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 are robust and effective input and output filters which provide dramatically reduced input and output noise performance when compared to other manufacturers competing devices. Operating at a nominal fixed frequency of 500 kHz, these regulated, isolated units utilize a high speed magnetic feedback design and 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 and certified to MIL-PRF-38534 and MIL-STD-883.

This product may incorporate one or more of the following U.S. patents:

5,784,266
5,790,389
5,963,438
5,999,433
6,005,780
6,084,792
6,118,673

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
- Fault Tolerant Magnetic Feedback Circuit
- NO Use of Optoisolators
- Undervoltage Lockout
- Indefinite Short Circuit Protection
- Current Limit Protection
- Industry Standard Pinout
- Input Transient Voltage: 50 Volts for 1 second
- Precision Seam Welded Hermetic Package
- High Power Density: > 80 W/in^3
- Custom Versions Available
- Additional Environmental Screening Available
- Meets MIL-STD-461 Revisions C, D, E and F EMC Requirements when used with VPT's EMI Filters.
- MIL-PRF-38534 Element Evaluated Components
- Space Applications should consider VPT's "S" Series of Radiation Tolerant Power Conversion Devices. Contact VPT for details.

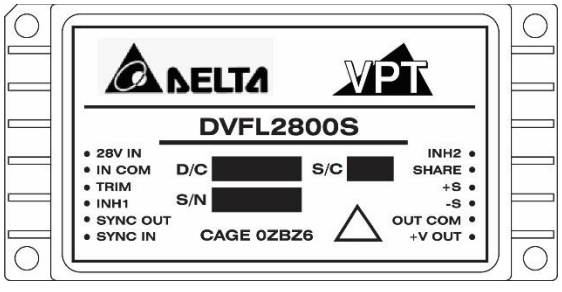

Figure 1 – DVFL2800S DC-DC Converter
(Exact marking may differ from that shown)

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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
ESD Rating per MIL-PRF-38534	1C	Weight (Maximum) (No Pin Extensions)	86 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	-	1	6	-	1	6	mA
	Inhibited 2	-	40	70	-	40	70	mA
	No Load	-	60	120	-	65	120	mA
Ripple Current	Full Load, 20Hz to 10MHz	-	25	80	-	35	80	mA_{p-p}
INH1 Pin Input[4]		0	-	1.5	0	-	1.5	V
INH2 Pin Input[4]		0	-	1	0	-	1	V
INH1 Pin Open Circuit Voltage[4]		10.5	-	15	10.5	-	15	V
INH2 Pin Open Circuit Voltage[4]		4	-	12	4	-	12	V
UVLO Turn On		14.5	-	16	14.5	-	16	V
UVLO Turn Off[4]		13.5	-	15.5	13.5	-	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[3]		0	-	66	0	-	100	W
Current[3] V_{OUT}		-	-	20	-	-	20	A
Ripple Voltage V_{OUT}	Full Load, 20Hz to 10MHz	-	15	80	-	15	80	mV_{p-p}
Line Regulation V_{OUT}	V_{IN} = 16V to 40V	-	2	20	-	2	20	mV
Load Regulation V_{OUT}	No Load to Full Load	-	2	80	-	2	100	mV
Voltage Trim[4] V_{OUT}	Full Load	-10	-	10	-20	-	10	%
Share Pin Voltage[4]		2	-	4	2	-	4	V
EFFICIENCY		68	72	-	72	78	-	%
LOAD FAULT POWER DISSIPATION	Overload[4]	-	-	50	-	-	50	W
	Short Circuit	-	-	50	-	-	50	W
CAPACITIVE LOAD[4]		-	-	1000	-	-	1000	µF
SWITCHING FREQUENCY		425	500	600	425	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
MTBF (MIL-HDBK-217F)	AIF @ T_C = 55°C	-	400	-	-	400	-	kHrs

Notes: 1. Dependent 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
ESD Rating per MIL-PRF-38534	1C	Weight (Maximum) (No Pin Extensions)	86 Grams

Parameter	Conditions	DVFL283R3S			DVFL2805S			Units
		Min	Typ	Max	Min	Typ	Max	
DYNAMIC								
Load Step Output Transient V_{OUT}	Half Load to Full Load	-	140	400	-	160	400	mV_{PK}
Load Step Recovery[2]		-	260	500	-	260	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	-	5	20	-	5	20	mSec
Turn On Overshoot		-	0	15	-	0	25	mV_{PK}

Notes: 1. Dependent 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
ESD Rating per MIL-PRF-38534	1C	Weight (Maximum) (No Pin Extensions)	86 Grams

Parameter	Conditions	DVFL286R3S			DVFL2807S			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	-	1	6	-	1	6	mA
	Inhibited 2	-	40	70	-	40	70	mA
	No Load	-	65	120	-	65	120	mA
Ripple Current	Full Load, 20Hz to 10MHz	-	35	80	-	35	80	mA_{p-p}
INH1 Pin Input[4]		0	-	1.5	0	-	1.5	V
INH2 Pin Input[4]		0	-	1	0	-	1	V
INH1 Pin Open Circuit Voltage[4]		10.5	-	15	10.5	-	15	V
INH2 Pin Open Circuit Voltage[4]		4	-	12	4	-	12	V
UVLO Turn On		14.5	-	16	14.5	-	16	V
UVLO Turn Off[4]		13.5	-	15.5	13.5	-	15.5	V
OUTPUT Voltage V_{OUT}	T_{CASE} = 25°C	6.237	6.3	6.363	6.93	7	7.07	V
V_{OUT}	T_{CASE} = -55°C to +125°C	6.205	6.3	6.395	6.895	7	7.105	V
Power[3]		-	-	100	-	-	100	W
Current[3] V_{OUT}		-	-	15.9	-	-	14.3	A
Ripple Voltage V_{OUT}	Full Load, 20Hz to 10MHz	-	15	80	-	15	80	mV_{p-p}
Line Regulation V_{OUT}	V_{IN} = 16V to 40V	-	2	20	-	2	20	mV
Load Regulation V_{OUT}	No Load to Full Load	-	2	100	-	2	100	mV
Voltage Trim[4] V_{OUT}	Full Load	-20	-	10	-20	-	10	%
Share Pin Voltage[4]		2	-	4	2	-	4	V
EFFICIENCY		74	79	-	74	80	-	%
LOAD FAULT POWER DISSIPATION	Overload[4]	-	-	50	-	-	50	W
	Short Circuit	-	-	50	-	-	50	W
CAPACITIVE LOAD[4]		-	-	1000	-	-	1000	µF
SWITCHING FREQUENCY		425	500	600	425	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
MTBF (MIL-HDBK-217F)	AIF @ T_C = 55°C	-	400	-	-	400	-	kHrs

Notes: 1. Dependent 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
ESD Rating per MIL-PRF-38534	1C	Weight (Maximum) (No Pin Extensions)	86 Grams

Parameter		Conditions	DVFL286R3S			DVFL2807S			Units
			Min	Typ	Max	Max	Typ	Max	
DYNAMIC									
Load Step Output Transient	V_{OUT}	Half Load to Full Load	-	150	300	-	150	300	mV_{PK}
Load Step Recovery[2]			-	200	350	-	200	350	µSec
Line Step Output Transient[4]	V_{OUT}	V_{IN} = 16V to 40V	-	150	300	-	150	300	mV_{PK}
Line Step Recovery[2, 4]			-	150	300	-	200	400	µSec
Turn On Delay	V_{OUT}	V_{IN} = 0V to 28V	-	5	20	-	5	20	mSec
Turn On Overshoot			-	0	25	-	0	25	mV_{PK}

Notes: 1. Dependent 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
ESD Rating per MIL-PRF-38534	1C	Weight (Maximum) (No Pin Extensions)	86 Grams

Parameter	Conditions	DVFL2808S			DVFL289R5S			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	-	1	6	-	1	6	mA
	Inhibited 2	-	40	70	-	40	70	mA
	No Load	-	70	120	-	80	120	mA
Ripple Current	Full Load, 20Hz to 10MHz	-	30	80	-	30	80	mA_{p-p}
INH1 Pin Input[4]		0	-	1.5	0	-	1.5	V
INH2 Pin Input[4]		0	-	1	0	-	1	V
INH1 Pin Open Circuit Voltage[4]		10.5	-	15	10.5	-	15	V
INH2 Pin Open Circuit Voltage[4]		4	-	12	4	-	12	V
UVLO Turn On		14.5	-	16	14.5	-	16	V
UVLO Turn Off[4]		13.5	-	15.5	13.5	-	15.5	V
OUTPUT Voltage V_{OUT}	T_{CASE} = 25°C	7.92	8	8.08	9.405	9.5	9.595	V
V_{OUT}	T_{CASE} = -55°C to +125°C	7.88	8	8.12	9.357	9.5	9.643	V
Power[3]		-	-	100	-	-	100	W
Current[3] V_{OUT}		-	-	12.5	-	-	10.5	A
Ripple Voltage V_{OUT}	Full Load, 20Hz to 10MHz	-	15	80	-	25	80	mV_{p-p}
Line Regulation V_{OUT}	V_{IN} = 16V to 40V	-	2	20	-	2	20	mV
Load Regulation V_{OUT}	No Load to Full Load	-	2	100	-	2	100	mV
Voltage Trim[4] V_{OUT}	Full Load	-20	-	10	-20	-	10	%
Share Pin Voltage[4]		2	-	4	2	-	4	V
EFFICIENCY		76	82	-	78	83	-	%
LOAD FAULT POWER DISSIPATION	Overload[4]	-	-	50	-	-	50	W
	Short Circuit	-	-	50	-	-	50	W
CAPACITIVE LOAD[4]		-	-	1000	-	-	500	µF
SWITCHING FREQUENCY		425	500	600	425	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
MTBF (MIL-HDBK-217F)	AIF @ T_C = 55°C	-	400	-	-	400	-	kHrs

Notes: 1. Dependent 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
ESD Rating per MIL-PRF-38534	1C	Weight (Maximum) (No Pin Extensions)	86 Grams

Parameter		Conditions	DVFL2808S			DVFL289R5S			Units
			Min	Typ	Max	Max	Typ	Max	
DYNAMIC									
Load Step Output Transient	V_{OUT}	Half Load to Full Load	-	200	350	-	1000	1300	mV_{PK}
Load Step Recovery[2]			-	200	350	-	450	700	µSec
Line Step Output Transient[4]	V_{OUT}	V_{IN} = 16V to 40V	-	250	450	-	850	1400	mV_{PK}
Line Step Recovery[2, 4]			-	250	350	-	500	700	µSec
Turn On Delay	V_{OUT}	V_{IN} = 0V to 28V	-	5	20	-	5	20	mSec
Turn On Overshoot			-	0	25	-	0	25	mV_{PK}

Notes: 1. Dependent 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
ESD Rating per MIL-PRF-38534	1C	Weight (Maximum) (No Pin Extensions)	86 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	-	1	6	-	1	6	mA
		Inhibited 2	-	40	70	-	40	70	mA
		No Load	-	80	120	-	85	120	mA
Ripple Current		Full Load, 20Hz to 10MHz	-	30	80	-	30	80	mA_{p-p}
INH1 Pin Input[4]			0	-	1.5	0	-	1.5	V
INH2 Pin Input[4]			0	-	1	0	-	1	V
INH1 Pin Open Circuit Voltage[4]			10.5	-	15	10.5	-	15	V
INH2 Pin Open Circuit Voltage[4]			4	-	12	4	-	12	V
UVLO Turn On			14.5	-	16	14.5	-	16	V
UVLO Turn Off[4]			13.5	-	15.5	13.5	-	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[3]			-	-	110	-	-	120	W
Current[3]	V_{OUT}		-	-	9.2	-	-	8.0	A
Ripple Voltage	V_{OUT}	Full Load, 20Hz to 10MHz	-	25	80	-	25	80	mV_{p-p}
Line Regulation	V_{OUT}	V_{IN} = 16V to 40V	-	2	20	-	2	20	mV
Load Regulation	V_{OUT}	No Load to Full Load	-	2	120	-	2	120	mV
Voltage Trim[4]	V_{OUT}	Full Load	-20	-	10	-20	-	10	%
Share Pin Voltage[4]			2	-	4	2	-	4	V
EFFICIENCY			79	86	-	80	86	-	%
LOAD FAULT POWER DISSIPATION		Overload[4]	-	-	50	-	-	50	W
		Short Circuit	-	-	50	-	-	50	W
CAPACITIVE LOAD[4]			-	-	500	-	-	500	µF
SWITCHING FREQUENCY			425	500	600	425	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
MTBF (MIL-HDBK-217F)		AIF @ T_C = 55°C	-	400	-	-	400	-	kHrs

Notes: 1. Dependent 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
ESD Rating per MIL-PRF-38534	1C	Weight (Maximum) (No Pin Extensions)	86 Grams

Parameter	Conditions	DVFL2812S			DVFL2815S			Units
		Min	Typ	Max	Min	Typ	Max	
DYNAMIC								
Load Step Output Transient V_{OUT}	Half Load to Full Load	-	570	1000	-	640	1000	mV_{PK}
Load Step Recovery[2]		-	290	500	-	260	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	-	5	20	-	5	20	mSec
Turn On Overshoot		-	0	50	-	0	50	mV_{PK}

Notes: 1. Dependent 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
ESD Rating per MIL-PRF-38534	1C	Weight (Maximum) (No Pin Extensions)	86 Grams

Parameter	Conditions	DVFL2818S			DVFL2828S			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	-	1	6	-	1	6	mA
	Inhibited 2	-	40	70	-	40	70	mA
	No Load	-	100	160	-	110	160	mA
Ripple Current	Full Load, 20Hz to 10MHz	-	30	80	-	35	80	mA_{p-p}
INH1 Pin Input[4]		0	-	1.5	0	-	1.5	V
INH2 Pin Input[4]		0	-	1	0	-	1	V
INH1 Pin Open Circuit Voltage[4]		10.5	-	15	10.5	-	15	V
INH2 Pin Open Circuit Voltage[4]		4	-	12	4	-	12	V
UVLO Turn On		14.5	-	16	14.5	-	16	V
UVLO Turn Off[4]		13.5	-	15.5	13.5	-	15.5	V
OUTPUT Voltage V_{OUT}	T_{CASE} = 25°C	17.82	18	18.18	27.72	28	28.28	V
V_{OUT}	T_{CASE} = -55°C to +125°C	17.73	18	18.27	27.58	28	28.42	V
Power[3]		-	-	120	-	-	115	W
Current[3] V_{OUT}		-	-	6.67	-	-	4.1	A
Ripple Voltage V_{OUT}	Full Load, 20Hz to 10MHz	-	60	100	-	50	120	mV_{p-p}
Line Regulation V_{OUT}	V_{IN} = 16V to 40V	-	2	20	-	20	80	mV
Load Regulation V_{OUT}	No Load to Full Load	-	2	120	-	25	100	mV
Voltage Trim[4] V_{OUT}	Full Load	-20	-	10	-20	-	10	%
Share Pin Voltage[4]		2	-	4	2	-	4	V
EFFICIENCY		80	85	-	81	85	-	%
LOAD FAULT POWER DISSIPATION	Overload[4]	-	-	50	-	-	50	W
	Short Circuit	-	-	50	-	-	50	W
CAPACITIVE LOAD[4]		-	-	500	-	-	500	µF
SWITCHING FREQUENCY		425	500	600	425	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
MTBF (MIL-HDBK-217F)	AIF @ T_C = 55°C	-	400	-	-	400	-	kHrs

Notes: 1. Dependent 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
ESD Rating per MIL-PRF-38534	1C	Weight (Maximum) (No Pin Extensions)	86 Grams

Parameter		Conditions	DVFL2818S			DVFL2828S			Units
			Min	Typ	Max	Min	Typ	Max	
DYNAMIC									
Load Step Output Transient	V_{OUT}	Half Load to Full Load	-	1100	1500	-	1000	1500	mV_{PK}
Load Step Recovery[2]			-	350	700		200	350	µSec
Line Step Output Transient[4]	V_{OUT}	V_{IN} = 16V to 40V	-	1000	1900	-	1000	2200	mV_{PK}
Line Step Recovery[2, 4]			-	450	700		200	400	µSec
Turn On Delay	V_{OUT}	V_{IN} = 0V to 28V	-	5	20	-	5	20	mSec
Turn On Overshoot			-	0	50	-	0	50	mV_{PK}

Notes: 1. Dependent 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

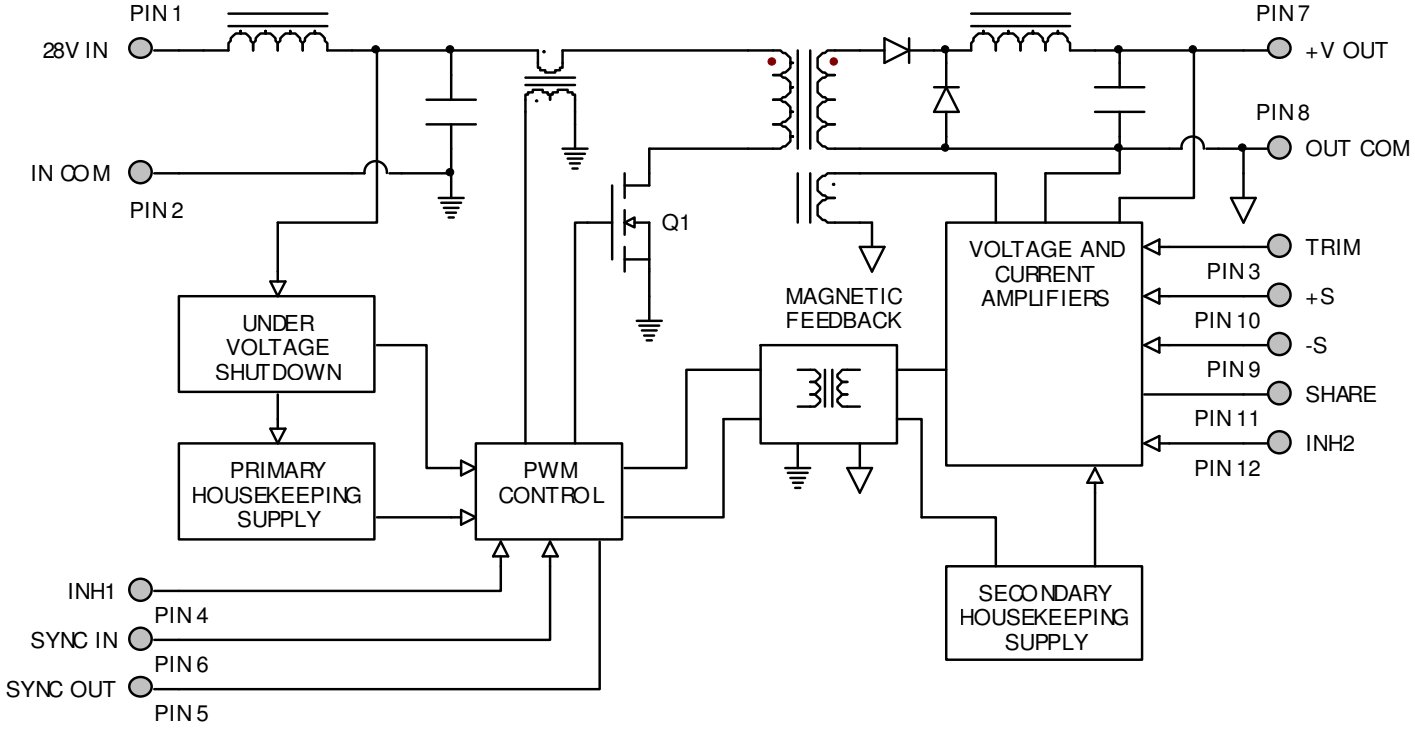


Figure 2

CONNECTION DIAGRAM

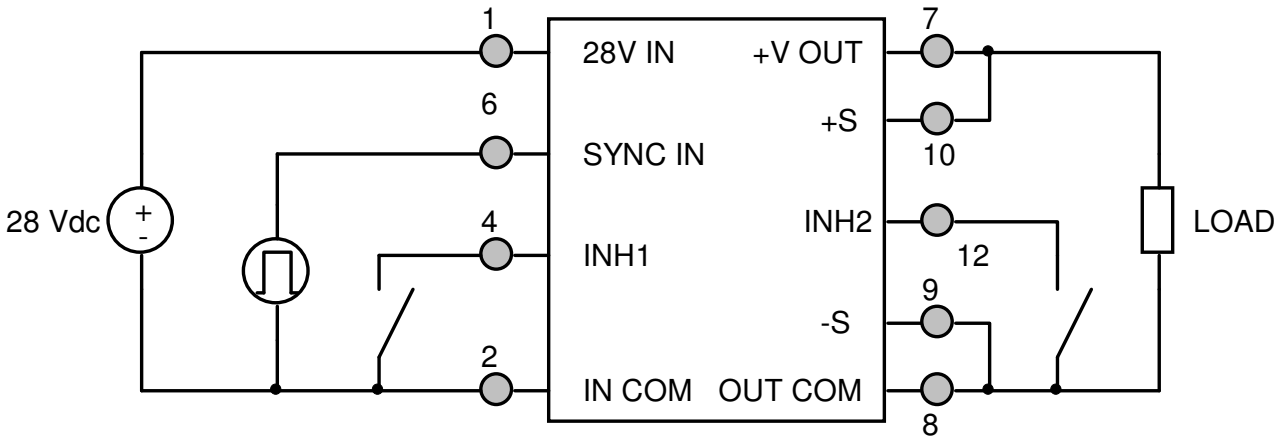


Figure 3

INHIBIT DRIVE CONNECTION DIAGRAM

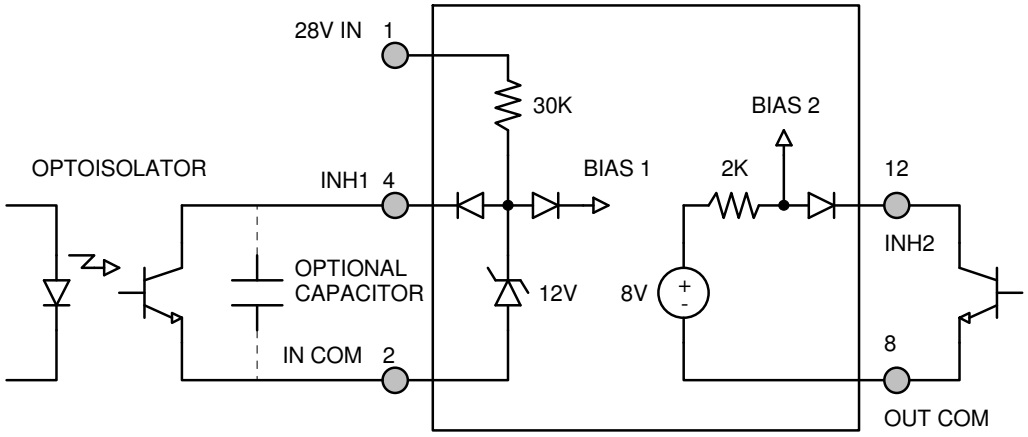


Figure 4 – Isolated Inhibit Drive and Internal Equivalent Circuit

(Shown with optional capacitor for turn-on delay)

EMI FILTER HOOKUP DIAGRAM

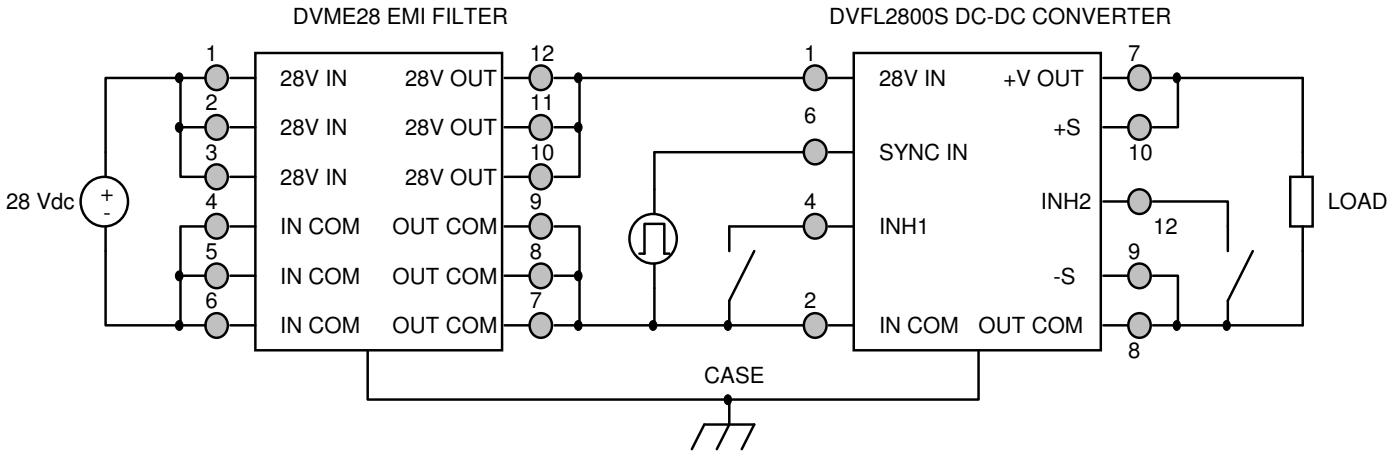


Figure 5 – Converter with EMI Filter

PARALLEL CONNECTION DIAGRAMS

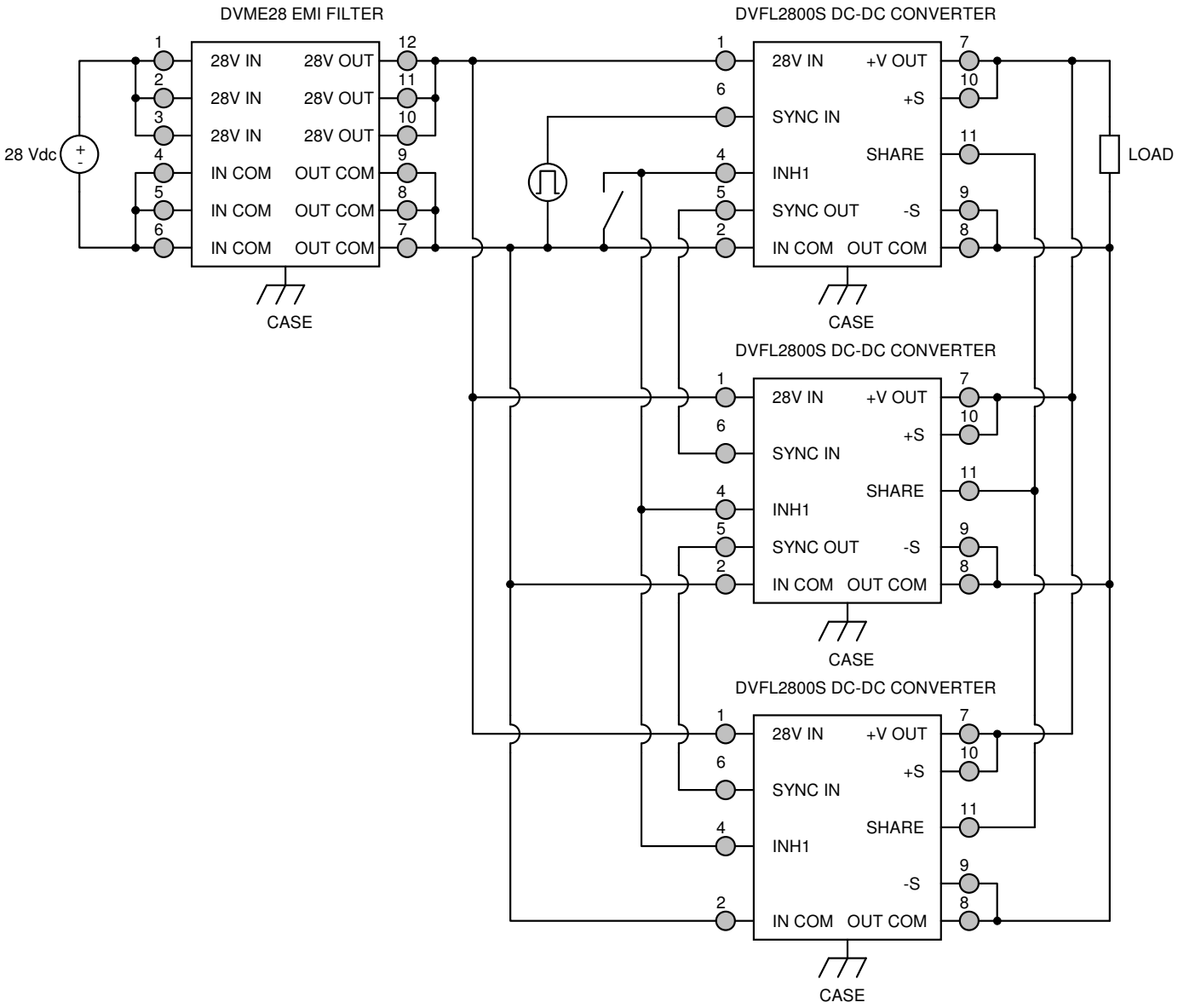
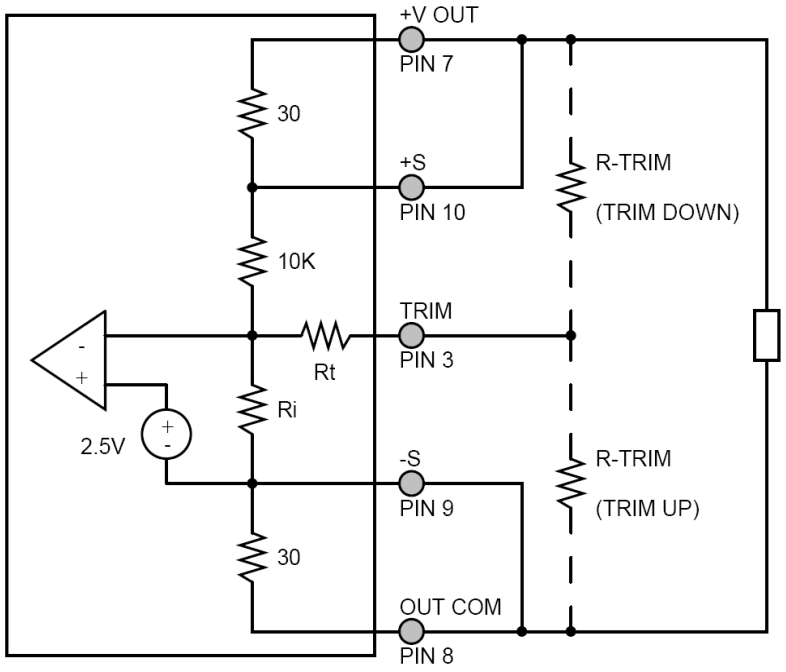


Figure 6 – Current Sharing Parallel Connection for Multiple Converters

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 7 – Output Voltage Trim

DVFL283R3S		DVFL2805S		DVFL286R3S		DVFL2807S		DVFL2808S	
$+V_{OUT}$ (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	35.0k	6.9	28.1k	7.70	21.0k	8.80	16.3k
3.55	85.0k	5.4	47.5k	6.8	36.7k	7.55	30.8k	8.65	23.5k
3.50	110k	5.3	68.3k	6.7	49.6k	7.40	48.0k	8.50	35.1k
3.45	152k	5.2	110k	6.6	71.1k	7.25	85.8k	8.35	56.5k
3.40	235k	5.1	235k	6.5	114k	7.10	237k	8.20	110.3k
3.35	485k	5.0	-	6.4	243k	7.00	-	8.05	490.6k
3.30	-	4.9	225k	6.3	-	6.85	277k	8.00	-
3.25	135k	4.8	100k	6.2	367k	6.70	126k	7.90	522k
3.20	55.0k	4.7	58.3k	6.1	171k	6.55	75.7k	7.75	195k
3.15	28.3k	4.6	37.5k	6.0	106k	6.40	50.5k	7.60	112k
3.10	15.0k	4.5	25.0k	5.9	72.9k	6.25	35.4k	7.45	74.9k
3.05	7.0k	4.4	16.7k	5.8	53.2k	6.10	25.3k	7.30	53.5k
3.00	1.7k	4.3	10.7k	5.7	40.1k	5.95	18.1k	7.15	39.7k
		4.2	6.3k	5.6	30.8k	5.80	12.7k	7.00	30.0k
		4.1	2.8k	5.5	23.8k	5.65	8.52k	6.85	22.8k
		4.0	0	5.4	18.3k			6.70	17.3k
				5.3	13.9k			6.55	12.9k
				5.2	10.4k			6.40	9.37k
				5.1	7.4k				

(continued on next page)

OUTPUT VOLTAGE TRIM

DVFL289R5S		DVFL2812S		DVFL2815S		DVFL2818S		DVFL2828S	
$+V_{OUT}$ (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)
10.45	11.5k	13.2	5.8k	16.50	1.7k	19.8	5.07k	30.8	0.91k
10.3	16.5k	13.0	10.0k	16.25	5.0k	19.5	8.08k	30.4	2.42k
10.1	27.0k	12.8	16.2k	16.00	10.0k	19.2	12.6k	30.0	4.55k
9.9	48.0k	12.6	26.6k	15.75	18.3k	18.9	20.1k	29.6	7.74k
9.7	111k	12.4	47.3k	15.50	35.0k	18.6	35.2k	29.2	13.1k
9.5	-	12.2	109k	15.25	85.0k	18.3	80.4k	28.8	23.7k
9.4	681k	12.0	-	15.00	-	18.0	-	28.4	55.6k
9.2	210k	11.8	454k	14.75	475k	17.7	540k	28.0	-
9.0	116k	11.6	213k	14.50	225k	17.4	259k	27.6	632k
8.8	75.7k	11.4	134k	14.25	142k	17.1	166k	27.2	307k
8.6	53.3k	11.2	94.0k	14.00	100k	16.8	119k	26.8	198k
8.4	39.1k	11.0	70.1k	13.75	75.0k	16.5	91.3k	26.4	144k
8.2	29.2k	10.8	54.3k	13.50	58.3k	16.2	72.6k	26.0	112k
8.0	22.0k	10.6	42.9k	13.25	46.4k	15.9	59.2k	25.6	90.0k
7.8	16.4k	10.4	34.4k	13.00	37.5k	15.6	49.2k	25.2	74.5k
7.6	12.1k	10.2	27.8k	12.75	30.6k	15.3	41.4k	24.8	62.9k
		10.0	22.5k	12.50	25.0k	15.0	35.2k	24.4	53.9k
		9.8	18.2k	12.25	20.5k	14.7	30.1k	24.0	46.6k
		9.6	14.6k	12.00	16.7k	14.4	25.9k	23.6	40.7k
								23.2	35.8k
								22.8	31.6k
								22.4	28.0k

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

V_{IN} = 16V	V_{IN} = 28V	V_{IN} = 40V

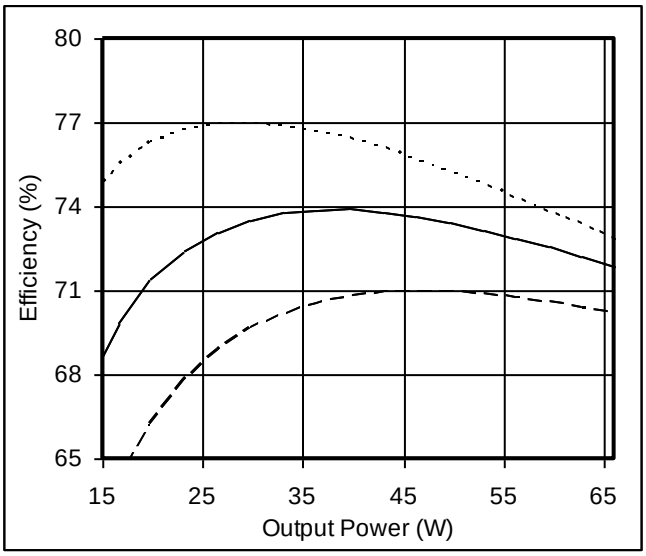


Figure 8 – DVFL283R3S

Efficiency (%) vs. Output Power (W)

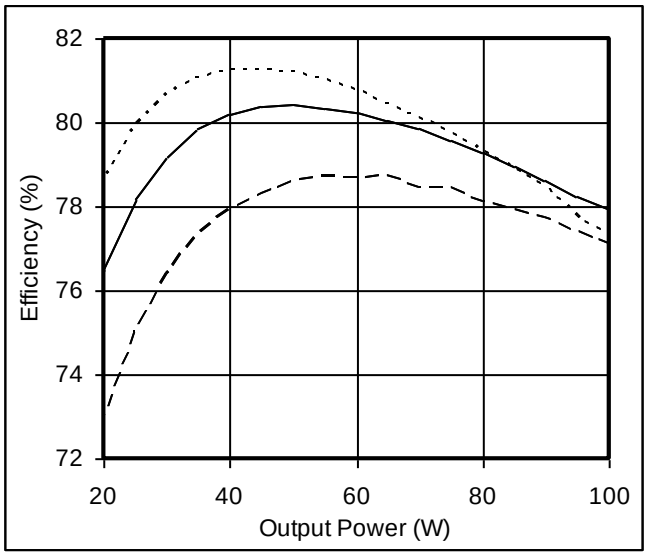


Figure 9 – DVFL2805S

Efficiency (%) vs. Output Power (W)

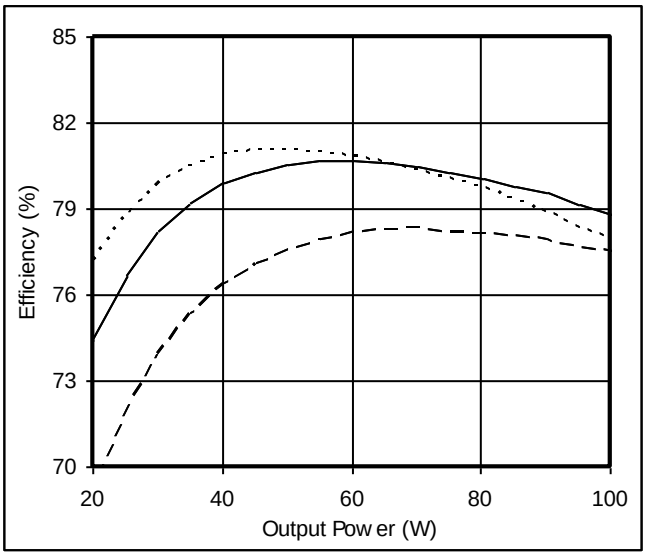


Figure 10 – DVFL286R3S

Efficiency (%) vs. Output Power (W)

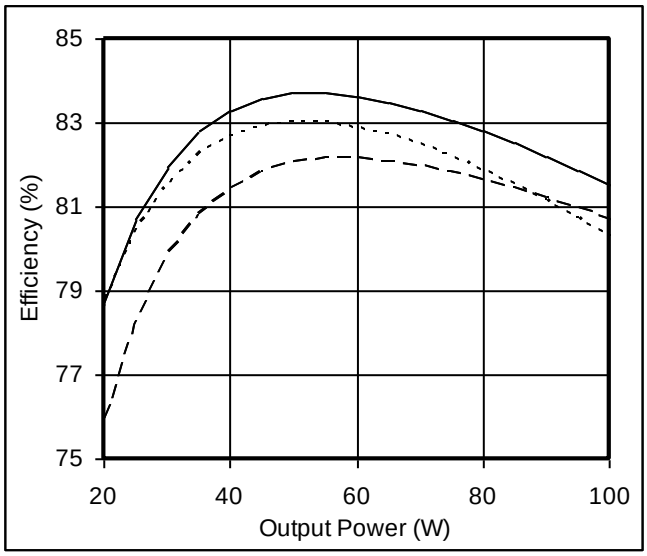


Figure 11 – DVFL2807S

Efficiency (%) vs. Output Power (W)

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

V_{IN} = 16V	V_{IN} = 28V	V_{IN} = 40V

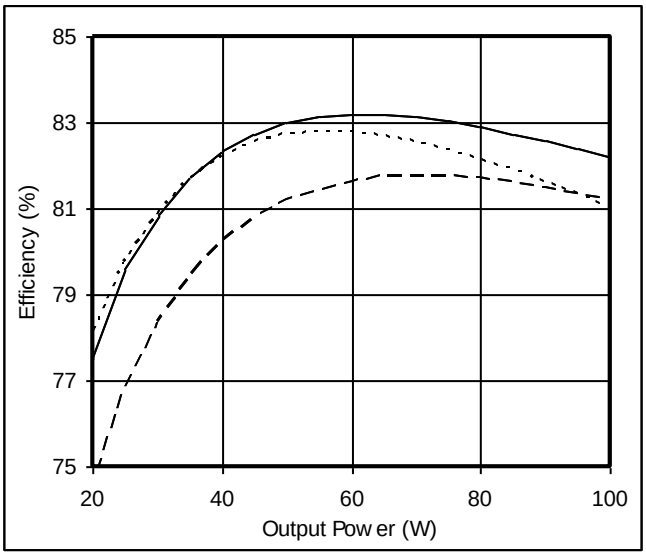


Figure 12 – DVFL2808S

Efficiency (%) vs. Output Power (W)

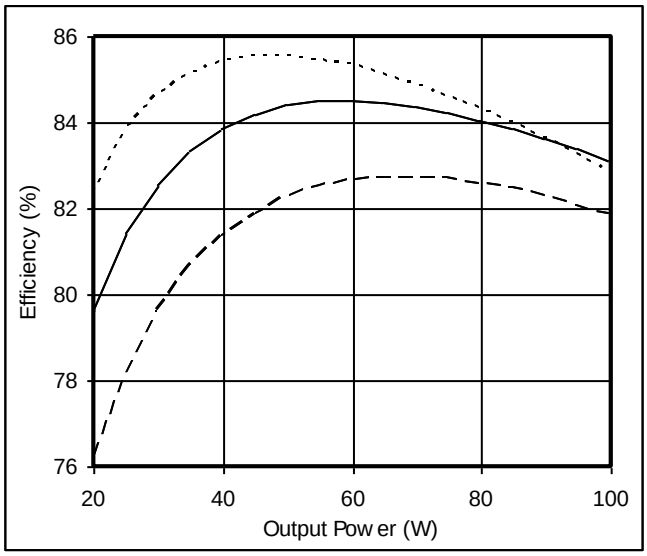


Figure 13 – DVFL289R5S

Efficiency (%) vs. Output Power (W)

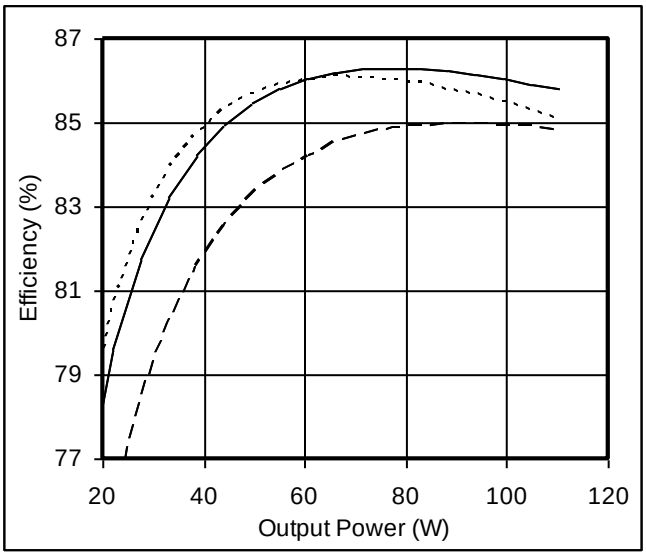


Figure 14 – DVFL2812S

Efficiency (%) vs. Output Power (W)

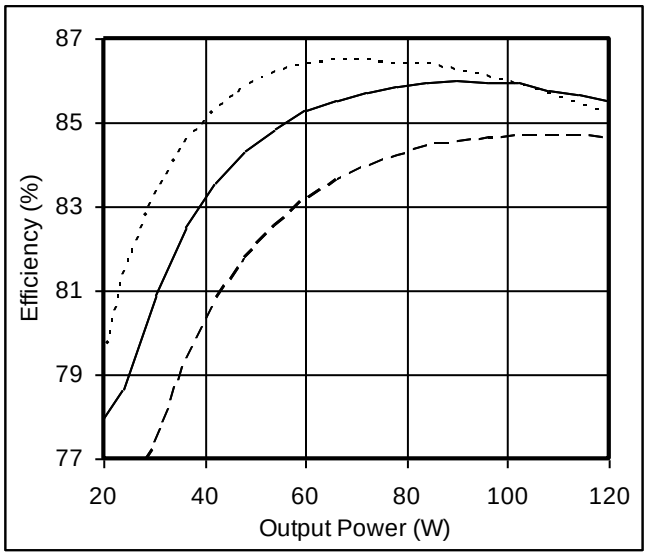


Figure 15 – DVFL2815S

Efficiency (%) vs. Output Power (W)

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

V_{IN} = 16V	V_{IN} = 28V	V_{IN} = 40V

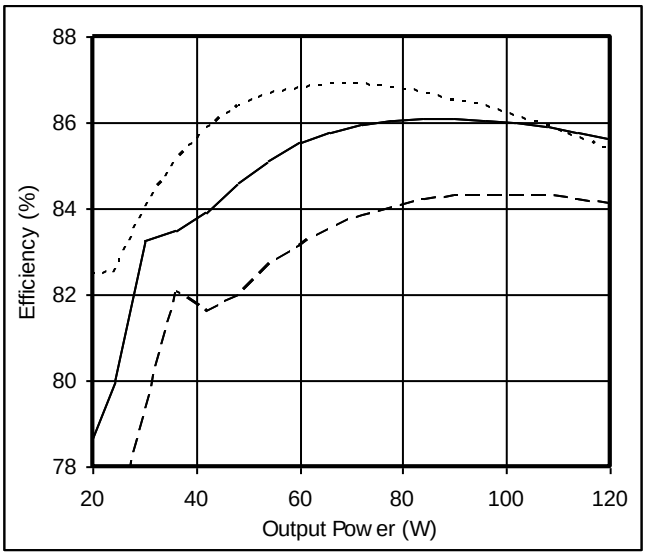


Figure 16 – DVFL2818S
Efficiency (%) vs. Output Power (W)

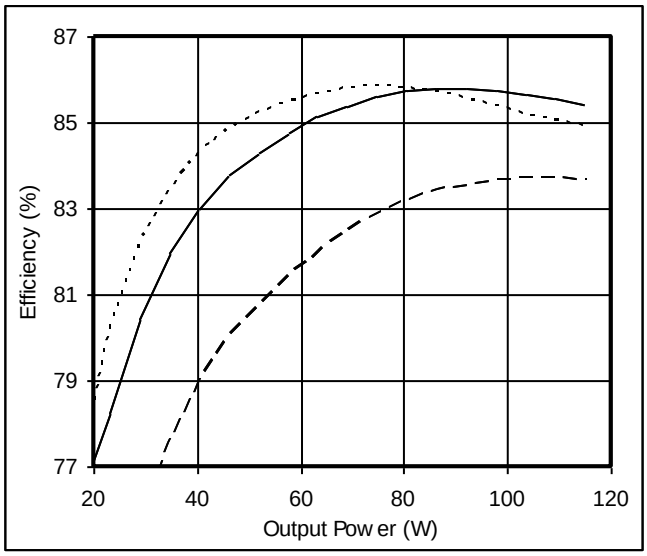


Figure 17 – DVFL2828S
Efficiency (%) vs. Output Power (W)

EMI PERFORMANCE CURVES

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

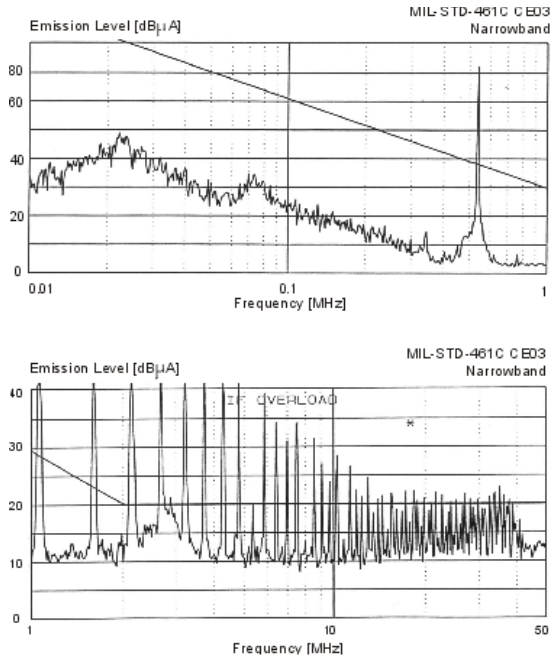


Figure 18 – DVFL2800S without EMI Filter

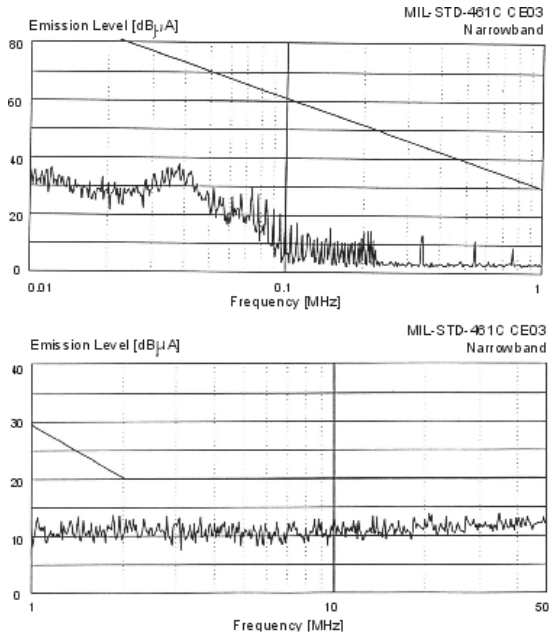
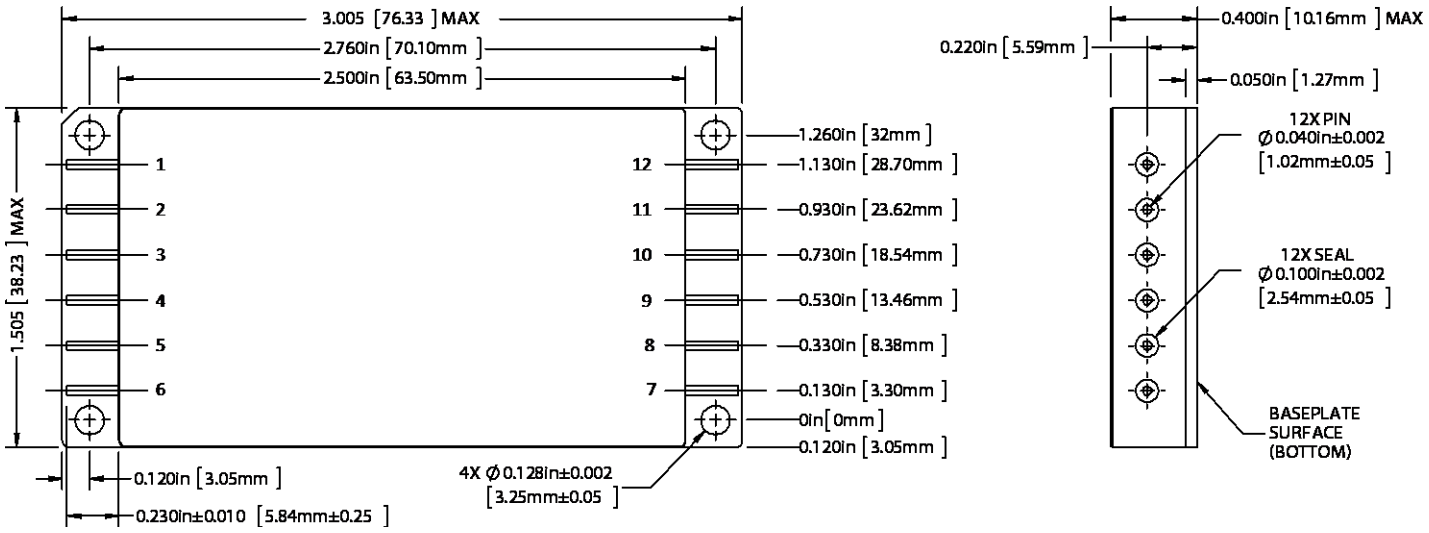


Figure 19 – DVFL2800S with EMI Filter

STANDARD PACKAGE DRAWINGS

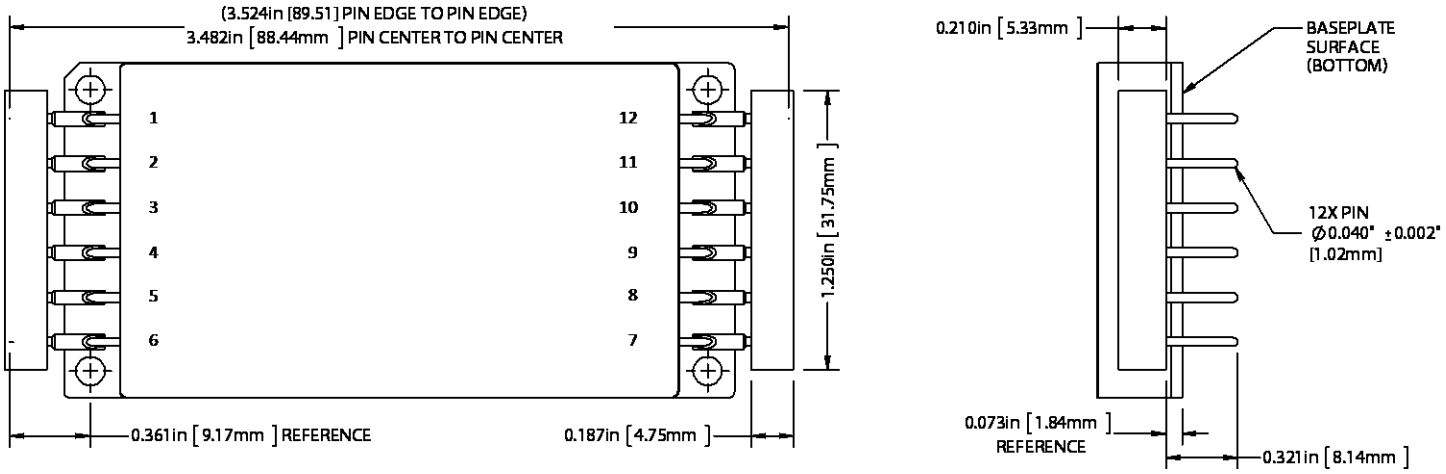


1. Tolerances are +0.005" unless otherwise stated
2. Case temperature is measured on the center of the baseplate surface
3. Mounting holes are not threaded. Recommended fastener is 4-40
4. Product Materials:
   Case (Steel, gold over nickel plated); Cover (Kovar, nickel plated); Pin (Copper-cored alloy 52, gold over nickel plated); Pin Seals (Glass)

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

Figure 20 – Standard Package and Pinout

STANDARD PACKAGE DRAWINGS

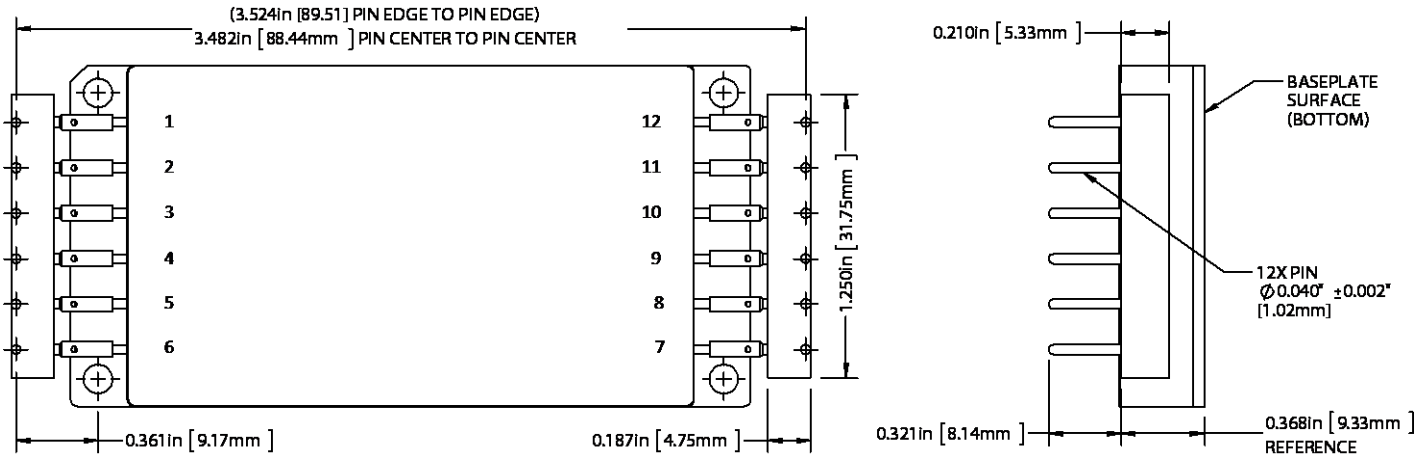


1. Tolerances are +0.005" unless otherwise stated
2. Case temperature is measured on the center of the baseplate surface
3. Mounting holes are not threaded. Recommended fastener is 4-40
4. Product Materials:
   Case (Steel, gold over nickel plated); Cover (Kovar, nickel plated); Pin (Copper-cored alloy 52, gold over nickel plated); Pin Seals (Glass)
5. Pin Extension Materials:
   Body (Diallyl-Phthalate/DAP, WH-9100-BLK F-Type or equivalent), Pins (Copper Alloy, Sn90/Pb10 solder plated)

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

Figure 21 – Standard Package with Down-Leads and Pinout

STANDARD PACKAGE DRAWINGS

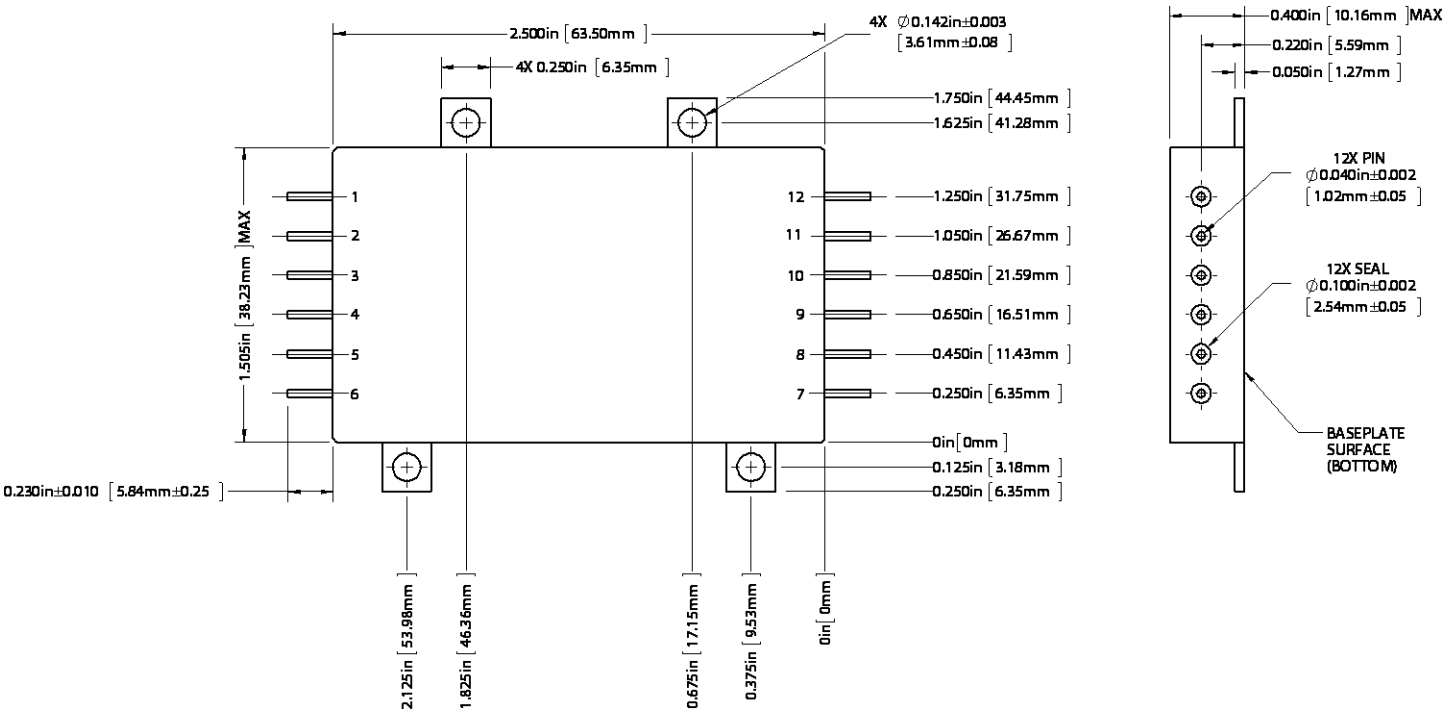


1. Tolerances are +0.005" unless otherwise stated
2. Case temperature is measured on the center of the baseplate surface
3. Mounting holes are not threaded. Recommended fastener is 4-40
4. Product Materials:
   Case (Steel, gold over nickel plated); Cover (Kovar, nickel plated); Pin (Copper-cored alloy 52, gold over nickel plated); Pin Seals (Glass)
5. Pin Extension Materials:
   Body (Diallyl-Phthalate/DAP, WH-9100-BLK F-Type or equivalent), Pins (Copper Alloy, Sn90/Pb10 solder plated)

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

Figure 22 – Standard Package with Up-Leads and Pinout

FLANGED PACKAGE DRAWINGS

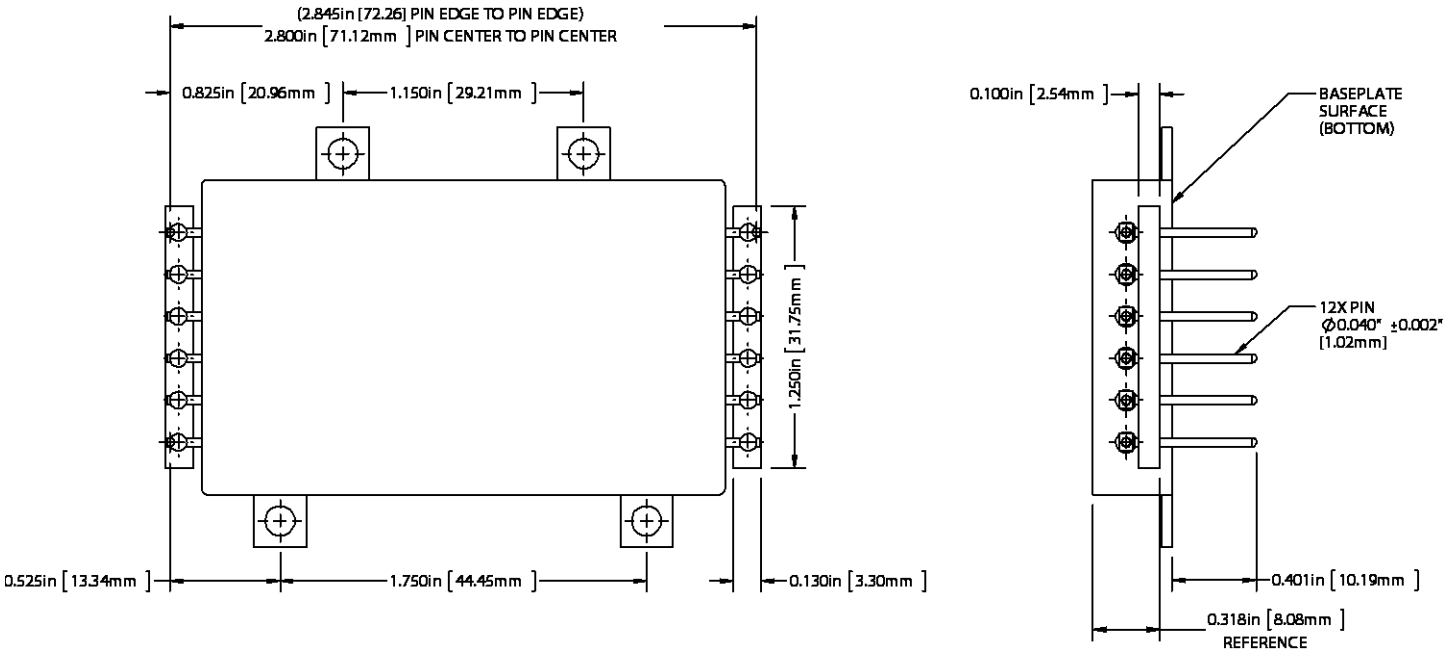


1. Tolerances are +0.005" unless otherwise stated
2. Case temperature is measured on the center of the baseplate surface
3. Mounting holes are not threaded. Recommended fastener is 4-40
4. Product Materials:
   Case (Steel, gold over nickel plated); Cover (Kovar, nickel plated); Pin (Copper-cored alloy 52, gold over nickel plated); Pin Seals (Glass)

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

Figure 23 – Flanged Package and Pinout

FLANGED PACKAGE DRAWINGS

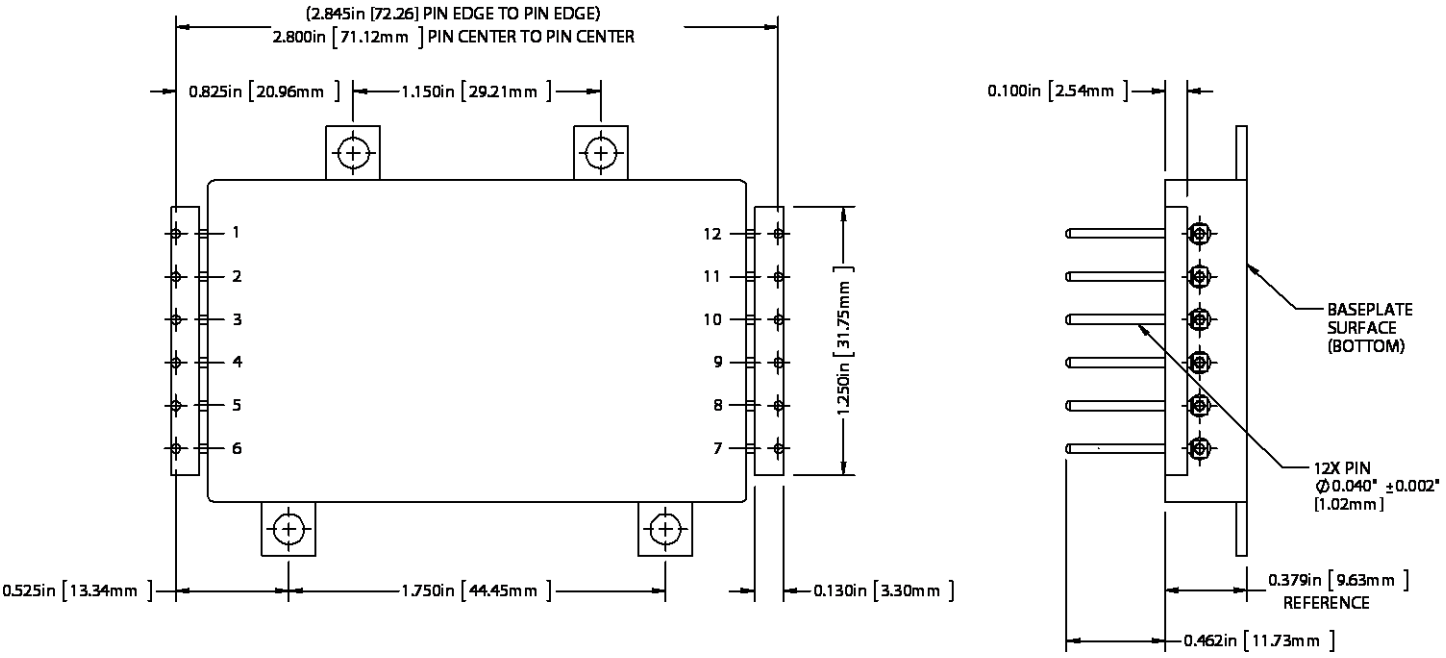


1. Tolerances are +0.005" unless otherwise stated
2. Case temperature is measured on the center of the baseplate surface
3. Mounting holes are not threaded. Recommended fastener is 4-40
4. Product Materials:
   Case (Steel, gold over nickel plated); Cover (Kovar, nickel plated); Pin (Copper-cored alloy 52, gold over nickel plated); Pin Seals (Glass)
5. Pin Extension Materials:
   Body (Diallyl-Phthalate/DAP, WH-9100-BLK F-Type or equivalent), Pins (Copper Alloy, Sn90/Pb10 solder plated)

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

Figure 24 – Flanged Package with Down-Leads and Pinout

FLANGED PACKAGE DRAWINGS



1. Tolerances are +0.005" unless otherwise stated
2. Case temperature is measured on the center of the baseplate surface
3. Mounting holes are not threaded. Recommended fastener is 4-40
4. Product Materials:
   Case (Steel, gold over nickel plated); Cover (Kovar, nickel plated); Pin (Copper-cored alloy 52, gold over nickel plated); Pin Seals (Glass)
5. Pin Extension Materials:
   Body (Diallyl-Phthalate/DAP, WH-9100-BLK F-Type or equivalent), Pins (Copper Alloy, Sn90/Pb10 solder plated)

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

Figure 25 – Flanged Package with Up-Leads and Pinout

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 (100% Tested Per MIL-STD-883 as referenced to MIL-PRF-38534)

Test	MIL-STD-883 Test Method, Condition	No Suffix (Standard) Non-QML ⑤	/ES (Extended) Non-QML ⑤	/HB (HB) Non-QML ⑤	/H (Class H) ⑩	/KB (KB) Non-QML ⑤	/K (Class K) ⑩
Non-Destructive Bond Pull	TM2023	• ④	• ④	• ④	• ④	•	•
Internal Visual	TM2010, TM2017, TM2032 (MIL-STD-750, TM2072, TM2073)	•	•	•	•	•	•
Temperature Cycling	TM1010, Condition C -65°C to 150°C, Ambient			•	•	•	•
	TM1010, Condition B -55°C to 125°C, Ambient		•				
Constant Acceleration	TM2001, 3000g, Y1 Direction			•	•	•	•
	TM2001, 500g, Y1 Direction		•				
PIND ⑦	TM2020, Condition A					•	•
Pre Burn-In Electrical	25°C					•	•
Burn-In	TM1015, 320 hrs, 125°C, Case Typ					•	•
	TM1015, 160 hrs, 125°C, Case Typ			•	•		
	96 hrs, 125°C, Case Typ		•				
	24 hrs, 125°C, Case Typ	•					
Final Electrical	MIL-PRF-38534, Group A Subgroups 1-6 -55°C, 25°C, 125°C ③			•	•	•	•
	MIL-PRF-38534, Group A Subgroups 1 and 4 25°C	•	•				
Hermeticity (Seal)	TM1014, Fine Leak, Condition A2 or B1		•	•	•	•	•
	TM1014, Gross Leak, Condition C or B2		•	•	•	•	•
	Gross Leak, Dip (1×10^{-3})	•					
Radiography ⑧	TM2012					•	•
External Visual	TM2009	•	•	•	•	•	•

Notes:
① Contact Sales for more information concerning additional environmental screening and testing options desired.
② VPT Inc. reserves the right to ship higher screened or SMD products to meet lower screened orders at our sole discretion unless specifically forbidden by customer contract.
③ 100% R&R testing with all test data included in product shipment.
④ Not required per MIL-PRF-38534. Test is performed for additional product quality assurance.
⑤ Non-QML products may not meet all requirements of MIL-PRF-38534.
⑥ Note intentionally not used.
⑦ PIND test Certificate of Compliance included in product shipment.
⑧ Radiographic test Certificate of Compliance and film(s) or data CD included in product shipment.
⑨ Note intentionally not used.
⑩ QML screening levels are not available for products with Up-Leaded or Down-Leaded pin extensions added.

ORDERING INFORMATION

DVFL	28	05	S	F	DL	/H	-	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** **6R3** **07** **08** **9R5** **12** **15** **18** **28**	3.3 Volts 5 Volts 6.3 Volts 7 Volts 8 Volts 9.5 Volts 12 Volts 15 Volts 18 volts 28 volts	**S**	Single

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

Package Option		Package Lead Option		Screening Code[1,2,3]		Additional Screening Code
None **F**	Standard Flanged	**None** **DL** **UL**	No Lead Extensions Down-Lead Up-Lead	**None** **/ES** **/HB** **/H** **/KB** **/K**	Standard Extended Class HB Class H Class KB Class K	Contact Sales

Notes:
1. Contact the VPT Inc. Sales Department for availability of Class H (/H) or Class K (/K) qualified products.
2. VPT Inc. reserves the right to ship higher screened or SMD products to meet lower screened orders at our sole discretion unless specifically forbidden by customer contract.
3. Class H and Class K not available for DL and UL Package Lead Options.

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.

SMD (STANDARD MICROCIRCUIT DRAWING) NUMBERS

Standard Microcircuit Drawing (SMD)	DVFL2800S Series Similar Part Number
5962-0724301HXC	DVFL283R3S/H
5962-0724301HXA	DVFL283R3S/H-E
5962-0724301KXC	DVFL283R3S/K
5962-0724301KXA	DVFL283R3S/K-E
5962-0724301HYC	DVFL283R3SF/H
5962-0724301HYA	DVFL283R3SF/H-E
5962-0724301KYC	DVFL283R3SF/K
5962-0724301KYA	DVFL283R3SF/K-E
5962-0724302HXC	DVFL2805S/H
5962-0724302HXA	DVFL2805S/H-E
5962-0724302KXC	DVFL2805S/K
5962-0724302KXA	DVFL2805S/K-E
5962-0724302HYC	DVFL2805SF/H
5962-0724302HYA	DVFL2805SF/H-E
5962-0724302KYC	DVFL2805SF/K
5962-0724302KYA	DVFL2805SF/K-E
5962-0724308HXC	DVFL286R3S/H
5962-0724308HXA	DVFL286R3S/H-E
5962-0724308KXC	DVFL286R3S/K
5962-0724308KXA	DVFL286R3S/K-E
5962-0724308HYC	DVFL286R3SF/H
5962-0724308HYA	DVFL286R3SF/H-E
5962-0724308KYC	DVFL286R3SF/K
5962-0724308KYA	DVFL286R3SF/K-E
5962-0724305HXC	DVFL2807S/H
5962-0724305HXA	DVFL2807S/H-E
5962-0724305KXC	DVFL2807S/K
5962-0724305KXA	DVFL2807S/K-E
5962-0724305HYC	DVFL2807SF/H
5962-0724305HYA	DVFL2807SF/H-E
5962-0724305KYC	DVFL2807SF/K
5962-0724305KYA	DVFL2807SF/K-E
*T.B.D.	DVFL2808S/H DVFL2808S/K

Standard Microcircuit Drawing (SMD)	DVFL2800S Series Similar Part Number
5962-0724306HXC	DVFL289R5S/H
5962-0724306HXA	DVFL289R5S/H-E
5962-0724306KXC	DVFL289R5S/K
5962-0724306KXA	DVFL289R5S/K-E
5962-0724306HYC	DVFL289R5SF/H
5962-0724306HYA	DVFL289R5SF/H-E
5962-0724306KYC	DVFL289R5SF/K
5962-0724306KYA	DVFL289R5SF/K-E
5962-0724303HXC	DVFL2812S/H
5962-0724303HXA	DVFL2812S/H-E
5962-0724303KXC	DVFL2812S/K
5962-0724303KXA	DVFL2812S/K-E
5962-0724303HYC	DVFL2812SF/H
5962-0724303HYA	DVFL2812SF/H-E
5962-0724303KYC	DVFL2812SF/K
5962-0724303KYA	DVFL2812SF/K-E
5962-0724304HXC	DVFL2815S/H
5962-0724304HXA	DVFL2815S/H-E
5962-0724304KXC	DVFL2815S/K
5962-0724304KXA	DVFL2815S/K-E
5962-0724304HYC	DVFL2815SF/H
5962-0724304HYA	DVFL2815SF/H-E
5962-0724304KYC	DVFL2815SF/K
5962-0724304KYA	DVFL2815SF/K-E
5962-0724309HXC	DVFL2818S/H
5962-0724309HXA	DVFL2818S/H-E
5962-0724309KXC	DVFL2818S/K
5962-0724309KXA	DVFL2818S/K-E
5962-0724309HYC	DVFL2818SF/H
5962-0724309HYA	DVFL2818SF/H-E
5962-0724309KYC	DVFL2818SF/K
5962-0724309KYA	DVFL2818SF/K-E
5962-0724307HXC	DVFL2828S/H
5962-0724307HXA	DVFL2828S/H-E
5962-0724307KXC	DVFL2828S/K
5962-0724307KXA	DVFL2828S/K-E
5962-0724307HYC	DVFL2828SF/H
5962-0724307HYA	DVFL2828SF/H-E
5962-0724307KYC	DVFL2828SF/K
5962-0724307KYA	DVFL2828SF/K-E

Do not use the DVFL2800S Series similar part number for SMD product acquisition. It is listed for reference only. For exact specifications for the SMD product, refer to the SMD drawing. SMDs can be downloaded from the DLA Land and Maritime (Previously known as DSCC) website at https://landandmaritimeapps.dla.mil/programs/defaultapps.asp. The SMD number listed above represents the Federal Stock Class, Device Type, Device Class Designator, Case Outline, Lead Finish and RHA Designator (where applicable). Please reference the SMD for other screening levels, lead finishes, and radiation levels. All SMD products are marked with a "Q" on the cover as specified by the QML certification mark requirement of MIL-PRF-38534.

CONTACT INFORMATION

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

Phone: (425) 353-3010
Fax: (425) 353-4030
E-mail: vptsales@vptpower.com