

Features

Regulated Converters

- Highest Power Density In SIP Package
- 1.6kVDC/1 Minute Isolation
- Efficiency Up To 88%
- -40°C To +75°C Operating Temperature Range @ Full Load
- EN60950 And IEC/EN62368-1 Certified
- Industry Standard Pinout

Description

The RS6 series offer very high power density (2.7W/cm³), wide input voltage range and an industrial operating temperature range of -40°C to +75°C without derating. High efficiency, tight regulation, 2kVDC isolation and remote on/off are just some of the characteristics of this advanced SIP8 6W converter which is ideal for high density power supply designs in demanding industrial applications.

Selection Guide

Part Number	nom. Input Voltage [VDC]	Output Voltage [VDC]	Output Current [mA]	Efficiency typ. ⁽¹⁾ [%]	max. Capacitive Load ⁽²⁾ [μF]
RS6-053.3S	5	3.3	1300	83	6600
RS6-0505S	5	5	1200	86	3300
RS6-0512S	5	12	500	87	1600
RS6-0515S	5	15	400	86	1400
RS6-0505D	5	±5	±600	84	±2000
RS6-0512D	5	±12	±250	87	±900
RS6-0515D	5	±15	±200	86	±660
RS6-123.3S	12	3.3	1300	81	6600
RS6-1205S	12	5	1200	86	3300
RS6-1212S	12	12	500	87	1600
RS6-1215S	12	15	400	87	1400
RS6-1205D	12	±5	±600	85	±2000
RS6-1212D	12	±12	±250	87	±900
RS6-1215D	12	±15	±200	87	±660
RS6-243.3S	24	3.3	1300	81	6600
RS6-2405S	24	5	1200	87	3300
RS6-2412S	24	12	500	87	1600
RS6-2415S	24	15	400	87	1400
RS6-2405D	24	±5	±600	85	±2000
RS6-2412D	24	±12	±250	87	±900
RS6-2415D	24	±15	±200	87	±660
RS6-483.3S	48	3.3	1300	81	6600
RS6-4805S	48	5	1200	87	3300
RS6-4812S	48	12	500	87	1600
RS6-4815S	48	15	400	88	1400
RS6-4805D	48	±5	±600	85	±2000
RS6-4812D	48	±12	±250	87	±900
RS6-4815D	48	±15	±200	88	±660

Notes:

Note1: Efficiency is tested by nominal input and full load at +25°C ambient.

Note2: Max Cap Load is tested by minimum input and constant resistor load.

RECOM
DC/DC Converter

RS6

**6 Watt
SIP8
Single and Dual
Output**



EN60950-1 Certified
IEC/EN62368-1 Certified
EN55022 compliant

Specifications (measured @ $t_a = 25^\circ\text{C}$, nominal input voltage, full load and after warm up unless otherwise specified)

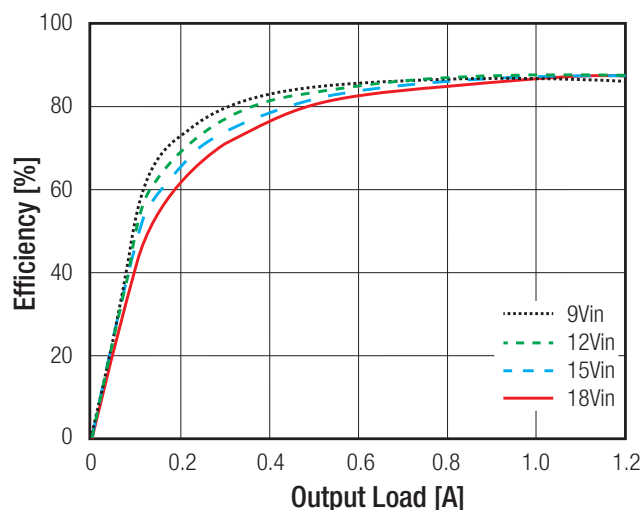
BASIC CHARACTERISTICS					
Parameter	Condition		Min.	Typ.	Max.
Input Filter			capacitor		
Input Voltage Range	nom. $V_{in} =$	5VDC 12VDC 24VDC 48VDC	4.5VDC 9VDC 18VDC 36VDC	5VDC 12VDC 24VDC 48VDC	9VDC 18VDC 36VDC 75VDC
Input Surge Voltage	1 second max.	nom. $V_{in} =$ 5VDC 12VDC 24VDC 48VDC			15VDC 25VDC 50VDC 100VDC
Quiescent Current	nom. $V_{in} =$	5VDC 2VDC 24VDC 48VDC			105mA 55mA 28mA 14mA
Output Voltage Trimming	see calculation on next page	Trim up Trim down			+10% -8%
Start-up time				2ms	
Under Voltage Lockout	nom. $V_{in} = 5V$	DC-DC ON DC-DC OFF		4.5VDC 2.7VDC	
	nom. $V_{in} = 12V$	DC-DC ON DC-DC OFF		9VDC 7VDC	
	nom. $V_{in} = 24V$	DC-DC ON DC-DC OFF		18VDC 15VDC	
	nom. $V_{in} = 48V$	DC-DC ON DC-DC OFF		36VDC 30VDC	
ON/OFF CTRL	DC-DC ON DC-DC OFF		Open 5V < V_r < 10VDC		
Internal Operating Frequency	0-100% load		200kHz		
Minimum Load				0%	
Output Ripple and Noise ⁽³⁾	20MHz BW			50mVp-p	75mVp-p

Notes:

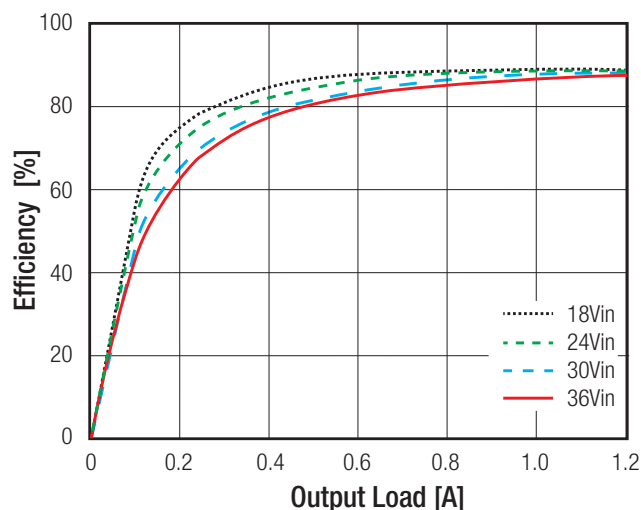
Note3: Measurements are made with a 1.0 μ F MLCC across output (low ESR).

Efficiency vs. Load

RS6-1205S



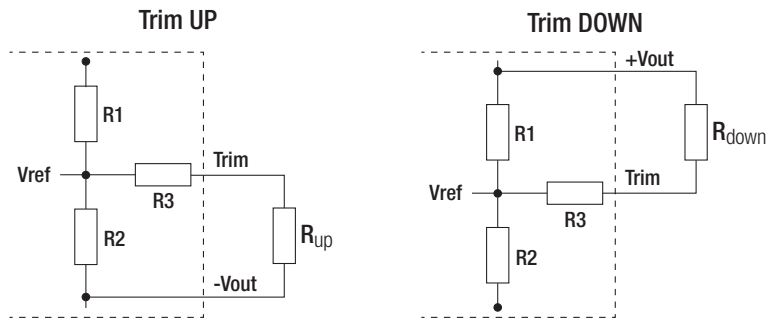
RS6-2405S



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Specifications (measured @ $t_a = 25^\circ\text{C}$, nominal input voltage, full load and after warm up unless otherwise specified)

Output Voltage Trimming



Vout	3.3V	5V	12V	15V
R1	16.74k Ω	10k Ω	38k Ω	50k Ω
R2	10k Ω			
R3	52.3k Ω	39k Ω	68k Ω	68k Ω
Vref	1.24V	2.5V		

Trim Calculation

Vout = nom. Output Voltage

ΔVout = Output Voltage Trim

R_{up} = Trim up resistor

R_{down} = trim down resistor

a = trim up factor

b = trim down factor

$$\Delta\text{Vout} = \text{Vout} - \text{Vout}_{\text{trimmed}}$$

$$R_{up} = \left[\frac{a \cdot R2}{R2 - a} \right] - R3 = k\Omega$$

$$a = \left[\frac{V_{ref}}{(\text{Vout} + \Delta\text{Vout}) - V_{ref}} \right] \cdot R1 = k\Omega$$

$$R_{down} = \left[\frac{b \cdot R1}{R1 - b} \right] - R3 = k\Omega$$

$$b = \left[\frac{(\text{Vout} + \Delta\text{Vout}) - V_{ref}}{V_{ref}} \right] \cdot R2 = k\Omega$$

Practical Example:

Trim Up:

Vout = 5V, $\Delta\text{Vout} = 0.5\text{V}$ (10%), Vref = 2.5V

$$a = \left[\frac{2.5\text{V}}{(5\text{V} + 0.5\text{V}) - 2.5\text{V}} \right] \cdot 10\text{k}\Omega = 8.33\text{k}\Omega$$

$$R_{up} = \left[\frac{8.33\text{k}\Omega \cdot 10\text{k}\Omega}{10\text{k}\Omega - 8.33\text{k}\Omega} \right] - 39 = 11.0\text{k}\Omega$$

RS6-xx03.3S

Trim up	1	2	3	4	5	6	7	8	9	10	%
Vout =	3.33	3.36	3.39	3.43	3.46	3.49	3.53	3.56	3.59	3.63	Volts
R_{up} =	1151.73	360.87	197.07	126.28	86.79	61.60	44.14	31.32	21.15	13.76	kOhms

RS6-xx05S

Trim up	1	2	3	4	5	6	7	8	9	10	%
Vout =	5.05	5.10	5.15	5.20	5.25	5.30	5.35	5.4	5.45	5.50	Volts
R_{up} =	461.00	211.00	127.67	86.00	61.00	44.33	32.43	23.50	16.56	11.00	kOhms

RS6-xx12S

Trim up	1	2	3	4	5	6	7	8	9	10	%
Vout =	12.12	12.24	12.36	12.48	12.60	12.72	12.84	12.96	13.08	13.20	Volts
R_{up} =	723.67	327.83	195.89	129.92	90.33	63.94	45.10	30.96	19.96	11.17	kOhms

RS6-xx15S

Trim up	1	2	3	4	5	6	7	8	9	10	%
Vout =	15.15	15.3	15.45	15.60	15.75	15.90	16.05	16.20	16.35	16.50	Volts
R_{up} =	765.33	348.67	209.78	140.33	98.67	70.89	51.05	36.17	24.59	15.33	kOhms

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Specifications (measured @ $t_a = 25^\circ\text{C}$, nominal input voltage, full load and after warm up unless otherwise specified)

Trim down:

$V_{out} = 5\text{V}$, $\Delta V_{out} = -0.4\text{V}$ (-8%), $V_{ref} = 2.5\text{V}$

$$b = \left[\frac{[5\text{V} + (-0.4\text{V})] - 2.5\text{V}}{2.5\text{V}} \right] * 10\text{k}\Omega = 8.4\text{k}\Omega \quad R_{down} = \left[\frac{8.4\text{k}\Omega * 10\text{k}\Omega}{10\text{k}\Omega - 8.4\text{k}\Omega} \right] - 39\text{k}\Omega = 13.5\text{k}\Omega$$

RS6-xx03.3S

Trim down	-1	-2	-3	-4	-5	-6	-7	-8	%
$V_{out} =$	3.267	3.234	3.201	3.168	3.135	3.102	3.069	3.036	Volts
$R_{down} =$	643.60	355.96	233.75	166.13	123.19	93.52	71.78	55.17	kOhms

RS6-xx05S

Trim down	-1	-2	-3	-4	-5	-6	-7	-8	%
$V_{out} =$	4.95	4.90	4.85	4.80	4.75	4.70	4.65	4.60	Volts
$R_{down} =$	451.00	201.00	117.67	76.00	51.00	34.33	22.43	13.50	kOhms

RS6-xx12S

Trim down	-1	-2	-3	-4	-5	-6	-7	-8	%
$V_{out} =$	11.88	11.76	11.64	11.52	11.40	11.28	11.16	11.04	Volts
$R_{down} =$	2902.33	1398.17	896.78	646.08	495.67	395.39	323.76	270.04	kOhms

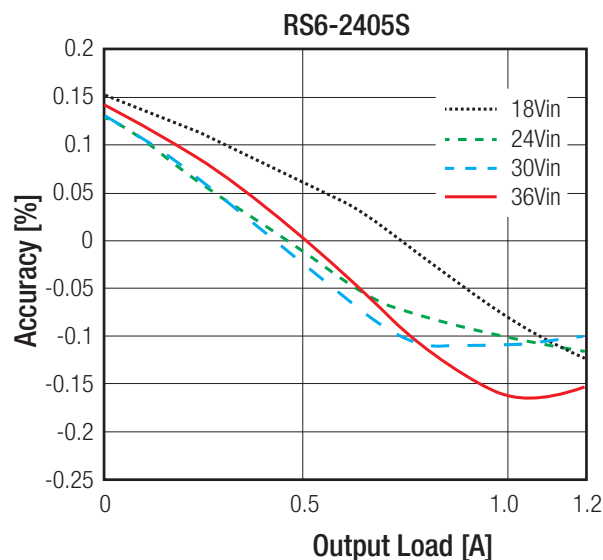
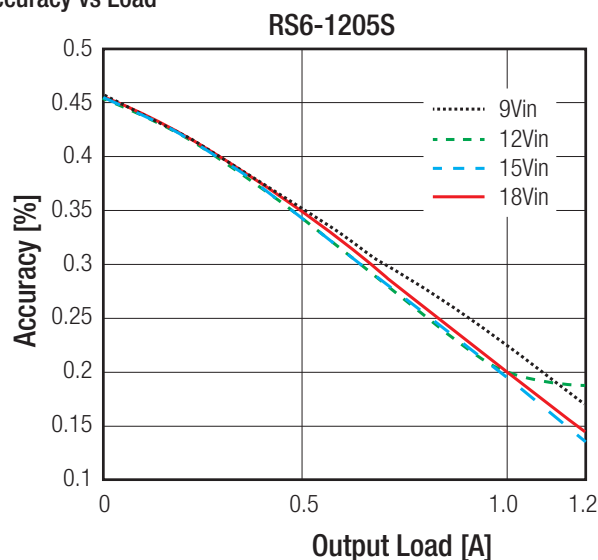
RS6-xx15S

Trim down	-1	-2	-3	-4	-5	-6	-7	-8	%
$V_{out} =$	14.85	14.70	14.55	14.40	14.25	14.10	13.95	13.80	Volts
$R_{down} =$	4048.67	1965.33	1270.89	923.67	715.33	576.44	477.24	402.83	kOhms

REGULATIONS

Parameter	Condition	Values
Output Accuracy		$\pm 1.0\%$ typ.
Line Regulation	low line to high line	$\pm 0.2\%$ typ.
Load Regulation	0% to 100% load	$\pm 1.0\%$ typ.
Cross Regulation	25% to 100% load	$\pm 5.0\%$ typ.
Transient Response	25% load step change	500 μs typ.

Accuracy vs Load



Specifications (measured @ $t_a = 25^\circ\text{C}$, nominal input voltage, full load and after warm up unless otherwise specified)

PROTECTIONS

Parameter	Condition		Value
Short Circuit Protection (SCP)	below $100\text{m}\Omega$		continuous, automatic recovery
Over Load Protection (OLP)			150% load, continuous, automatic recovery
Isolation Voltage ⁽⁵⁾	I/P to O/P	tested for 1 second rated for 1 minute	2kVDC 1.6kVDC
Isolation Capacitance			110pF max.
Isolation Resistance			$1\text{G}\Omega$ typ.
Isolation Grade			Functional

Notes:

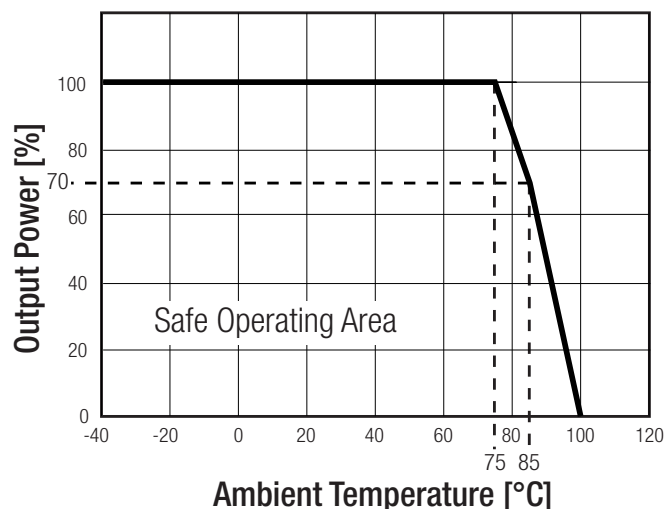
Note5: For repeat Hi-Pot testing, reduce the time and/or the test voltage

ENVIRONMENTAL

Parameter	Condition		Value
Operating Temperature Range ⁽⁶⁾	without derating (see graph)		-40°C to $+75^\circ\text{C}$
Maximum Case Temperature			$+105^\circ\text{C}$
Temperature Coefficient			$\pm 0.02\%/^\circ\text{C}$
Operating Humidity	non-condensing		5% - 95% RH max.
Vibration			MIL-STD-202G
MTBF	according to MIL-HDBK-217F, G.B.	$+25^\circ\text{C}$	1776×10^3 hours

Derating Graph

(@ Chamber and natural convection 0.1 m/s)



Notes:

Note6: Derating Graph is referring to RS6-0505S. For more details, please contact our technical support service at TechsupportAT@recom-power.com.

SAFETY AND CERTIFICATIONS

Certificate Type	Report / File Number	Standard
Information Technology Equipment, General Requirements for Safety (LVD)	L0339m26-B1-L	EN60950-1, 2nd Edition AM2, 2013
Audio/video, information and communication technology equipment - Safety requirements	L0339m27-B1-L	ICE/EN62368-1, 2014
RoHS2		RoHS-2011/65/EU + AM-2015/863

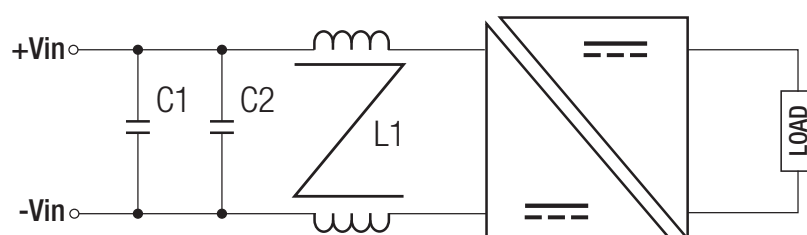
EMC Compliance	Condition	Standard / Criterion
Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement	with external filter (see filter suggestions)	EN55022, Class A EN55022, Class B
Information technology equipment - Immunity characteristics - Limits and methods of measurement		EN55024, 2010

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Specifications (measured @ $t_a = 25^\circ\text{C}$, nominal input voltage, full load and after warm up unless otherwise specified)

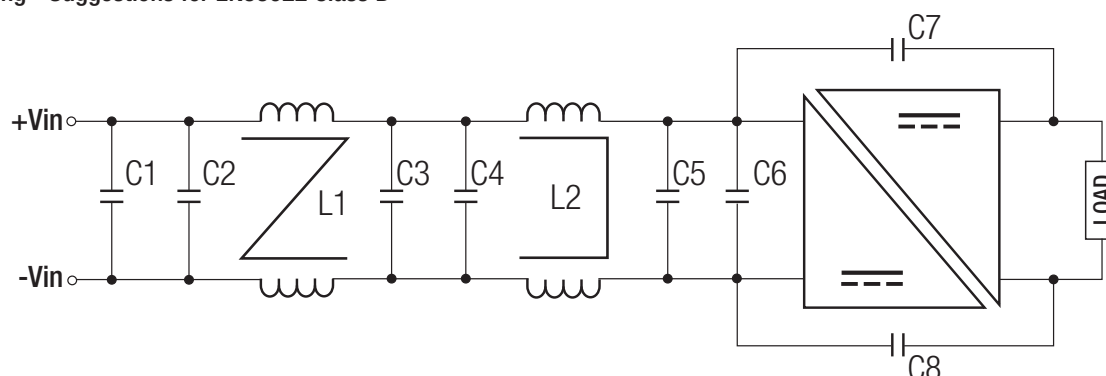
ESD Electrostatic discharge immunity test	$\pm 8\text{kV}$ Air Discharge, $\pm 4\text{kV}$ Contact Discharge	EN61000-4-2, Criteria A
Radiated, radio-frequency, electromagnetic field immunity test	3V/m	EN61000-4-3, Criteria A
Fast Transient and Burst Immunity	$\pm 0.5\text{kV}$	EN61000-4-4, Criteria A
Surge Immunity	$\pm 0.5\text{kV}$	EN61000-4-5, Criteria A
Immunity to conducted disturbances, induced by radio-frequency fields	3Vr.m.s	EN61000-4-6, Criteria A
Power Magnetic Field Immunity	50Hz, 1A/m	EN61000-4-8, Criteria A

EMC Filtering - Suggestions for EN55022 Class A



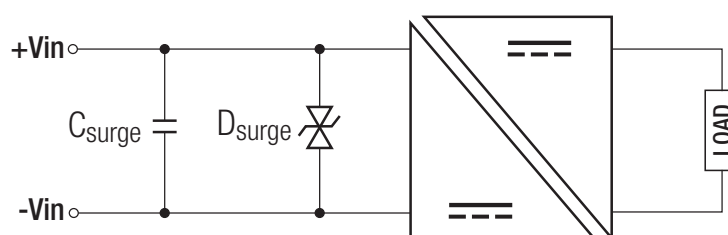
Model	C1	C2	L1
RS6-05xx	22μF	N/A	1μH CMC
RS6-12xx	4.7μF		2.2μH CMC
RS6-24xx			6.8μH CMC
RS6-48xx	2.2μF	2.2μF	10μH CMC

EMC Filtering - Suggestions for EN55022 Class B



Model	C1	C2	L1	C3	C4	L2	C5	C6	C7	C8
RS6-05xx	22 μF	N/A	1 μH CMC	10 μF	N/A	200 μH CMC	10 μF	N/A	47pF	100pF
RS6-12xx	10 μF		6.8 μH CMC					4.7 μF		
RS6-24xx	4.7 μF		10 μH CMC	4.7 μF			4.7 μF	N/A	33pF	220pF
RS6-48xx	2.2 μF	2.2 μF	22 μH CMC	2.2 μF	2.2 μF	600 μH CMC	1 μF		47pF	680pF

Surge Protection Circuit according to EN61000-4-5, Criteria A



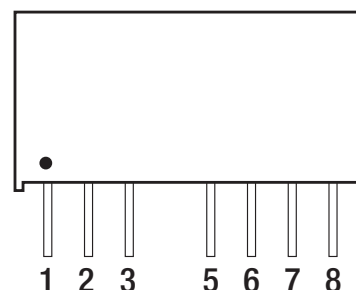
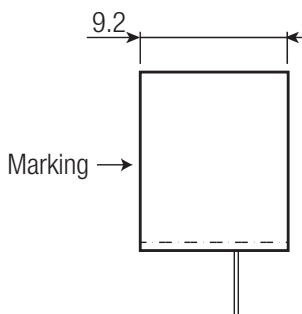
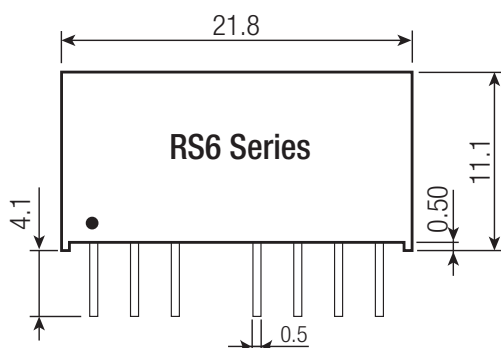
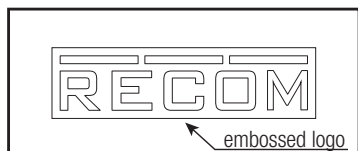
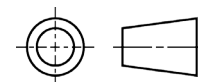
Input Voltage	Csurge	Dsurge	max. Surge Voltage
5VDC	100V, 220F E/Cap	TVS (P4SMAJ15CA)	±1kVDC
12VDC		N/A	
24VDC			
48VDC			

Specifications (measured @ $t_a = 25^\circ\text{C}$, nominal input voltage, full load and after warm up unless otherwise specified)

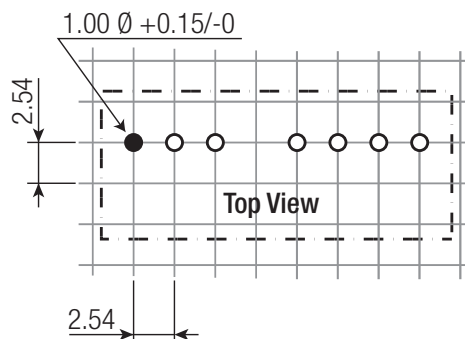
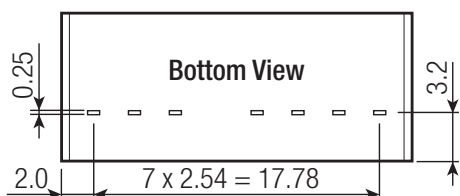
DIMENSION and PHYSICAL CHARACTERISTICS

Parameter	Type	Value
Material	Case Potting	non conductive plastic (UL94V-0) Epoxy (UL94V-0)
Package Dimension (LxWxH)		21.8 x 9.2 x 11.1mm
Package Weight		4.0g

Dimension Drawing (mm)



Recommended Footprint Details



Pin Connections

Pin #	Single	Dual
1	-Vin	-Vin
2	+Vin	+Vin
3	CTRL	CTRL
5	Trim	NC
6	+Vout	+Vout
7	-Vout	Com
8	NC	-Vout

NC= no connection
Tolerance: xx.x= $\pm 0.5\text{mm}$
xx.xx= $\pm 0.25\text{mm}$
Pin dimension: $\pm 0.1\text{mm}$
Pin pitch: $\pm 0.25\text{mm}$

PACKAGING INFORMATION

Packaging Dimension (LxWxH)	tube	520.0 x 18.2 x 11.2mm
Packaging Quantity		22pcs
Storage Temperature Range		-55°C to +125°C
Storage Humidity	non-condensing	95% RH max.

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