EC6AW SERIES
8 WATT 4:1 INPUT
ISOLATED DC-DC CONVERTER

Features

- Efficiency Up to 86%
- 100KHz Switching Frequency
- Regulated Outputs
- Remote On/Off
- Fully Protected (OTP/OCP/OVP/UVLO)
- 1500Vdc I/O Isolation
- Operating Ambient Temperature -40 to +85℃
- DIP: 1.25”x0.80”x0.40”, SMD: 1.25”x0.80”x0.43”
  Meet Industrial Standard
- EN 50155 Compliant with External Circuits
- Shock & Vibration EN 50155 (EN 61373) Compliant
- Fire & Smoke EN 45545-2 Compliant
- 3000m Operating Altitude
- Safety Meets IEC/EN/UL 62368-1
- Without Tantalum Capacitors Inside

Railway System

MODEL NUMBER	INPUT VOLTAGE	OUTPUT VOLTAGE	OUTPUT CURRENT		INPUT CURRENT		% EFF.	CAPACITOR LOAD MAX.
			MIN.	MAX.	NO LOAD	FULL LOAD		
EC6AW-24S33	9-36 VDC	3.3 VDC	0 mA	2000 mA	10 mA	344 mA	80	2000uF
EC6AW-24S05	9-36 VDC	5 VDC	0 mA	1600 mA	10 mA	406 mA	82	1600uF
EC6AW-24S12	9-36 VDC	12 VDC	0 mA	666 mA	10 mA	392 mA	85	666uF
EC6AW-24S15	9-36 VDC	15 VDC	0 mA	530 mA	10 mA	390 mA	85	530uF
EC6AW-24D05	9-36 VDC	±5 VDC	0 mA	±800mA	10 mA	406 mA	82	800uF
EC6AW-24D12	9-36 VDC	±12 VDC	0 mA	±333mA	10 mA	392 mA	85	333uF
EC6AW-24D15	9-36 VDC	±15 VDC	0 mA	±265mA	10 mA	390 mA	85	265uF
EC6AW-48S33	18-75 VDC	3.3 VDC	0 mA	2000 mA	5 mA	172 mA	80	2000uF
EC6AW-48S05	18-75 VDC	5 VDC	0 mA	1600 mA	5 mA	201 mA	83	1600uF
EC6AW-48S12	18-75 VDC	12 VDC	0 mA	666 mA	5 mA	194 mA	86	666uF
EC6AW-48S15	18-75 VDC	15 VDC	0 mA	530 mA	5 mA	193 mA	86	530uF
EC6AW-48D05	18-75 VDC	±5 VDC	0 mA	±800mA	5 mA	201 mA	83	800uF
EC6AW-48D12	18-75 VDC	±12 VDC	0 mA	±333mA	5 mA	194 mA	86	333uF
EC6AW-48D15	18-75 VDC	±15 VDC	0 mA	±265mA	5 mA	193 mA	86	265uF

NOTE:

1. Nominal Input Voltage 24 or 48 VDC

PART NUMBER

Series	Nominal Input Voltage	Number of Outputs	Nominal Output Voltage	Remote On/Off Logic	Packages
EC6AW-	II	O	XX	L	-Y
EC6AW	24 : 24 VDC 48 : 48 VDC	S : Single D : Dual	33 : 3.3VDC 05 : 5VDC 12 : 12VDC 15 : 15VDC 05 : ±5VDC 12 : ±12VDC 15 : ±15VDC	None : Positive N : Negative	None : DIP S : SMD

Part Number Example:

EC6AW-24S12N: 1.25"x0.8", 8W, 4:1 9-36Vdc Input, Single 12Vdc Output, Negative Logic

TECHNICAL SPECIFICATIONS

(All specifications are typical at nominal input, full load at 25℃ unless otherwise noted.)

ABSOLUTE MAXIMUM RATINGS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Input Voltage	Continuous	24Vin 48Vin	9 18	24 48	36 75	V_{dc}
Input Surge Voltage	100ms max.	24Vin 48Vin			50 100	V_{dc}
Operating Ambient Temperature	With derating, above 71℃	All	-40		85	℃
Operating Case Temperature	At the center part of case plate	All			100	℃
Storage Temperature		All	-55		125	℃

INPUT CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Operating Input Voltage		24Vin 48Vin	9 18	24 48	36 75	V_{dc}
Input Under Voltage Lockout						
Turn-On Voltage Threshold	100% Load	24Vin 48Vin	8 16	8.5 16.5	8.8 17.5	V_{dc}
Turn-Off Voltage Threshold	100% Load	24Vin 48Vin	7.7 15.5	8 16	8.3 17	V_{dc}
Lockout Hysteresis Voltage	100% Load	24Vin 48Vin		0.5 1		V_{dc}
Maximum Input Current	V_{in}=9V, Full load V_{in}=18V, Full load	24Vin 48Vin		1.2 0.6		A
No-Load Input Current	V_{in}=Nominal, Io=0A	See Model Number Table				mA
Input Filter	Pi filter	All				
Inrush Current (I^2t)	As per ETS300 132-2	All			0.1	A^2s
Input Reflected Ripple Current	P-P thru 12uH inductor, 5Hz to 20MHz	All		30		mA

OUTPUT CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Voltage Set Point Accuracy	V_{in}=Nominal, full load, T_c=25℃	All	-1.5		+1.5	%
Output Voltage Balance	V_{in}=Nominal, full load, T_c=25℃	Dual	-1.0		+1.0	%
Output Voltage Regulation						
Line Regulation	V_{in}=High line to low line, full load	All			±0.5	%
Load Regulation	Full load to no load	Single			±0.5	%
		Dual			±1.0	%
Cross Regulation	Load cross variation 25%/100%	Dual			±5.0	%
Temperature Coefficient	T_c=-40℃ to 85℃	All			±0.03	%/℃
Output Voltage Ripple and Noise (5Hz to 20MHz bandwidth)						
Peak-to-Peak	Full Load,20MHz bandwidth 0.1uF Ceramic capacitor	3.3Vo 5Vo			75	mV
		12Vo 15Vo			100	mV
Output Current Range	V_{in}=Nominal	See Model Number Table				A
Over Current Protection	Auto recovery	All	120			%
Short Circuit Protection		All	Continuous, Auto Recovery			
External Load Capacitance	Full load (resistive)	See Model Number Table				uF

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Output Over Voltage Protection	Zener or TVS Clamp	3.3Vo		3.9		V
		5Vo		6.2		
		12Vo		15		
		15Vo		18		
		±5Vo		±6.2		
		±12Vo		±15		
		±15Vo		±18		

EFFICIENCY

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
100% Load	V_{in}=Nominal, full load, T_c=25℃	See Model Number Table				%

DYNAMIC CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Output Voltage Current Transient						
Error Band	75% to 100% of $I_{o\_max.}$ step load change d_i/d_t=0.1A/us (within 1% V_{out} nominal)	All			±5	%
Recovery Time					500	us
Turn-On Delay and Rise Time	Full load (Constant resistive load)					
Turn-On Delay Time, From On/Off Control	$V_{on/off}$ to 10%V_{o_set}, Remote on	All		2		ms
Turn-On Delay Time, From Input	$V_{in\_min.}$ to 10%V_{o_set}, Power up	All		2		ms
Output Voltage Rise Time	10%V_{o_set} to 90%V_{o_set}	All		1.5		ms

ISOLATION CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Isolation Voltage (100% factory Hi-Pot tested @2sec.)	1 Minute; input to output	All			1500	V_{dc}
Isolation Resistance	Input to output	All	1000			MΩ
Isolation Capacitance	Input to output	All		1000		pF

FEATURE CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Switching Frequency	V_{in}=Nominal, I_o=I_o. max. V_{in}=Low line, I_o=I_o. max.	All	200 100			KHz
On/Off Control, Positive Remote On/Off Logic, Refer to -Vin Pin						
Logic Low (Module Off)	$V_{on/off}$ at $I_{on/off}$=1.0mA	All	0		1.2	V
Logic High (Module On)	$V_{on/off}$ at $I_{on/off}$=0.1uA, Pin open=on	All	3.5 or Open Circuit		36	V
On/Off Control, Negative Remote On/Off Logic, Refer to -Vin Pin						
Logic High (Module Off)	$V_{on/off}$ at $I_{on/off}$=0.1uA, Pin open=off	All	3.5 or Open Circuit		36	V
Logic Low (Module On)	$V_{on/off}$ at $I_{on/off}$=1.0mA	All	0		1.2	V
On/Off Current (for Both Remote On/Off Logic)	$I_{on/off}$ at $V_{on/off}$=0V	All		0.3	1	mA
Leakage Current (for Both Remote On/Off Logic)	Logic high, $V_{on/off}$=15V	All			30	uA
Off Converter Input Current	Shutdown input idle current	All		4	10	mA

GENERAL SPECIFICATIONS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
MTBF	I_o=100% of $I_{o\_max.}$; MIL-HDBK - 217F_Notice 1, GB, 25℃	Single		1.5		M hours
		Dual		1.3		
Weight		All		18.4		grams

GENERAL SPECIFICATIONS

Case Material	Black Coated Copper
Base plate Material	Non-Conductive Base
Potting Material	UL 94V-0
Pin Material	Base: Copper Plating: Nickel with Matte Tin
Shock/Vibration	MIL-STD-810F/EN61373 Compliant
Humidity	95% RH max. Non Condensing
Altitude	3000m Operating Altitude, 12000m Transport Altitude
Thermal Shock	MIL-STD-810F
Fire & Smoke	EN 45545-2 Compliant

EMC SPECIFICATIONS (External components required, please refer to application note.)

EMI	Meets EN 55032 & EN 50155 Compliant (with external filter)		Class A
ESD	EN 61000-4-2	Level 3: Air ±8kV, Contact ±6kV	Perf. Criteria A
Radiated Immunity	EN 61000-4-3	Level 3: 80~1000MHz, 20V/m	Perf. Criteria A
Fast Transient	EN 61000-4-4	Level 3: On power input port, ±2kV, external components required (EN 50155)	Perf. Criteria A
Surge	EN 61000-4-5	Level 3: Line to earth, ±2kV, Line to line, ±1kV (EN 50155), external components required	Perf. Criteria A
Conducted Immunity	EN 61000-4-6	Level 3: 0.15~80MHz, 10V	Perf. Criteria A
Interruptions of Voltage Supply	EN 50155	Class S3: 20ms interruptions	Perf. Criteria A
Supply Change Over	EN 50155	Class C2: During a supply break of 30 ms	Perf. Criteria A
Application Note Link			EC6AW Series App Notes
Packaging Information Link			Packaging Information

Immunity to Environmental Conditions

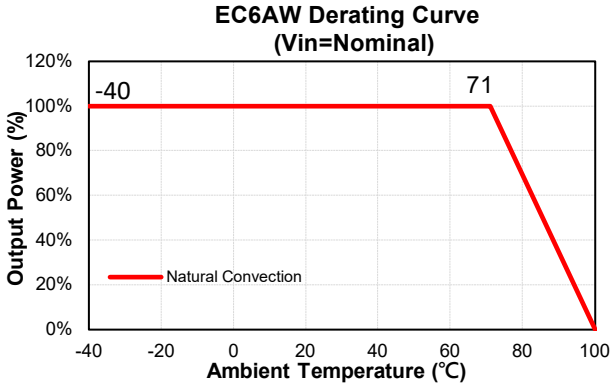
Phenomenon	EN50155; 2017 Reference Clause(s)	Reference Standard	Test Conditions	Result
Low Temperature Start-up test	13.4.4	EN 60068-2-1	Class OT4 Temperature: -40℃ Duration: 2 hrs	Pass
Dry Heat Test	13.4.5	EN 60068-2-2	Class OT4 & Cycle B Temperature: 70℃ Duration: 6 hrs Extended temperature: 85℃ Extended Duration: 10min	Pass
Low Temperature Storage Test	13.4.6	EN 60068-2-1	Temperature: -40℃ Duration: 16 hrs	Pass
Cyclic Damp Heat Test	13.4.7	EN 60068-2-30	Temperature: 25℃ - 55℃ Humidity: 90% RH Duration: 48 hrs	Pass
Random Vibration Test	13.4.11	EN 61373	Temperature: 25℃ +/- 10℃ Humidity: 50% +/-25% RH Frequency range: 5 ~ 150 Hz Vertical: 0.98 m/s^2 Transverse: 0.44 m/s^2 Longitudinal: 0.69 m/s^2 Duration: 10 min / axis	Pass
Simulated Long Life Test at Increased Random Vibration Levels	13.4.11	EN 61373	Temperature: 25℃±10℃ Humidity: 50% ±25% RH Frequency range: 5 ~ 150 Hz Vertical: 5.72 m/s^2 Transverse: 2.5 m/s^2 Longitudinal: 3.96 m/s^2 Duration: 5 hrs / axis	Pass
Shock Test	13.4.11	EN 61373	Temperature: 25℃±10℃ Humidity: 50% ±25% RH Frequency range: 5 ~ 150 Hz ±Vertical: 30 m/s^2 ±-Transverse: 30 m/s^2 ±Longitudinal: 50 m/s^2 Duration: 30ms x18 (Each axis 3 shocks)	Pass

EN45545-2 Fire & Smoke Test Conditions

Item		Standard	Hazard Level
R22	Oxygen Index Test	EN 45545-2: 2013 EN ISO 4589-2: 2006	HL1, HL2, HL3
	Smoke Density Test	EN 45545-2: 2013 EN ISO 5659-2: 2013	HL1, HL2, HL3
	Smoke Toxicity Test	EN 45545-2: 2013 NF X70-100: 2006	HL1, HL2, HL3
R23	Oxygen Index Test	EN 45545-2: 2013 EN ISO 4589-2: 2006	HL1, HL2, HL3
	Smoke Density Test	EN 45545-2: 2013 EN ISO 5659-2: 2013	HL1, HL2, HL3
	Smoke Toxicity Test	EN 45545-2: 2013 NF X70-100: 2006	HL1, HL2, HL3
R24	Oxygen Index Test	EN45545-2: 2013 EN ISO 4589-2	HL1, HL2, HL3
R25	Glow - Wire Test	EN 45545-2:2013 EN 60695-2-11:2001	HL1, HL2, HL3
R26	Vertical Flame Test	EN 45545-2: 2013 EN 60695-11-10: 2013	HL1, HL2, HL3

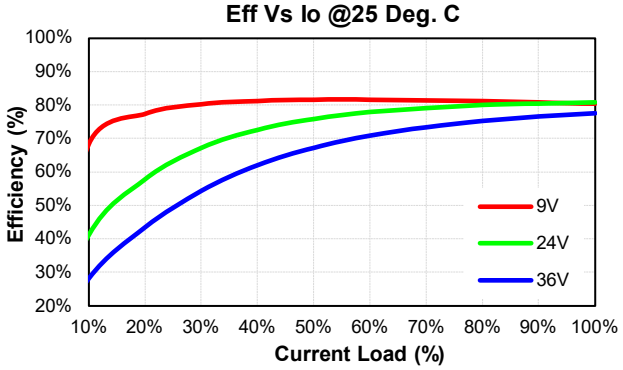
CHARACTERISTIC CURVE

Power Derating Curve



Performance Data

EC6AW-24S33
Eff Vs Io @25 Deg. C



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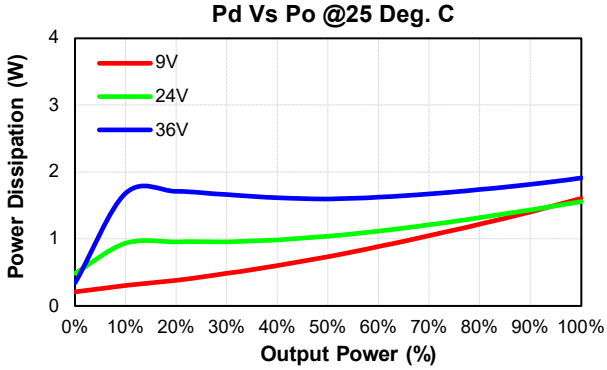

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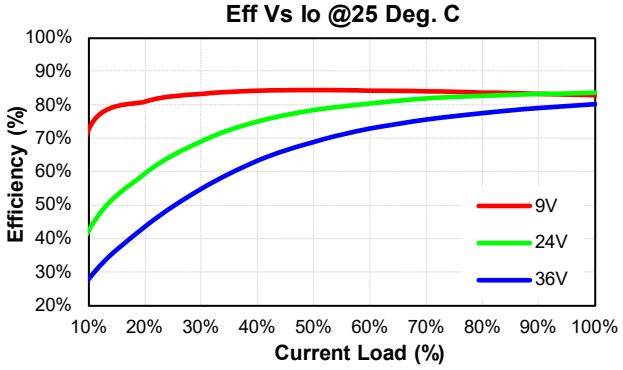

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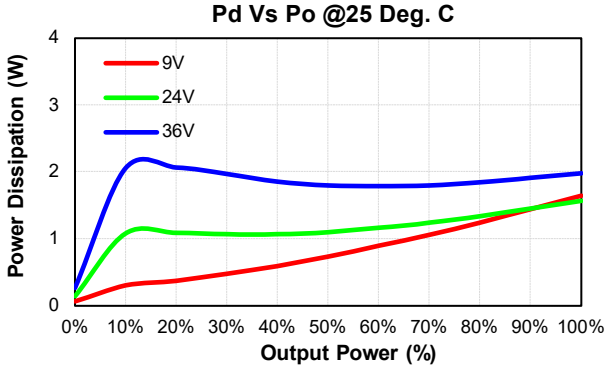

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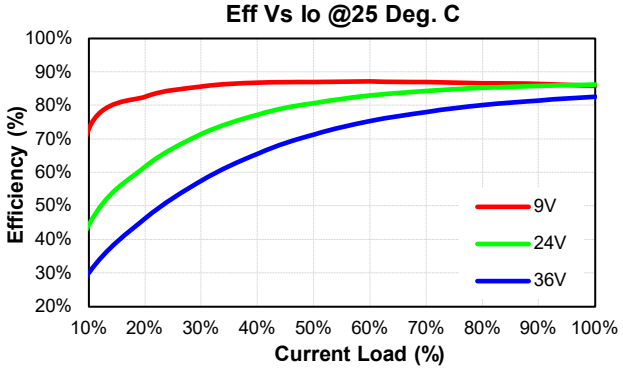

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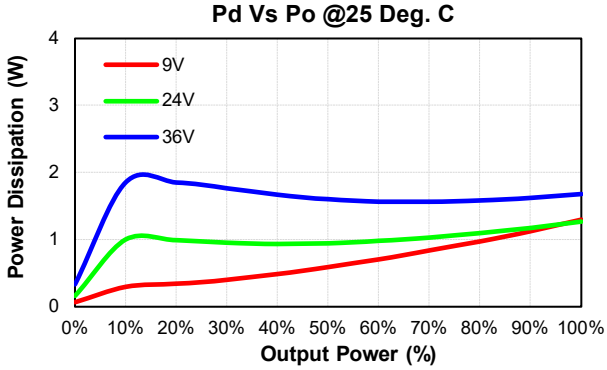

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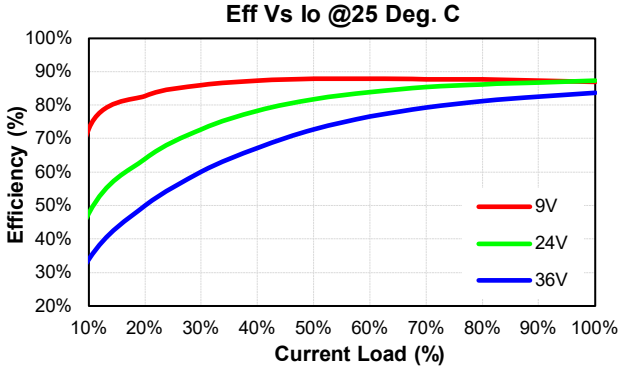

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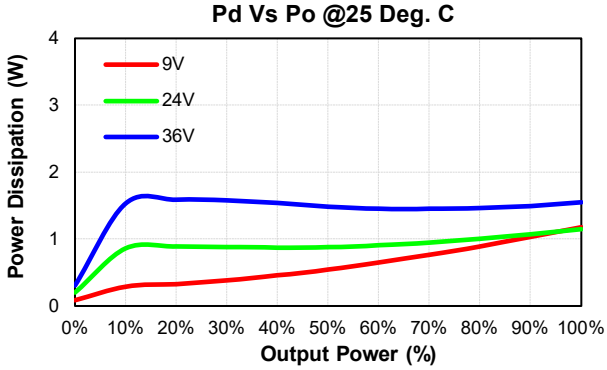

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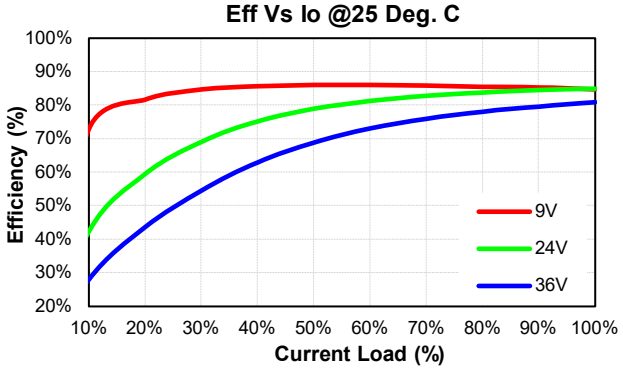

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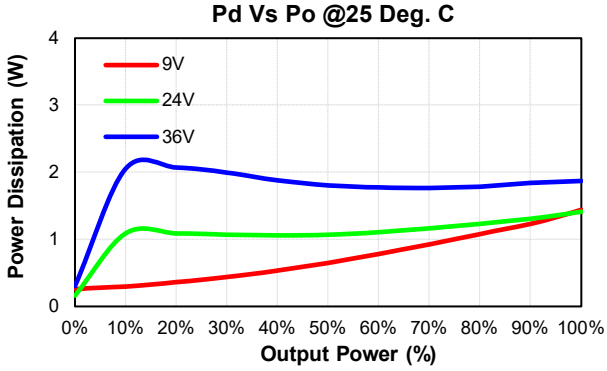

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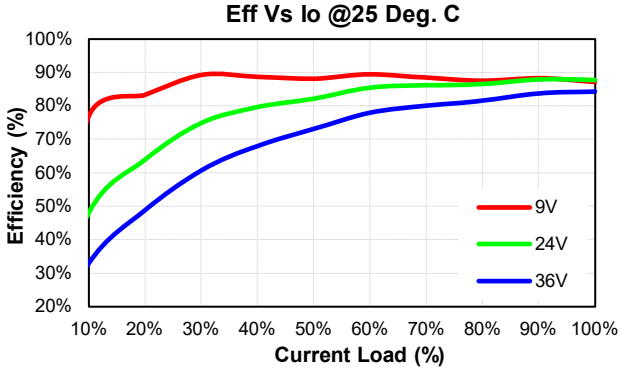

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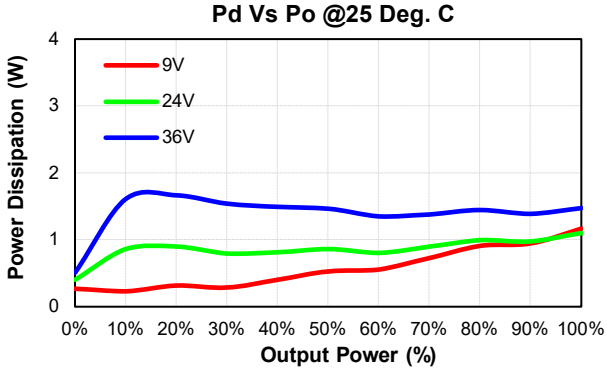

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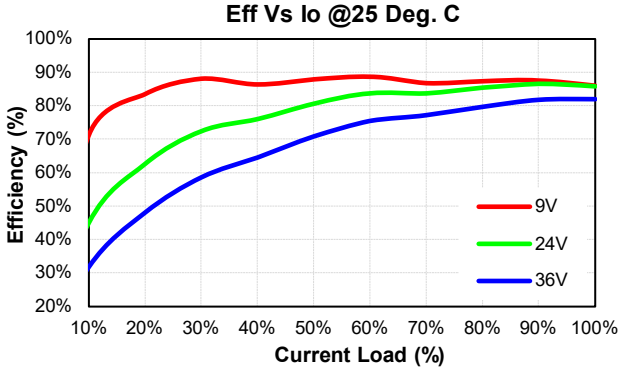

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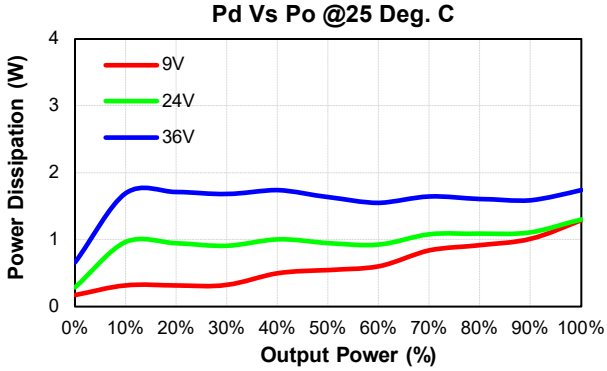

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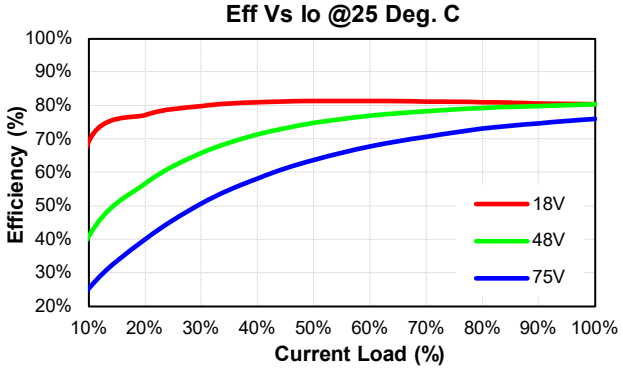

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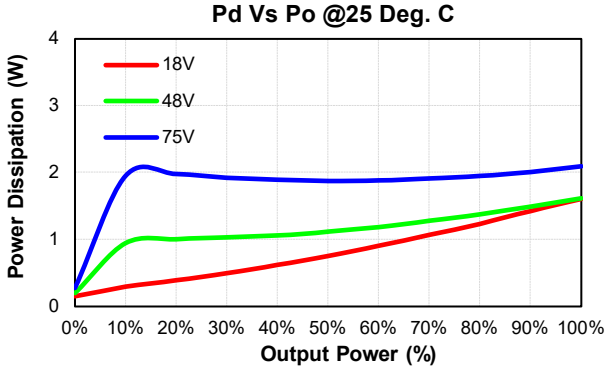

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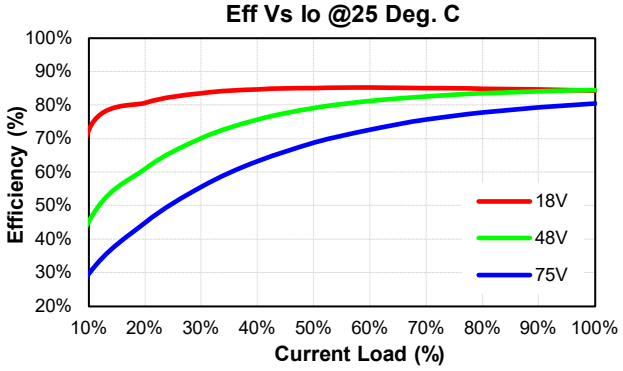

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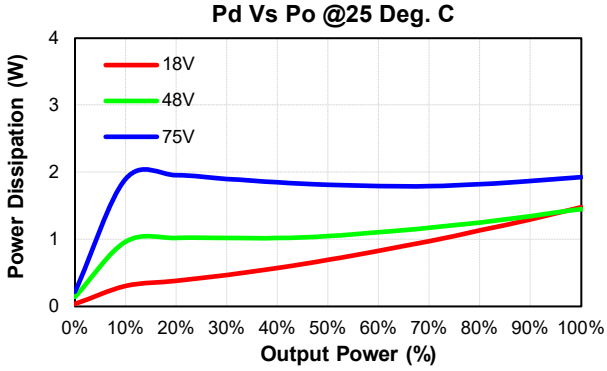

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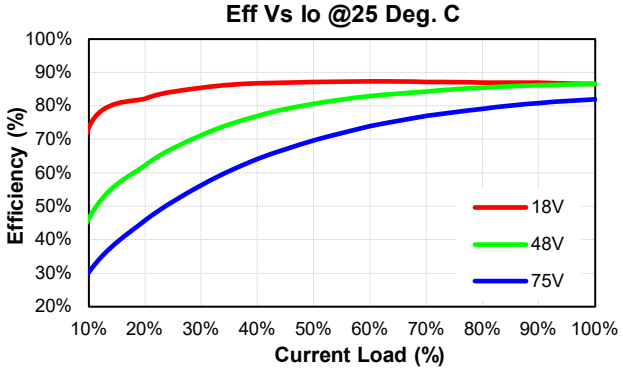

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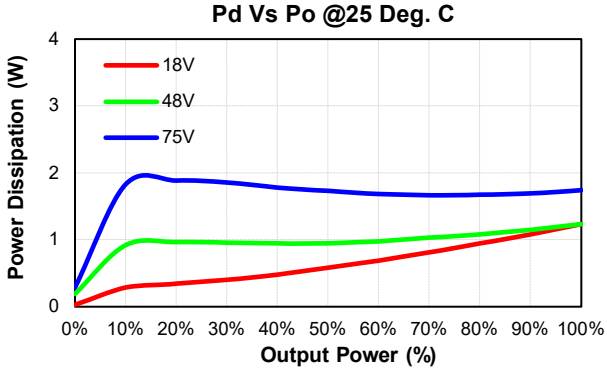

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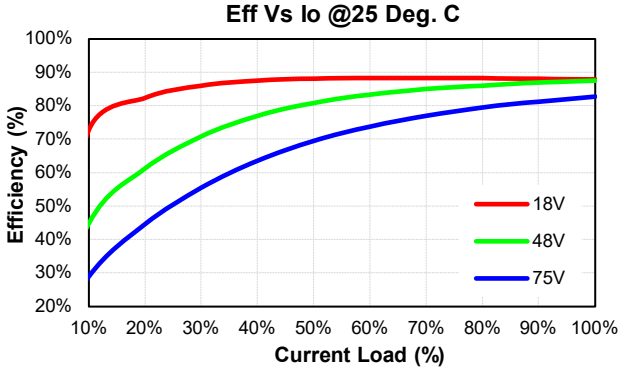

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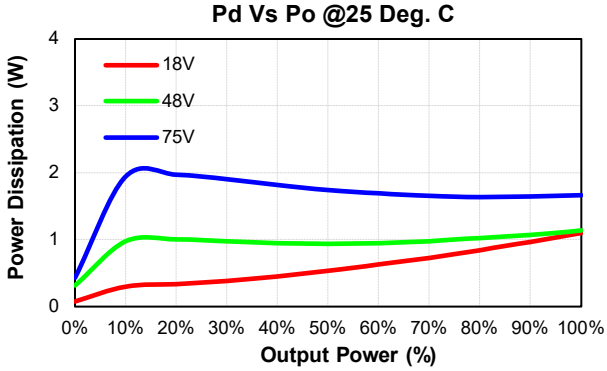

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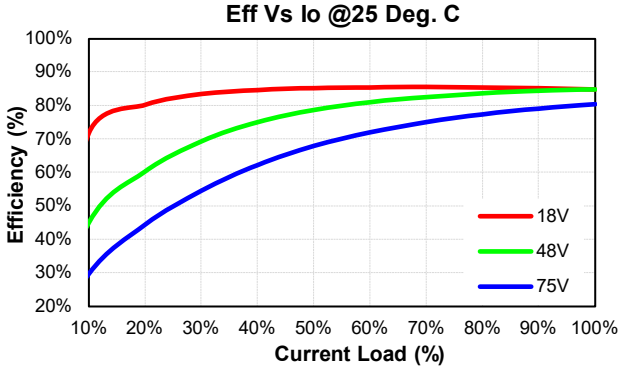

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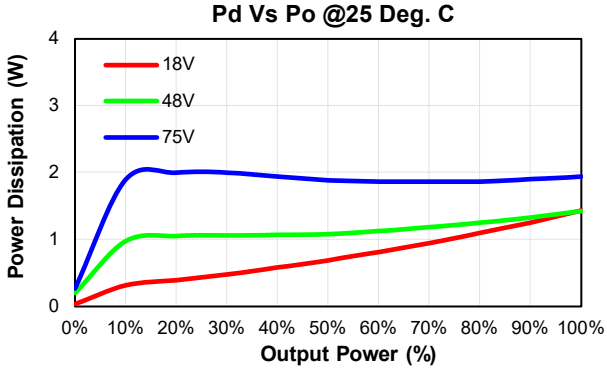
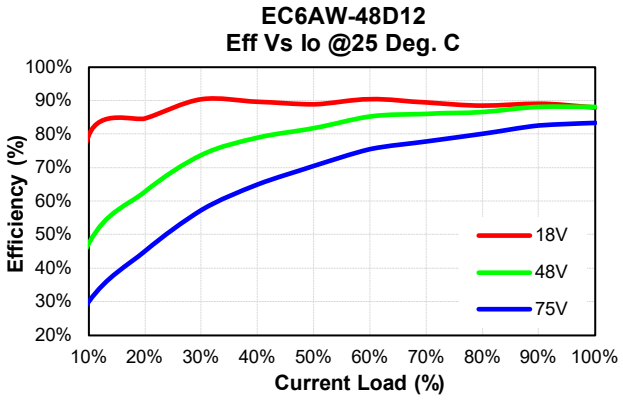
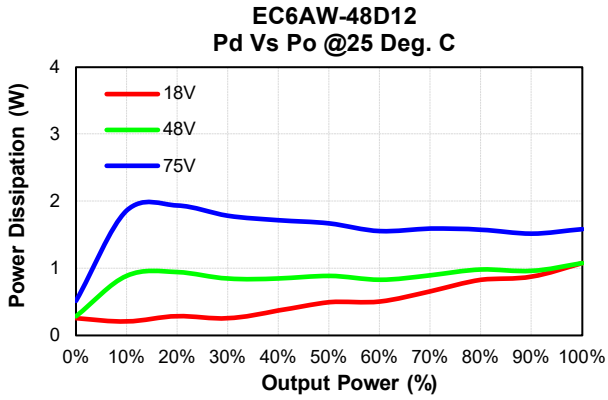
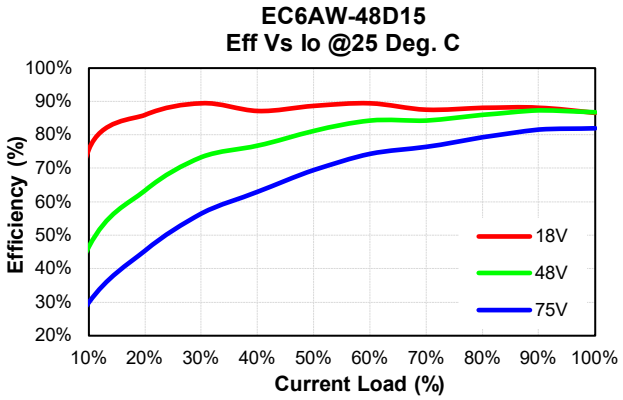
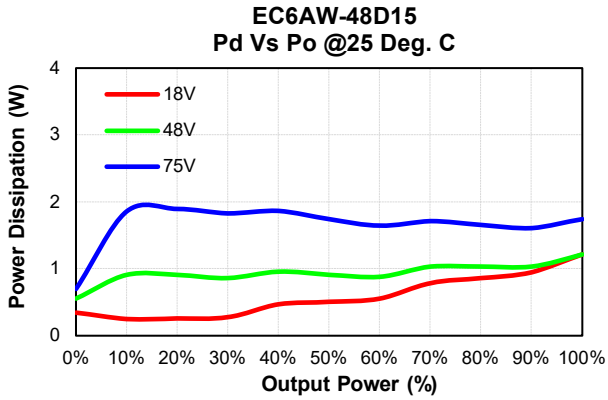






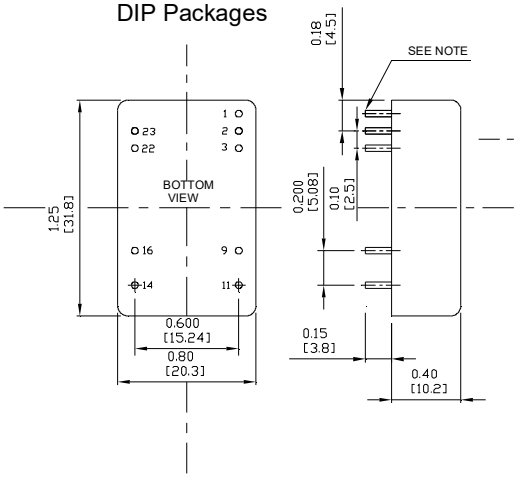




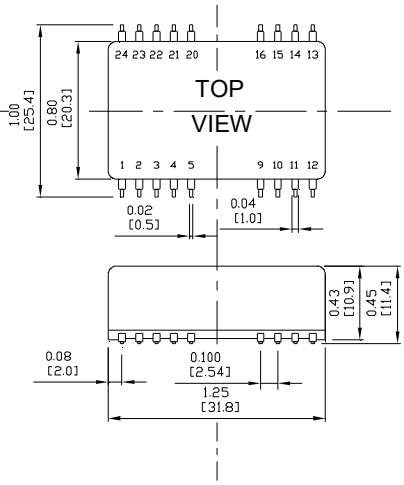
MECHANICAL SPECIFICATION

NOTE:Pin Size is 0.02±0.002 Inch (0.5±0.05 mm)DIA
All Dimensions In Inches (mm)
Tolerances Inches: X.XX= ±0.02 , X.XXX= ±0.010
Millimeters: X.X= ±0.5 , X.XX=±0.25

DIP Packages



SMD Packages



PIN CONNECTION				
Pin	Single Output		Dual Output	
	DIP	SMD	DIP	SMD
1	Remote on/off	Remote on/off	Remote on/off	Remote on/off
2,3	-V Input		-V Input	
4,5	NP	NC	NP	NC
9	NP	NC	Common	
10	NP	NC	NP	NC
11	NC		-V Output	
12	NP	NC	NP	NC
13	NP	+V Output	NP	NC
14	+V Output		+V Output	
15	NP	-V Output	NP	NC
16	-V Output		Common	
20,21,24	NP	NC	NP	NC
22,23	+V Input		+V Input	

* NC-NO CONNECTION WITH PIN
* NP-NO PIN

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