AEE (15W) Isolated DC/DC Converter Module
Industry Standard Size, 2" x 1" x 0.44"
9-36V/18-75V Inputs, 3.3V/5V/±5V/12V/±12V/15V/±15V Outputs

The AEE (15W) Isolated DC/DC Converter is Astec's 4:1 wide input voltage family for low power applications. With efficiency up to 83% typical for 5V module, this product is allowed to work at operating temperature range from -40ºC to 71ºC and a wide input voltage range of 4:1. Single-output models are available for a wide range of applications in telecommunication, transportation equipment, etc.. Housed in small package, 2" x 1" x 0.44" , with industry standard pinout, AEE family eases the PCB designs and mechanical designs of customers' end products.

Industry Standard Size
2" ×1" × 0.44"

Special Features

- **Wide 4:1 input range**
- **High efficiency, 83%@5V**
- **-40°C to 90°C case surface operating temperature**
- **Input / Output isolation 1.5KVdc**
- **Low output ripple and noise**
- **Shielded metal case with size (2"x1"x0.44")**
- **Industrial standard pinout**
- **Lead-free soldering pins**
- **Fixed switching frequency (300KHz)**

Electrical Parameters

Input

Input range	**9-36 VDC; 18-75 VDC**
Efficiency	**83%@ 5V (Typical)**

Output

Regulation (Line, Load, Temp)	**<1%**
Ripple and noise	**2% typical (100mV p-p max@ 5V)**
Transient Response	**6% max deviation with 50% load to full load 300uS (max) recovery**
Short Circuit Protection	**Indefinite**

Safety

Designed to meet EN60950 (up to SELV limit)

Environmental Specifications

- **Operating temperature: -40°C to +71°C**
- **Storage temperature: -55°C to +105°C**
- **MTBF: >700K hours**
- **ROHS Compliant**

RoHS 2002/95/EC

AEE (15W) SERIES

THIS SPECIFICATION COVERS THE REQUIREMENTS
FOR AN INDUSTRY STANDARD PACKAGE OF 2”x1”x0.44”, 4:1 INPUT RANGE,
15W, SINGLE OUTPUT AND DUAL OUTPUT ISOLATED DC/DC CONVERTER

PART NUMBERS

MODEL NAME / SIS CODE	Nominal Vin / Range of Vin	Vout / Iout
AEE04F18-L	**24V / 9-36V**	**3.3V / 4A**
AEE03A18-L	**24V / 9-36V**	**5V / 3A**
AEE01AA18-L	**24V / 9-36V**	**±5V / ±1.5A**
AEE01B18-L	**24V / 9-36V**	**12V / 1.25A**
AEE00BB18-L	**24V / 9-36V**	**±12V / ±0.625A**
AEE01C18-L	**24V / 9-36V**	**15V / 1A**
AEE00CC18-L	**24V / 9-36V**	**±15V / ±0.5A**
AEE04F36-L	**48V /18-75V**	**3.3V / 4A**
AEE03A36-L	**48V /18-75V**	**5V / 3A**
AEE01AA36-L	**48V /18-75V**	**±5V / ±1.5A**
AEE01B36-L	**48V / 18-75V**	**12V / 1.25A**
AEE00BB36-L	**48V /18-75V**	**±12V / ±0.625A**
AEE01C36-L	**48V / 18-75V**	**15V / 1A**
AEE00CC36-L	**48V /18-75V**	**±15V / ±0.5A**

ELECTRICAL SPECIFICATIONS

Unless otherwise indicated, specifications apply over all operating input voltage and temperature conditions. Standard test condition on a single unit.

Tambient :	25°C
+Vin :	24V ±2% (AEExxxx18-L)
	48V ±2% (AEExxxx36-L)
–Vin :	return pin for +Vin
+Vout :	connect to load
–Vout :	connect to load (return)

ABSOLUTE MAXIMUM RATINGS

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of the IPS. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

Parameter	Device	Symbol	Min	Typ	Max	Unit
a) Input Voltage:						
Continuous:	AEExxx18-L	V_I	0	-	36	Vdc
Transient (100ms)	AEExxx18-L	$V_{I, trans}$	0	-	44	Vdc
Continuous:	AEExxx36-L	V_I	0	-	75	Vdc
Transient (100ms)	AEExxx36-L	$V_{I, trans}$	0	-	88	Vdc
b) Operating Temperature						
Ambient	All	Ta	-40	-	71	ºC
Case Surface		Tc	-40	-	100	ºC
c) Storage Temperature	All	T_{STG}	-55	-	105	ºC
d) Operating Humidity	All	-	-	-	95	%
e) I/O Isolation (Conditions : 0.5mA for 60 sec)						
Input-Output	All	-	-	-	1500	Vdc
f) Output Power	3.3V	Po,max	-	-	13.2	W
	Others	Po,max	-	-	15	W

INPUT SPECIFICATIONS

Parameter	Device	Symbol	Min	Typ	Max	Unit
a) Operating Input Voltage	AEExxx18-L	V_I	9	24	36	V_{DC}
	AEExxx36-L	V_I	18	48	75	V_{DC}
b) Maximum Input Current	3.3V	$I_{I,max}$	-	-	2.9	A
AEExxxx18-L	5V / ±5V	$I_{I,max}$	-	-	2.9	A
(V_I = 0 to $V_{I,max}$: Io = Io,max)	12V / ±12V	$I_{I,max}$	-	-	2.6	A
	15V / ±15V	$I_{I,max}$	-	-	2.6	A
AEExxxx36-L	3.3V	$I_{I,max}$	-	-	1.5	A
(V_I = 0 to $V_{I,max}$: Io = Io,max)	5V / ±5V	$I_{I,max}$	-	-	1.5	A
	12V / ±12V	$I_{I,max}$	-	-	1.3	A
	15V / ±15V	$I_{I,max}$	-	-	1.3	A
c) No Load Input Power (V_I = $V_{I,nom}$)	All	-	-	-	0.5	W
d) External Fuse Ratings	3.3V		-	4	-	A
AEExxxx18-L	5V		-	4	-	A
	12V		-	3	-	A
	15V		-	3	-	A
AEExxxx36-L	3.3V		-	2	-	A
	5V		-	2	-	A
	12V		-	2	-	A
	15V		-	2	-	A

CAUTION: This power module is not internally fused. An input fuse must always be used.

OUTPUT SPECIFICATIONS

Parameter	Device	Symbol	Min	Typ	Max	Unit
a) Output Voltage Setpoint	3.3V	$V_{o,set}$	3.23	3.30	3.37	V_{dc}
($V_I = V_{I,min}$ to $V_{I,max}$: Io = $I_{o,,max}$; T_A	5V	$V_{o,set}$	4.90	5.00	5.10	V_{dc}
= 25 ºC)	12V	$V_{o,set}$	11.76	12.00	12.24	V_{dc}
	15V	$V_{o,set}$	14.70	15.00	15.30	V_{dc}
	±5V	$V_{o,set}$	±4.90	±5.00	±5.10	V_{dc}
	±12V	$V_{o,set}$	±11.76	±12.00	±12.24	V_{dc}
	±15V	$V_{o,set}$	±14.70	±15.00	±15.30	V_{dc}
b) Output Regulation:						
Line ($V_I = V_{I,max}$ to$V_{I,min}$; Io = $I_{o,,max}$)	All	-	-	-	0.5	%
Load ($V_I = V_{I,,nom}$; Io = $I_{o,min}$ to $I_{o,max}$)	All	-	-	-	1	%
Cross ($V_I = V_{I,,nom}$; Io = +$I_{o,max,}$ -$I_{o,min}$ or +$I_{o,min,}$ -$I_{o,max}$ to +$I_{o,max,}$ -$I_{o,max}$)	±5V/±12V/ ±15V	-	-	-	4	%
Temperature (Tc = -40ºC to +90ºC)	All	-	-	-	1	%Vo
c) Output Ripple and Noise	3.3V	-	-	-	100	mVp-p
(Across 1µF @50V, X7R ceramic capacitor &	5V / ±5V	-	-	-	100	mVp-p
10µF @25V tantalum capacitor)	12V /	-	-	-	120	mVp-p
See Figure 1.	±12V	-	-	-	120	mVp-p
Peak-to-Peak (5 Hz to 20 MHz)	15V / ±15V					
d) Rated Output Current	3.3V	Io	400	-	4000	mA
Single Output	5V	Io	300	-	3000	mA
	12V	Io	125	-	1250	mA
	15V	Io	100	-	1000	mA
Dual Output	±5V	Io	±150	-	±1500	mA
	±12V	Io	±63	-	±625	mA
	±15V	Io	±50	-	±500	mA
e) Efficiency						
($V_I = V_{I,nom}$; $I_{o,max}$; T_A = 25°C)	3.3V	-	-	80	-	%
	5V	-	-	83	-	%
	12V	-	-	84	-	%
	15V	-	-	84	-	%
	±5V	-	-	82	-	%
	±12V	-	-	83	-	%
	±15V	-	-	84	-	%
f) Switching Frequency	All	-	270	300	330	KHz

OUTPUT SPECIFICATIONS (Cont.)

Parameter	Device (Series)	Symbol	Min	Typ	Max	Unit
g) Dynamic Response : (ΔIo/Δt = 0.08A/µs ; $V_I = V_{I,,nom}$; T_A = 25°C)						
Load Change from Io = 50% to 100% of Io,max :	3.3V/5V/±5V	-	-	-	6	%Vo
Peak Deviation Settling Time (to $V_{o,nom}$)	12V/±12V/ 15V/±15V	-	-	-	2	%Vo
	All	-	-	-	300	µSec
Turn-On Time (Io = Io,max ; Vo within 1%)	All	-	-	5	10	msec
i) Output Voltage Overshoot (Io = Io,max ; T_A = 25°C)	All	-	-	1	4	%Vo

FEATURE SPECIFICATIONS

Parameter	Device (Series)	Symbol	Min	Typ	Max	Unit
Undervoltage Lockout						
Turn-on Point	AEExxx18-L	-	-	8.6	9	V
	AEExxx36-L	-	-	16	18	V
Turn-off Point	AEExxx18-L	-	6.5	7.8	-	V
	AEExxx36-L	-	12.5	14	-	V
Isolation Capacitance	All	-	-	1000	-	PF
Isolation Resistance	All	-	10	-	-	MΩ
Calculated MTBF (Io = Io,max ; T_A = 25°C)	All	-	700K	-	-	Hours
Weight	All	-	-	-	40	g

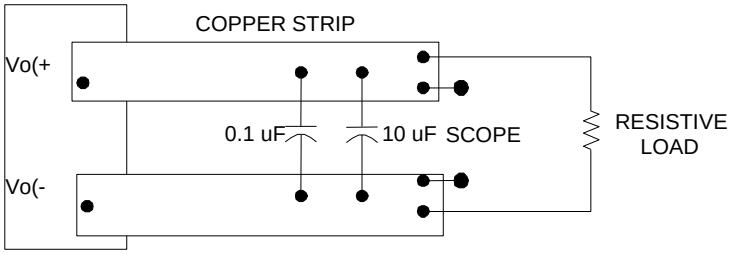
Basic Operation and Features

The AEE converters were designed specifically to address applications where high power density is required.
These modules provide 1500V isolation and operate from the input ranges of 9V-36V and 18V-75V with standard features such as short circuit protection.

Output Current Protection

To provide protection in a short circuit condition, the converter is equipped with current limiting circuitry and can endure the fault condition for an unlimited duration. At the point of current-limit inception, the converter goes into “Hiccup Mode”, causing the output current to be limited both in peak and duration. The converter operates normally once the output current is brought back into its specified range.

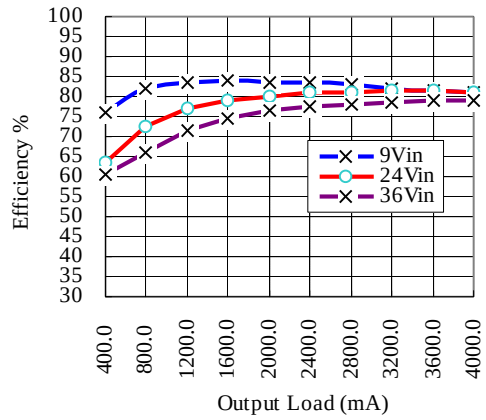
TEST SETUP



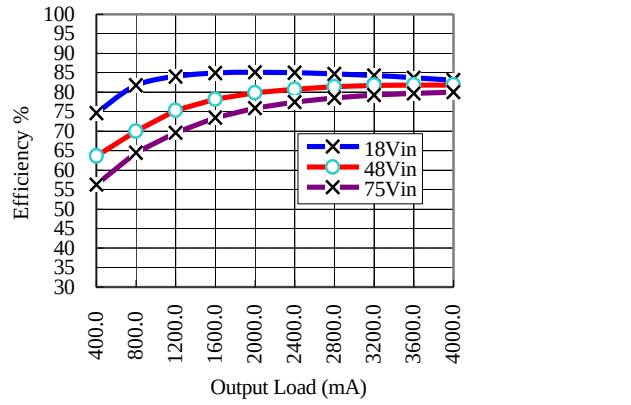
Note: Use a 0.1µF @50V X7R ceramic capacitor and a 10µF @ 25V tantalum capacitor. Scope measurement should be made using a BNC socket. Position the load between 51 mm and 76 mm (2 in. and 3 in.) from module.

Figure 1 : Peak-to-Peak Output Noise Measurement Test Setup.

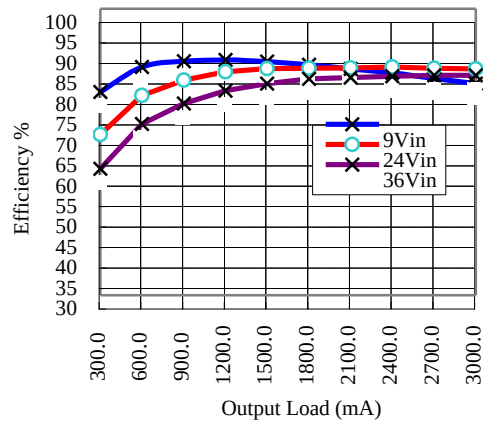
Performance Curves – Efficiency Curve



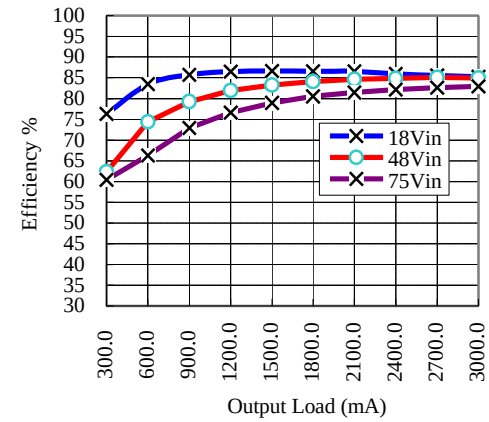
Efficiency vs. Load @ +25° Ambient, AEE04F18-L



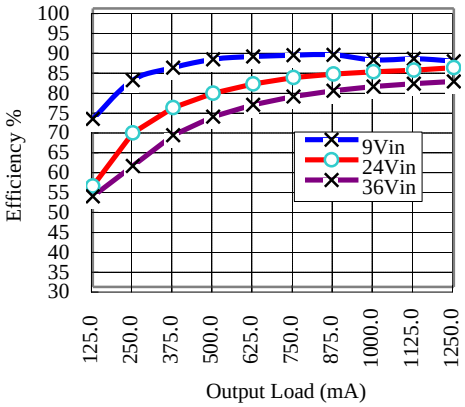
Efficiency vs. Load @ +25° Ambient, AEE04F36-L



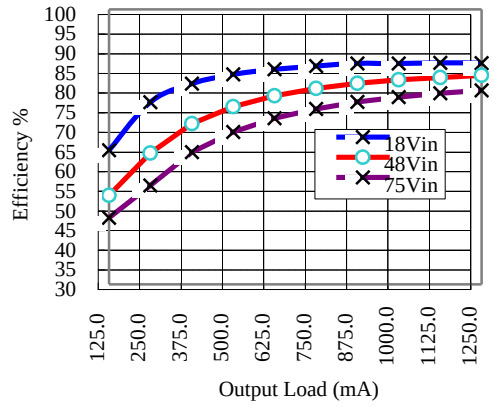
Efficiency vs. Load @ +25° Ambient, AEE03A18-L



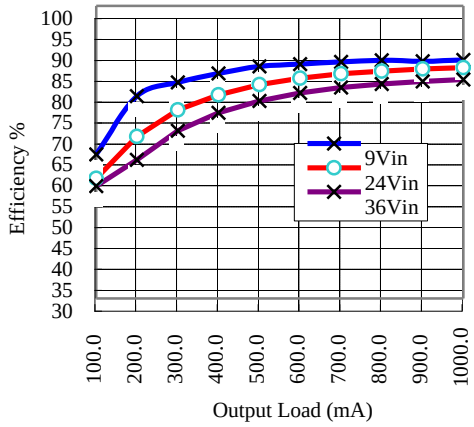
Efficiency vs. Load @ +25° Ambient, AEE03A36-L



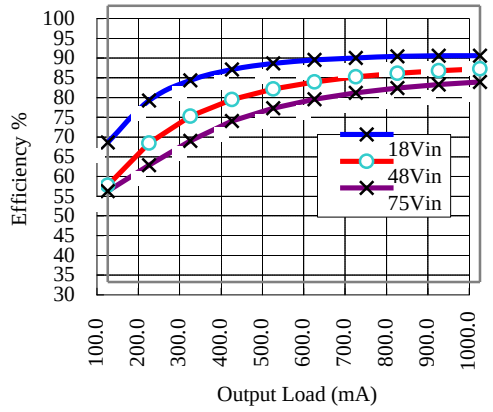
Efficiency vs. Load @ +25° Ambient, AEE01B18-L



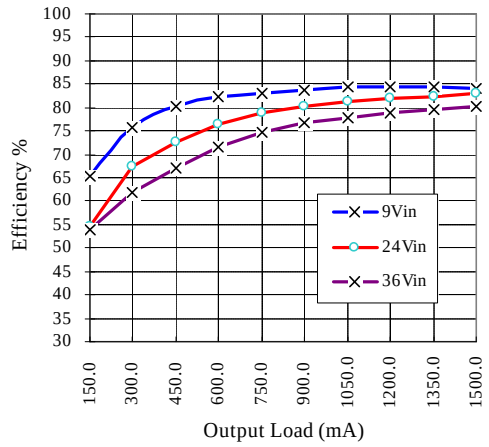
Efficiency vs. Load @ +25° Ambient, AEE01B36-L



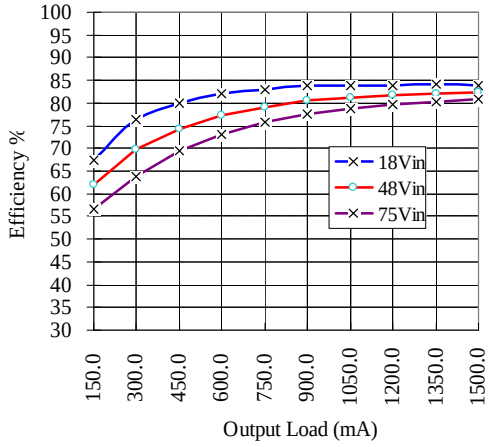
Efficiency vs. Load @ +25° Ambient, AEE01C18-L



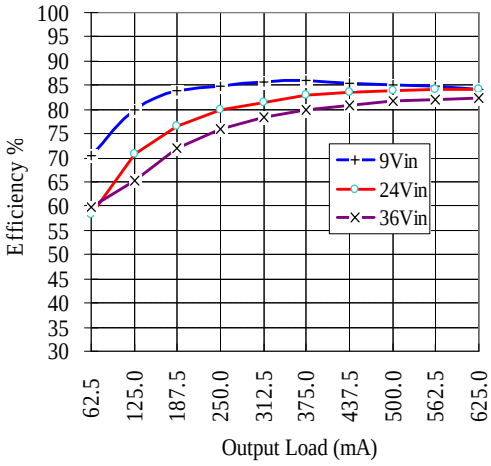
Efficiency vs. Load @ +25° Ambient, AEE01C36-L



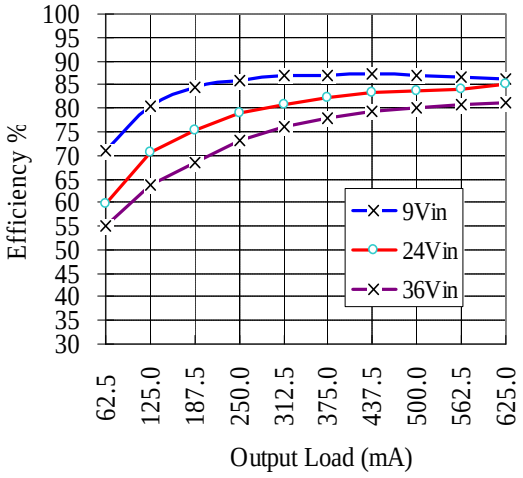
Efficiency vs. Load @ +25° Ambient, AEE01AA18-L



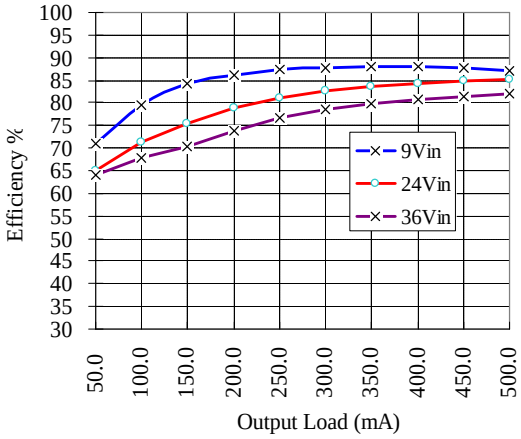
Efficiency vs. Load @ +25° Ambient, AEE01AA36-L



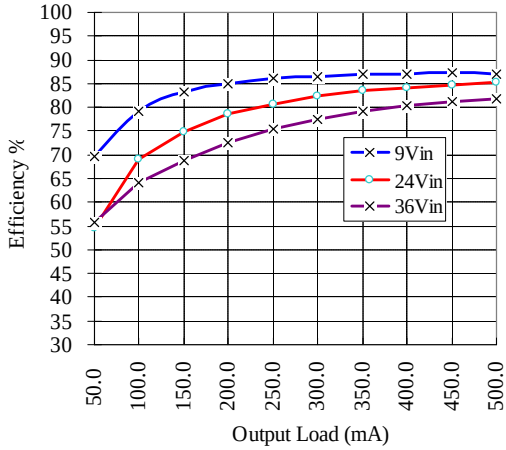
Efficiency vs. Load @ +25° Ambient, AEE00BB18-L



Efficiency vs. Load @ +25° Ambient, AEE00BB-L

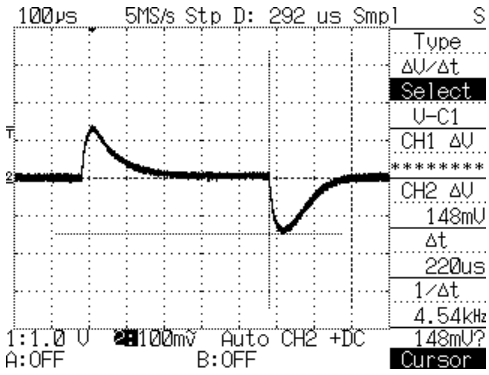


Efficiency vs. Load @ +25° Ambient, AEE00CC18-L

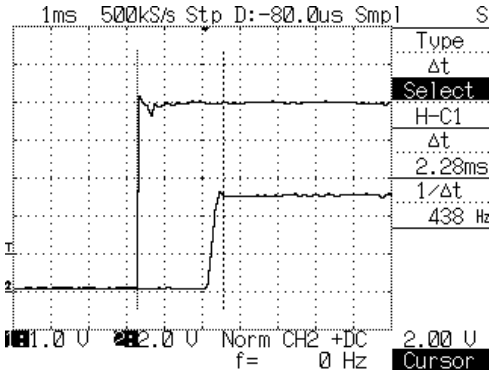


Efficiency vs. Load @ +25° Ambient, AEE00CC36-L

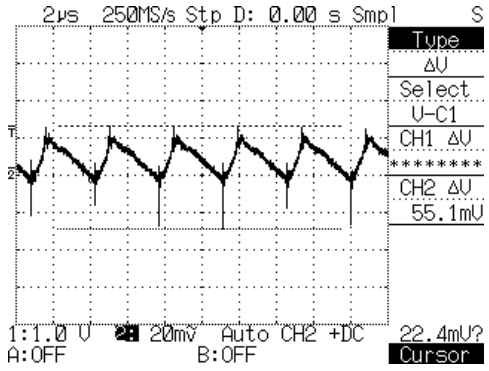
Performance Curves



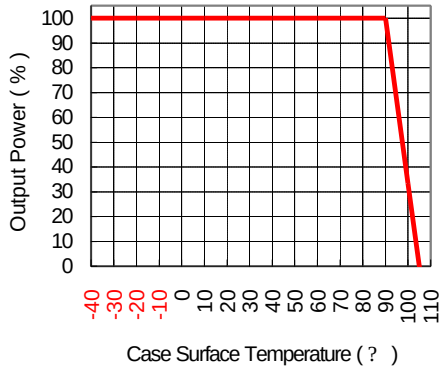
Transient Response – 50% to 100% load (AEE03A36-L)



Start-Up Time (AEE03A36-L)



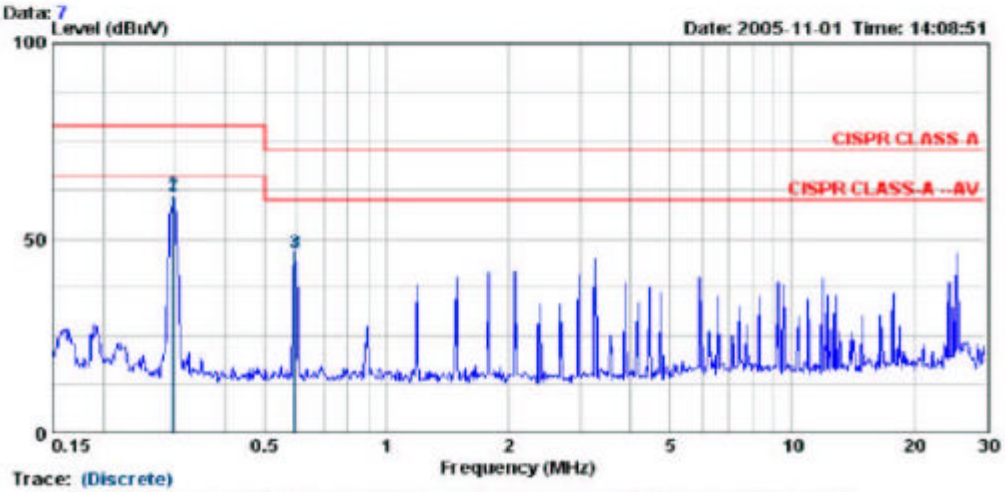
Ripple & Noise (AEE03A36-L)



Power Derating

Conducted EMI Performance

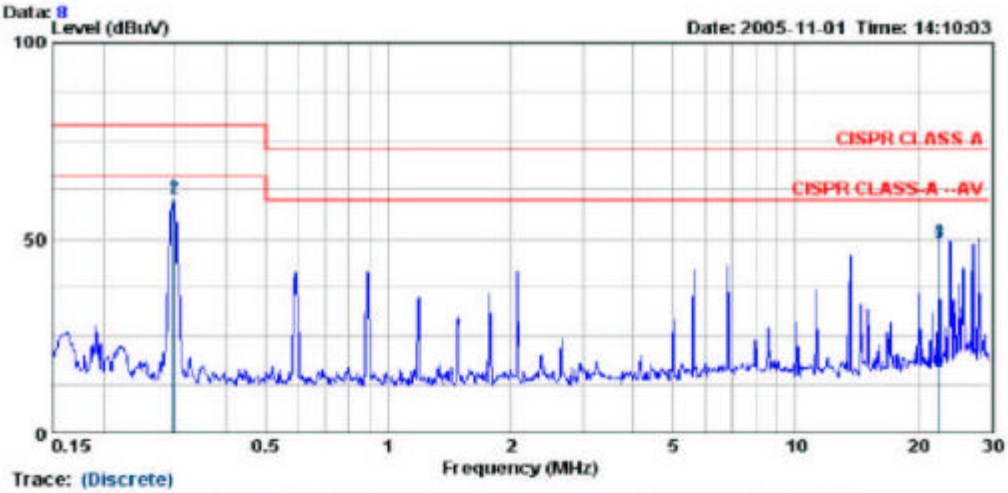
EUT : CONVERTER Test voltage : 48Vdc
M/N : AEE03A36 Test mode : FULL LOAD
POL : LINE Engineer : TEMP. : Humidity :



Trace: (Discrete)

Freq. MHz	LISN Factor dB	Cable Loss dB	Meter Reading dBuV	Measured Level dBuV	Limits dBuV	Over Limits dBuV	Detector
0.30	9.86	0.05	50.74	60.65	79.00	-18.35	QP
0.30	9.86	0.05	51.19	61.10	66.00	-4.90	AVERAGE
0.59	9.90	0.05	36.74	46.69	60.00	-13.31	AVERAGE
0.59	9.90	0.05	36.24	46.19	73.00	-26.81	QP

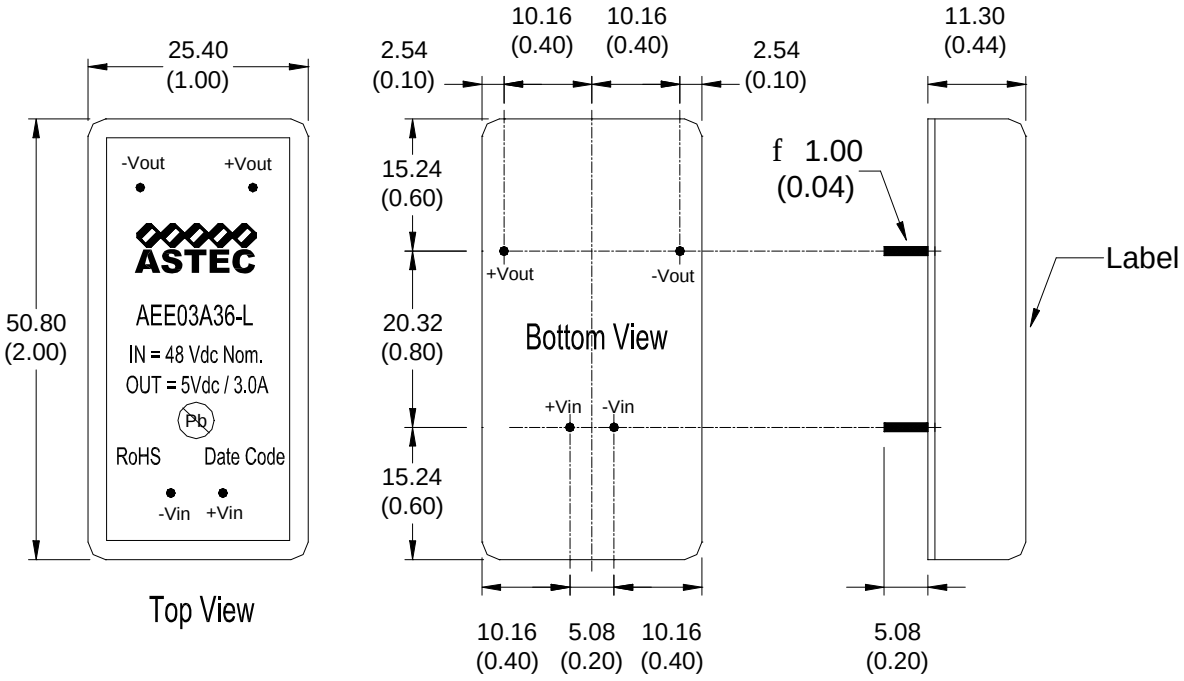
EUT : CONVERTER Test voltage : 48Vdc
M/N : AEE03A36 Test mode : FULL LOAD
POL : NEUTRAL Engineer : TEMP. : Humidity :



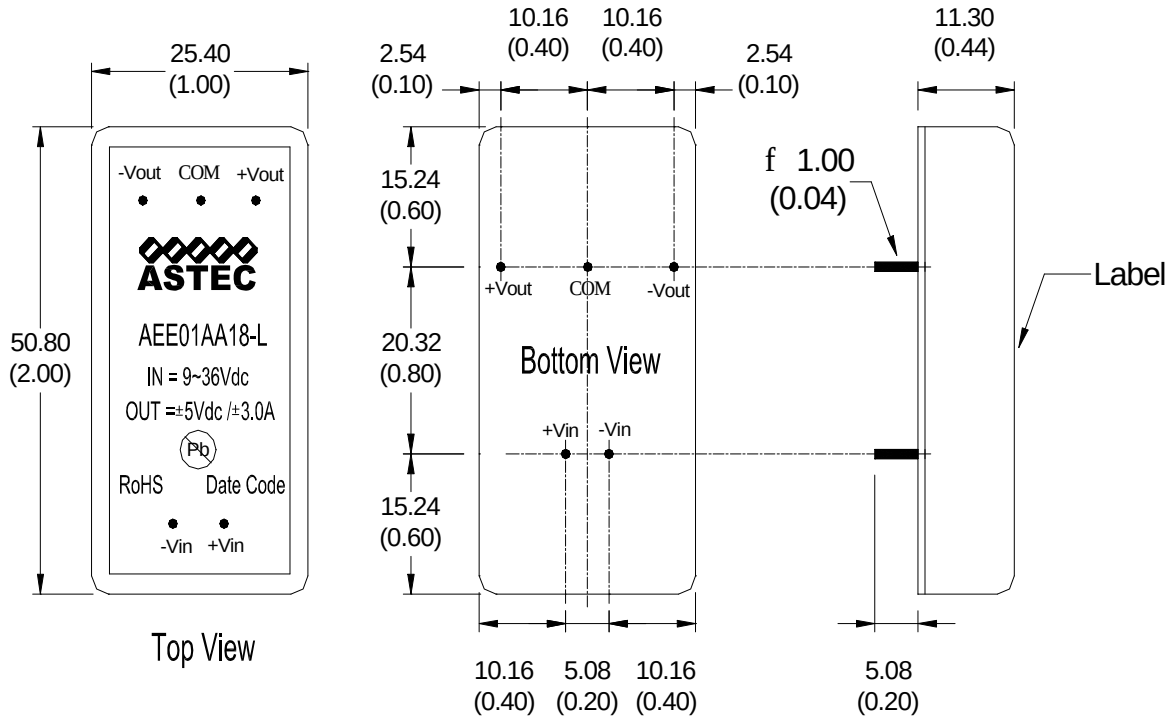
Trace: (Discrete)

Freq. MHz	LISN Factor dB	Cable Loss dB	Meter Reading dBuV	Measured Level dBuV	Limits dBuV	Over Limits dBuV	Detector
0.30	9.86	0.05	50.09	60.00	79.00	-19.00	QP
0.30	9.86	0.05	50.48	60.39	66.00	-5.61	AVERAGE
22.50	10.00	0.51	38.67	49.18	73.00	-23.82	QP
22.51	10.00	0.51	39.10	49.61	60.00	-10.39	AVERAGE

Mechanical Dimensions and Module Pin Assignment



Outline Drawing for AEE Single Series

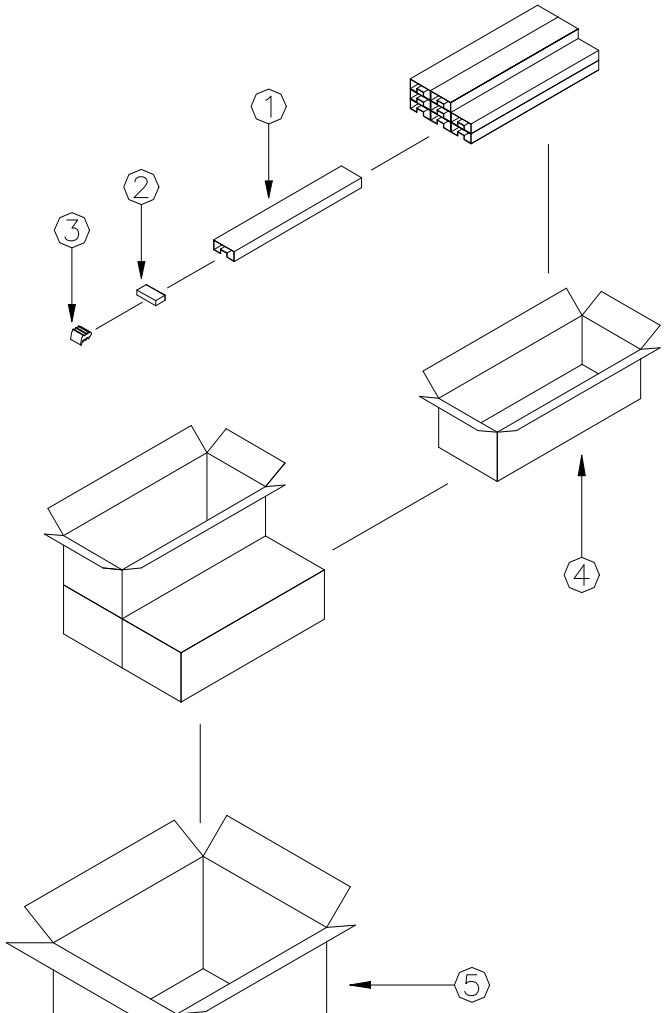


Outline Drawing for AEE Dual Series

Package Information

REV	REF	DESCRIPTION	AUTH	DATE

1. PACKING TUBE: 345*53.4*21.4mm ; ONE TUBE = 12 PCS
2. PRODUCTS: AEE SERIES
3. STOPPER
4. INNER CARTON: 388*159*115mm
   ONE INNER CARTON = 9 TUBES = 108 PCS
5. OUTER CARTON: 405*334*263mm
   ONE OUTER CARTON = 4 INNER CARTONS = 432 PCS



STANDARD TOLERANCE LIMITS UNLESS OTHER SPECIFIED.				
RANGE	ANGLE	TOLERANCE	THIRD ANGLE PROJECTION	
>0~3	±1°	±0.1		
>3~6	±2°	±0.15	UNIT:m/m	
>6~30	±3°	±0.18	SCALE	REV
>30~120	±5°	±0.20	1 : 1	A0

Recommended Lead-Free Wave Soldering Temperature Profile