

F1-Series

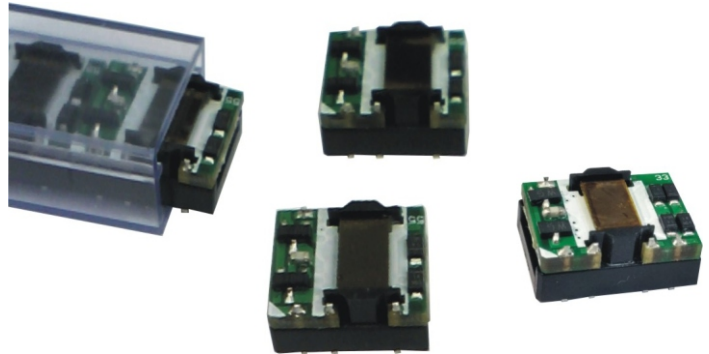
1W Unregulated Single & Dual output



electronic powersolutions

Features

- SMD 8Pin / 10Pin Package
- 4200 VDC High Isolation
- Efficiency up to 78%
- -40 ~ 105°C Operation Temperature Range
- Rated working voltage for 250Vrms and 400Vdc
- Low coupling capacity
- Qualified for Lead-free Reflow Solder Process According to IPC/JEDEC J-STD-020D.1
- Tape & Reel Package Available



The F1 series is a family of cost effective 1W single & dual output DC-DC converters. These converters achieve low cost and Small SMD package with standard footprint. High performance features include 4200Vdc input/output isolation. Input voltages are 3.3V, 5Vdc. with output voltage of 3.3, 5, ± 3.3 , ± 5 Vdc. Standard features include an input range of $\pm 10\%$ tolerance and low output noise and ripple.

All specifications typical at Ta=25°C, nominal input voltage and full load unless otherwise specified

| OUTPUT SPECIFICATIONS | |
|---|---|
| Output Voltage Accuracy | See Tolerance Envelope Curve |
| Line Regulation | $\pm 1.2\%$ / Per 1% Vin Change, max. |
| Load Regulation | (From 10% to 100% Load) 3.3 Vdc output Models $\pm 15\%$, max. 5 Vdc output Models $\pm 12\%$, max. |
| Ripple & Noise(1) (20 Mhz bandwidth) | Single output Models 150mVpk-pk, max. Dual output Models ± 120 mVpk-pk, max. |
| Short Circuit Protection | (Automatic Recovery) 0.5sec, max. |
| Temperature Coefficient | $\pm 0.03\%/^{\circ}\text{C}$ |
| Capacitive Load(2) | See Table, max. |

| INPUT SPECIFICATIONS | |
|--|-------------------|
| Input Voltage Range | $\pm 10\%$, max. |
| Input Current (Full-Load) | See Table, typ. |
| Input Current (No-Load) | See Table, max. |
| Input Filter | Capacitor |
| Input Reflected Ripple Current(3) | 20mApk-pk, typ. |
| Start up Time (Nominal Vin and constant resistive load) | 20mS, typ. |

| GENERAL SPECIFICATIONS | |
|---|--|
| Efficiency | See table, typ. |
| I/O Isolation Voltage | Qualification tested for 60sec, 4200Vdc Production tested for 3sec, 4200Vdc |
| I/O Isolation Capacitance | 25 pF, typ. |
| I/O Isolation Resistance | 1000M Ω , min. |
| Switching Frequency | 50~80kHz |
| Humidity | 95% rel H |
| Reliability Calculated MTBF(MIL-HDBK-217 F) | >7.0 Mhrs |
| Safety Standard | UL/cUL 60950-1, 62368-1 IEC/EN 60950-1, 62368-1 |
| Safety Approvals | UL/cUL 60950-1, 62368-1 IEC/EN 60950-1, 62368-1 |
| Moisture Sensitivity Level (MSL) | IPC/JEDEC J-STD-020D.1 Level 1 |

| PHYSICAL SPECIFICATIONS | |
|-------------------------|--|
| Base Material | Non-conductive Black Plastic(UL94V-0 rated) |
| Pin Material | 0.5mm C5191R-H Solder-coated |
| Weight | Single output Models 1.52g Dual output Models 1.80g |
| Dimensions | Single output Models 0.50"x0.44"x0.27" Dual output Models 0.60"x0.44"x0.27" |

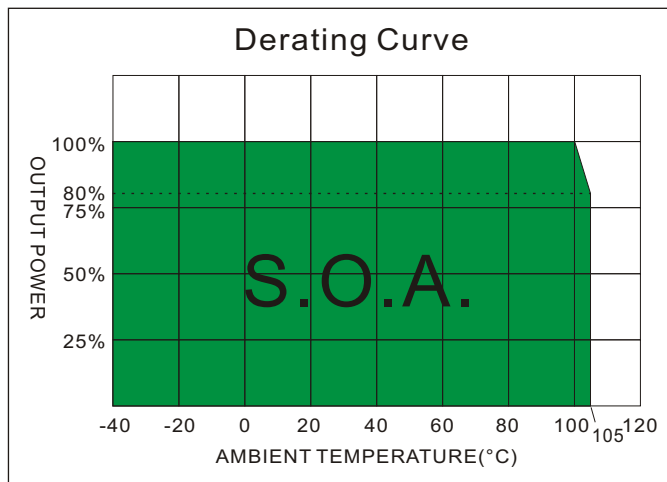
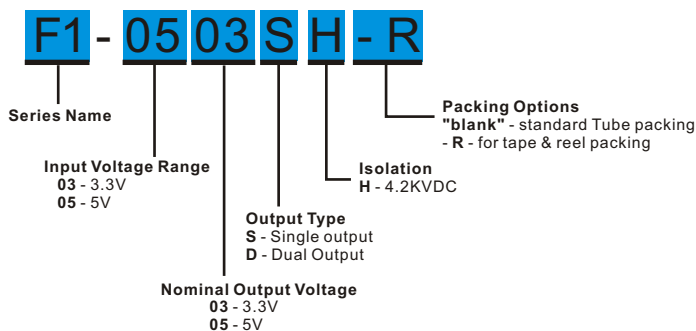
| ENVIRONMENT SPECIFICATIONS | |
|---------------------------------|---|
| Operating Temperature | -40°C ~ +105°C (See Derating Curve) -40°C ~ +100°C (For 100% load) |
| Storage Temperature | -55°C~125°C |
| Cooling(4) | Nature Convection |
| Lead-free Reflow Solder Process | IPC/JEDEC J-STD-020D.1 |
| Reflow Temperature | Peak 245°C (10sec), max. |
| Vibration | MIL-STD-810F |

| ABSOLUTE MAXIMUM RATINGS(5) | |
|--|-------------|
| These are stress ratings. Exposure of devices to any of these conditions may adversely affect long-term reliability. | |
| Input Surge Voltage(1000mS) | |
| 3.3 Models | 5 Vdc, max. |
| 5 Models | 9 Vdc, max. |

| EMC SPECIFICATIONS | | |
|------------------------|---------------|------------------|
| Conducted Emissions(6) | EN55032 | CLASS B |
| Radiated Emissions | EN55032 | CLASS B |
| ESD | IEC 61000-4-2 | Perf. Criteria A |
| RS | IEC 61000-4-3 | Perf. Criteria A |
| EFT(7) | IEC 61000-4-4 | Perf. Criteria A |
| Surge (7) | IEC 61000-4-5 | Perf. Criteria A |
| CS | IEC 61000-4-6 | Perf. Criteria A |
| PFMF | IEC 61000-4-8 | Perf. Criteria A |

F1 - 1W Unregulated Single & Dual output

PART NUMBER STRUCTURE



MODEL SELECTION GUIDE

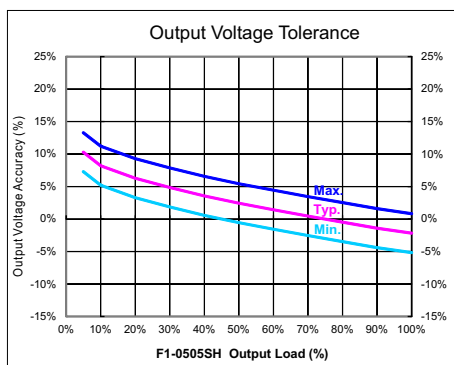
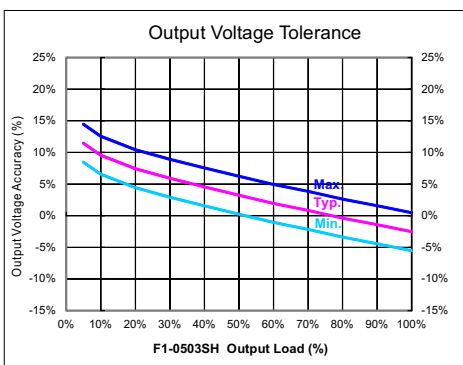
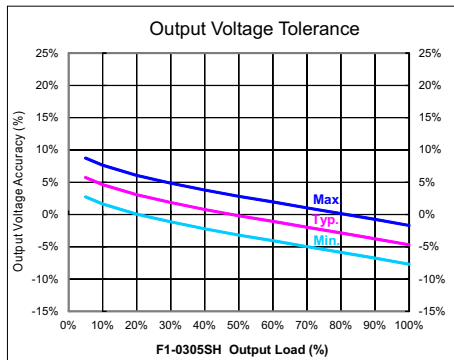
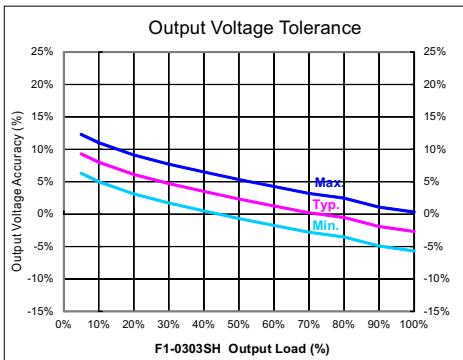
| MODEL NUMBER | INPUT Voltage Range (V dc) | INPUT Current | | OUTPUT Voltage (V dc) | OUTPUT Current Full load (mA) | EFFICIENCY @FL (% , typ.) | Capacitor Load @FL (µF, max.) |
|--------------|----------------------------|--------------------|----------------------|-----------------------|-------------------------------|---------------------------|-------------------------------|
| | | No-Load (mA, max.) | Full Load (mA, typ.) | | | | |
| F1-0303SH | 3.3 (2.97 ~ 3.63) | 50 | 416 | 3.3 | 303 | 73 | 220 |
| F1-0305SH | 3.3 (2.97 ~ 3.63) | 50 | 404 | 5 | 200 | 75 | 220 |
| F1-0503SH | 5 (4.5 ~ 5.5) | 40 | 274 | 3.3 | 303 | 73 | 220 |
| F1-0505SH | 5 (4.5 ~ 5.5) | 40 | 264 | 5 | 200 | 76 | 220 |
| F1-0303SH-R | 3.3 (2.97 ~ 3.63) | 50 | 416 | 3.3 | 303 | 73 | 220 |
| F1-0305SH-R | 3.3 (2.97 ~ 3.63) | 50 | 404 | 5 | 200 | 75 | 220 |
| F1-0503SH-R | 5 (4.5 ~ 5.5) | 40 | 274 | 3.3 | 303 | 73 | 220 |
| F1-0505SH-R | 5 (4.5 ~ 5.5) | 40 | 264 | 5 | 200 | 76 | 220 |
| F1-0303DH | 3.3 (2.97 ~ 3.63) | 50 | 404 | ±3.3 | ±151 | 75 | ±100 |
| F1-0305DH | 3.3 (2.97 ~ 3.63) | 50 | 389 | ±5 | ±100 | 78 | ±100 |
| F1-0503DH | 5 (4.5 ~ 5.5) | 40 | 267 | ±3.3 | ±151 | 75 | ±100 |
| F1-0505DH | 5 (4.5 ~ 5.5) | 40 | 257 | ±5 | ±100 | 78 | ±100 |
| F1-0303DH-R | 3.3 (2.97 ~ 3.63) | 50 | 404 | ±3.3 | ±151 | 75 | ±100 |
| F1-0305DH-R | 3.3 (2.97 ~ 3.63) | 50 | 389 | ±5 | ±100 | 78 | ±100 |
| F1-0503DH-R | 5 (4.5 ~ 5.5) | 40 | 267 | ±3.3 | ±151 | 75 | ±100 |
| F1-0505DH-R | 5 (4.5 ~ 5.5) | 40 | 257 | ±5 | ±100 | 78 | ±100 |

NOTE

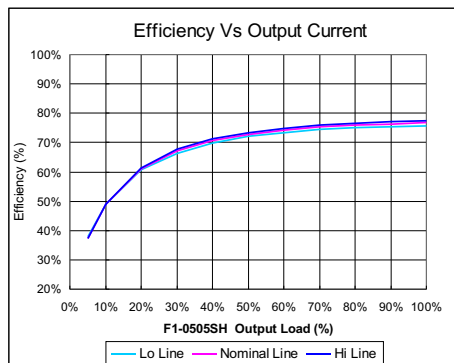
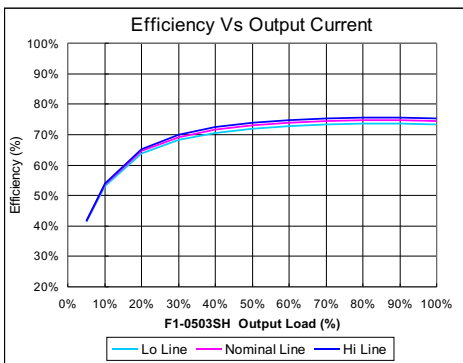
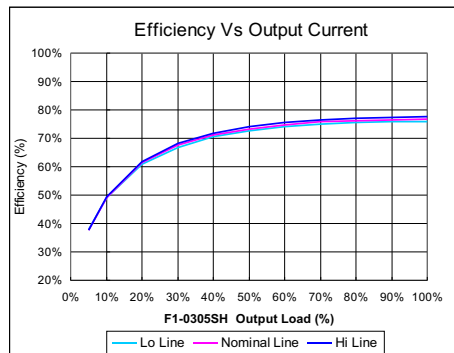
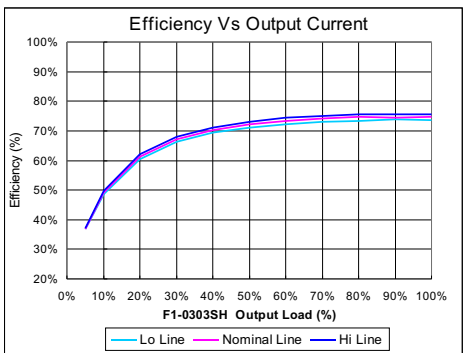
- Ripple/Noise measured with a 10µF electrolytic capacitor and 0.1µF ceramic capacitor.
- Tested by minimal Vin and constant resistive load.
- Measured Input reflected ripple current with a simulated source inductance of 12µH And a source capacitor Cin(47µF, ESR<1.0Ω at100kHz).
- "Nature Convection" is usually about 30-65 LFM but is not equal to still air (0 LFM).
- Exceeding the absolute ratings of the unit could cause damage. It is not allowed for continuous operating.
- Input filter components are required to help meet conducted emission class B, which application refer to the EMI Filter of design & feature configuration.
- Input components (C1,D1) are used to help meet surge test requirement for the module. C1 and D1 recommended nichicon UHE series and Littelfuse SMDJ series.
- Operation under no-load conditions will not damage these devices, however they may not meet all listed specifications.
- The F1 Series of converters are not internally fused so to meet the requirements of UL an anti-surge input line fuse should always be used with ratings as defined below.
Input Voltage, 3.3V: 1.0A(Slow Burning Fuses)
Input Voltage, 5.0V: 0.5A(Slow Burning Fuses)
All fuses should be UL recognized and rated to at least the maximum allowable DC input voltage.
- It is not recommended to use water-washing process on SMT units.

DERATING CURVE AND EFFICIENCY Vs OUTPUT CURRENT CURVE

Single Output Tolerance Envelope Curve

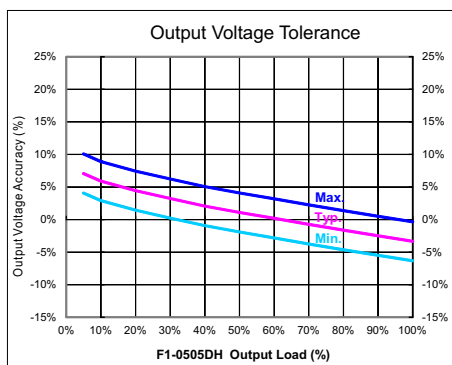
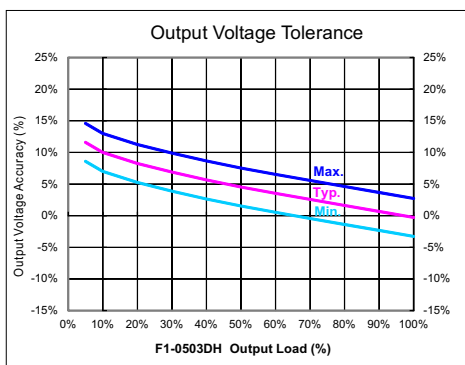
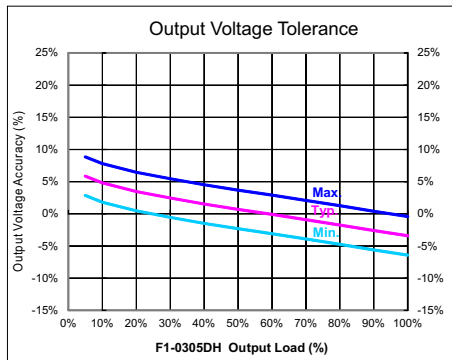
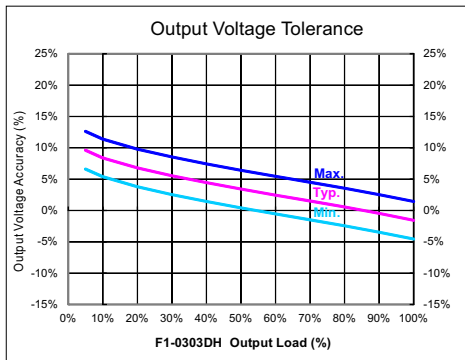


Efficiency Vs Output Current Curve

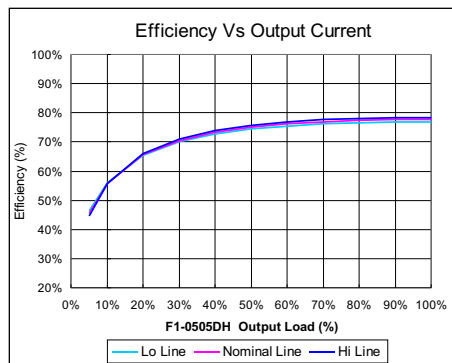
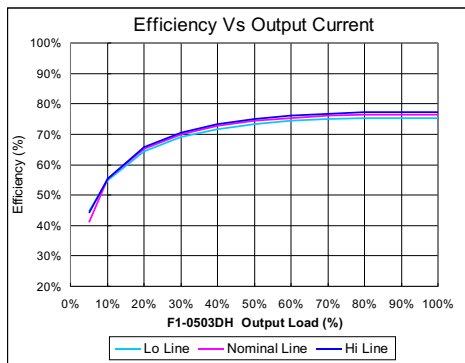
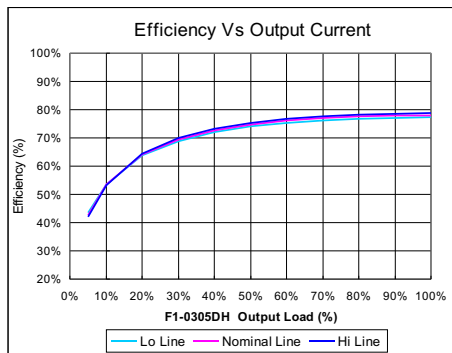
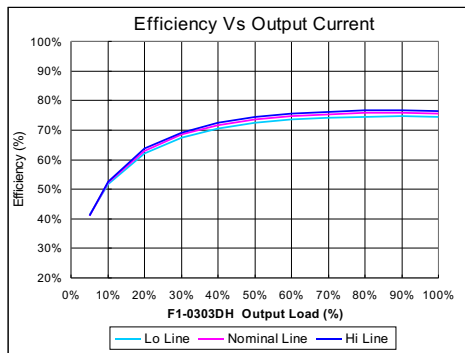


DERATING CURVE AND EFFICIENCY VS OUTPUT CURRENT CURVE

Dual Output Tolerance Envelope Curve

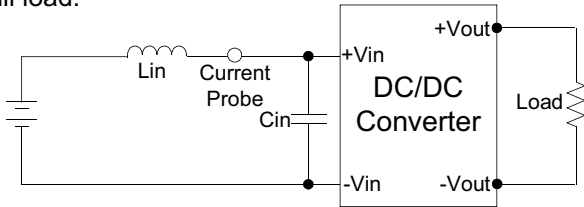


Efficiency Vs Output Current Curve

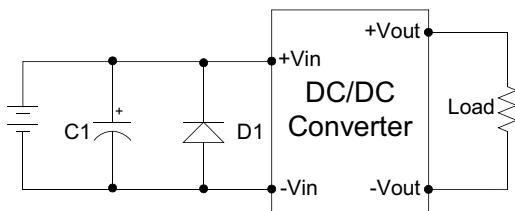


TEST CONFIGURATIONS
Input Reflected Ripple Current Test Step

Input reflected ripple current is measured through a source inductor L_{in} ($12\mu\text{H}$) and a source capacitor C_{in} ($47\mu\text{F}$, $\text{ESR} < 1.0\Omega$ at 100kHz) at nominal input and full load.


EFT & SURGE Filter

Input components ($C1, D1$) are used to help meet surge test requirement for the module.



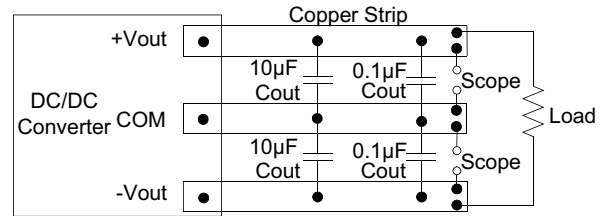
| C1 | D1 |
|------------------------------|----------|
| 330 $\mu\text{F}/50\text{V}$ | SMDJ9.0A |

D1: Transient Voltage Suppression Diodes

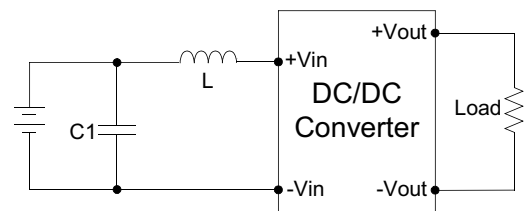
Output Ripple & Noise Measurement Test

Use a $10\mu\text{F}$ electrolytic capacitor and $0.1\mu\text{F}$ ceramic capacitor.

The Scope measurement bandwidth is 0-20MHz.


EMI Filter

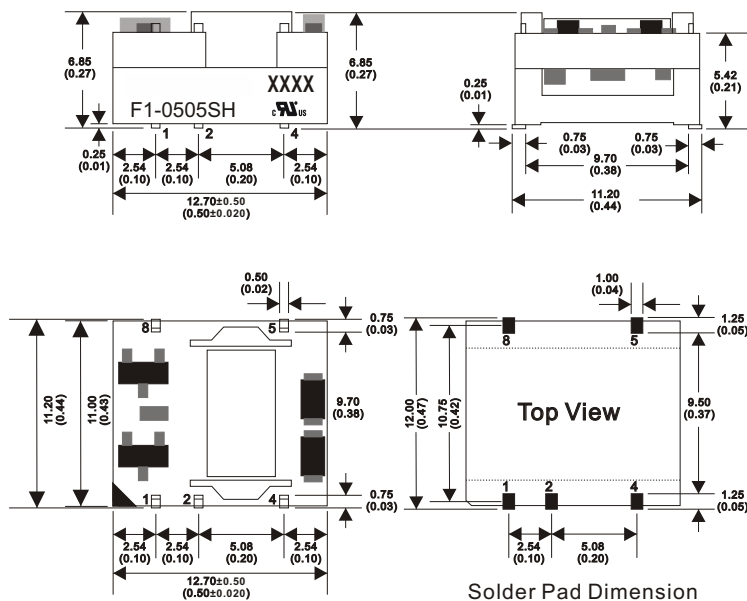
Input filter components ($C1, L$) are used to help meet conducted emissions requirement for the module. These components should be mounted as close as possible to the module; and all leads should be minimized to decrease radiated noise.



| C1 | L |
|-----------------------------------|-------------------|
| 1206, 22 $\mu\text{F}/10\text{V}$ | 6.8 μH |

F1 - 1W Unregulated Single & Dual output

MECHANICAL SPECIFICATIONS - Single Output Models

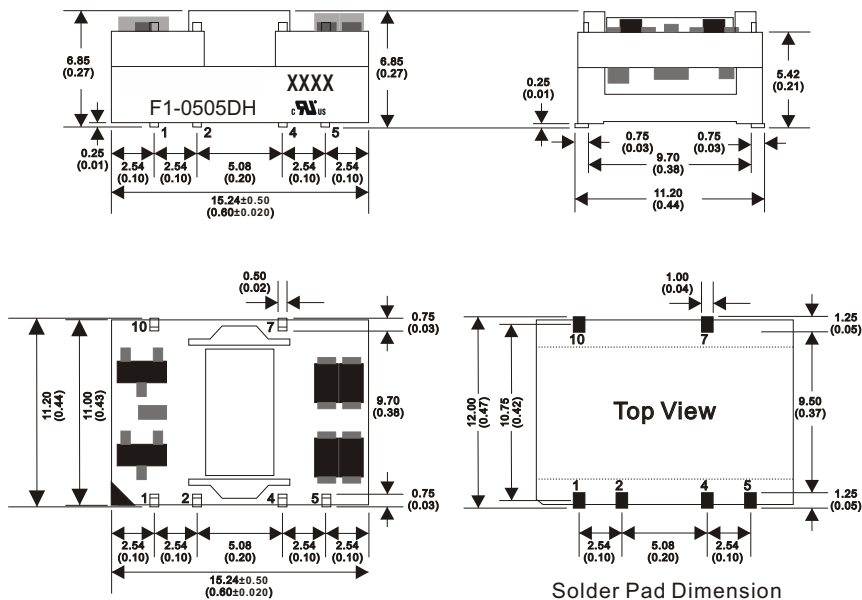


| PIN CONNECTIONS | |
|-----------------|------------|
| PIN NUMBER | SINGLE |
| 1 | - V Input |
| 2 | +V Input |
| 4 | - V Output |
| 5 | +V Output |
| 8 | N.C |

SMD 8Pin Package

Notes : All dimensions are typical in millimeters (inches).
 1. Not marked Tolerances: ± 0.25 (± 0.01)
 2. N.C = No Connection

MECHANICAL SPECIFICATIONS - Dual Output Models



| PIN CONNECTIONS | |
|-----------------|------------|
| PIN NUMBER | DUAL |
| 1 | - V Input |
| 2 | +V Input |
| 4 | Common |
| 5 | - V Output |
| 7 | +V Output |
| 10 | N.C |

SMD 10Pin Package

Notes : All dimensions are typical in millimeters (inches).
 1. Not marked Tolerances: ± 0.25 (± 0.01)
 2. N.C = No Connection