



FEATURES

- OUTPUT CURRENT UP TO 20A
- 4:1 WIDE INPUT VOLTAGE RANGE
- HIGH EFFICIENCY UP TO 90%
- NO MINIMUM LOAD
- SOFT-START
- ADJUSTABLE OUTPUT VOLTAGE
- UNDER-VOLTAGE LOCKOUT
- INPUT REVERSE PROTECTION
- INDUSTRY STANDARD HALF-BRICK FOOTPRINT
- SIX-SIDED CONTINUOUS SHIELD
- INPUT TO OUTPUT BASIC INSULATION
- BUS TERMINAL BLOCK OPTION

OPTIONS

- Positive logic remote ON/OFF
- Terminal block
- Terminal block with EMC Filter
- Pin length
- Heat-sink

DESCRIPTION

HAE75W-SERIES DC/DC converters provide up to 75 watts of output power in an industry standard half-brick package and footprint. All models feature a wide input range, adjustable output voltage.

APPLICATIONS

Wireless Network
Telecom/Datacom
Industry Control System
Distributed Power Architectures
Semiconductor Equipment

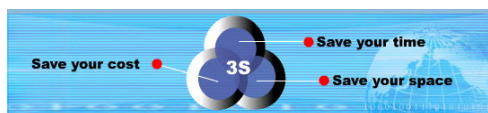
Standard

Terminal Block

TECHNICAL SPECIFICATION All specifications are typical at nominal input, full load and 25°C otherwise noted

OUTPUT SPECIFICATIONS			
Output power		75 Watts, max.	
Voltage accuracy	Full load and Vin, nom	±1%	
Voltage adjustability (Note 7)		+10%, -20%	
Minimum load		0%	
Line regulation	LL to HL at FL	See table	
Load regulation	No Load to Full Load	See table	
Remote sense (Note 8)		10% of Vout, nom	
Ripple and noise	20MHz bandwidth	See table	
Temperature coefficient		±0.02%/°C, max.	
Transient response recovery time	25% load step change	200µs	
Over voltage protection threshold	(Hiccup) 115% ~ 130% of Vout, nom		
Over current protection threshold	110% ~ 140% of Iout Rated		
Short circuit protection	Hiccup, automatic recovery		
INPUT SPECIFICATIONS			
Input voltage range	24V nominal input	9 – 36VDC	
	48V nominal input	18 – 75VDC	
Start-up voltage	24V nominal input	8.5VDC	
	48V nominal input	17.5VDC	
Shutdown voltage	24V nominal input	7.5VDC	
	48V nominal input	16VDC	
Input filter (Note 14)		Pi type	
Input surge voltage 100ms max	24V nominal input	50VDC	
	48V nominal input	100VDC	
Input reverse protection (Note 9)		Parallel diode	
Start up time	Vin, nom and constant resistive load	Power up	25mS, typ.
		Remote ON/OFF	25mS, typ.
Remote ON/OFF (Note 6) (Negative logic) (Standard)	DC-DC ON	Short or 0V < Vr < 1.2V	
	DC-DC OFF	Open or 3V < Vr < 12V	
	DC-DC ON	Open or 3V < Vr < 12V	
	DC-DC OFF	Short or 0V < Vr < 1.2V	
(Positive logic) (Option)	Vin(nom)	-0.5mA ~ 1mA	
	Remote off input current	3mA	

GENERAL SPECIFICATIONS			
Efficiency			See table
Isolation voltage	Input to Output (Basic insulation)		2250 VDC, min.
	Input (Output) to Case		1600 VDC, min.
Isolation resistance			10 ⁹ ohms, min.
Isolation capacitance			2500pF, max.
Switching frequency			300KHz, typ.
Design meet safety standard		IEC60950-1, UL60950-1, EN60950-1	
Case material			Metal
Base material			FR4 PCB
Potting material			Silicon (UL94-V0)
Dimensions			2.40 X 2.28 X 0.50 Inches (61.0×57.9×12.7 mm)
Weight			97g (3.42oz)
MTBF (Note 1)	BELLCORE TR-NWT-000332		1.010 x 10 ⁶ hrs
	MIL-HDBK-217F		7.416 x 10 ⁴ hrs
ENVIRONMENTAL SPECIFICATIONS			
Operating ambient temperature (Note10) (For 3,3,5,12,15Vout)	Without Heat-sink	-40°C ~ +35°C (without derating) +35°C ~ +84°C (with derating)	
	With Heat-sink (0.24" Height)	-40°C ~ +49°C (without derating) +49°C ~ +88°C (with derating)	
	Without Heat-sink	-40°C ~ +28°C (without derating) +28°C ~ +76°C (with derating)	
	With Heat-sink (0.24" Height)	-40°C ~ +43°C (without derating) +43°C ~ +82°C (with derating)	
Maximum case temperature			105°C
Over temperature protection			115°C
Storage temperature range			-55°C to +125°C
Thermal impedance (Note 11)	without Heat-sink		6.7°C/watt
	with 0.24" Height Heat-sink		5.4°C/watt
	with 0.45" Height Heat-sink		4.7°C/watt
Thermal shock			MIL-STD-810F
Vibration			MIL-STD-810F
Relative humidity			5% to 95% RH
EMC CHARACTERISTICS (Note 12)			
EMI	EN55022		Class A
ESD	EN61000-4-2	Air Contact	± 8KV Perf. Criteria A
			± 6KV Perf. Criteria A
Radiated immunity	EN61000-4-3	10 V/m	Perf. Criteria A
Fast transient	EN61000-4-4	± 2KV	Perf. Criteria A
Surge	EN61000-4-5	± 1KV	Perf. Criteria A
Conducted immunity	EN61000-4-6	10 Vr.m.s	Perf. Criteria A



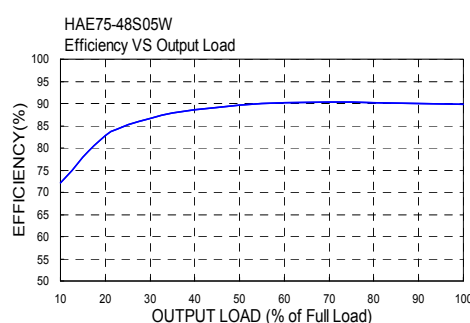
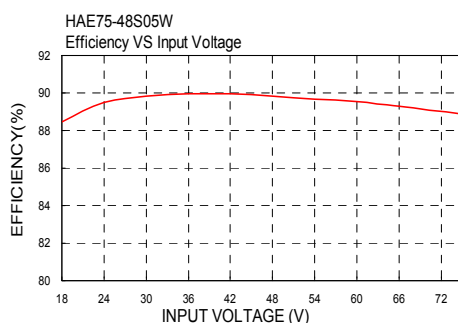
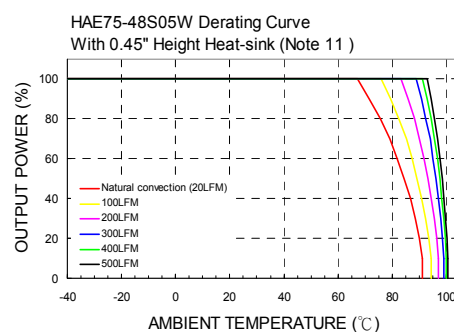
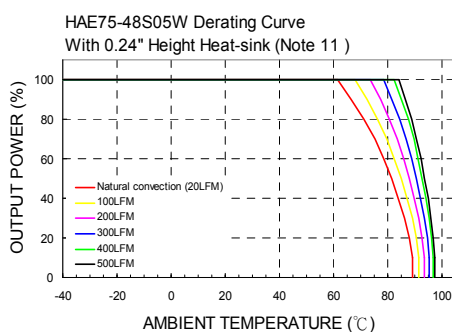
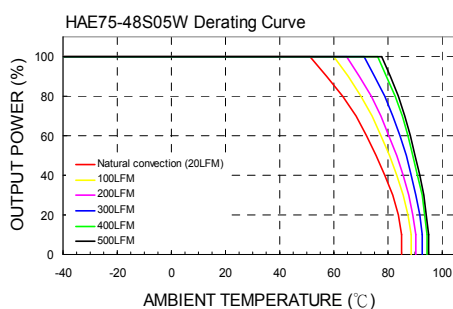


Model Number	Input Range	Output Voltage	Output Current		Line Regulation	Load Regulation	Output ^{(4) (5)} Ripple & Noise	Input Current		Eff ⁽⁴⁾ (%)
			Min. load	Full load				No Load ⁽³⁾	Full Load ⁽²⁾	
HAE75-24S3P3W	9 – 36 VDC	3.3 VDC	0mA	20 A	7mV	10mV	75mVp-p	100mA	3.216 A	87
HAE75-24S05W	9 – 36 VDC	5 VDC	0mA	15 A	10mV	15mV	75mVp-p	185mA	3.613 A	88
HAE75-24S12W	9 – 36 VDC	12 VDC	0mA	6.3 A	24mV	30mV	100mVp-p	185mA	3.642 A	88
HAE75-24S15W	9 – 36 VDC	15 VDC	0mA	5 A	30mV	38mV	100mVp-p	185mA	3.613 A	88
HAE75-24S24W	9 – 36 VDC	24 VDC	0mA	3.2 A	48mV	48mV	200mVp-p	85mA	3.743 A	87
HAE75-24S28W	9 – 36 VDC	28 VDC	0mA	2.7 A	56mV	56mV	200mVp-p	85mA	3.684 A	87
HAE75-24S48W	9 – 36 VDC	48 VDC	0mA	1.6 A	96mV	72mV	300mVp-p	85mA	3.743 A	87
HAE75-48S3P3W	18 – 75 VDC	3.3 VDC	0mA	20 A	7mV	10mV	75mVp-p	80mA	1.590 A	88
HAE75-48S05W	18 – 75 VDC	5 VDC	0mA	15 A	10mV	15mV	75mVp-p	90mA	1.766 A	90
HAE75-48S12W	18 – 75 VDC	12 VDC	0mA	6.3 A	24mV	30mV	100mVp-p	90mA	1.780 A	90
HAE75-48S15W	18 – 75 VDC	15 VDC	0mA	5 A	30mV	38mV	100mVp-p	90mA	1.786 A	89
HAE75-48S24W	18 – 75 VDC	24 VDC	0mA	3.2 A	48mV	48mV	200mVp-p	50mA	1.850 A	88
HAE75-48S28W	18 – 75 VDC	28 VDC	0mA	2.7 A	56mV	56mV	200mVp-p	50mA	1.821 A	88
HAE75-48S48W	18 – 75 VDC	48 VDC	0mA	1.6 A	96mV	72mV	300mVp-p	50mA	1.871 A	87

Note

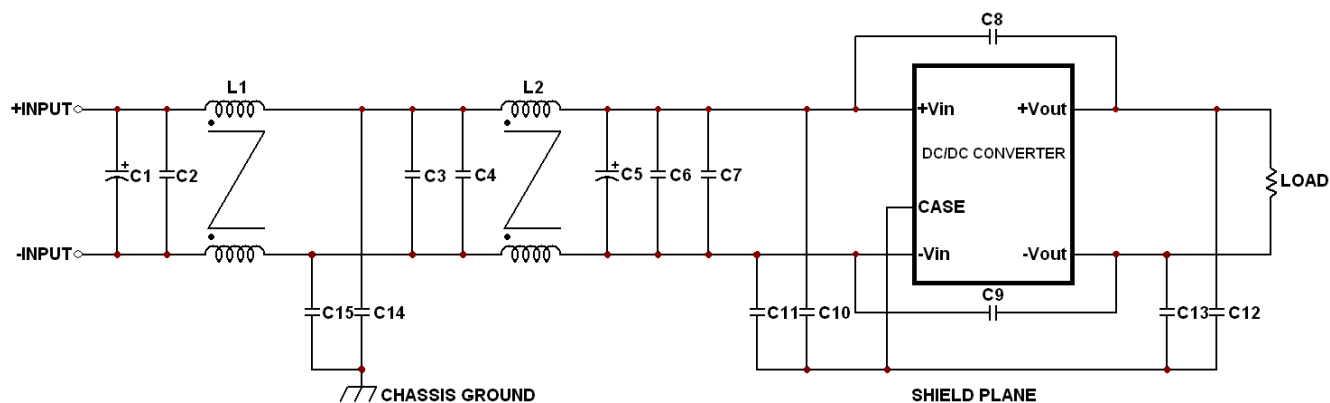
- BELLCORE TR-NWT-000332. Case 1: 50% Stress, Temperature at 40°C.
MIL-HDBK-217F Notice2 @Ta=25°C, Full load(Ground, Benign, controlled environment).
- Maximum value at nominal input voltage and full load.
- Typical value at nominal input voltage and no load.
- Typical value at nominal input voltage and full load.
- The ripple and noise of output voltage 48V is measured with a 2.2μF/100V X7R MLCC;
The ripple and noise of other output voltage is measured with a 4.7μF/50V X7R MLCC.
- The remote ON/OFF control pin voltage is referenced to -Vin. The positive logic and pin length are optional.
To order positive logic ON-OFF control add the suffix -P (Ex: HAE75-48S05W-P).
- Output voltage is adjustable for 10% trim up or -20% trim down of nominal output voltage by connecting a single resistor between TRIM and +SENSE pins for trim up or between TRIM and -SENSE pins for trim down. To calculate the value of the resistor Ru and Rd for a particular output voltage uses the following equation:
$$R_U = \left(\frac{V_{OUT}(100 + \Delta\%) - (100 + 2\Delta\%)}{1.225\Delta\%} \right) K\Omega$$

$$R_D = \left(\frac{100}{\Delta\%} - 2 \right) K\Omega$$
- Maximum output deviation is +10% inclusive of remote sense. If remote sense is not being used, the +SENSE should be connected to its corresponding +OUTPUT and likewise the -SENSE should be connected to its corresponding -OUTPUT.
- Internal fusing is not included, so we suggest to use an input line fuse.
- Test condition with vertical direction by natural convection (20LFM).
- Heat sink is optional and P/N: 7G-0021A-F, 7G-0022A-F, 7G-0023A-F, 7G-0024A-F.
- The HAE75W series meets EMC characteristics only with external components connected before the input pin to the converter. If customer only need to meet EN61000-4-4 and EN61000-4-5, an external input filter capacitor is required
The filter capacitor Power Mate suggest: Nippon chemi-con KY series, 220μF /100V, ESR 48mΩ.
- CASE GROUNDING : When you connect the case pin and the four screw bolts to shield plane, the EMI could be better reduced.
- An external input capacitor is recommended for 24Vin model. Power Mate suggest: 4.7μF/50V X7R MLCC or Nippon chemi-con KY series, 68μF /100V, ESR 110mΩ or better capacitor. For terminal block version, the capacitor has included in as standard, it isn't required external capacitor.





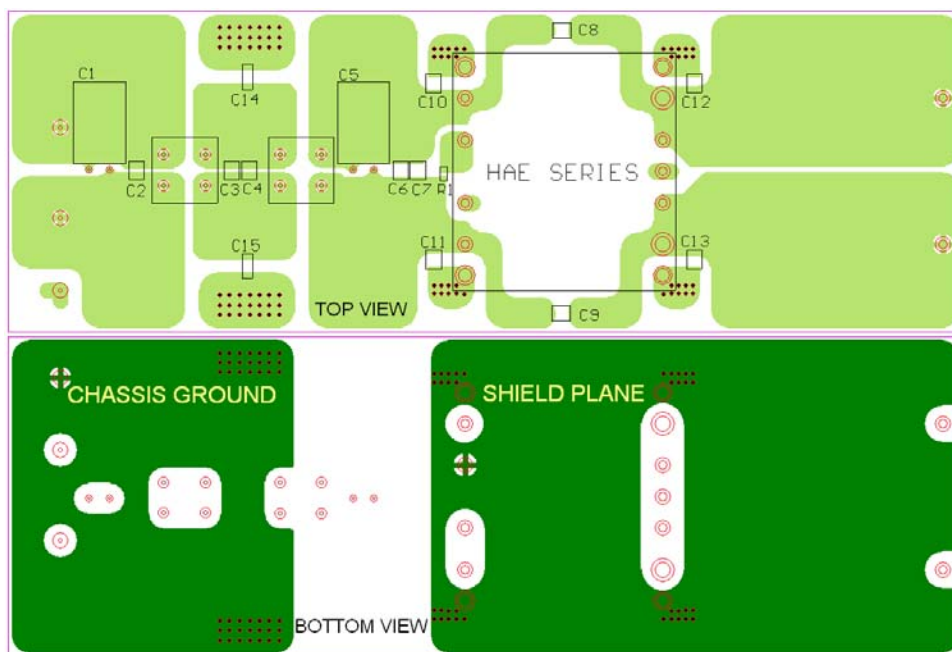
EMI Filter For EN55022 Class B Recommendation



Recommended Filter for EN55022 Class B Compliance

The components used in the above figure, together with the manufacturers' part numbers for these components, are as follows:

	C1,C5	C2,C3,C4,C6,C7	C8	C9	C10,C11,C12,C13	C14,C15	L1	L2
HAE75-24SXXW	100 μ F/50V	4.7 μ F/50V 1812 MLCC	1000pF/3KV 1808 MLCC	1000pF/3KV 1808 MLCC	10nF/2KV 1812 MLCC	1000pF/3KV 1808 MLCC	Common Choke PMT-073 305 μ H	Common Choke PMT-073 305 μ H
HAE75-48SXXW	100 μ F/100V	2.2 μ F/100V 1812 MLCC	1000pF/3KV 1808 MLCC	4700pF/3KV 1812 MLCC	10nF/2KV 1812 MLCC	1000pF/3KV 1808 MLCC	Common Choke PMT-064 1400 μ H	Common Choke PMT-072 156 μ H

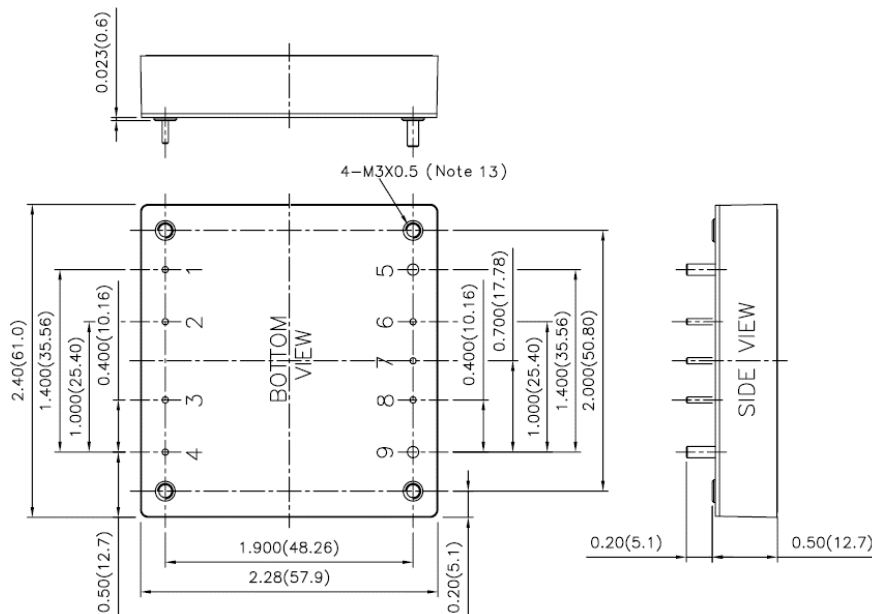


Recommended EN55022 Class B Filter Circuit Layout





Mechanical Drawing



1. Pin 1,2,3,4,6,7,8. DIA. 0.040 (1.02mm)
Pin 5,9. DIA. 0.080 (2.03mm)
2. All dimensions in inches (mm)
3. Tolerance :x.xx±0.02 (x.x±0.5)
x.xxx±0.01 (x.xx±0.25)
4. Pin pitch tolerance ±0.01 (0.25)
5. Pin dimension tolerance ±0.004(0.1)

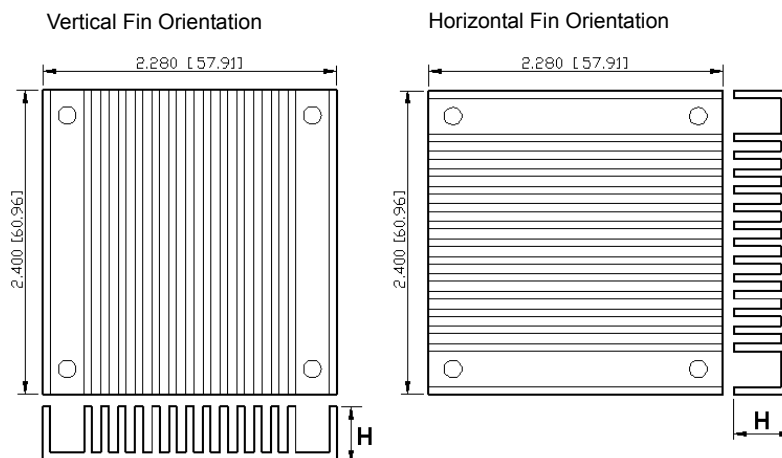
PIN CONNECTION		
PIN	Define	Diameter
1	- INPUT	0.04 Inches
2	CASE	0.04 Inches
3	CTRL	0.04 Inches
4	+ INPUT	0.04 Inches
5	- OUTPUT	0.08 Inches
6	- SENSE	0.04 Inches
7	TRIM	0.04 Inches
8	+ SENSE	0.04 Inches
9	+ OUTPUT	0.08 Inches

EXTERNAL OUTPUT TRIMMING	
Output can be externally trimmed by using the method shown below.	
TRIM UP 7 8	TRIM DOWN 6 7

Product Option

Product option			Product option		
Negative remote ON/OFF logic	0.20" pin length	-	Heat-sink	H= 0.24" Vertical	7G-0023A-F - HS2
	0.145" pin length	- L		H= 0.45" Vertical	7G-0021A-F - HS
	0.11" pin length	- K		H= 0.24" Horizontal	7G-0022A-F - HS1
Positive remote ON/OFF logic	0.20" pin length	- P	Terminal Block	H= 0.45" Horizontal	7G-0024A-F - HS3
	0.145" pin length	- S		Without EMC filter	- T
	0.11" pin length	- M		With EMC filter	- TF

Heat-Sink Type (Suffix-HS)

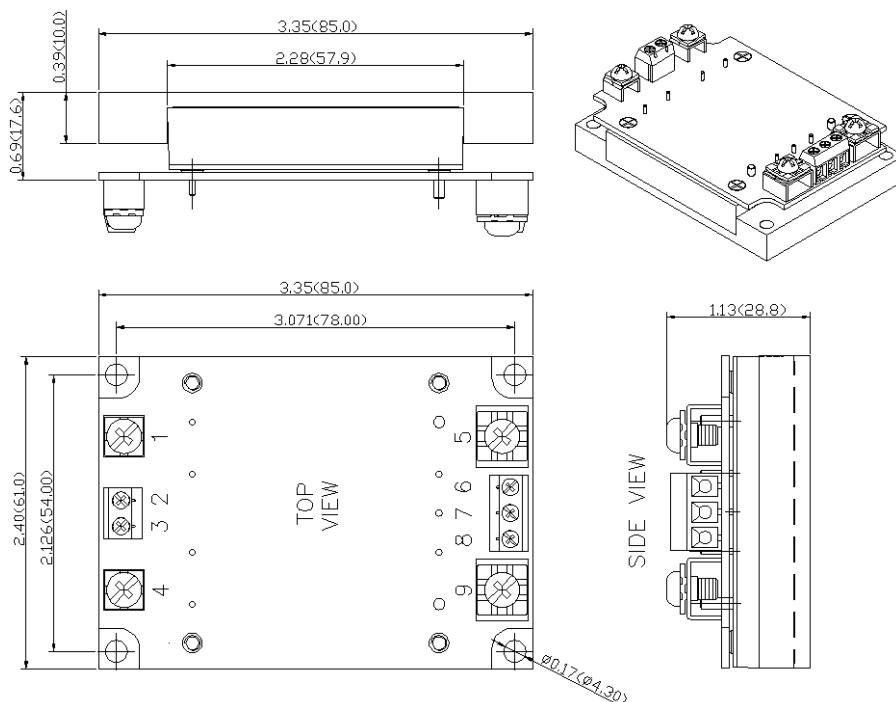


Terminal Block Type

Note : Terminal Block without EMC Filter (Suffix-T) and Terminal Block with EMC Filter (Suffix-TF)

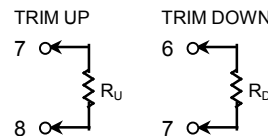
The terminal block type of HAE75W can meet the EMC characteristics with an EMC filter. Followings are the mechanical drawings for reference. Pin assignments are same as standard type.

1) Terminal Block without EMC Filter (Suffix-T)



EXTERNAL OUTPUT TRIMMING

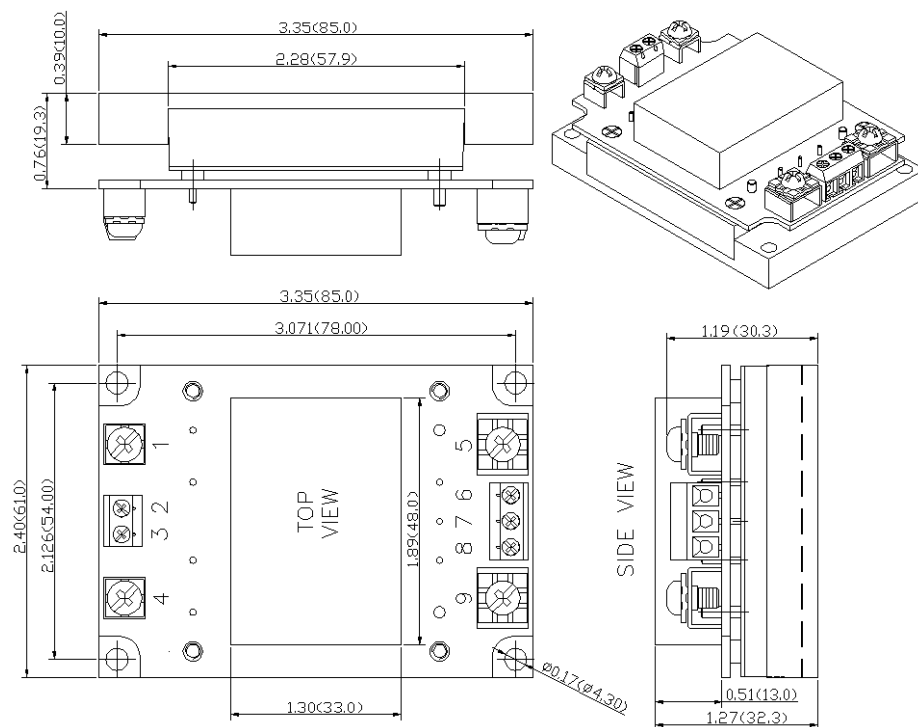
Output can be externally trimmed by using the method shown below.



TERMINAL CONNECTION

Terminal	Define	wire range
1	- INPUT	14 AWG to 16 AWG
2	CASE	14 AWG to 18 AWG
3	CTRL	14 AWG to 18 AWG
4	+ INPUT	14 AWG to 16 AWG
5	- OUTPUT	10 AWG to 12 AWG
6	- SENSE	14 AWG to 18 AWG
7	TRIM	14 AWG to 18 AWG
8	+ SENSE	14 AWG to 18 AWG
9	+ OUTPUT	10 AWG to 12 AWG

2) Terminal Block with EMC Filter (Suffix-TF)



All dimensions : inches (mm)
Tolerance : x.xx±0.02 (x.x±0.5)
x.xxx±0.01 (x.xx±0.25)