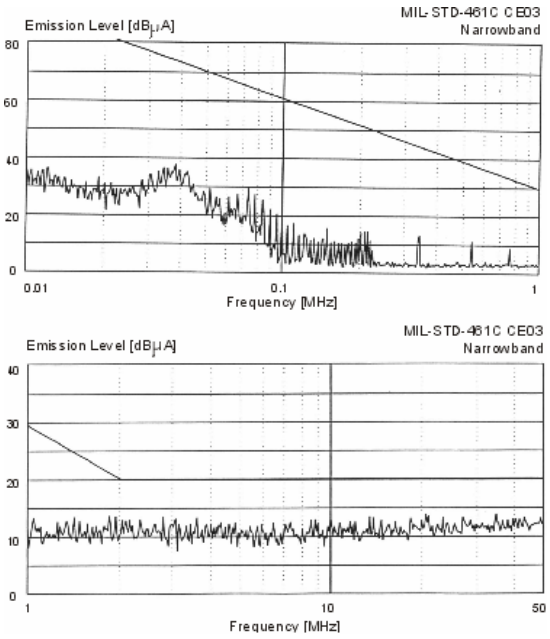
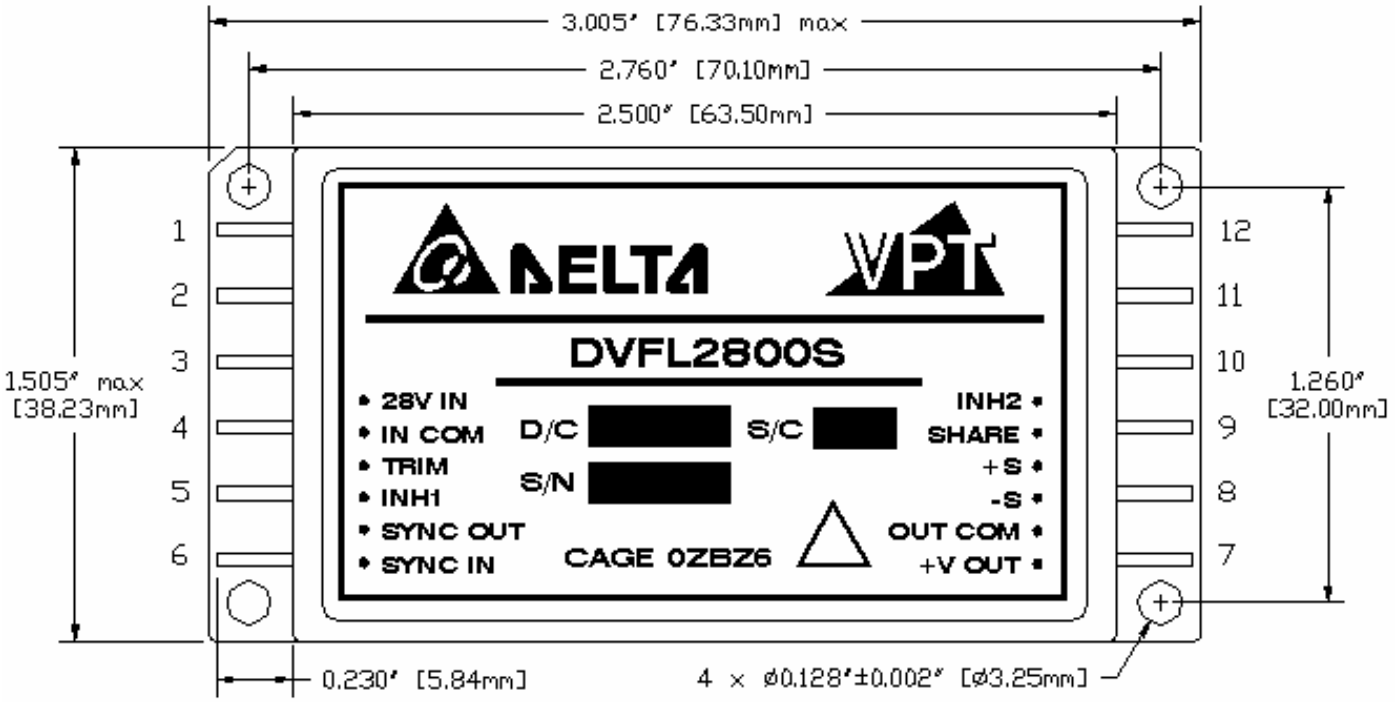
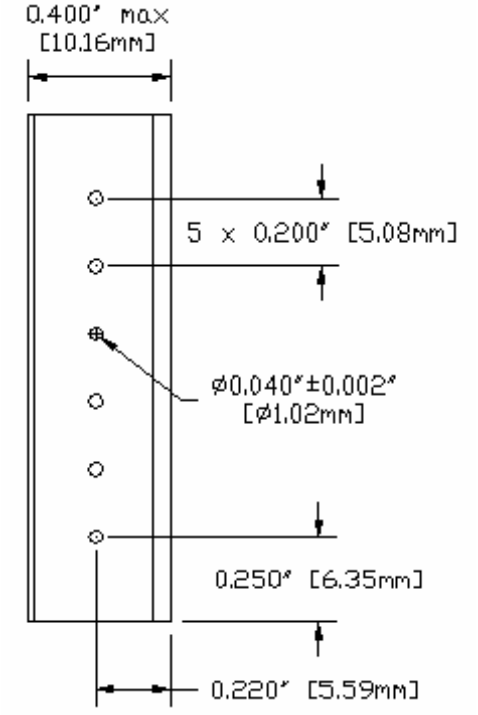


Figure 14 – DVFL2800S with EMI Filter

PACKAGE SPECIFICATIONS



TOP VIEW

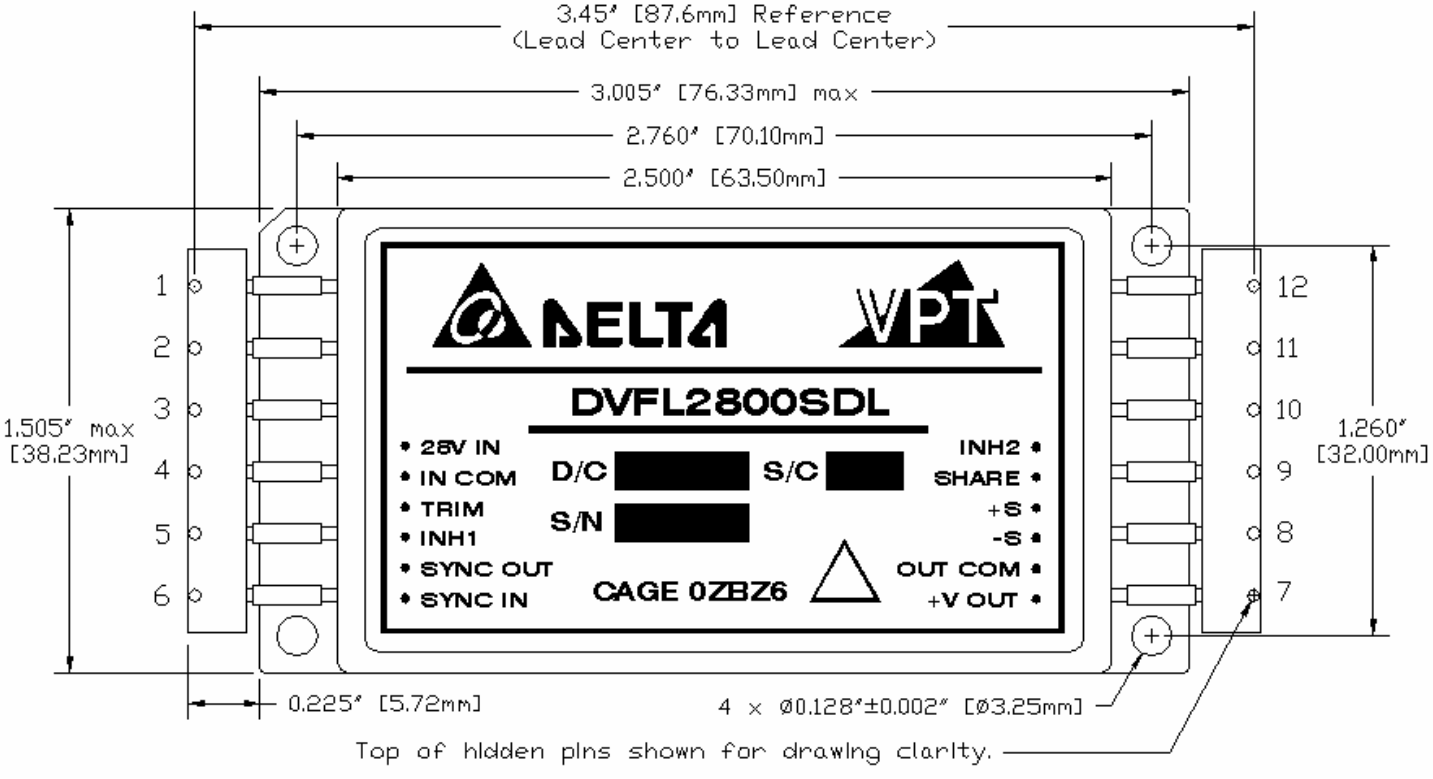


SIDE VIEW

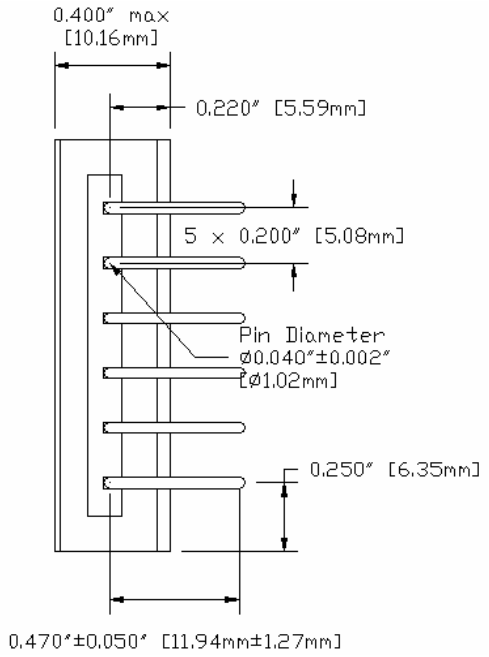
PIN	FUNCTION
1	28V IN
2	IN COM
3	TRIM
4	INH1
5	SYNC OUT
6	SYNC IN
7	+V OUT
8	OUT COM
9	-S
10	+S
11	SHARE
12	INH2

Figure 15 – Package and Pinout
(Pin Length is ±0.01", Other Dimensional Limits are ±0.005" Unless Otherwise Stated)

PACKAGE SPECIFICATIONS (DOWN-LEADED)



TOP VIEW

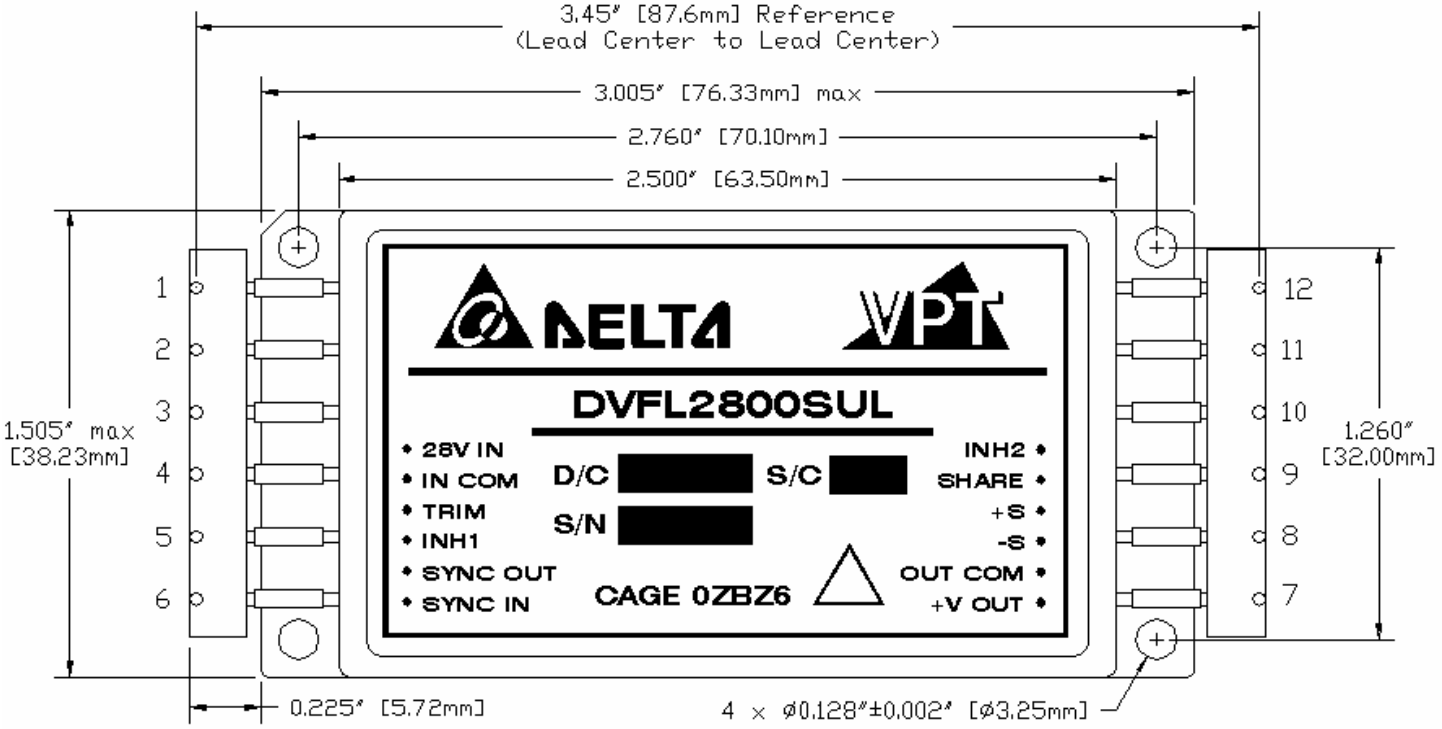


SIDE VIEW

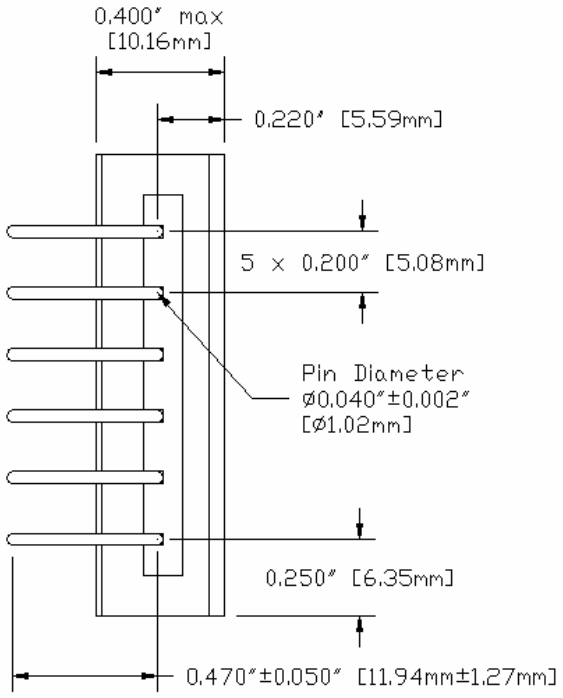
PIN	FUNCTION
1	28V IN
2	IN COM
3	TRIM
4	INH1
5	SYNC OUT
6	SYNC IN
7	+V OUT
8	OUT COM
9	-S
10	+S
11	SHARE
12	INH2

Figure 16 – Package and Pinout (With Down-Leaded Pin Extensions Added)
(Pin Length is ±0.01", Other Dimensional Limits are ±0.005" Unless Otherwise Stated)

PACKAGE SPECIFICATIONS (UP-LEADED)



TOP VIEW



SIDE VIEW

PIN	FUNCTION
1	28V IN
2	IN COM
3	TRIM
4	INH1
5	SYNC OUT
6	SYNC IN
7	+V OUT
8	OUT COM
9	-S
10	+S
11	SHARE
12	INH2

Figure 17 – Package and Pinout (With Up-Leaded Pin Extensions Added)
(Pin Length is ±0.01”, Other Dimensional Limits are ±0.005” Unless Otherwise Stated)

PACKAGE PIN DESCRIPTION

Pin	Function	Description
1	28V IN	Positive Input Voltage Connection
2	IN COM	Input Common Connection
3	TRIM	Trim Output Voltage to +10%, -20% of Nominal Value
4	INH1	Logic Low = Disabled Output. Connecting the inhibit(1) pin to input common causes converter shutdown. Logic High = Enabled Output. Unconnected or open collector TTL.
5	SYNC OUT	Output Synchronization Signal
6	SYNC IN	Input Synchronization Signal
7	+V OUT	Positive Output Voltage Connection
8	OUT COM	Output Common Connection
9	-S	Return Sense
10	+S	Positive Sense
11	SHARE	Current Share
12	INH2	Logic Low = Disabled Output. Connecting the inhibit(2) pin to output common causes converter shutdown. Logic High = Enabled Output. Unconnected or open collector TTL.

ENVIRONMENTAL SCREENING (Per MIL-STD-883 as referenced to MIL-PRF-38534, Class H)

Screening	MIL-STD-883	Standard (No Suffix)	Extended /ES	HB /HB
Pre-Cap Inspection	Method 2017, 2032 Internal Procedure	•	•	•
Temperature Cycling	Method 1010, Condition C Method 1010, -55°C to 125°C		•	•
Constant Acceleration	Method 2001, Condition A Method 2001, 500g		•	•
Burn-In	Method 1015, 160 hours at +125°C 96 hours at +125°C 24 hours at +125°C	•	•	•
Hermeticity	Method 1014, Fine Leak, Condition A Method 1014, Gross Leak, Condition C Dip (1×10^{-3})	•	• •	• •
Final Electrical	MIL-PRF-38534, Group A[1] 100% at 25°C	•	•	•
Final Inspection	Method 2009	•	•	•

Note: 1. 100% R&R testing at –55°C, +25°C, and +125°C with all test data included in product shipment.

ORDERING INFORMATION

DVFL	28	05	S	R	DL	/HB	-	XXX
1	2	3	4	5	6	7		8

(1) (2) (3) (4)

Product Series	Nominal Input Voltage		Output Voltage		Number of Outputs	
DVFL	**28**	28 Volts	**3R3** **05** **5R2** **12** **15**	3.3 Volts 5 Volts 5.2 Volts 12 Volts 15 Volts	**S**	Single

(5) (6) (7) (8)

Rad-Hard Option		Package Option		Screening Code		Additional Screening Code
None **R**	Standard 100 kRad	**None** **DL** **UL**	Standard Down-Lead Up-Lead	**None** **/ES** **/HB**	Standard Extended HB	Contact Sales

Please contact your sales representative or the VPT Inc. Sales Department for more information concerning additional environmental screening and testing, different input voltage, output voltage, power requirement, source inspection, and/or special element evaluation for space or other higher quality applications.

CONTACT INFORMATION

To request a quotation or place an order please contact your sales representative or the VPT Inc. Sales Department at:

Phone: (425) 487-4850
Fax: (425) 487-4802
E-mail: sales@vpt-inc.com