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AM60QB-TT



¼ brick

The AM60QB-TT series is a high-performance quarter brick DC/DC converter specifically designed for a variety of railway applications. It features 60W of output power with no requirement for minimum load, a wide input voltage of 14-160VDC, operating temperature up to 105°C and reinforced I/O isolation of 3000VDC.

Additionally, this series features include input under-voltage protection, output over-voltage, short-circuit, over-current and over-temperature protection, remote On/Off control, remote sense compensation and output voltage trim adjustment.

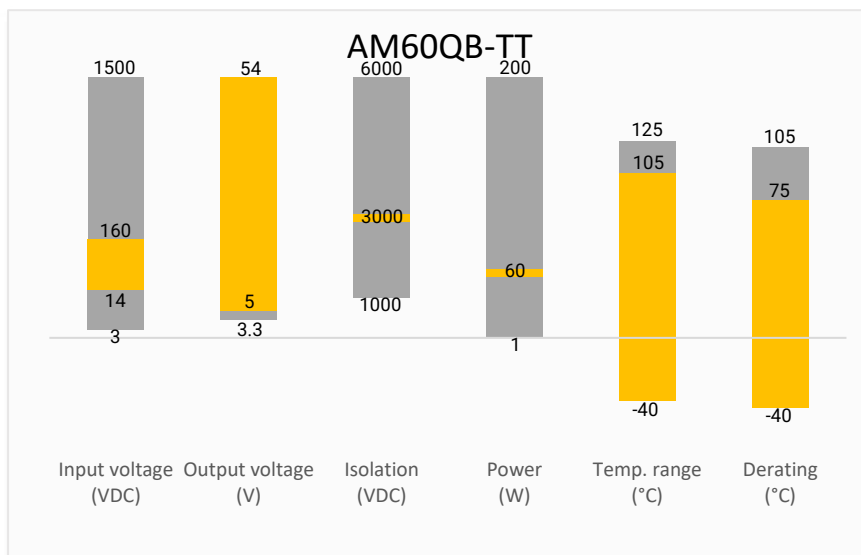
The AM60QB-TT meets EN50155 and EN45545-2 railway standards and are widely used in the centralized lighting, air conditioning and related on-board equipment.

Features

- Operating Temp: -40 °C to +105 °C
- Isolation voltage: 3000VDC / 2000VAC
- High efficiency: Up to 89% typ.
- Regulated single output
- Output short circuit, over-current, over-voltage, input under-voltage, over temperature protection
- Standard ¼ brick package
- Design to meet EN50155 and EN45545-2



Summary



Training



Product Training Video
(click to open)



Press Release

Coming Soon!

Application Notes

Applications



Railway



Industrial

Models & Specifications

Single Output

Model	Input Voltage (VDC)	Output Voltage (VDC)	Output Current Max (A)	Isolation Voltage (VDC/VAC)	* Ripple & Noise max (mVp-p)	** Maximum Capacitive Load (μF)	Efficiency Full Load Typ (%)
AM60QB-11005SH30TT	110 (14-160)	5	12	3000/2000	100	20000	88
AM60QB-11012SH30TT	110 (14-160)	12	5	3000/2000	150	3300	89
AM60QB-11024SH30TT	110 (14-160)	24	2.5	3000/2000	200	1200	88
AM60QB-11048SH30TT	110 (14-160)	48	1.25	3000/2000	300	390	88
AM60QB-11054SH30TT	110 (14-160)	54	1.111	3000/2000	300	330	88

* For the measurement of Ripple and Noise, please refer to Ripple & Noise Circuit.

** The capacitive load is test by minimum input and constant resistive load.

Input Specification

Parameters	Conditions	Typical	Maximum	Units
Input voltage	Nominal 110V	>14	160	VDC
Input surge voltage	1s max.	200		VDC
Start-up voltage	0% - 100% load		13.9	VDC
Under voltage lockout	0% - 100% load	12		VDC
On/Off control	On	open or 3Vdc<Vr<12Vdc		
	Off	short or 0Vdc<Vr<1.2Vdc		
Input filter	Pi filter			

Isolation Specification

Parameters	Conditions	Typical	Maximum	Units
Isolation voltage	Input / output 60 sec, ≤ 1mA	≥3000		VDC
	Input / output 60 sec, ≤ 2mA	≥2000		VAC
Resistance	500VDC	≥1000		MΩ
Capacitance			1500	pF

Output Specification

Parameters	Conditions	Typical	Maximum	Units
Voltage accuracy	100% Load & 110V input		±1	%
Line regulation	LL – HL 100% load		±0.2	%
Load regulation	0% - 100% load		±0.2	%
Short circuit protection	Continues, Auto recovery			
Over current protection		150		% Io
Over voltage protection	5V output, Zener diode clamp		8	V
	12V output, Zener diode clamp		19.2	V
	24V output, Zener diode clamp		38.4	V
	48V output, Zener diode clamp		76.8	V
	54V output, Zener diode clamp		86.4	V
Transient Recovery Time	Nominal input, 25% load step change (75% - 100% load)	500		μs
Trim-Voltage adjustability		±10		%

General Specifications

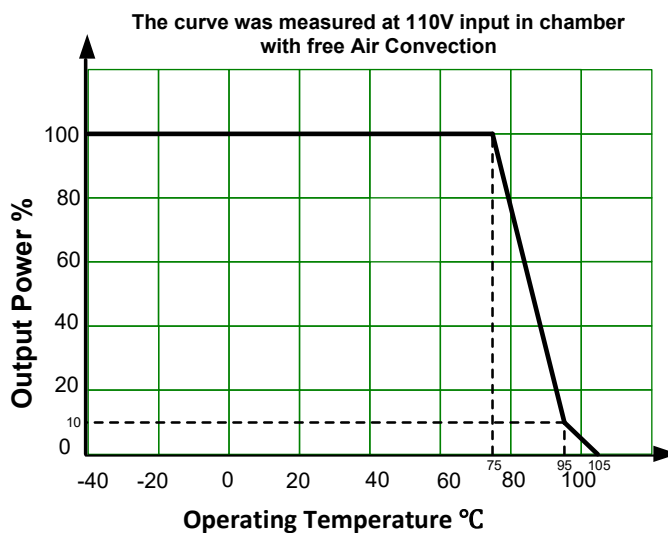
Parameters	Conditions	Typical	Maximum	Units
Switching frequency	100% Load at Nominal Vin	250		KHz
Operating temperature	With derating	-40 to +105		°C
Storage temperature		-55 to +125		°C
Over temperature protection			115	°C
Temperature coefficient			± 0.05	%/ °C
Cooling	Free air convection			
Humidity	Non-condensing	≥5	95	% RH
Operating altitude	3000			m
Weight		68		g
Dimensions (L x W x H)	2.28 x 1.45 x 0.50 inches (57.9 x 36.8 x 12.7 mm)			
Case material	Plastic			
Potting material	Silicon			
MTBF	≥ 205 000 hrs (MIL-HDBK -217F, t=+25°C)			
	≥ 84 000 hrs (MIL-HDBK -217F, t=+51°C)			
Vibration	EN61373			
NOTE: All specifications in this datasheet are measured at an ambient temperature of 25°C, humidity<75%, nominal input voltage and at rated output load unless otherwise specified.				

Safety Specifications

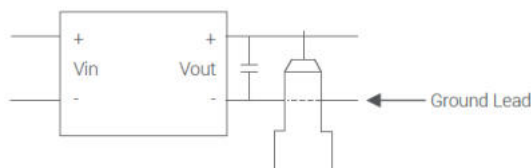
Parameters

Standards	Design to meet EN62368-1, EN50155 and EN45545-2	
	EMI - Conducted and radiated emission	EN50121-3-2/ EN55032/55011 See the recommended EMC circuit for class A See the recommended EMC circuit 1 for class B
	Electrostatic Discharge Immunity	IEC/EN 61000-4-2, Contact ±6KV, Air ±8KV, Criteria A
	RF, Electromagnetic Field Immunity	IEC/EN 61000-4-3, 10V/m, Criteria A
	Electrical Fast Transient/Burst Immunity *	IEC/EN 61000-4-4, ±2KV, Criteria A
	Surge Immunity *	IEC/EN 61000-4-5, ±2KV, Criteria A
	RF, Conducted Disturbance Immunity	IEC/EN 61000-4-6, 10Vrms, Criteria A
	Magnetic field immunity	IEC/EN 61000-4-8, 10A/m, Criteria A
* External input capacitor required 1500µF/50V @24Vin, 470µF/100V @72Vin, 330µF/200V @110Vin.		

Derating

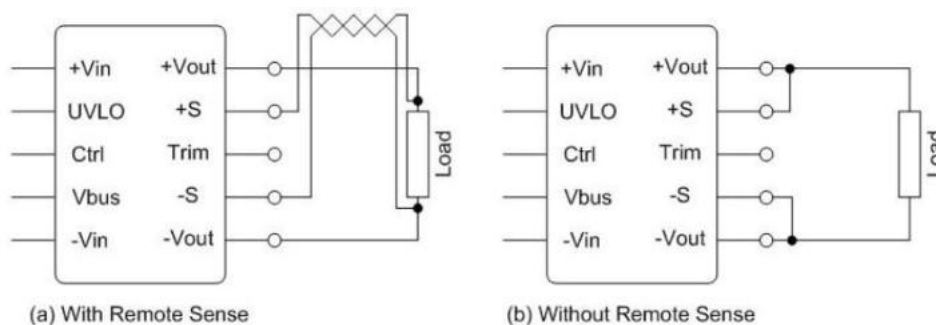


Ripple & Noise Circuit

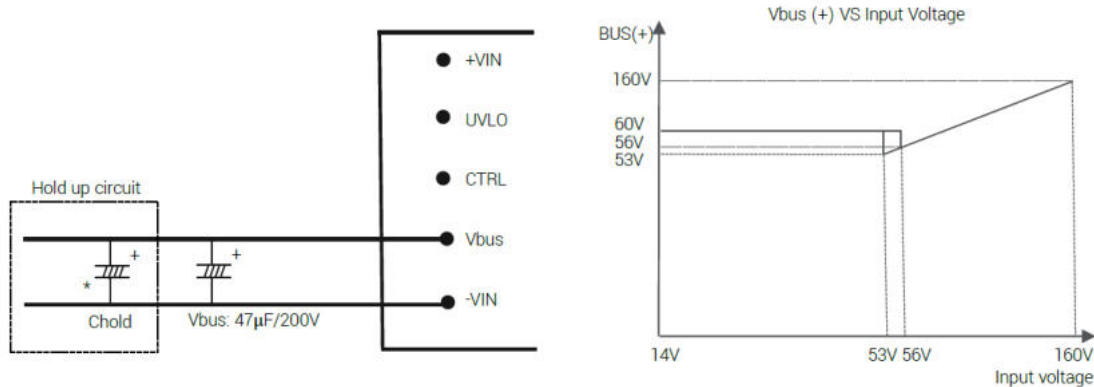


5V output measured with 20MHZ BW at Vin range 0% ~ 100% load with a 47uF / 10V X7R MLCC.
Others measured with 20MHZ BW at Vin range 0% ~ 100% load with a 1uF / 50V X7R MLCC.

Remote Sense Application



Hold up time



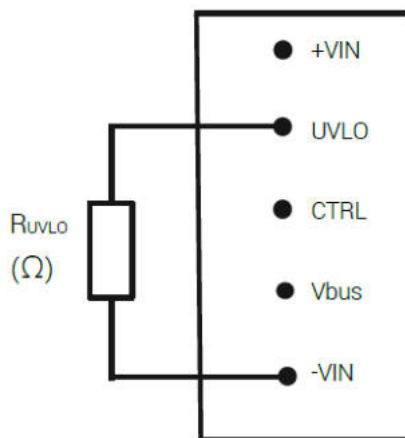
Chold table	Nominal Vin	24V	36V	48V	72V	96V	110V
	10ms (S2)	800uF	800uF	800uF	440uF	180uF	120uF
	30ms (C2)	2200μF	2200μF	2200μF	1200uF	540uF	400uF

Based on EN50155

S2: The Spec of Interruptions of Voltage Supply. In case of voltage interruption up to 10 ms the equipment shall behave according to performance criterion A.

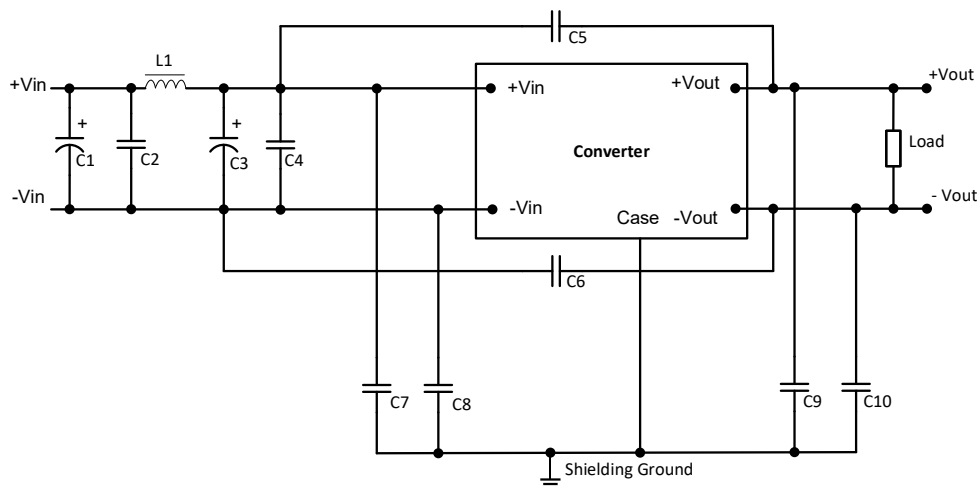
C2: The Spec of Voltage Change-Over. During a supply break of 30 ms stating at Vin. Performance criterion B.

UVLO



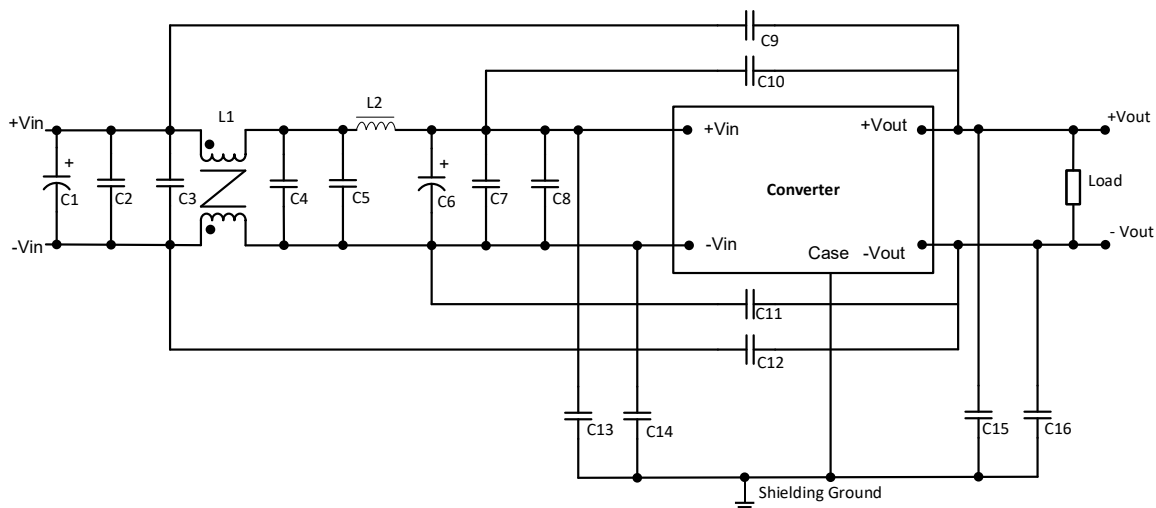
UVLO External Resistor (Ω)	OPEN	140K	62K
Turn-off Threshold	12.7V	19.6V	26.3V
Turn-on Threshold	13.6V	20.4V	27.3V

Recommended EMC circuit



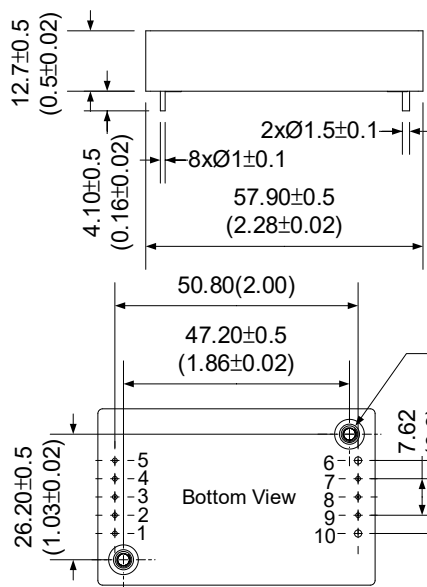
Vout	C1	C2, 4	C3	C5	C6	C7, 8, 9, 10	L1
5V	100uF/200V E-Cap KXJ Series	0.68uF/250V MLCC, 1210	47uF/200V E-Cap KXJ Series	1000pF/3KV MLCC, 1808	1000pF/3KV MLCC, 1808	1000pF/2KV MLCC, 1206	10uF GSTD1265PE-100M
12V	100uF/200V E-Cap KXJ Series	0.68uF/250V MLCC, 1210	47uF/200V E-Cap KXJ Series	1000pF/3KV MLCC, 1808	1000pF/3KV MLCC, 1808	1000pF/2KV MLCC, 1206	10uF GSTD1265PE-100M
24V	100uF/200V E-Cap KXJ Series	0.68uF/250V MLCC, 1210	47uF/200V E-Cap KXJ Series	2200pF/3KV MLCC, 1808	1000pF/3KV MLCC, 1808	1000pF/2KV MLCC, 1206	10uF GSTD1265PE-100M
48V	100uF/200V E-Cap KXJ Series	0.68uF/250V MLCC, 1210	47uF/200V E-Cap KXJ Series	2200pF/3KV MLCC, 1808	2200pF/3KV MLCC, 1808	1000pF/2KV MLCC, 1206	10uF GSTD1265PE-100M
54V	100uF/200V E-Cap KXJ Series	0.68uF/250V MLCC, 1210	47uF/200V E-Cap KXJ Series	2200pF/3KV MLCC, 1808	2200pF/3KV MLCC, 1808	1000pF/2KV MLCC, 1206	10uF GSTD1265PE-100M

Recommended EMC circuit 1



Vout	C1	C2, 3, 4 5, 7, 8	C6	C9	C10	C11	C12	C13, 14 15, 16	L1	L2
5V	100uF/200V E-Cap KXJ Series	0.68uF/250V MLCC, 1210	47uF/200V E-Cap KXJ Series	N.C.	3300pF/3KV MLCC, 1206	3300pF/3KV MLCC, 1808	N.C.	4700pF/2KV MLCC, 1206	CommonChoke A10 T16X12X8C 2.2mH±35%	4.7uF GSTD1265PE- 4R7M
12V	100uF/200V E-Cap KXJ Series	0.68uF/250V MLCC, 1210	47uF/200V E-Cap KXJ Series	1500pF/3KV MLCC, 1808	2200pF/3KV MLCC, 1808	2200pF/3KV MLCC, 1808	1500pF/3KV MLCC, 1808	1000pF/2KV MLCC, 1206	CommonChoke A10 T16X12X8C 2.2mH±35%	4.7uF GSTD1265PE- 4R7M
24V	100uF/200V E-Cap KXJ Series	0.68uF/250V MLCC, 1210	47uF/200V E-Cap KXJ Series	1000pF/3KV MLCC, 1808	2200pF/3KV MLCC, 1808	1000pF/3KV MLCC, 1808	1000pF/3KV MLCC, 1808	1000pF/2KV MLCC, 1206	CommonChoke A10 T16X12X8C 2.2mH±35%	4.7uF GSTD1265PE- 4R7M
48V	100uF/200V E-Cap KXJ Series	0.68uF/250V MLCC, 1210	47uF/200V E-Cap KXJ Series	N.C.	2200pF/3KV MLCC, 1808	2200pF/3KV MLCC, 1808	N.C.	4700pF/2KV MLCC	CommonChoke A10 T16X12X8C 2.2mH±35%	4.7uF GSTD1265PE- 4R7M
54V	100uF/200V E-Cap KXJ Series	0.68uF/250V MLCC, 1210	47uF/200V E-Cap KXJ Series	N.C.	2200pF/3KV MLCC, 1808	2200pF/3KV MLCC, 1808	N.C.	4700pF/2KV MLCC	CommonChoke A10 T16X12X8C 2.2mH±35%	4.7uF GSTD1265PE- 4R7M

Dimension

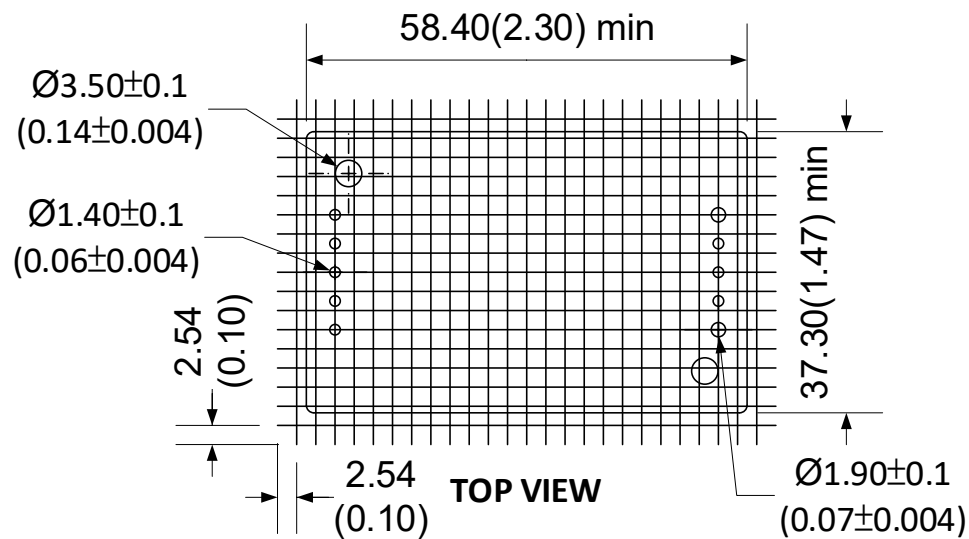


Mounting Inserts
M3*0.5 Through 2pl.

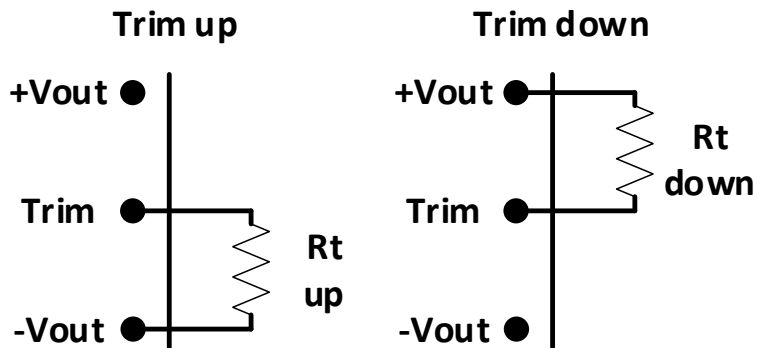
Projection: Third angle projection
Unit: mm(inch)
Tolerance: ± 0.25 (0.01)

Pin Out Specifications	
Pin	Single
1	+Vin
2	UVLO
3	On/Off Ctrl
4	Vbus
5	-Vin
6	-Vout
7	-S
8	Trim
9	+S
10	+Vout

Recommended Footprint



Trim



Vout= 5										
Trim down %	1	2	3	4	5	6	7	8	9	10
Vout (VDC)	4.950	4.900	4.850	4.800	4.750	4.700	4.650	4.600	4.550	4.500
Rt down (KΩ)	1213.257	736.327	513.760	384.905	300.870	241.733	197.858	164.011	137.108	115.209
Trim up %	1	2	3	4	5	6	7	8	9	10
Vout (VDC)	5.050	5.100	5.150	5.200	5.250	5.300	5.350	5.400	5.450	5.500
Rt up (KΩ)	2962.000	538.000	268.667	165.077	110.235	76.286	53.200	36.483	23.818	13.892
Vout= 12										
Trim down %	1	2	3	4	5	6	7	8	9	10
Vout (VDC)	11.880	11.760	11.640	11.520	11.400	11.280	11.160	11.040	10.920	10.800
Rt down (KΩ)	846.809	430.930	281.105	203.901	156.818	125.106	102.293	85.096	71.667	60.890
Trim up %	1	2	3	4	5	6	7	8	9	10
Vout (VDC)	12.120	12.240	12.360	12.480	12.600	12.720	12.840	12.960	13.080	13.200
Rt up (KΩ)	274.580	114.750	66.154	42.649	28.789	19.649	13.168	8.333	4.588	1.601
Vout= 24										
Trim down %	1	2	3	4	5	6	7	8	9	10
Vout (VDC)	23.760	23.520	23.280	23.040	22.800	22.560	22.320	22.080	21.840	21.600
Rt down (KΩ)	1508.633	738.217	481.411	353.008	275.967	224.606	187.919	160.404	139.004	121.883
Trim up %	1	2	3	4	5	6	7	8	9	10
Vout (VDC)	24.240	24.480	24.720	24.960	25.200	25.440	25.680	25.920	26.160	26.400
Rt up (KΩ)	164.167	74.583	44.722	29.792	20.833	14.861	10.595	7.396	4.907	2.917
Vout= 48										
Trim down %	1	2	3	4	5	6	7	8	9	10
Vout (VDC)	47.520	47.040	46.560	46.080	45.600	45.120	44.640	44.160	43.680	43.200
Rt down (KΩ)	3398.217	1673.008	1097.939	810.404	637.883	522.869	440.717	379.102	331.180	292.842
Trim up %	1	2	3	4	5	6	7	8	9	10
Vout (VDC)	48.480	48.960	49.440	49.920	50.400	50.880	51.360	51.840	52.320	52.800
Rt up (KΩ)	173.783	78.992	47.394	31.596	22.117	15.797	11.283	7.898	5.265	3.158

Vout= 54										
Trim down %	1	2	3	4	5	6	7	8	9	10
Vout (VDC)	53.460	52.920	52.380	51.840	51.300	50.760	50.220	49.680	49.140	48.600
Rt down (KΩ)	3872.259	1907.630	1252.753	925.315	728.852	597.877	504.323	434.157	379.584	335.926
Trim up %	1	2	3	4	5	6	7	8	9	10
Vout (VDC)	54.540	55.080	55.620	56.160	56.700	57.240	57.780	58.320	58.860	59.400
Rt up (KΩ)	174.941	79.570	47.780	31.885	22.348	15.990	11.449	8.043	5.393	3.274

NOTE: **1.** Datasheets are updated as needed and as such, specifications are subject to change without notice. Once printed or downloaded, datasheets are no longer controlled by Aimtec; refer to www.aimtec.com for the most current product specifications. **2.** Product labels shown, including safety agency certifications on labels, may vary based on the date manufactured. **3.** Mechanical drawings and specifications are for reference only. **4.** All specifications are measured at an ambient temperature of 25°C, humidity<75%, nominal input voltage and at rated output load unless otherwise specified. **5.** Aimtec may not have conducted destructive testing or chemical analysis on all internal components and chemicals at the time of publishing this document. CAS numbers and other limited information are considered proprietary and may not be available for release. **6.** This product is not designed for use in critical life support systems, equipment used in hazardous environments, nuclear control systems or other such applications which necessitate specific safety and regulatory standards other the ones listed in this datasheet. **7.** Warranty is in accordance with Aimtec's standard Terms of Sale available at www.aimtec.com.