

MFL Single and Dual DC-DC Converters

28 VOLT INPUT - 65 WATT

FEATURES

- Parallel up to 3 converters—maximum recommended power is 70% of the total available power.
- Operating temperature -55°C to +125°C
- Qualified to MIL-PRF-38534 Class H
- Input voltage range 16 to 40 volts
- Transient protection up to 80 volts for 50 ms
 - Converter will shut down at an input voltage above approximately 45 volts
- Fully isolated, magnetic feedback
- Fixed high switching frequency
- Remote sense and output trim on single output models
- Primary and secondary inhibit function
- Synchronization input and output
- Indefinite short circuit protection
- High power density with up to 85% efficiency



| MODELS | |
|--------------------|------|
| OUTPUT VOLTAGE (V) | |
| SINGLE | DUAL |
| 3.3 | ±5 |
| 5 | ±12 |
| 12 | ±15 |
| 15 | |
| 28 | |

DESCRIPTION

The Interpoint® MFL Series™ 28 volt dc-dc converters are rated up to 65 watts output power over a -55°C to +125°C temperature range with a 28 V nominal input. On dual output models, up to 70% of the rated output power can be drawn from either the positive or negative outputs. The welded, hermetically sealed package is 3.005 x 1.505 x 0.400 inches.

SCREENING

MFL converters are offered with standard screening, “ES” or fully compliant to MIL-PRF-38534 Class H screening. See Table 9 on page 13 and Table 10 on page 14 for more information.

DESIGN FEATURES

The MFL Series converters are switching regulators that use a quasi-square wave, single ended forward converter design with a constant switching frequency of 600 kHz.

Isolation between input and output circuits is provided with a transformer in the forward path and wide bandwidth magnetic coupling in the feedback control loop. The MFL Series uses a unique dual loop feedback technique that controls output current with an inner feedback loop and output voltage with a cascaded voltage mode feedback loop.

The additional secondary current mode feedback loop improves transient response in a manner similar to primary current mode control and allows for ease of paralleling.

Tight load regulation is achieved through a wide-bandwidth magnetic feedback circuit.

INHIBIT

The MFL Series converters have two inhibit terminals (INH1 and INH2) that can be used to disable power conversion, resulting in a very low quiescent input current. See Table 5 on page 6 for specifications.

SYNC

Converters may be synced to an external clock (525 to 675 kHz) or to one another by using the sync in or out pins. See Table 5 on page 6 for specifications.

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SENSE AND TRIM

Single output models provide sense to maintain voltage at the load. The converters output voltage can also be trimmed up. See Figure 1.

CURRENT SHARING AND PARALLEL OPERATION

For increased power parallel up to 3 converters. The maximum recommended power is 70% of the total available power. Multiple MFL converters may be used in parallel to drive a common load. Only single output models with SENSE and SNS RTN can be used in the share mode. In this mode of operation the load current is shared by two or three MFL converters.

In current sharing mode, one MFL converter is designated as a master. The SLAVE pin (pin 11) of the master is left unconnected and the MSTR/INH2 pin (pin 12) of the master is connected to the SLAVE pin (pin 11) of the slave units.

The units designated as slaves have the MSTR/INH2 pin (pin 12) connected to the SNS RTN pin (pin 9) of the master unit. Figure 2 on page 3 shows the typical setup for two or three units in parallel.

A second slave unit may be placed in parallel with a master and slave; this requires the TRI pin (pin 3) of the master unit to be connected to the SNS RTN pins (pin 9), per Figure 2 on page 3.

In current sharing mode, the converters function as a current source. For this reason it is important that their outputs be connected to the common ground at all times to prevent an excessively high voltage at their outputs.

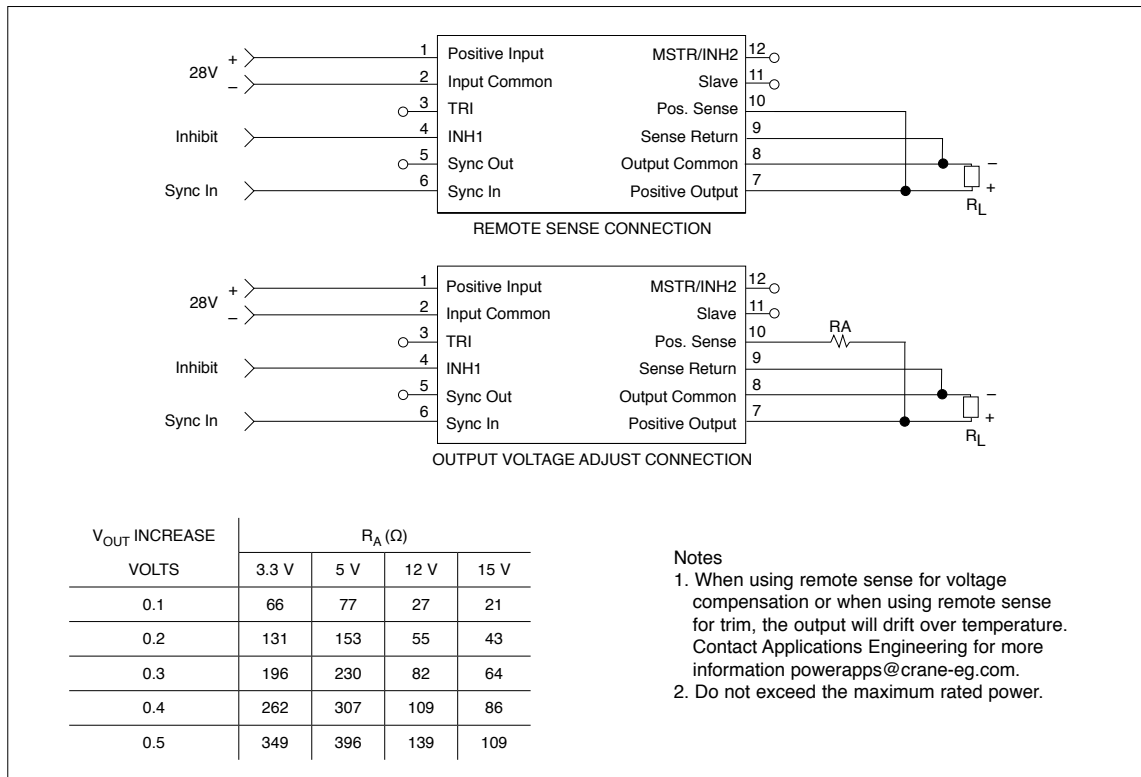


FIGURE 1: SENSE CONNECTIONS AND TRIM TABLE – SINGLE OUTPUT MODELS

MFL Single and Dual DC-DC Converters

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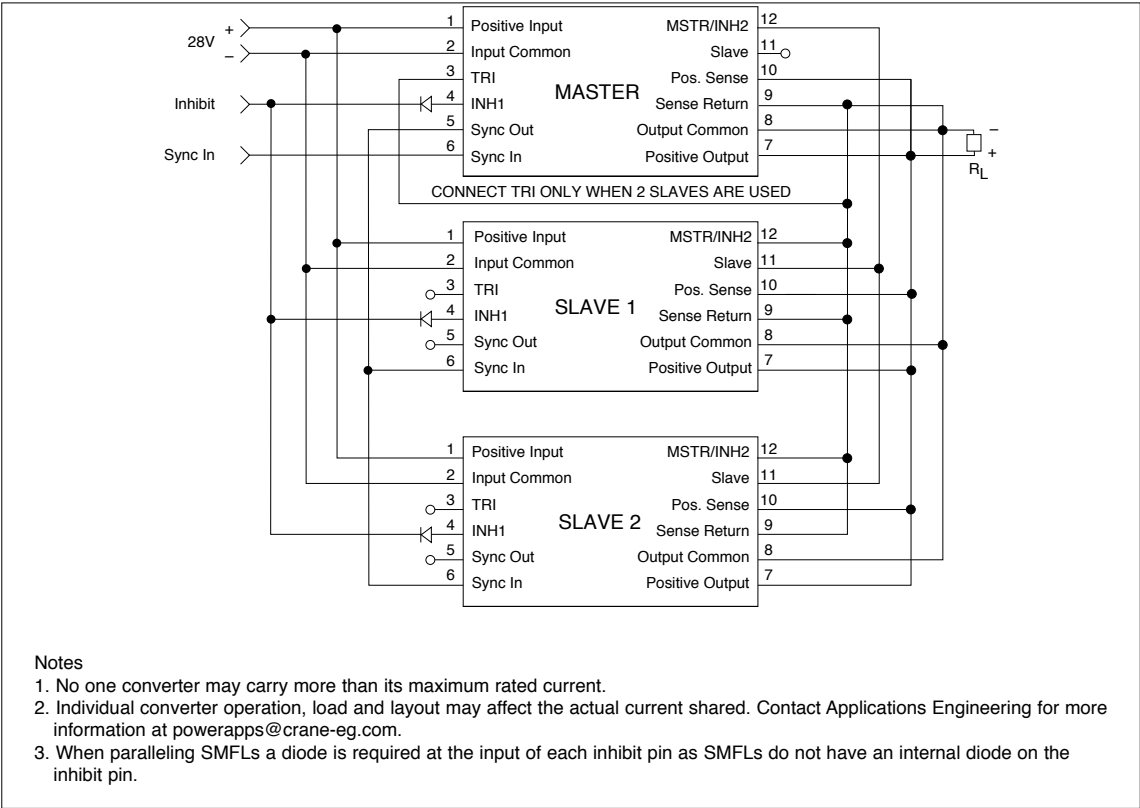


FIGURE 2: PARALLEL CONNECTIONS – SINGLE OUTPUT MODELS

MFL Single and Dual DC-DC Converters

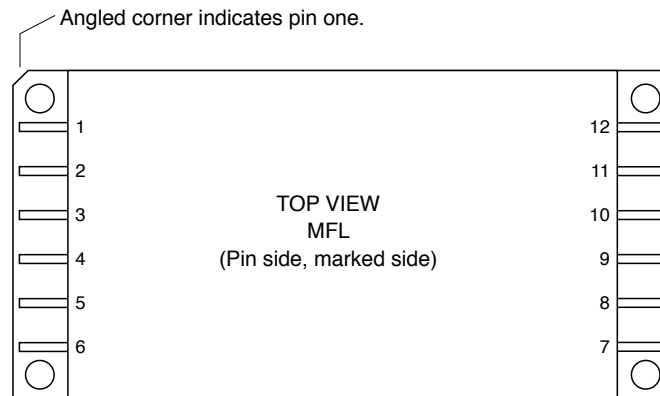
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| PIN OUT | | | |
|---------|------------------------------|------------------------------|------------------------------|
| Pin | Single Output | MFL2828S only | Dual Output |
| 1 | Positive Input | Positive Input | Positive Input |
| 2 | Input Common | Input Common | Input Common |
| 3 | Triple (TRI) | Triple (TRI) | Triple (TRI) |
| 4 | Inhibit 1 (INH1) | Inhibit 1 (INH1) | Inhibit 1 (INH1) |
| 5 | Sync Out | Sync Out | Sync Out |
| 6 | Sync In | Sync In | Sync In |
| 7 | Positive Output | Positive Output | Positive Output |
| 8 | Output Common | No connection | Output Common |
| 9 | Sense Return | Output Common | Negative Output |
| 10 | Positive Sense | No connection | No connection |
| 11 | Slave | Slave | Slave |
| 12 | Master/Inhibit 2 (MSTR/INH2) | Master/Inhibit 2 (MSTR/INH2) | Master/Inhibit 2 (MSTR/INH2) |

TABLE 1: PIN OUT

| PINS NOT IN USE | |
|------------------------------|----------------------------|
| TRI | Leave unconnected |
| Inhibit 1 (INH1) | Leave unconnected |
| Sync Out | Leave unconnected |
| Sync In | Connect to Input Common |
| Sense Return | Connect to Output Common |
| Positive Sense | Connect to Positive Output |
| Slave | Leave unconnected |
| Master/Inhibit 2 (MSTR/INH2) | Leave unconnected |

TABLE 2: PINS NOT IN USE



See Figure 18 on page 12 for dimensions

FIGURE 3: PIN OUT

MFL Single and Dual DC-DC Converters

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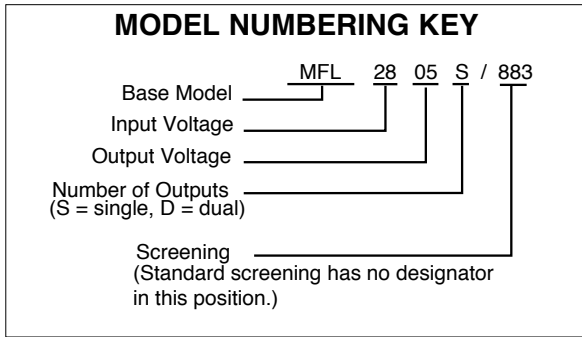


FIGURE 4: MODEL NUMBERING KEY

| SMD NUMBERS | |
|-------------------------------------|-------------------------|
| STANDARD MICROCIRCUIT DRAWING (SMD) | MFL SERIES SIMILAR PART |
| 5962-0621301HXC | MFL283R3S/883 |
| 5962-9316301HXC | MFL2805S/883 |
| 5962-9316201HXC | MFL2812S/883 |
| 5962-9316101HXC | MFL2815S/883 |
| 5962-9319101HXC | MFL2805D/883 |
| 5962-9319201HXC | MFL2812D/883 |
| 5962-9319301HXC | MFL2815D/883 |

The SMD number shown is for Class H screening. For exact specifications for an SMD product, refer to the SMD drawing. SMDs can be downloaded from www.landandmaritime.dla.mil/programs/smcr

TABLE 3: SMD NUMBER CROSS REFERENCE

| MODEL NUMBER OPTIONS | | | | |
|--|------------------------------|-----------------------------|--------------------------------|-------------------------|
| TO DETERMINE THE MODEL NUMBER ENTER ONE OPTION FROM EACH CATEGORY IN THE FORM BELOW. | | | | |
| CATEGORY | Base Model and Input Voltage | Output Voltage ¹ | Number of Outputs ² | Screening ³ |
| OPTIONS | MFL28 | 3R3, 05, 12, 15, 28 | S | (standard, leave blank) |
| | | 05, 12, 15 | D | ES 883 |
| FILL IN FOR MODEL # | MFL28 | _____ | _____ | / _____ |

Notes

- Output Voltage: An R indicates a decimal point. 3R3 is 3.3 volts out. The value of 3R3 is only available in single output models.
- Number of Outputs: S is a single output and D is a dual output.
- Screening: For standard screening leave the screening option blank. For other screening options, insert the desired screening level. For more information see Table 9 on page 13 and Table 10 on page 14. MFL2828S is not available on an SMD.

TABLE 4: MODEL NUMBER OPTIONS

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TABLE 5: OPERATING CONDITIONS, ALL MODELS, 25°C CASE, 28 VIN, 100% LOAD, UNLESS OTHERWISE SPECIFIED.

| PARAMETER | CONDITIONS | ALL MODELS | | | UNITS |
|--|---|-----------------------------------|-----|------|---------|
| | | MIN | TYP | MAX | |
| LEAD SOLDERING TEMPERATURE ¹ | 10 SECONDS MAX. | — | — | 300 | °C |
| STORAGE TEMPERATURE ¹ | | -65 | — | +150 | °C |
| CASE OPERATING TEMPERATURE | FULL POWER | -55 | — | +125 | °C |
| | ABSOLUTE ¹ | -55 | — | +135 | |
| DERATING OUTPUT POWER/CURRENT ¹ | LINEARLY | From 100% at 125°C to 0% at 135°C | | | |
| ISOLATION: INPUT TO OUTPUT OR ANY PIN TO CASE | @ 500 VDC AT 25°C | 100 | — | — | Megohms |
| INPUT TO OUTPUT CAPACITANCE ¹ | | — | 150 | — | pF |
| CURRENT LIMIT ² | % OF FULL LOAD | — | 125 | — | % |
| AUDIO REJECTION ¹ | | — | 50 | — | dB |
| CONVERSION FREQUENCY, FREE RUN | FREE RUN, -55°C TO +125°C | 525 | 600 | 675 | kHz |
| SYNCHRONIZATION IN -55°C TO +125°C | INPUT FREQUENCY | 525 | — | 675 | kHz |
| | DUTY CYCLE ¹ | 40 | — | 60 | % |
| | ACTIVE LOW | — | — | 0.8 | V |
| | ACTIVE HIGH ¹ | 4.5 | — | 5.0 | |
| | REFERENCED TO | INPUT COMMON | | | |
| | IF NOT USED | CONNECT TO INPUT COMMON | | | |
| SYNCHRONIZATION OUT | REFERENCED TO | INPUT COMMON | | | |
| | IF NOT USED | LEAVE UNCONNECTED | | | |
| INHIBIT 1 ACTIVE LOW (OUTPUT DISABLED) Do not apply a voltage to the inhibit pin. ³ | INHIBIT PIN PULLED LOW | — | — | 0.8 | V |
| | INHIBIT PIN SOURCE CURRENT ¹ | — | — | 10 | mA |
| | REFERENCED TO | INPUT COMMON | | | |
| INHIBIT 1 ACTIVE HIGH (OUTPUT ENABLED) Do not apply a voltage to the inhibit pin. ³ | INHIBIT PIN CONDITION | OPEN COLLECTOR OR UNCONNECTED | | | |
| | OPEN INHIBIT PIN VOLTAGE ¹ | 9 | — | 12 | V |
| INHIBIT 2 ACTIVE LOW (OUTPUT DISABLED) Do not apply a voltage to the inhibit pin. ³ | INHIBIT PIN PULLED LOW | — | — | 0.5 | V |
| | INHIBIT PIN SOURCE CURRENT ¹ | — | — | 5 | mA |
| | REFERENCED TO | OUTPUT COMMON | | | |
| INHIBIT 2 ACTIVE HIGH (OUTPUT ENABLED) Do not apply a voltage to the inhibit pin. ³ | INHIBIT PIN CONDITION | OPEN COLLECTOR OR UNCONNECTED | | | |
| | OPEN INHIBIT PIN VOLTAGE ¹ | — | — | 9 | V |

**For mean time between failures (MTBF) contact Applications Engineering
powerapps@crane-eg.com +1 425-882-3100 option 7**

Notes

1. Guaranteed by qualification test and/or analysis. Not an in-line test.
2. Dual outputs: The over-current limit will trigger when the sum of the currents from both outputs reaches 125% (typical value) of the maximum rated "total" current of both outputs.
3. An external inhibit interface should be used to pull the inhibits low or leave them floating. The inhibit pins can be left unconnected if not used.

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TABLE 6: ELECTRICAL CHARACTERISTICS: -55°C TO +125°C CASE, 28 VIN, 100% LOAD, FREE RUN, UNLESS OTHERWISE SPECIFIED.

| SINGLE OUTPUT MODELS | | MFL283R3S | | | MFL2805S | | | MFL2812S | | | UNITS |
|------------------------------------|---|-----------|------|-------|----------|------|------|----------|-------|-------|---------------|
| PARAMETER | CONDITIONS | MIN | TYP | MAX | MIN | TYP | MAX | MIN | TYP | MAX | |
| OUTPUT VOLTAGE | | 3.21 | 3.30 | 3.39 | 4.87 | 5.00 | 5.13 | 11.76 | 12.00 | 12.24 | V |
| OUTPUT CURRENT | $V_{IN} = 16$ to 40 V | 0 | — | 12.12 | 0 | — | 10 | 0 | — | 5 | A |
| OUTPUT POWER | $V_{IN} = 16$ to 40 V | 0 | — | 40 | 0 | — | 50 | 0 | — | 60 | W |
| OUTPUT RIPPLE | $T_C = 25^\circ\text{C}$ | — | 10 | 35 | — | 15 | 35 | — | 30 | 75 | mV p-p |
| 10 KHZ - 2 MHZ | $T_C = -55^\circ\text{C}$ TO $+125^\circ\text{C}$ | — | 10 | 50 | — | 30 | 50 | — | 45 | 100 | |
| LINE REGULATION | $V_{IN} = 16$ TO 40 V | — | 0 | 20 | — | 0 | 20 | — | 0 | 20 | mV |
| LOAD REGULATION | NO LOAD TO FULL | — | — | 40 | — | — | 20 | — | — | 20 | mV |
| INPUT VOLTAGE | CONTINUOUS | 16 | 28 | 40 | 16 | 28 | 40 | 16 | 28 | 40 | V |
| NO LOAD TO FULL | TRANSIENT 50 ms ^{1, 2} | — | — | 80 | — | — | 80 | — | — | 80 | V |
| INPUT CURRENT | NO LOAD | — | 70 | 100 | — | 70 | 120 | — | 50 | 100 | mA |
| | INHIBITED—INH1 | — | 9 | 14 | — | 9 | 14 | — | 9 | 14 | |
| | INHIBITED—INH2 | — | 35 | 70 | — | 35 | 70 | — | 35 | 70 | |
| INPUT RIPPLE CURRENT | 10 kHz - 10 MHz | — | 15 | 50 | — | 15 | 50 | — | 15 | 50 | mA p-p |
| EFFICIENCY | $T_C = 25^\circ\text{C}$ | 73 | 76 | — | 77 | 80 | — | 83 | 86 | — | % |
| | $T_C = -55^\circ\text{C}$ TO $+125^\circ\text{C}$ | 71 | — | — | 75 | — | — | 81 | — | — | |
| LOAD FAULT | POWER DISSIPATION | — | 12.5 | 16 | — | 12.5 | 18 | — | 10 | 16 | W |
| | RECOVERY ¹ | — | 1.5 | 6 | — | 1.5 | 4 | — | 1.5 | 4 | ms |
| STEP LOAD RESPONSE ³ | TRANSIENT | — | 200 | 300 | — | 250 | 350 | — | 450 | 600 | mV pk |
| 50% - 100% - 50% | RECOVERY ¹ | — | 1.5 | 3.0 | — | 1.5 | 3.0 | — | 1.5 | 3.0 | ms |
| STEP LINE RESPONSE ^{1, 3} | TRANSIENT | — | 250 | 300 | — | 250 | 300 | — | 250 | 400 | mV pk |
| 16 - 40 - 16 | RECOVERY | — | 200 | 600 | — | 200 | 300 | — | 200 | 300 | μs |
| START-UP ⁴ | DELAY | — | 3.5 | 6 | — | 3.5 | 6 | — | 3.5 | 6 | ms |
| | OVERSHOOT ¹ | — | 0 | 25 | — | 0 | 25 | — | 0 | 25 | mV pk |
| CAPACITIVE LOAD ^{1, 5} | $T_C = 25^\circ\text{C}$ | — | — | 1000 | — | — | 1000 | — | — | 1000 | μF |

Notes

- Guaranteed by qualification test and/or analysis. Not an in-line test.
- Converter will shut down above approximately 45 volts input but will be undamaged and will restart when voltage drops into normal range.
- Recovery time is measured from application of the transient to the point at which V_{OUT} is within 1% of final value.

- Tested on release from inhibit.
- No effect on dc performance.

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TABLE 7: ELECTRICAL CHARACTERISTICS: -55°C TO +125°C CASE, 28 VIN, 100% LOAD, FREE RUN, UNLESS OTHERWISE SPECIFIED.

| SINGLE OUTPUT MODELS | | MFL2815S | | | MFL2828S ² | | | UNITS |
|---------------------------------------|----------------------------------|----------|-------|-------|-----------------------|-------|-------|--------|
| PARAMETER | CONDITIONS | MIN | TYP | MAX | MIN | TYP | MAX | |
| OUTPUT VOLTAGE | | 14.55 | 15.00 | 15.45 | 27.16 | 28.00 | 28.84 | V |
| OUTPUT CURRENT | V _{IN} = 16 to 40 V | 0 | — | 4.33 | 0 | — | 2.32 | A |
| OUTPUT POWER | V _{IN} = 16 to 40 V | 0 | — | 65 | 0 | — | 65 | W |
| OUTPUT RIPPLE | T _C = 25°C | — | 30 | 85 | — | 100 | 200 | mV p-p |
| 10 KHZ - 2 MHZ | T _C = -55°C TO +125°C | — | 45 | 110 | — | — | 275 | |
| LINE REGULATION ² | V _{IN} = 16 TO 40 V | — | 0 | 20 | — | 20 | 60 | mV |
| LOAD REGULATION | NO LOAD TO FULL | — | 0 | 20 | — | 20 | 75 | mV |
| INPUT VOLTAGE ² | CONTINUOUS | 16 | 28 | 40 | 16 ² | 28 | 40 | V |
| NO LOAD TO FULL | TRANSIENT 50 ms ^{1, 3} | — | — | 80 | — | — | 80 | V |
| INPUT CURRENT | NO LOAD | — | 50 | 100 | — | 60 | 100 | mA |
| | INHIBITED-INH1 | — | 9 | 14 | — | 9 | 14 | |
| | INHIBITED-INH2 | — | 35 | 70 | — | 35 | 70 | |
| INPUT RIPPLE CURRENT | 10 kHz - 10 MHz | — | 15 | 50 | — | 20 | 50 | mA p-p |
| EFFICIENCY | T _C = 25°C | 84 | 87 | — | 83 | 86 | — | % |
| | T _C = -55°C TO +125°C | 82 | — | — | 81 | — | — | |
| LOAD FAULT | POWER DISSIPATION | — | 10 | 16 | — | 7 | 14 | W |
| | RECOVERY ¹ | — | 1.5 | 4 | — | 1.0 | 4 | ms |
| STEP LOAD RESPONSE ⁴ | TRANSIENT | — | 500 | 600 | — | 800 | 1400 | mV pk |
| 50% - 100% - 50% | RECOVERY ¹ | — | 1.5 | 3.0 | — | 1.5 | 3.0 | ms |
| STEP LINE RESPONSE ^{1, 2, 4} | TRANSIENT | — | 250 | 500 | — | 250 | 800 | mV pk |
| 16 - 40 - 16 V | RECOVERY | — | 200 | 300 | — | 200 | 400 | μs |
| START-UP ^{2, 5} | DELAY | — | 3.5 | 6 | — | 3.5 | 6 | ms |
| | OVERSHOOT ¹ | — | 0 | 50 | — | 0 | 100 | mV pk |
| CAPACITIVE LOAD ^{1, 6} | T _C = 25°C | — | — | 1000 | — | — | 1000 | μF |

Notes

1. Guaranteed by qualification test and/or analysis. Not an in-line test.
2. MFL2828S will operate at 16 volts input but requires 19 volts input to start.
3. Converter will shut down above approximately 45 volts input but will be undamaged and will restart when voltage drops into normal range.

4. Recovery time is measured from application of the transient to the point at which V_{out} is within 1% of final value.
5. Tested on release from inhibit.
6. No affect on dc performance.

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TABLE 8: ELECTRICAL CHARACTERISTICS: -55°C TO +125°C CASE, 28 VIN, 100% LOAD, FREE RUN, UNLESS OTHERWISE SPECIFIED.

| DUAL OUTPUT MODELS | | MFL2805D | | | MFL2812D | | | MFL2815D | | | UNITS |
|---|----------------------------------|----------|------|------|----------|-------|-------|----------|-------|-------|--------|
| PARAMETER | CONDITIONS | MIN | TYP | MAX | MIN | TYP | MAX | MIN | TYP | MAX | |
| OUTPUT VOLTAGE | + V _{OUT} | 4.85 | 5.00 | 5.15 | 11.64 | 12.00 | 12.36 | 14.55 | 15.00 | 15.45 | V |
| | - V _{OUT} | 4.82 | 5.00 | 5.18 | 11.58 | 12.00 | 12.42 | 14.47 | 15.00 | 15.53 | |
| OUTPUT CURRENT ² V _{IN} = 16 TO 40 V | EITHER OUTPUT | 0 | ±5 | 7 | 0 | ±2.5 | 3.5 | 0 | ±2.16 | 3.03 | A |
| | TOTAL OUTPUT | 0 | — | 10 | 0 | — | 5 | 0 | — | 4.34 | |
| OUTPUT POWER ² V _{IN} = 16 to 40 V | EITHER OUTPUT | 0 | ±25 | 35 | 0 | ±30 | 42 | 0 | ±32.5 | 45.5 | W |
| | TOTAL OUTPUT | — | — | 50 | — | — | 60 | — | — | 65 | |
| OUTPUT RIPPLE 10 kHz - 2 MHz ± V _{OUT} | T _C = 25°C | — | — | 50 | — | — | 80 | — | — | 100 | mV p-p |
| | T _C = -55°C TO +125°C | — | 50 | 100 | — | 50 | 120 | — | 50 | 150 | |
| LINE REGULATION V _{IN} = 16 TO 40 V | + V _{OUT} | — | 0 | 50 | — | 0 | 50 | — | 0 | 50 | mV |
| | - V _{OUT} | — | 25 | 100 | — | 25 | 100 | — | 25 | 100 | |
| LOAD REGULATION NO LOAD TO FULL | + V _{OUT} | — | 0 | 50 | — | 10 | 50 | — | 10 | 50 | mV |
| | - V _{OUT} | — | 25 | 100 | — | 25 | 120 | — | 50 | 150 | |
| CROSS REGULATION T _C = 25°C | SEE NOTE 3 | — | 5 | 8 | — | 2 | 4 | — | 2 | 4 | % |
| | SEE NOTE 4 | — | 3 | 7 | — | 2 | 4 | — | 2 | 4 | |
| INPUT VOLTAGE NO LOAD TO FULL | CONTINUOUS | 16 | 28 | 40 | 16 | 28 | 40 | 16 | 28 | 40 | V |
| | TRANSIENT 50 ms ^{1, 5} | — | — | 80 | — | — | 80 | — | — | 80 | V |
| INPUT CURRENT | NO LOAD | — | 50 | 120 | — | 50 | 100 | — | 50 | 100 | mA |
| | INHIBITED—INH1 | — | 9 | 14 | — | 9 | 14 | — | 9 | 14 | |
| | INHIBITED—INH2 | — | 35 | 70 | — | 35 | 70 | — | 35 | 70 | |
| INPUT RIPPLE CURRENT | 10 kHz - 10 MHz | — | 15 | 50 | — | 15 | 50 | — | 15 | 50 | mA p-p |
| EFFICIENCY BALANCED LOAD | T _C = 25°C | 77 | 80 | — | 83 | 86 | — | 84 | 87 | — | % |
| | T _C = -55°C TO +125°C | 75 | — | — | 81 | — | — | 82 | — | — | |
| LOAD FAULT | POWER DISSIPATION | — | 12.5 | 18 | — | 10 | 16 | — | 10 | 16 | W |
| | RECOVERY ¹ | — | 1.5 | 4 | — | 1.5 | 4 | — | 1.5 | 4.0 | ms |
| STEP LOAD RESPONSE ⁶ 50% - 100% - 50% ± V _{OUT} | TRANSIENT | — | 250 | 350 | — | 450 | 600 | — | 500 | 600 | mV pk |
| | RECOVERY ¹ | — | 1.5 | 3.0 | — | 1.5 | 3.0 | — | 1.5 | 3.0 | ms |
| STEP LINE RESPONSE ^{1, 6} 16 - 40 - 16 V ± V _{OUT} | TRANSIENT | — | 250 | 300 | — | 250 | 400 | — | 250 | 500 | mV pk |
| | RECOVERY | — | 200 | 300 | — | 200 | 300 | — | 200 | 300 | μs |
| START-UP ⁷ | DELAY | — | 3.5 | 6 | — | 3.5 | 6 | — | 3.5 | 6 | ms |
| | OVERSHOOT ¹ | — | 0 | 25 | — | 0 | 50 | — | 0 | 50 | mV pk |
| CAPACITIVE LOAD ^{1, 8, 9} | T _C = 25°C | — | — | 500 | — | — | 500 | — | — | 500 | μF |

Notes

- Guaranteed by qualification test and/or analysis. Not an in-line test.
- Up to 70% of the total output power is available from either output providing the opposite output is simultaneously carrying 30% of the total power.
- Effect on negative V_{out} from 50%/50% loads to 70%/30% or 30%/70% loads.
- Effect on negative V_{out} from 50%/50% loads to 50% then 10% load on negative V_{out}.
- Converter will shut down above approximately 45 volts input but will be undamaged and will restart when voltage drops into normal range.
- Recovery time is measured from application of the transient to point at which V_{out} is within 1% of final value.
- Tested on release from inhibit.
- No affect on dc performance.
- Applies to each output.

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TYPICAL PERFORMANCE PLOTS: 25°C CASE, 28 VIN, 100% LOAD, FREE RUN, UNLESS OTHERWISE SPECIFIED.
 These are examples for reference only and are not guaranteed specifications.

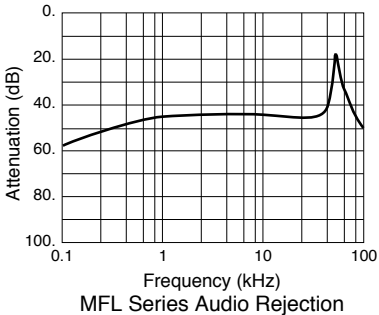


FIGURE 5

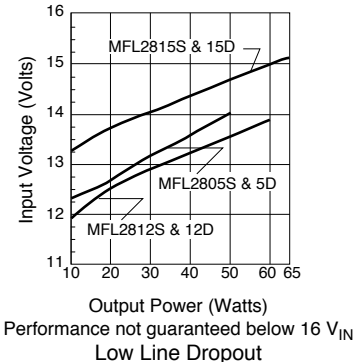


FIGURE 6

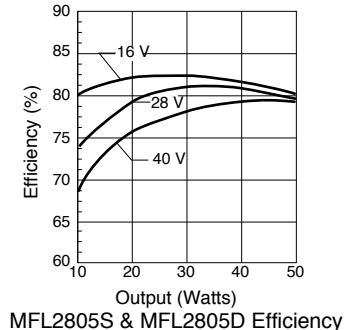


FIGURE 7

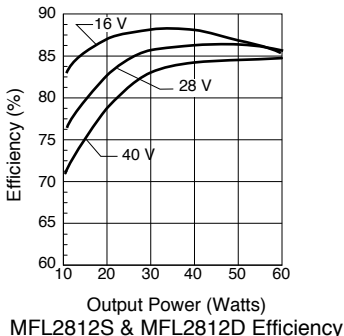


FIGURE 8

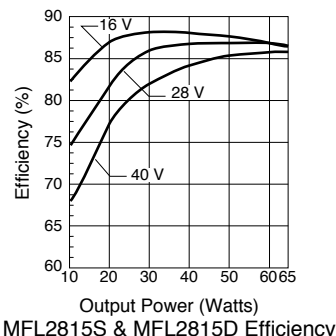


FIGURE 9

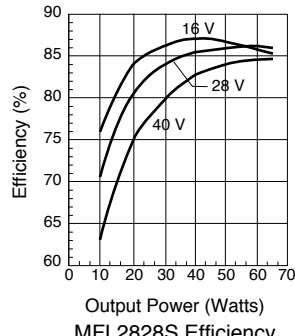


FIGURE 10

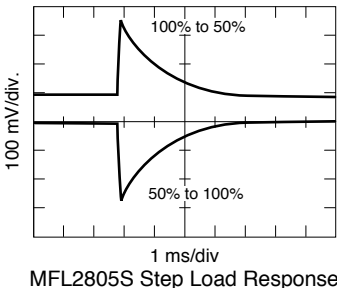


FIGURE 11

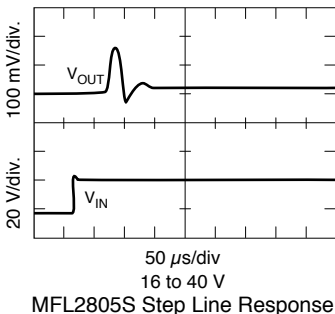


FIGURE 12

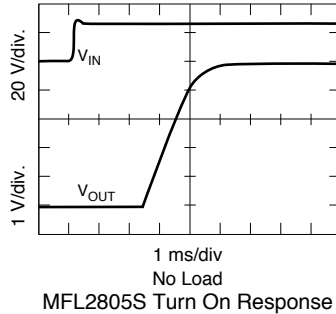


FIGURE 13

MFL Single and Dual DC-DC Converters

28 VOLT INPUT - 65 WATT

TYPICAL PERFORMANCE PLOTS: 25°C CASE, 28 VIN, 100% LOAD, FREE RUN, UNLESS OTHERWISE SPECIFIED.
These are examples for reference only and are not guaranteed specifications.

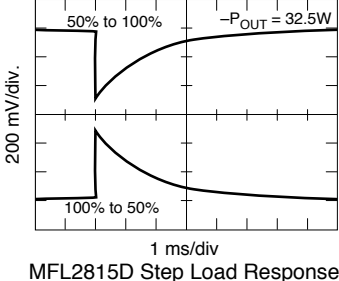
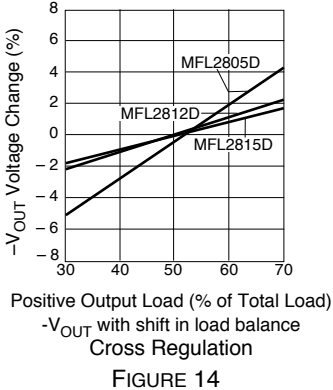


FIGURE 15

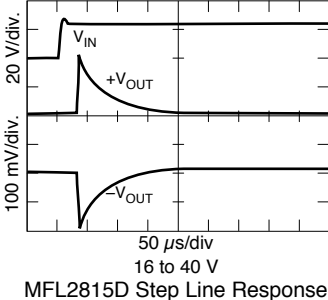
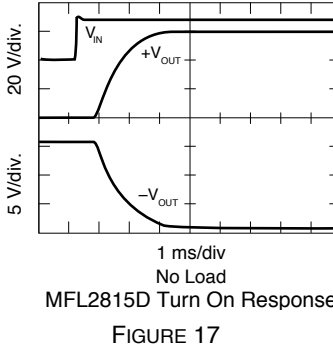


FIGURE 16

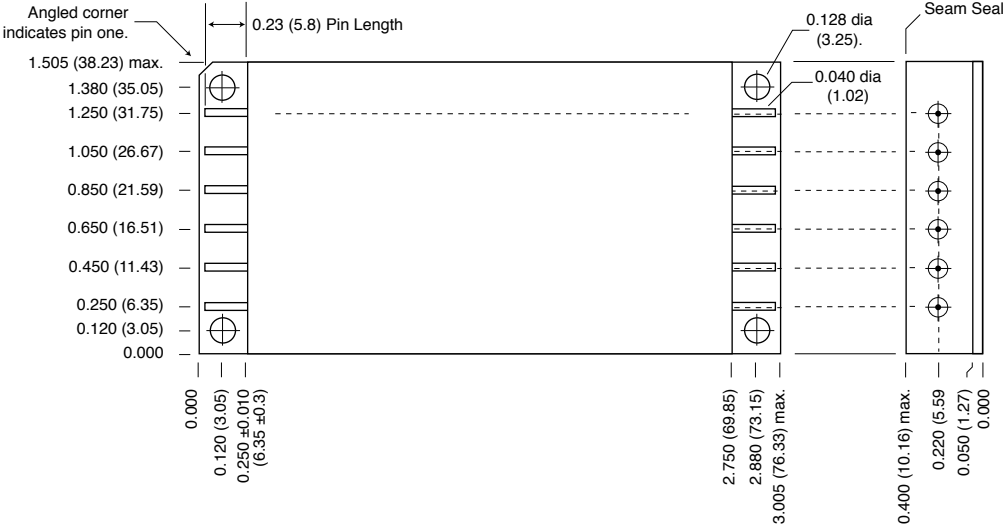


MFL Single and Dual DC-DC Converters

28 VOLT INPUT - 65 WATT

TOP VIEW CASE U Flanged case, short leads

Case "U" does not require a designator in the Case Option position of the model number.



Weight: 86 grams maximum

Case dimensions in inches (mm)
Tolerance ± 0.005 (0.13) for three decimal places
 ± 0.01 (0.3) for two decimal places
unless otherwise specified

CAUTION
Heat from reflow or wave soldering may damage the device. Solder pins individually with heat application not exceeding 300°C for 10 seconds per pin.

Materials
Header Cold Rolled Steel/Nickel/Gold
Cover Kovar/Nickel
Pins #52 alloy/Gold ceramic seal
Gold plating of 50 - 150 microinches is included in pin diameter
Seal Hole: 0.120 \pm 0.002 (3.05 \pm 0.05)

Case U, Rev K, 2014.03.03
Please refer to the numerical dimensions for accuracy.

FIGURE 18: CASE U

MFL Single and Dual DC-DC Converters

28 VOLT INPUT - 65 WATT

ELEMENT EVALUATION ¹ HIGH RELIABILITY /883 (CLASS H)

| COMPONENT-LEVEL TEST PERFORMED | QML | |
|--------------------------------|------------------|----------------|
| | CLASS H /883 | |
| | M/S ² | P ³ |
| Element Electrical | ■ | ■ |
| Visual | ■ | ■ |
| Internal Visual | ■ | |
| Final Electrical | ■ | ■ |
| Wire Bond Evaluation | ■ | ■ |

Notes

1. Element evaluation does not apply to standard and /ES product.
2. M/S = Active components (microcircuit and semiconductor die).
3. P = Passive components, Class H element evaluation. Not applicable to standard and /ES element evaluation.

TABLE 9: ELEMENT EVALUATION

MFL Single and Dual DC-DC Converters

28 VOLT INPUT - 65 WATT

ENVIRONMENTAL SCREENING HIGH RELIABILITY STANDARD, /ES AND /883 (CLASS H)

| TEST PERFORMED | NON-QML ¹ | | QML ² |
|---|----------------------|-----|------------------|
| | STANDARD | /ES | CLASS H /883 |
| Pre-cap Inspection, Method 2017, 2032 | ■ | ■ | ■ |
| Temperature Cycle (10 times) | | | |
| Method 1010, Cond. C, -65°C to +150°C, ambient | | | ■ |
| Method 1010, Cond. B, -55°C to +125°C, ambient | | ■ | |
| Constant Acceleration | | | |
| Method 2001, 3000 g | | | ■ |
| Method 2001, 500 g | | ■ | |
| PIND, Test Method 2020, Cond. A | | | ■ ³ |
| Burn-in Method 1015, +125°C case, typical ⁴ | | | |
| 96 hours | | ■ | |
| 160 hours | | | ■ |
| Final Electrical Test, MIL-PRF-38534, Group A, | | | |
| Subgroups 1 through 6, -55°C, +25°C, +125°C case | | | ■ |
| Subgroups 1 and 4, +25°C case | ■ | ■ | |
| Hermeticity Test | | | |
| Gross Leak, Cond. C ₁ , fluorocarbon | | ■ | ■ |
| Fine Leak, Cond. A ₂ , helium | | ■ | ■ |
| Gross Leak, Dip | ■ | | |
| Final visual inspection, Method 2009 | ■ | ■ | ■ |

Test methods are referenced to MIL-STD-883 as determined by MIL-PRF-38534.

Notes

- Standard and ES are non-QML products and may not meet all of the requirements of MIL-PRF-38534.
- All processes are QML qualified and performed by certified operators.
- Not required by DLA but performed to assure product quality.
- Burn-in temperature designed to bring the case temperature to +125°C minimum.
Burn-in is a powered test.

TABLE 10: ENVIRONMENTAL SCREENING