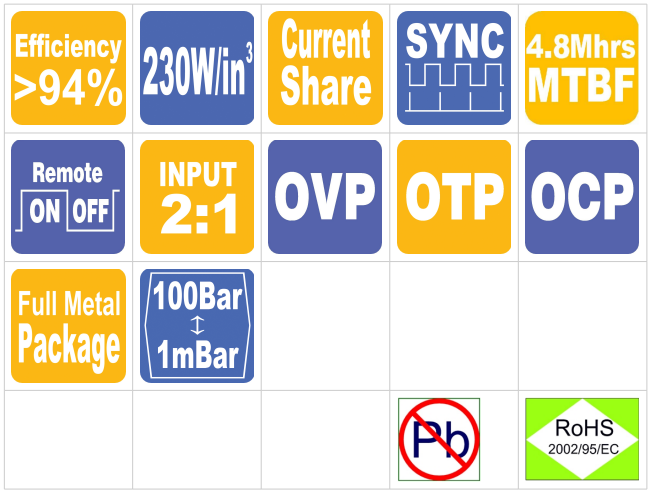
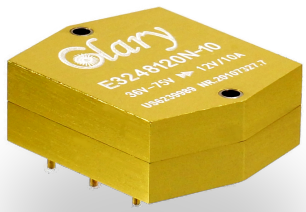




The **E32 Series** provides three outputs including 24V/5A, 12V/10A and 5V/25A from 18~36V or 36~75V input ranges with first-in-industry Hex-Brick metal package that operates at -60ºC~+130ºC temperature range. The efficient converter core is designed with patented ***"Buck-Reset Forward"*** topology, which cooperates with special designed ***"Partial-Resonant-Synchronous-Rectifier"*** stage at 500kHz switching frequency for efficiently delivering more power to achieve 94% of conversion efficiency and 230W/in^3 power density.

A proprietary ultra-fast current limiting circuit is also embedded in the E32 series to eliminate the long existing technical challenge of ***"Short-Circuit-Current-Runaway"***, which is a destructive high output current driven by the minimum output voltage in proportion with the propagation delay flowing through the short circuit loop or the low-impedance non-Ohmic loads. The propagation delay of the E32 series with ultra-fast current limiting can be as short as 60nS, effectively shifting the current limit set point higher than that of conventional converters without reliability impact, and makes it even more suitable for powering the non-Ohmic loads. For providing higher power and improving the system reliability, the E32 Series utilizes a proprietary wide-band ***"Droop Current Sharing"*** control circuit, which allows directly connecting the outputs of modules without a noise sensitive current share bus. The system built by paralleling multiple E32 modules is capable to respond full scale step load within 20µS without evidently overshot and ringing, which can trigger the OCP in the power system employed with a low bandwidth current control loop for balancing the modules.

Not only focusing on the conversion performances, the E32 Series is also designed with higher environmental resistances. All the power semiconductor chips are attached onto the inner surface of the low profile metallic case to spread heat to the outer surface homogeneously, and further result in lower thermal resistance with forced-air cooling. The E32 modules can be double-sides attached to external cooling means by using two screws, which provide sufficient mechanical strength for installing E32 module on high temperature and dusty environment with harsh vibration. The vacuum potted high thermal conductivity silicone helps with heat transfer and maintains hydrostatic pressure balance in the high strength metallic case to withstand pressure range from 1mBar to 100Bar. All the special design efforts embedded in this product effectively simplify the system power design of deep water probes, high altitude instruments and other equipments that the conventional module cannot be used.

MODEL NAME SYSTEM

E32	24	120	a	XYZ
Series	**Input Voltage**	**Output Voltage**	**Enable Logic**	Suffix
E32	**24:**18V~36V **48:**36V~75V	**120=** 12.0V **050=** 5.0V	**P:** Positive **N:** Negative	Classification only if used

The selected option code for the "**a**" section in the model name determines what enable logic will be applied in production. For example, the **E3224120N** module is configured to has negative enable logic without classification.

MODEL LIST (Contact factory for special input / output)

Model Name	Maximum Input		Maximum Output		Efficiency
E3224050a	18V-36V	142W	5.0V/25A	125W	91.0%
E3224120a	18V-36V	134W	12V/10A	120W	93.0%
E3224240a	18V-36V	135W	24V/5A	120W	92.0%

Model Name	Maximum Input		Maximum Output		Efficiency
E3248050a	36V-75V	140W	5.0V/25A	125W	92.0%
E3248120a	36V-75V	132W	12V/10A	120W	94.0%
E3248240a	36V-75V	134W	24V/5A	120W	93.0%

Since the E32 modules are designed to fulfill some critical mechanical and environmental requirements, which cannot be managed by just few digits of model name. Please contact Glary or our local distributors to obtain an additional ***Part Code*** *for purchasing of the specific E32 part.*

COMMON PARAMETERS

Absolute Maximum Ratings

Temperature	Operation Storage	-60°C to +130°C -60°C to +155°C
Input Voltage Range	Operation: 24V Models 48V Models Transient (100mS): 24V Models 48V Models	 -0.5V to +40Vdc -0.5V to +80Vdc 50V Maximum 100V Maximum
Isolation Voltage	Input to Output Input to Case Output to Case	2.0KV Minimum 1.0KV Minimum 1.0KV Minimum
Remote Control		-0.5V to +12Vdc

General

MTBF	Bellcore TR-332 issue 6	4.80×10^{6} hrs @GB/25°C (E3248050a)
OTP	T_{AVG} or T_C	130°C ±5°C for standard setting
Weight		16g

Control

Remote Control	Logic High Logic Low	+3.0V to +6.5V 0V to +1.0V
Input Current of Remote Control Pin		-0.5mA ~ +1.5mA

Input

Operation Voltage Range	24V Models 48V Models	+18V to +36Vdc +36V to +75Vdc
Power ON Voltage Ranges	24V Models 48V Models	+17V to +18Vdc +34V to +36Vdc
Power OFF Voltage Ranges	24V Models 48V Models	+15.6V to +16.6Vdc +31.2V to +33.2Vdc
Off State Input Current	V_{NOM}	6mA Max
Latch-State Input Current	V_{NOM}	8mA Max
Input Capacitance	24V Models 48V Models	20.0uF Max 14.0uF Max

Output Limitations

Part Number	Capacitive Load C_E	Pre-biased Voltage V_B	Reverse Current I_B	Short Circuit Output Current I_S	Note
E3224050a	<10000uF@200mΩ Load	<4.75V	<100mA@V_B	<50A @ 2mΩ Load	
E3224120a	<1000uF@1200mΩ Load	<11.4V	<100mA@V_B	<25A @ 2mΩ Load	
E3224240a	<330uF@4800mΩ Load	<22.8V	<100mA@V_B	<10A @ 2mΩ Load	
E3248050a	<10000uF@200mΩ Load	<4.75V	<100mA@V_B	<50A @ 2mΩ Load	
E3248120a	<1000uF@1200mΩ Load	<11.4V	<100mA@V_B	<25A @ 2mΩ Load	
E3248240a	<330uF@4800mΩ Load	<22.8V	<100mA@V_B	<10A @ 2mΩ Load	

Model Number: E3224050a

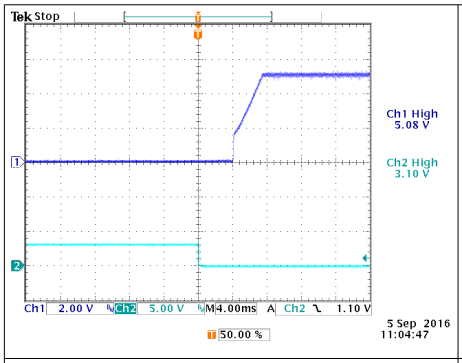
MODEL PARAMETERS

ALL SPECIFICATIONS ARE TYPICAL AT NOMINAL INPUT, FULL LOAD AND 25°C UNLESS OTHERWISE NOTED.

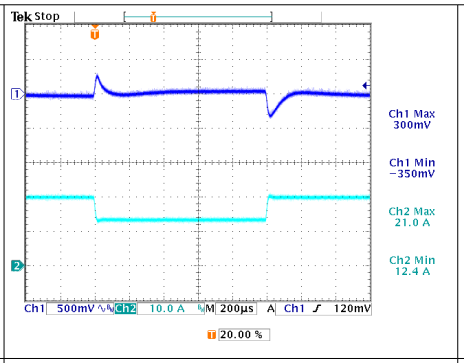
General		
Conversion Efficiency	Typical	See efficiency plots
Switching Frequency	Typical	450KHz

Input/Output		
Reflected Input Ripple Current	L_{EXT} = 10uH	20mA rms/60mAp-p
Input Ripple Rejection (<1KHz)	V_{NOM}, Full Load	-50dB
Voltage Accuracy	Typical	±1.0%
Line Regulation	Full Input Range	±0.2%
Load Regulation	10%~100% (sensing pins connected)	±0.2%
Temperature Drift	-60°C ~+130°C	±0.03%/°C
Output Tolerance Band	All Conditions	±4%
Ripple & Noise (20MHz)	Peak-Peak (RMS)	3% (1%) V_O
Over Voltage Protection	V_{NOM}, 10% Load	115~130 %V_O
Output Current Limits	V_{NOM}	120%~140%
Voltage Trim	V_{NOM}, 10% Load	±10%
Step Load (2.5A/μS)	50%~75% Load	±6%Vo/500μS

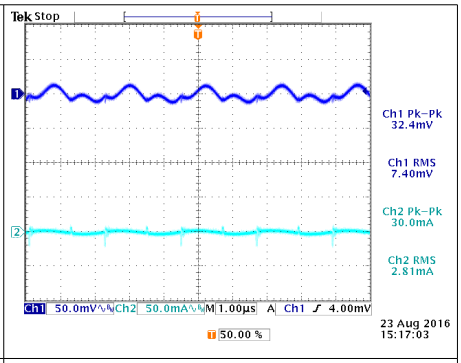
TYPICAL WAVES AND CURVES



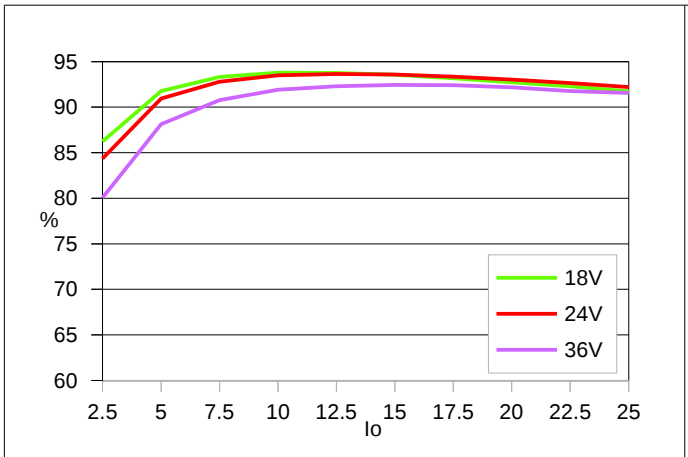
Start-up waveform of E3224050a
(V_{IN}: 24V, Load: 25A)



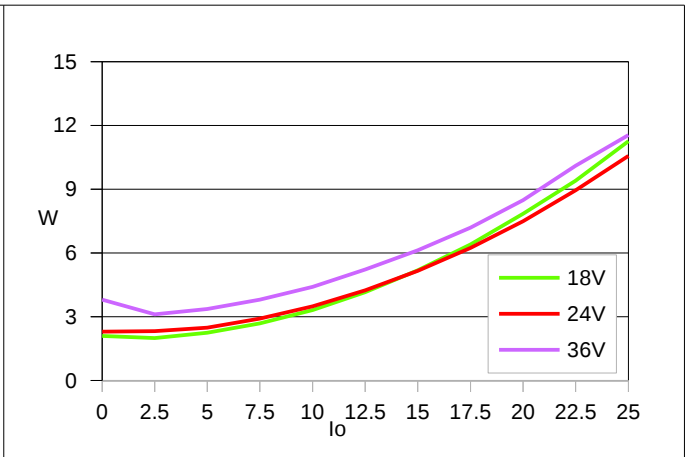
Transient response of E3224050a
(V_{IN}: 24V, Load: 12.5A/18.75A@2.5A/μS)



Input/Output ripples of E3224050a
(V_{IN}: 24V, Load: 25A, L_{IN}=10uH)



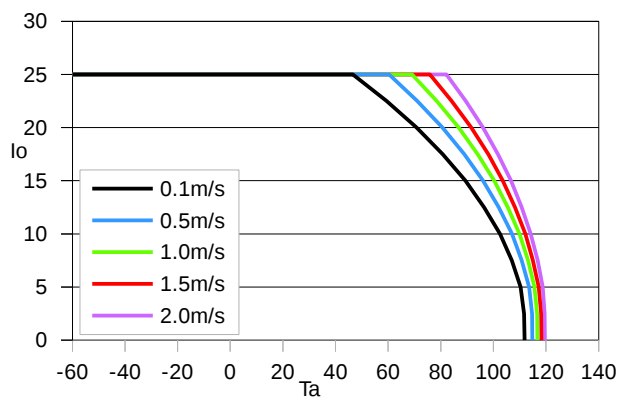
Efficiency plot of E3224050a



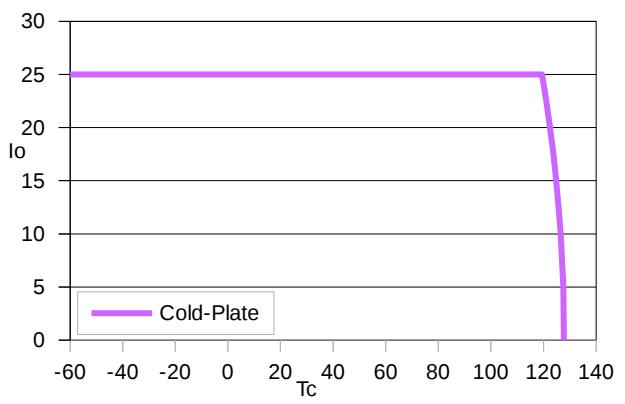
Power loss curves of E3224050a

Model Number: E3224050a

DERATING CURVES



Calculated derating of E3224050a with Forced-Air cooling

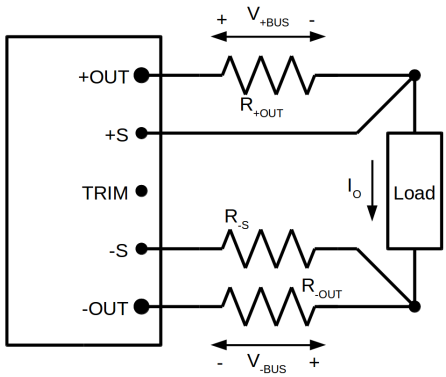


Calculated derating of E3224050a with Cold-Plate cooling

VOLTAGE DROP COMPENSATION

The resistors R_{+OUT} and R_{-OUT} on the right-hand side circuit represent the impedances of the power distribution bus contributing voltage drops V_{+BUS} and V_{-BUS} respectively. The voltage drop V_{+BUS} can be eliminated by connecting the +S to the positive node of the load. The -S pin functions differently as it can disable the droop current sharing, compensate the voltage drop V_{-BUS}, manipulate the load regulation of droop current sharing function or enhance the step load performance.

By connecting a resistor R_{-S} between the -S pin and the negative node of the voltage on the load can be regulated. The values of R_{-S} for eliminating different V_{-BUS} and droop current sharing regulation at full load condition are listed in table below, which can be calculated from the equation right-hand below by leting $I_O = I_{RATED}$ and $V_O = V_{RATED}$. Precision resistor with less than 1% of tolerance is recommended for R_{-S}.



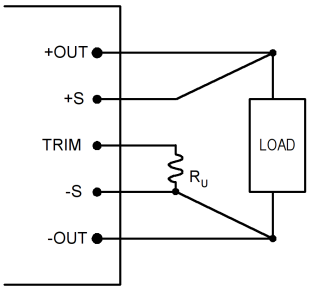
$$R_{-S} = \frac{(5\,V_{-BUS} + \frac{0.05\,I_O}{I_{RATED}})\,V_{RATED}}{V_O + V_{-BUS} + (\frac{I_O}{60\,I_{RATED}} - 1)\,V_{RATED}} - 3$$

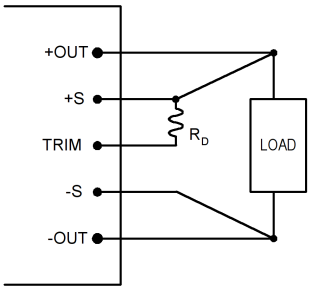
V_{-BUS}	25mV	50mV	75mV	100mV	125mV	150mV	175mV	200mV	225mV	250mV
R_S(Ω)	5.08	8.25	10.42	12.00	13.20	14.14	14.90	15.53	16.05	16.50

** Please consult Glary Power for manipulating load sharing and dynamic performance.*

TRIM AND TRIM TABLE

The output of the E3224050a power module can be adjusted for higher or lower than the rated voltage level by connecting the TRIM pin through a resistor to the pins of -S or +S respectively as shown as on the right hand side. The resistor for trimming output voltage higher or lower are denoted as R_U and R_D, which have different resistances for each different output voltage level. The resistance table for trimming the output voltage with 1% of step are listed as below for reference.





Trim Up	+1%	+2%	+3%	+4%	+5%	+6%	+7%	+8%	+9%	+10%	-	-	-	-	-	-	-	-	-	-
R_U (KΩ)	153.2	76.59	51.06	38.29	30.63	25.53	21.88	19.15	17.02	15.32	-	-	-	-	-	-	-	-	-	-

Trim Down	-1%	-2%	-3%	-4%	-5%	-6%	-7%	-8%	-9%	-10%	-	-	-	-	-	-	-	-	-	-
R_D (KΩ)	48.11	23.04	14.68	10.50	7.99	6.32	4.23	3.54	0.61	2.98	-	-	-	-	-	-	-	-	-	-

** Please contact Glary Power if a trim range beyond ±10% is needed.*

Model Number: E3224120a

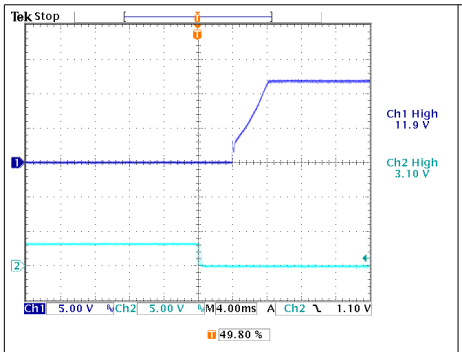
MODEL PARAMETERS

ALL SPECIFICATIONS ARE TYPICAL AT NOMINAL INPUT, FULL LOAD AND 25°C UNLESS OTHERWISE NOTED.

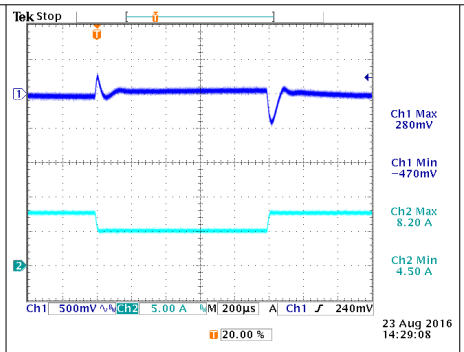
General		
Conversion Efficiency	Typical	See efficiency plots
Switching Frequency	Typical	480KHz

Output		
Voltage Accuracy	Typical	±1.0%
Line Regulation	Full Input Range	±0.2%
Load Regulation	10%~100% (sensing pins connected)	±0.2%
Temperature Drift	-60°C ~+130°C	±0.03%/°C
Output Tolerance Band	All Conditions	±4%
Ripple & Noise (20MHz)	Peak-Peak (RMS)	3% (1%) V_O
Over Voltage Protection	V_{NOM}, 10% Load	115~130 %V_O
Output Current Limits	V_{NOM}	120%~140%
Voltage Trim	V_{NOM}, 10% Load	±10%
Input Ripple Rejection (<1KHz)	V_{NOM}, Full Load	-50dB
Step Load (2.5A/μS)	50%~75% Load	±6%Vo/500μS
Start-Up Delay Time	V_{NOM}, Full Load	20mS/250mS

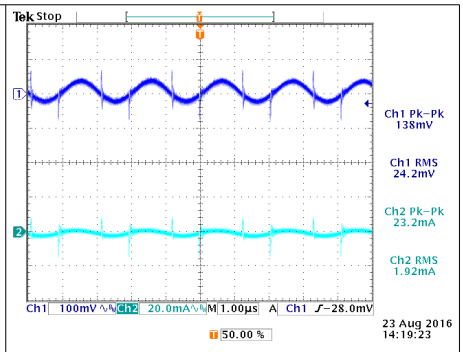
TYPICAL WAVES AND CURVES



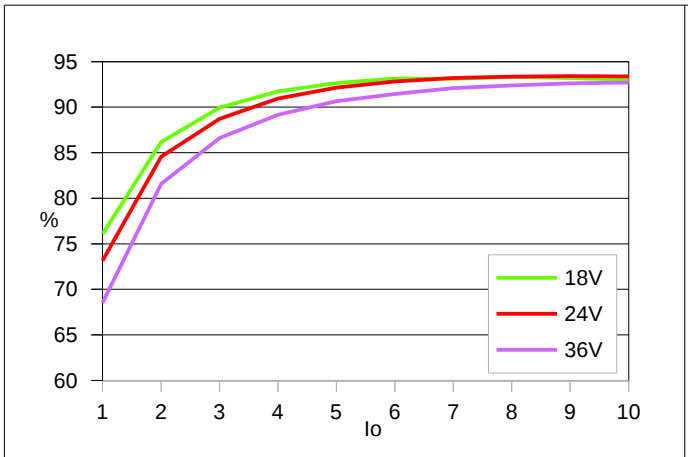
Start-up waveform of E3224120a
(V_{IN}: 24V, Load: 10A)



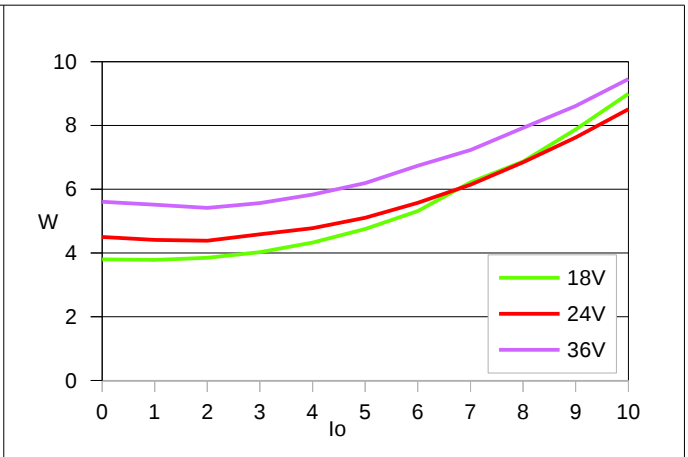
Transient response of E3224120a
(V_{IN}: 24V, Load: 5A/7.5A@2.5A/μS)



Input/Output ripples of E3224120a
(V_{IN}: 24V, Load: 10A, L_{IN}=10uH)



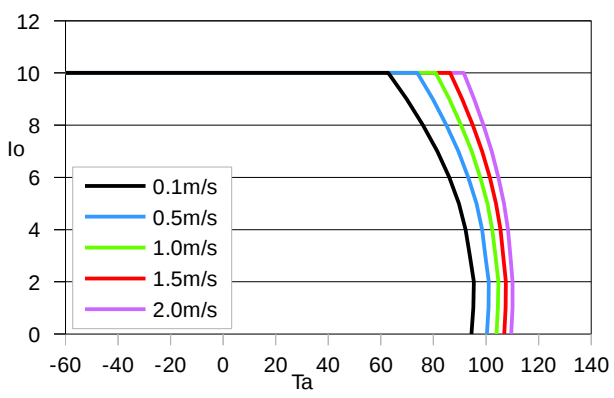
Efficiency plot of E3224120a



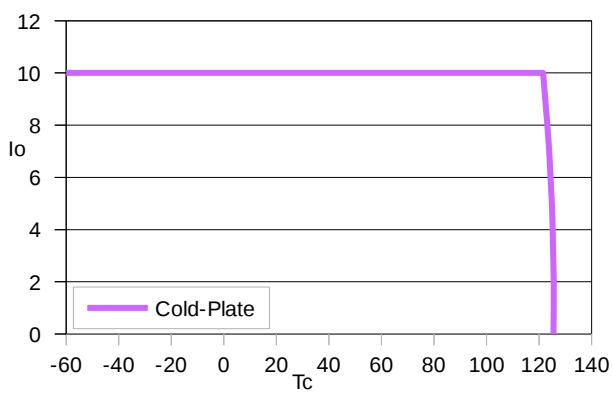
Power loss curves of E3224120a

Model Number: E3224120a

DERATING CURVES



Calculated derating of E3224120a with Forced-Air cooling

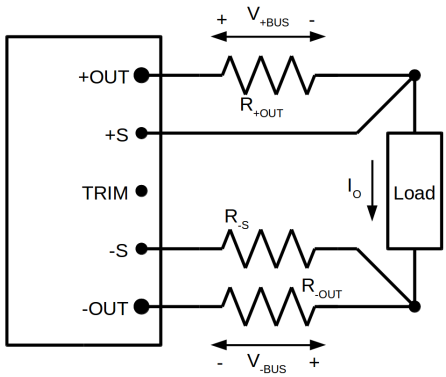


Calculated derating of E3224120a with Cold-Plate cooling

VOLTAGE DROP COMPENSATION

The resistors R_{+OUT} and R_{-OUT} on the right-hand side circuit represent the impedances of the power distribution bus contributing voltage drops V_{+BUS} and V_{-BUS} respectively. The voltage drop V_{+BUS} can be eliminated by connecting the +S to the positive node of the load. The -S pin functions differently as it can disable the droop current sharing, compensate the voltage drop V_{-BUS}, manipulate the load regulation of droop current sharing function or enhance the step load performance.

By connecting a resistor R_{-S} between the -S pin and the negative node of the voltage on the load can be regulated. The values of R_{-S} for eliminating different V_{-BUS} and droop current sharing regulation at full load condition are listed in table below, which can be calculated from the equation right-hand below by leting $I_O = I_{RATED}$ and $V_O = V_{RATED}$. Precision resistor with less than 1% of tolerance is recommended for R_{-S}.



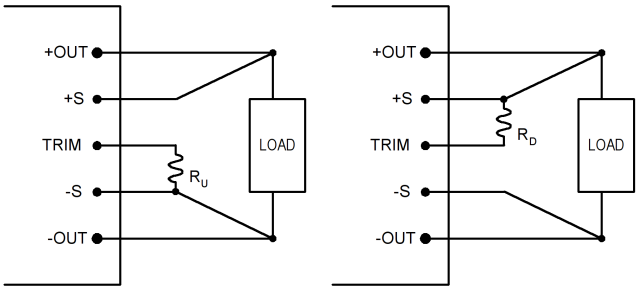
$$R_{-S} = \frac{(5\,V_{-BUS} + \frac{0.05\,I_O}{I_{RATED}})\,V_{RATED}}{V_O + V_{-BUS} + (\frac{I_O}{60\,I_{RATED}} - 1)\,V_{RATED}} - 3$$

V_{-BUS}	60mV	120mV	180mV	240mV	300mV	360mV	420mV	480mV	540mV	600mV
$R_S(\Omega)$	13.15	21.37	27.00	31.09	34.20	36.64	38.61	40.24	41.59	42.75

** Please consult Glary Power for manipulating load sharing and dynamic performance.*

TRIM AND TRIM TABLE

The output of the E3224120a power module can be adjusted for higher or lower than the rated voltage level by connecting the TRIM pin through a resistor to the pins of -S or +S respectively as shown as on the right hand side. The resistor for trimming output voltage higher or lower are denoted as R_U and R_D, which have different resistances for each different output voltage level. The resistance table for trimming the output voltage with 1% of step are listed as below for reference.



Trim Up	+1%	+2%	+3%	+4%	+5%	+6%	+7%	+8%	+9%	+10%	-	-	-	-	-	-	-	-	-	-
R_U (KΩ)	324.2	162.1	108.1	81.04	64.83	54.03	46.31	40.52	36.02	32.42	-	-	-	-	-	-	-	-	-	-

Trim Down	-1%	-2%	-3%	-4%	-5%	-6%	-7%	-8%	-9%	-10%	-	-	-	-	-	-	-	-	-	-
R_D (KΩ)	78.12	37.03	23.33	16.48	12.37	9.63	7.68	6.21	5.07	4.19	-	-	-	-	-	-	-	-	-	-

** Please contact Glary Power if a trim range beyond ±10% is needed.*

Model Number: E3224240a

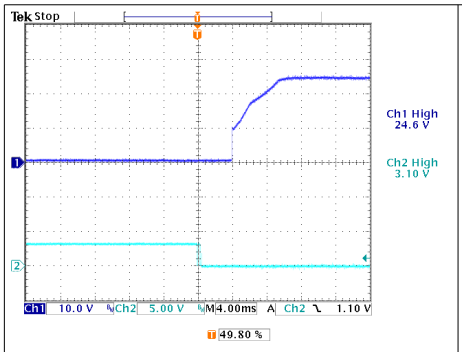
MODEL PARAMETERS

ALL SPECIFICATIONS ARE TYPICAL AT NOMINAL INPUT, FULL LOAD AND 25°C UNLESS OTHERWISE NOTED.

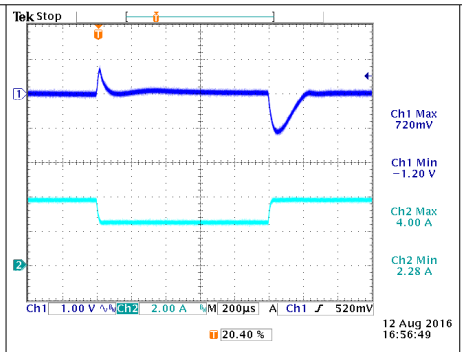
General		
Conversion Efficiency	Typical	See efficiency plots
Switching Frequency	Typical	480KHz

Output		
Voltage Accuracy	Typical	±1.0%
Line Regulation	Full Input Range	±0.2%
Load Regulation	10%~100% (sensing pins connected)	±0.2%
Temperature Drift	-60°C ~+130°C	±0.03%/°C
Output Tolerance Band	All Conditions	±4%
Ripple & Noise (20MHz)	Peak-Peak (RMS)	3% (1%) V_O
Over Voltage Protection	V_{NOM}, 10% Load	115~130 %V_O
Output Current Limits	V_{NOM}	120%~140%
Voltage Trim	V_{NOM}, 10% Load	±10%
Input Ripple Rejection (<1KHz)	V_{NOM}, Full Load	-50dB
Step Load (2.5A/μS)	50%~75% Load	±6%Vo/500μS
Start-Up Delay Time	V_{NOM}, Full Load	20mS/250mS

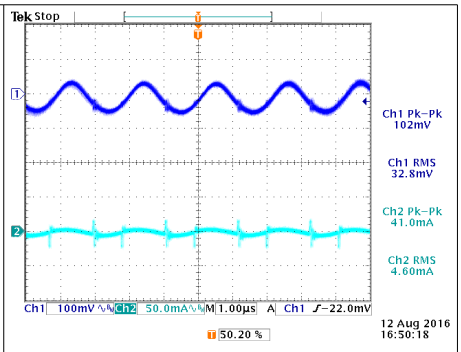
TYPICAL WAVES AND CURVES



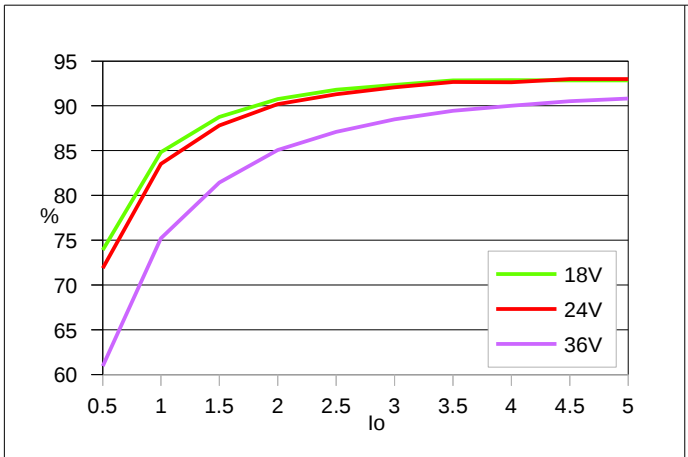
Start-up waveform of E3224240a
(V_{IN}: 24V, Load: 5A)



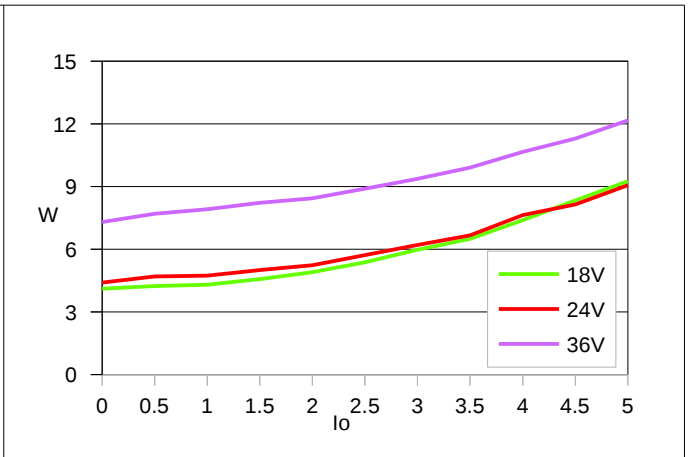
Transient response of E3224240a
(V_{IN}: 24V, Load: 2.5A/3.75A@2.5A/μS)



Input/Output ripples of E3224240a
(V_{IN}: 24V, Load: 5A, L_{IN}=10uH)



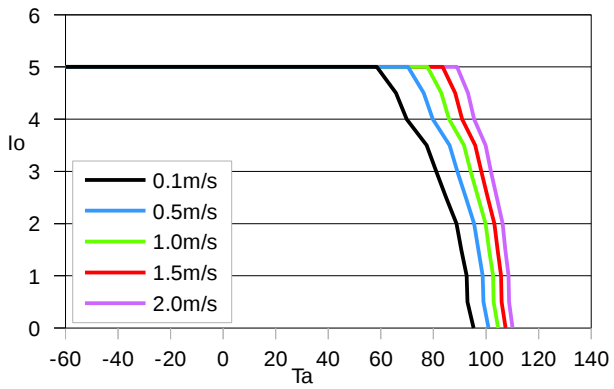
Efficiency plot of E3224240a



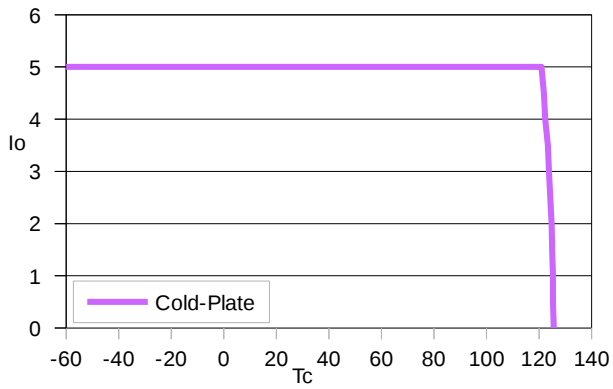
Power loss curves of E3224240a

Model Number: E3224240a

DERATING CURVES



Calculated derating of E3224240a with Forced-Air cooling

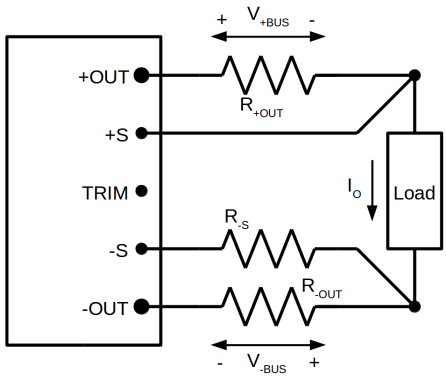


Calculated derating of E3224240a with Cold-Plate cooling

VOLTAGE DROP COMPENSATION

The resistors R_{+OUT} and R_{-OUT} on the right-hand side circuit represent the impedances of the power distribution bus contributing voltage drops V_{+BUS} and V_{-BUS} respectively. The voltage drop V_{+BUS} can be eliminated by connecting the +S to the positive node of the load. The -S pin functions differently as it can disable the droop current sharing, compensate the voltage drop V_{-BUS}, manipulate the load regulation of droop current sharing function or enhance the step load performance.

By connecting a resistor R_{-S} between the -S pin and the negative node of the voltage on the load can be regulated. The values of R_{-S} for eliminating different V_{-BUS} and droop current sharing regulation at full load condition are listed in table below, which can be calculated from the equation right-hand below by leting $I_O = I_{RATED}$ and $V_O = V_{RATED}$. Precision resistor with less than 1% of tolerance is recommended for R_{-S}.



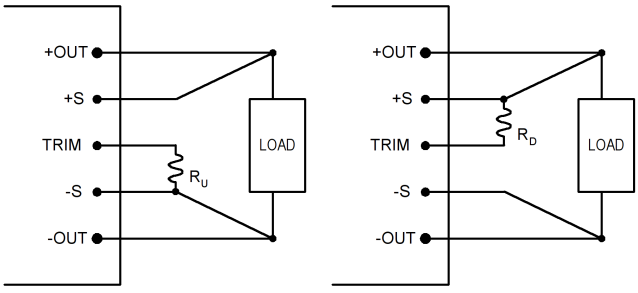
$$R_{-S} = \frac{(5\,V_{-BUS} + \frac{0.05\,I_O}{I_{RATED}})\,V_{RATED}}{V_O + V_{-BUS} + (\frac{I_O}{60\,I_{RATED}} - 1)\,V_{RATED}} - 3$$

V_{-BUS}	120mV	240mV	360mV	480mV	600mV	720mV	840mV	960mV	1.080V	1.200V
R_S(Ω)	27.00	43.87	55.42	63.82	70.20	75.21	79.26	82.59	85.38	87.75

** Please consult Glary Power for manipulating load sharing and dynamic performance.*

TRIM AND TRIM TABLE

The output of the E3224240a power module can be adjusted for higher or lower than the rated voltage level by connecting the TRIM pin through a resistor to the pins of -S or +S respectively as shown as on the right hand side. The resistor for trimming output voltage higher or lower are denoted as R_U and R_D, which have different resistances for each different output voltage level. The resistance table for trimming the output voltage with 1% of step are listed as below for reference.



Trim Up	+1%	+2%	+3%	+4%	+5%	+6%	+7%	+8%	+9%	+10%	-	-	-	-	-	-	-	-	-	-
R_U (KΩ)	645.1	322.5	215.0	161.3	129.0	107.5	92.15	80.63	71.67	64.51	-	-	-	-	-	-	-	-	-	-

Trim Down	-1%	-2%	-3%	-4%	-5%	-6%	-7%	-8%	-9%	-10%	-	-	-	-	-	-	-	-	-	-
R_D (KΩ)	158.0	74.92	47.24	33.40	25.10	19.57	15.61	12.65	10.34	8.50	-	-	-	-	-	-	-	-	-	-

** Please contact Glary Power if a trim range beyond ±10% is needed.*

Model Number: E3248050a

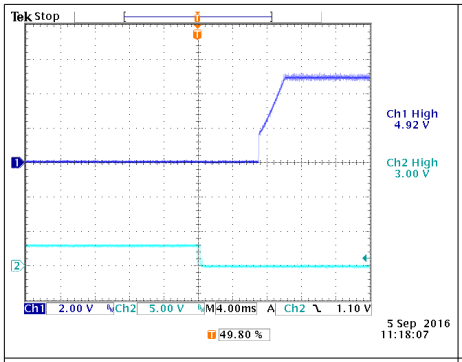
MODEL PARAMETERS

ALL SPECIFICATIONS ARE TYPICAL AT NOMINAL INPUT, FULL LOAD AND 25°C UNLESS OTHERWISE NOTED.

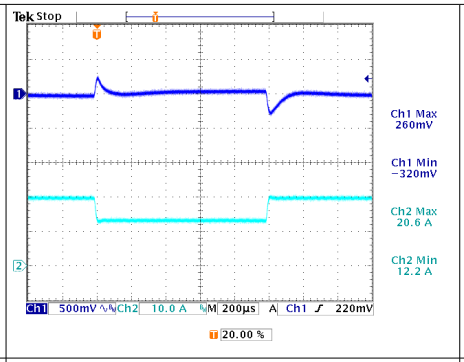
General		
Conversion Efficiency	Typical	See efficiency plots
Switching Frequency	Typical	470KHz

Output		
Voltage Accuracy	Typical	±1.0%
Line Regulation	Full Input Range	±0.2%
Load Regulation	10%~100% (sensing pins connected)	±0.2%
Temperature Drift	-60°C ~+130°C	±0.03%/°C
Output Tolerance Band	All Conditions	±4%
Ripple & Noise (20MHz)	Peak-Peak (RMS)	3% (1%) V_O
Over Voltage Protection	V_{NOM}, 10% Load	115~130 %V_O
Output Current Limits	V_{NOM}	120%~140%
Voltage Trim	V_{NOM}, 10% Load	±10%
Input Ripple Rejection (<1KHz)	V_{NOM}, Full Load	-50dB
Step Load (2.5A/μS)	50%~75% Load	±6%Vo/500μS
Start-Up Delay Time	V_{NOM}, Full Load	20mS/250mS

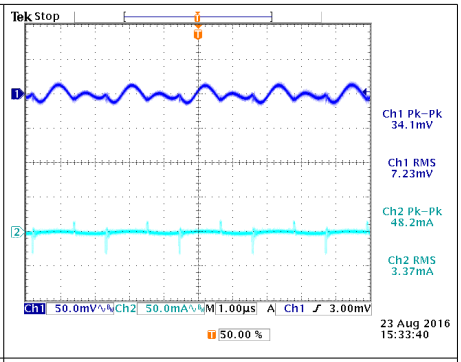
TYPICAL WAVES AND CURVES



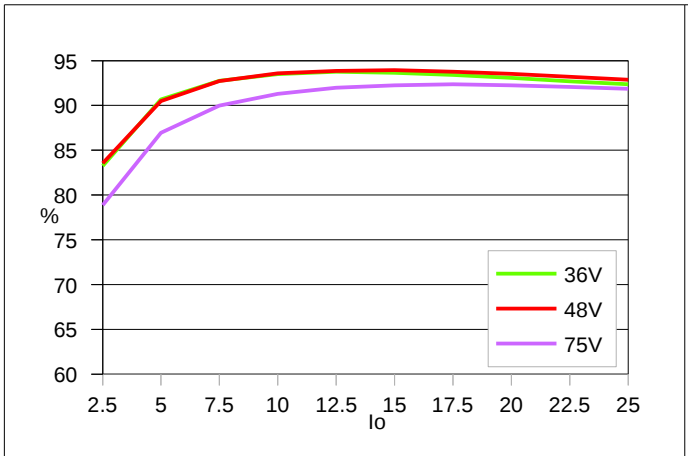
Start-up waveform of E3248050a
(V_{IN}: 48V, Load: 25A)



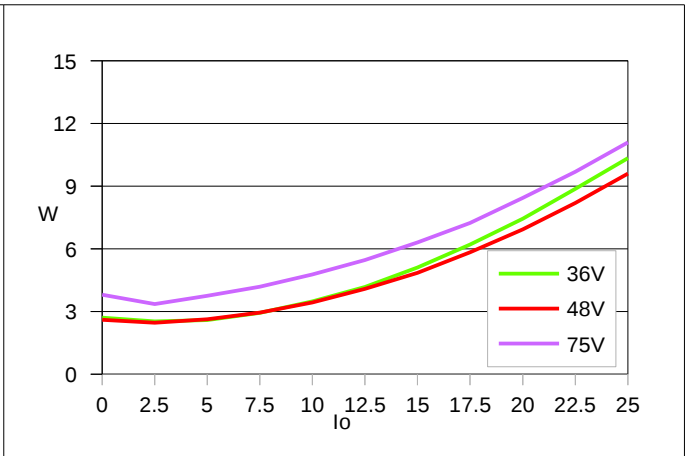
Transient response of E3248050a
(V_{IN}: 48V, Load: 12.5A/18.75A@2.5A/μS)



Input/Output ripples of E3248050a
(V_{IN}: 48V, Load: 25A, L_{IN}=10uH)



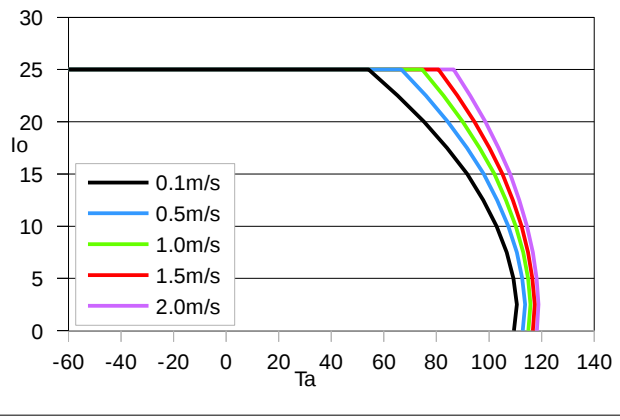
Efficiency plot of E3248050a



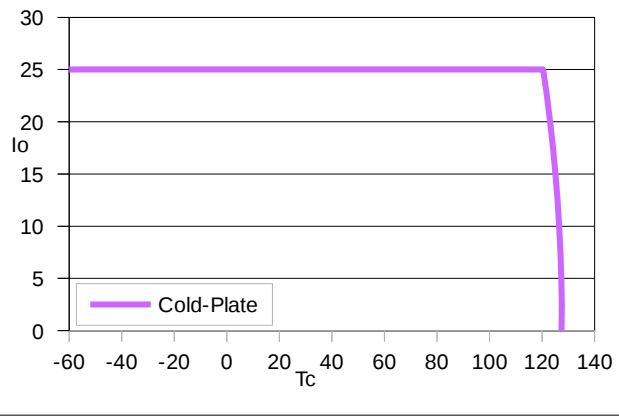
Power loss curves of E3248050a

Model Number: E3248050a

DERATING CURVES



Calculated derating of E3248050a with Forced-Air cooling

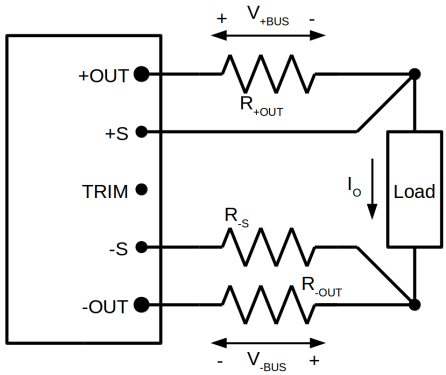


Calculated derating of E3248050a with Cold-Plate cooling

VOLTAGE DROP COMPENSATION

The resistors R_{+OUT} and R_{-OUT} on the right-hand side circuit represent the impedances of the power distribution bus contributing voltage drops V_{+BUS} and V_{-BUS} respectively. The voltage drop V_{+BUS} can be eliminated by connecting the +S to the positive node of the load. The -S pin functions differently as it can disable the droop current sharing, compensate the voltage drop V_{-BUS}, manipulate the load regulation of droop current sharing function or enhance the step load performance.

By connecting a resistor R_{-S} between the -S pin and the negative node of the voltage on the load can be regulated. The values of R_{-S} for eliminating different V_{-BUS} and droop current sharing regulation at full load condition are listed in table below, which can be calculated from the equation right-hand below by leting $I_O = I_{RATED}$ and $V_O = V_{RATED}$. Precision resistor with less than 1% of tolerance is recommended for R_{-S}.



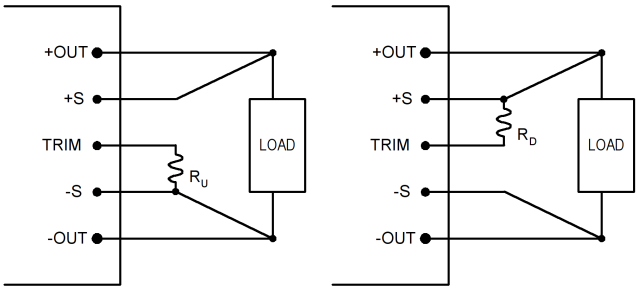
$$R_{-S} = \frac{(5\,V_{-BUS} + \frac{0.05\,I_O}{I_{RATED}})\,V_{RATED}}{V_O + V_{-BUS} + (\frac{I_O}{60\,I_{RATED}} - 1)\,V_{RATED}} - 3$$

V_{-BUS}	25mV	50mV	75mV	100mV	125mV	150mV	175mV	200mV	225mV	250mV
$R_S(\Omega)$	5.08	8.25	10.42	12.00	13.20	14.14	14.90	15.53	16.05	16.50

** Please consult Glary Power for manipulating load sharing and dynamic performance.*

TRIM AND TRIM TABLE

The output of the E3248050a power module can be adjusted for higher or lower than the rated voltage level by connecting the TRIM pin through a resistor to the pins of -S or +S respectively as shown as on the right hand side. The resistor for trimming output voltage higher or lower are denoted as R_U and R_D, which have different resistances for each different output voltage level. The resistance table for trimming the output voltage with 1% of step are listed as below for reference.



Trim Up	+1%	+2%	+3%	+4%	+5%	+6%	+7%	+8%	+9%	+10%	-	-	-	-	-	-	-	-	-	-
R_U (KΩ)	153.2	76.59	51.06	38.29	30.63	25.53	21.88	19.15	17.02	15.32	-	-	-	-	-	-	-	-	-	-

Trim Down	-1%	-2%	-3%	-4%	-5%	-6%	-7%	-8%	-9%	-10%	-	-	-	-	-	-	-	-	-	-
R_D (KΩ)	48.11	23.04	14.68	10.50	7.99	6.32	4.23	3.54	0.61	2.98	-	-	-	-	-	-	-	-	-	-

** Please contact Glary Power if a trim range beyond ±10% is needed.*

Model Number: E3248120a

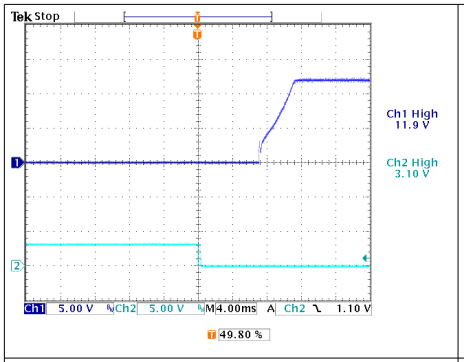
MODEL PARAMETERS

ALL SPECIFICATIONS ARE TYPICAL AT NOMINAL INPUT, FULL LOAD AND 25°C UNLESS OTHERWISE NOTED.

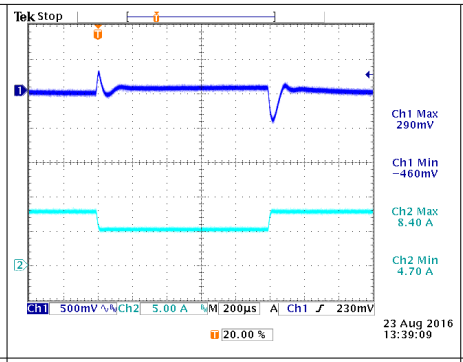
General		
Conversion Efficiency	Typical	See efficiency plots
Switching Frequency	Typical	480KHz

Output		
Voltage Accuracy	Typical	±1.0%
Line Regulation	Full Input Range	±0.2%
Load Regulation	10%~100% (sensing pins connected)	±0.2%
Temperature Drift	-60°C ~+130°C	±0.03%/°C
Output Tolerance Band	All Conditions	±4%
Ripple & Noise (20MHz)	Peak-Peak (RMS)	3% (1%) V_O
Over Voltage Protection	V_{NOM}, 10% Load	115~130 %V_O
Output Current Limits	V_{NOM}	120%~140%
Voltage Trim	V_{NOM}, 10% Load	±10%
Input Ripple Rejection (<1KHz)	V_{NOM}, Full Load	-50dB
Step Load (2.5A/μS)	50%~75% Load	±6%Vo/500μS
Start-Up Delay Time	V_{NOM}, Full Load	20mS/250mS

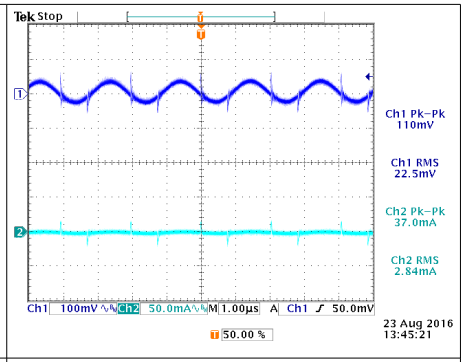
TYPICAL WAVES AND CURVES



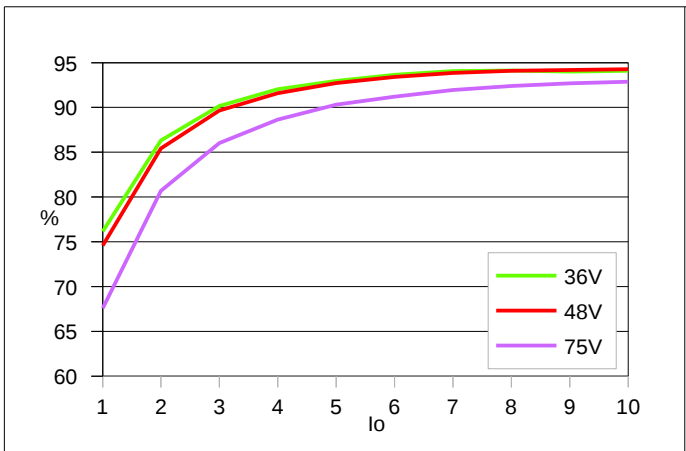
Start-up waveform of E3248120a
(V_{IN}: 48V, Load: 10A)



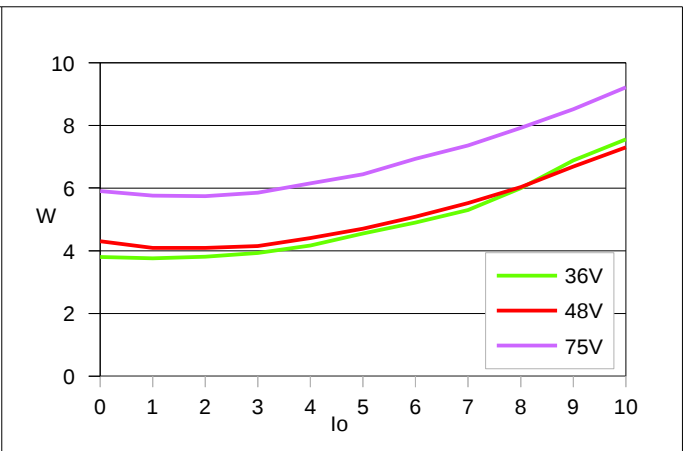
Transient response of E3248120a
(V_{IN}: 48V, Load: 5A/7.5A@2.5A/μS)



Input/Output ripples of E3248120a
(V_{IN}: 48V, Load: 10A, L_{IN}=10uH)



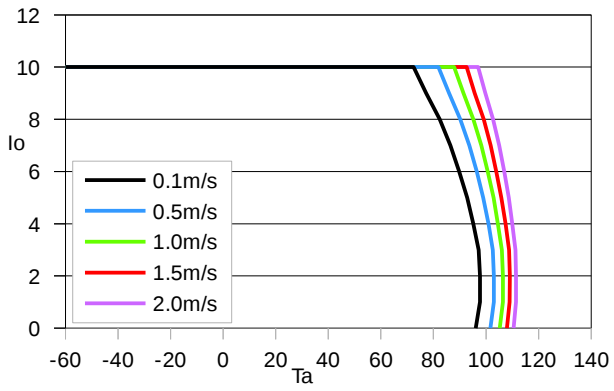
Efficiency plot of E3248120a



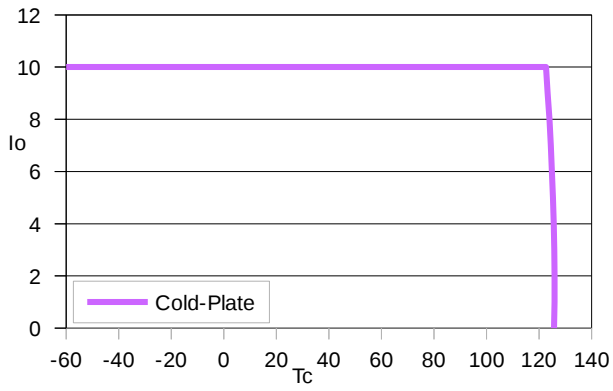
Power loss curves of E3248120a

Model Number: E3248120a

DERATING CURVES



Calculated derating of E3248120a with Forced-Air cooling

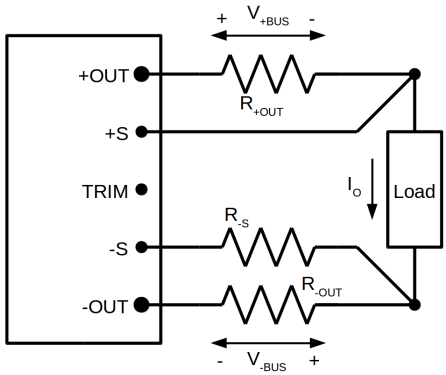


Calculated derating of E3248120a with Cold-Plate cooling

VOLTAGE DROP COMPENSATION

The resistors R_{+OUT} and R_{-OUT} on the right-hand side circuit represent the impedances of the power distribution bus contributing voltage drops V_{+BUS} and V_{-BUS} respectively. The voltage drop V_{+BUS} can be eliminated by connecting the +S to the positive node of the load. The -S pin functions differently as it can disable the droop current sharing, compensate the voltage drop V_{-BUS}, manipulate the load regulation of droop current sharing function or enhance the step load performance.

By connecting a resistor R_{-S} between the -S pin and the negative node of the voltage on the load can be regulated. The values of R_{-S} for eliminating different V_{-BUS} and droop current sharing regulation at full load condition are listed in table below, which can be calculated from the equation right-hand below by leting $I_O = I_{RATED}$ and $V_O = V_{RATED}$. Precision resistor with less than 1% of tolerance is recommended for R_{-S}.



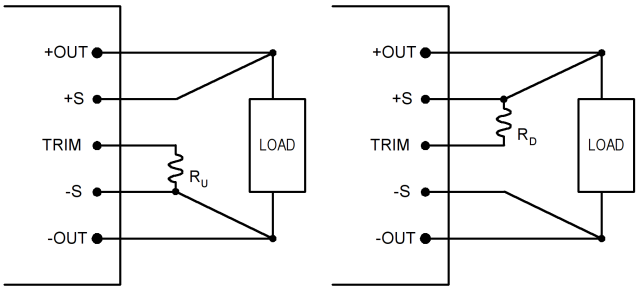
$$R_{-S} = \frac{(5\,V_{-BUS} + \frac{0.05\,I_O}{I_{RATED}})\,V_{RATED}}{V_O + V_{-BUS} + (\frac{I_O}{60\,I_{RATED}} - 1)\,V_{RATED}} - 3$$

V_{-BUS}	60mV	120mV	180mV	240mV	300mV	360mV	420mV	480mV	540mV	600mV
$R_S(\Omega)$	13.15	21.37	27.00	31.09	34.20	36.64	38.61	40.24	41.59	42.75

** Please consult Glary Power for manipulating load sharing and dynamic performance.*

TRIM AND TRIM TABLE

The output of the E3248120a power module can be adjusted for higher or lower than the rated voltage level by connecting the TRIM pin through a resistor to the pins of -S or +S respectively as shown as on the right hand side. The resistor for trimming output voltage higher or lower are denoted as R_U and R_D, which have different resistances for each different output voltage level. The resistance table for trimming the output voltage with 1% of step are listed as below for reference.



Trim Up	+1%	+2%	+3%	+4%	+5%	+6%	+7%	+8%	+9%	+10%	-	-	-	-	-	-	-	-	-	-
R_U (KΩ)	324.2	162.1	108.1	81.04	64.83	54.03	46.31	40.52	36.02	32.42	-	-	-	-	-	-	-	-	-	-

Trim Down	-1%	-2%	-3%	-4%	-5%	-6%	-7%	-8%	-9%	-10%	-	-	-	-	-	-	-	-	-	-
R_D (KΩ)	78.12	37.03	23.33	16.48	12.37	9.63	7.68	6.21	5.07	4.19	-	-	-	-	-	-	-	-	-	-

** Please contact Glary Power if a trim range beyond ±10% is needed.*

Model Number: E3248240a

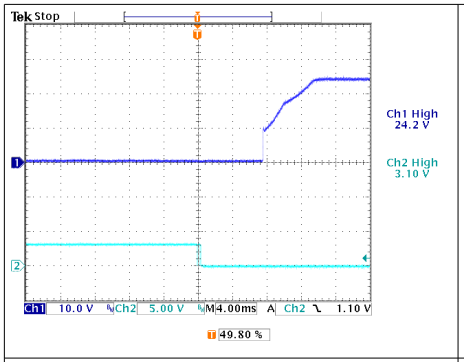
MODEL PARAMETERS

ALL SPECIFICATIONS ARE TYPICAL AT NOMINAL INPUT, FULL LOAD AND 25°C UNLESS OTHERWISE NOTED.

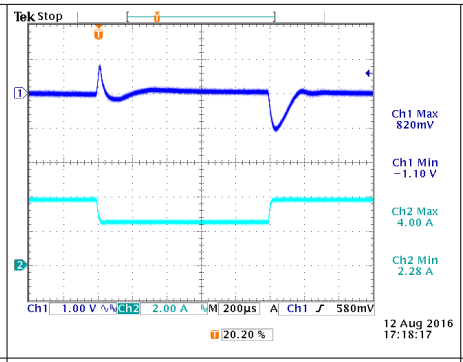
General		
Conversion Efficiency	Typical	See efficiency plots
Switching Frequency	Typical	480KHz

Output		
Voltage Accuracy	Typical	±1.0%
Line Regulation	Full Input Range	±0.2%
Load Regulation	10%~100% (sensing pins connected)	±0.2%
Temperature Drift	-60°C ~+130°C	±0.03%/°C
Output Tolerance Band	All Conditions	±4%
Ripple & Noise (20MHz)	Peak-Peak (RMS)	3% (1%) V_O
Over Voltage Protection	V_{NOM}, 10% Load	115~130 %V_O
Output Current Limits	V_{NOM}	120%~140%
Voltage Trim	V_{NOM}, 10% Load	±10%
Input Ripple Rejection (<1KHz)	V_{NOM}, Full Load	-50dB
Step Load (2.5A/μS)	50%~75% Load	±6%Vo/500μS
Start-Up Delay Time	V_{NOM}, Full Load	20mS/250mS

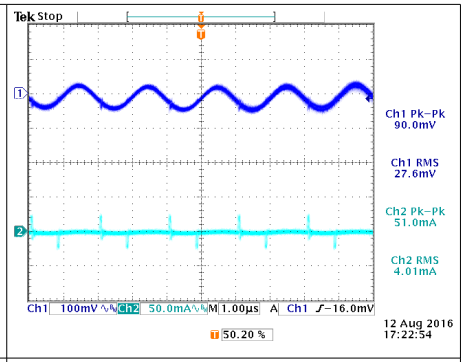
TYPICAL WAVES AND CURVES



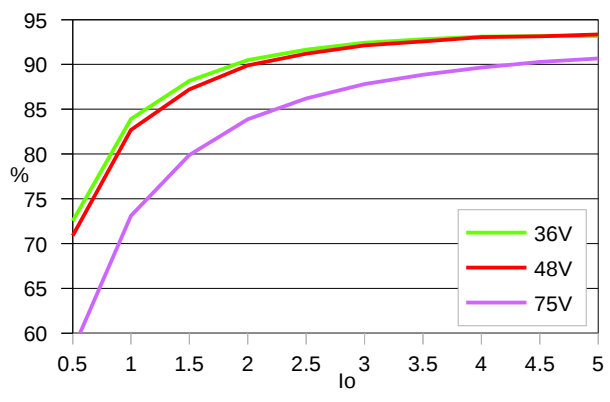
Start-up waveform of E3248240a
(V_{IN}: 48V, Load: 5A)



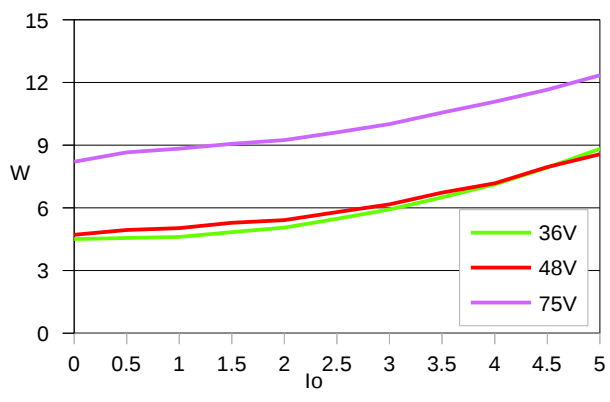
Transient response of E3248240a
(V_{IN}: 48V, Load: 2.5A/3.75A@2.5A/μS)



Input/Output ripples of E3248240a
(V_{IN}: 48V, Load: 5A, L_{IN}=10uH)



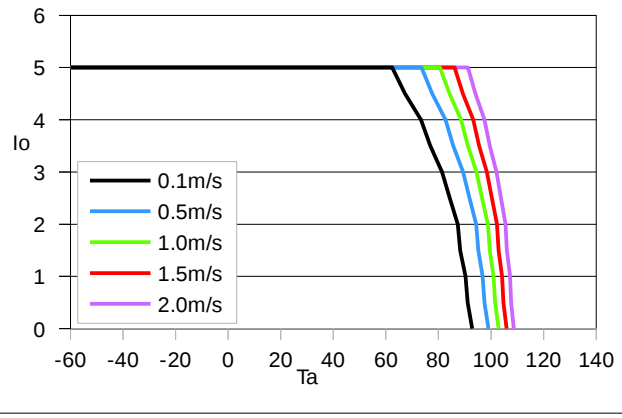
Efficiency plot of E3248240a



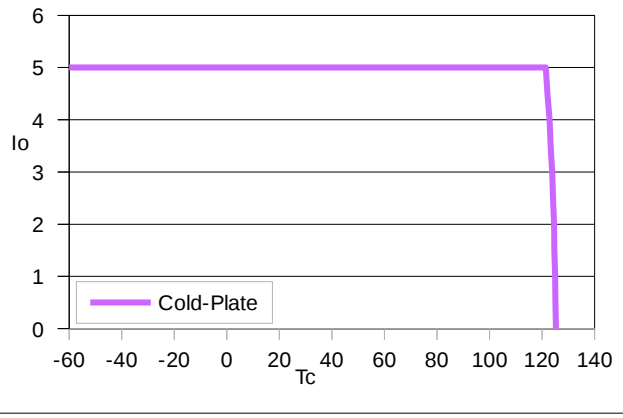
Power loss curves of E3248240a

Model Number: E3248240a

Derating Curves



Calculated derating of E3248240a with Forced-Air cooling

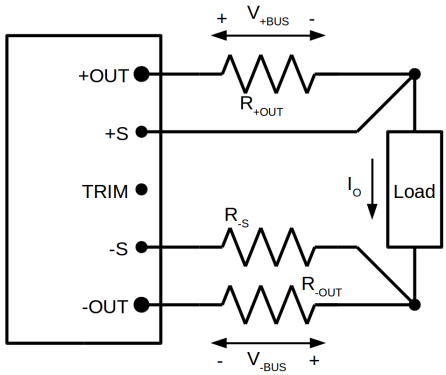


Calculated derating of E3248240a with Cold-Plate cooling

Voltage Drop Compensation

The resistors R_{+OUT} and R_{-OUT} on the right-hand side circuit represent the impedances of the power distribution bus contributing voltage drops V_{+BUS} and V_{-BUS} respectively. The voltage drop V_{+BUS} can be eliminated by connecting the +S to the positive node of the load. The -S pin functions differently as it can disable the droop current sharing, compensate the voltage drop V_{-BUS}, manipulate the load regulation of droop current sharing function or enhance the step load performance.

By connecting a resistor R_{-S} between the -S pin and the negative node of the voltage on the load can be regulated. The values of R_{-S} for eliminating different V_{-BUS} and droop current sharing regulation at full load condition are listed in table below, which can be calculated from the equation right-hand below by leting $I_O = I_{RATED}$ and $V_O = V_{RATED}$. Precision resistor with less than 1% of tolerance is recommended for R_{-S}.



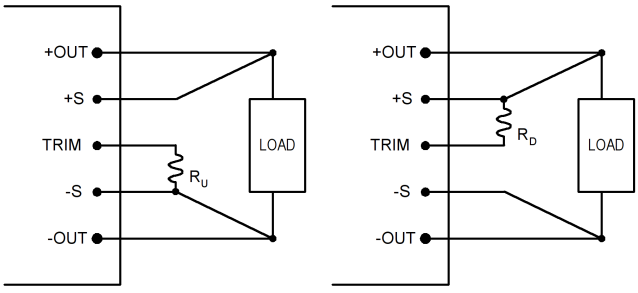
$$R_{-S} = \frac{(5\,V_{-BUS} + \frac{0.05\,I_O}{I_{RATED}})\,V_{RATED}}{V_O + V_{-BUS} + (\frac{I_O}{60\,I_{RATED}} - 1)\,V_{RATED}} - 3$$

V_{-BUS}	120mV	240mV	360mV	480mV	600mV	720mV	840mV	960mV	1.080V	1.200V
$R_S(\Omega)$	27.00	43.87	55.42	63.82	70.20	75.21	79.26	82.59	85.38	87.75

** Please consult Glary Power for manipulating load sharing and dynamic performance.*

Trim and Trim Table

The output of the E3248240a power module can be adjusted for higher or lower than the rated voltage level by connecting the TRIM pin through a resistor to the pins of -S or +S respectively as shown as on the right hand side. The resistor for trimming output voltage higher or lower are denoted as R_U and R_D, which have different resistances for each different output voltage level. The resistance table for trimming the output voltage with 1% of step are listed as below for reference.



Trim Up	+1%	+2%	+3%	+4%	+5%	+6%	+7%	+8%	+9%	+10%	-	-	-	-	-	-	-	-	-	-
R_U (KΩ)	645.1	322.5	215.0	161.3	129.0	107.5	92.15	80.63	71.67	64.51	-	-	-	-	-	-	-	-	-	-

Trim Down	-1%	-2%	-3%	-4%	-5%	-6%	-7%	-8%	-9%	-10%	-	-	-	-	-	-	-	-	-	-
R_D (KΩ)	158.0	74.92	47.24	33.40	25.10	19.57	15.61	12.65	10.34	8.50	-	-	-	-	-	-	-	-	-	-

** Please contact Glary Power if a trim range beyond ±10% is needed.*

EMC CHARATERISTICS

As shown as Fig.1, the EMC performances of E32 series Hex-Brick power module are characterized by using this simple EMC test board, whose schematic drawing and PCB layout are shown in Fig.2, Fig.3 and Fig.4. As it can deliver high power, the E32 modules inherently sink large input current, which requires low output impedance EMC filter to get sufficient attenuation on the wideband differential mode ripple and noise. In order to achieve this goal, the output capacitor of the EMC filter should be large enough to absorb the low frequency ripple but also low impedance sufficiently to reduce the high frequency noise. Therefore, a high capacitance solid-state electrolytic capacitor and a low impedance multi-layer ceramic capacitor are parallel connected as the capacitors C_2 and C_3 respectively. The capacitors C_2 and C_3 should be placed as close as possible to the input terminals of the power module, and the copper traces for carrying the input current should be direct and short between the capacitors and input terminals of the power module. Compared with 48V input E32 models, the 24V models have higher differential-mode noise with lower common-mode noise, which require a higher capacitance of the C_3 but lower inductance of the L_1 for achieving the similar EMC performance.

Fig.1 EMC Test Board with E32 Module

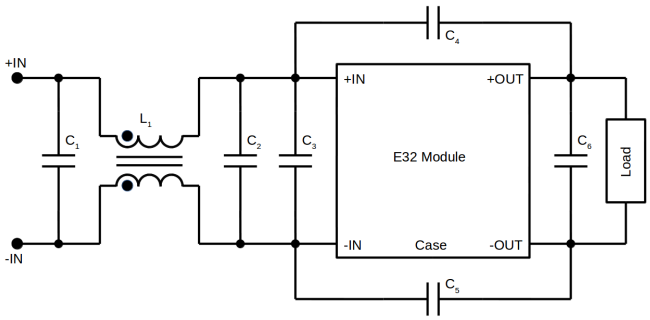


Fig.2 Circuit of EMC Test Board with E32 Module

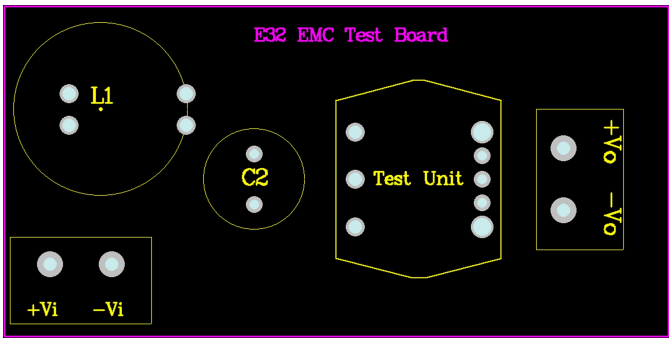


Fig.3 Top-side Layout of EMC Test Board

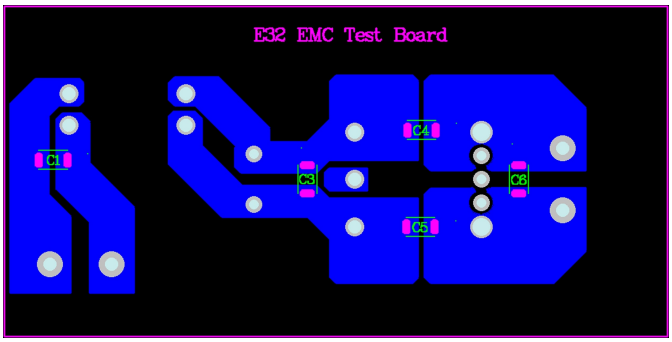


Fig.4 Bottom-side Layout of EMC Test Board

Designation	Specification	Part Number
L_1	6.0mH	ASC-2201V-GH
C_1	225pF/100V/X7R/1812	C4532X7R2A225MT
C_2	47uF/100V	VEJ470M100V
C_3	685pF/50V/X7R/1812	C4532X7R1H685MT
C_4	682pF/2KV/X7R/1812	202S43W682KV4E
C_5	682pF/2KV/X7R/1812	202S43W682KV4E
C_6	225pF/100V/X7R/1812	C4532X7R2A225MT

Table.1 Filter Parameters for 24Vin Models

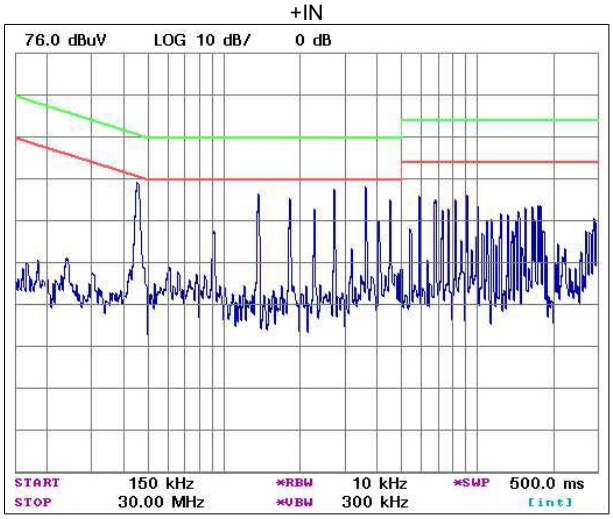
Designation	Specification	Part Number
L_1	7.8mH	ASC-2501V-G
C_1	225pF/100V/X7R/1812	C4532X7R2A225MT
C_2	47uF/100V	VEJ470M100V
C_3	225pF/100V/X7R/1812	C4532X7R2A225MT
C_4	682pF/2KV/X7R/1812	202S43W682KV4E
C_5	682pF/2KV/X7R/1812	202S43W682KV4E
C_6	225pF/100V/X7R/1812	C4532X7R2A225MT

Table.2 Filter Parameters for 48Vin Models

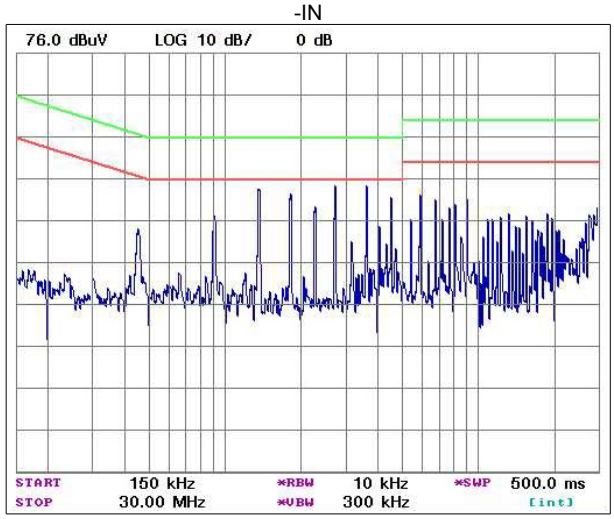
24V Models

E3224050N

+IN

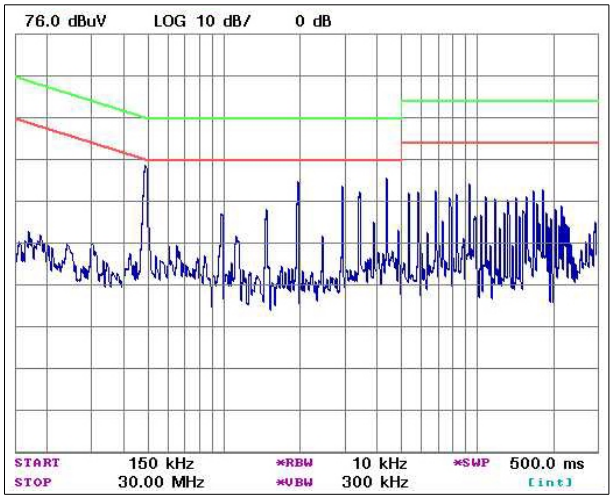


-IN

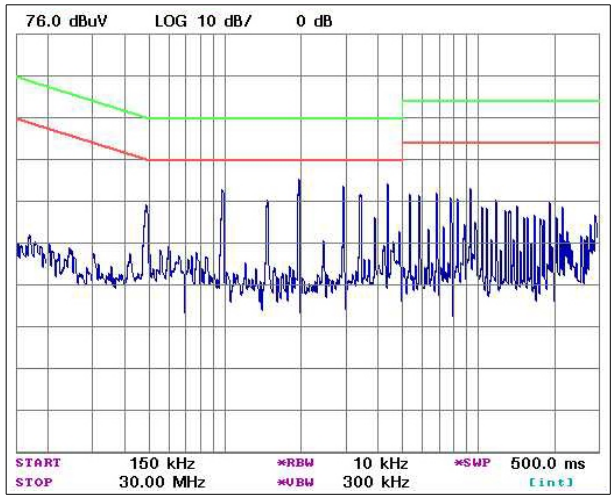


E3224120N

+IN

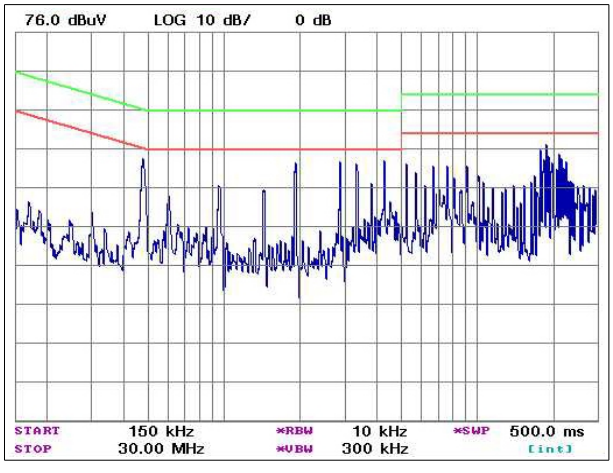


-IN

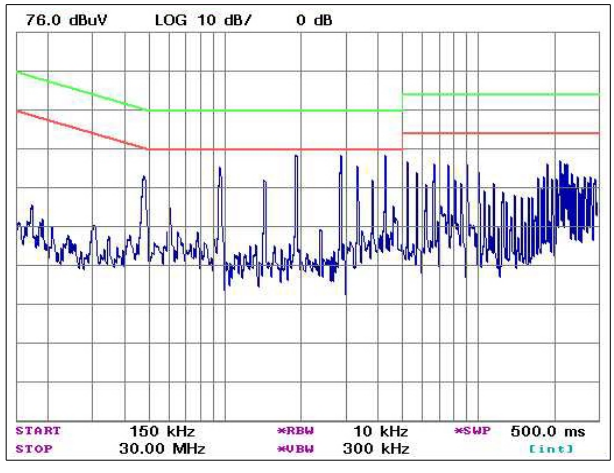


E3224240N

+IN



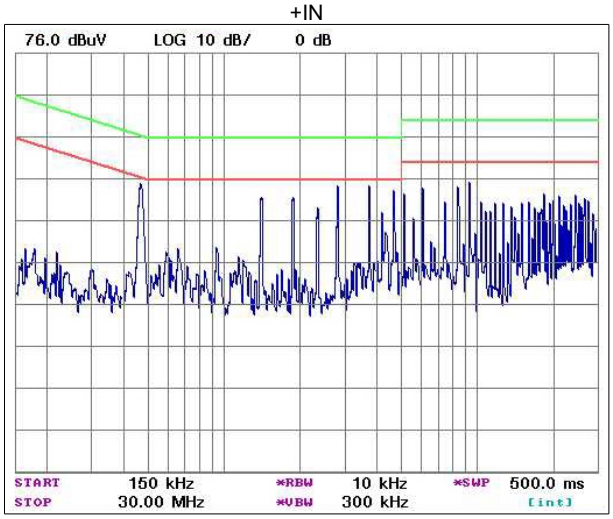
-IN



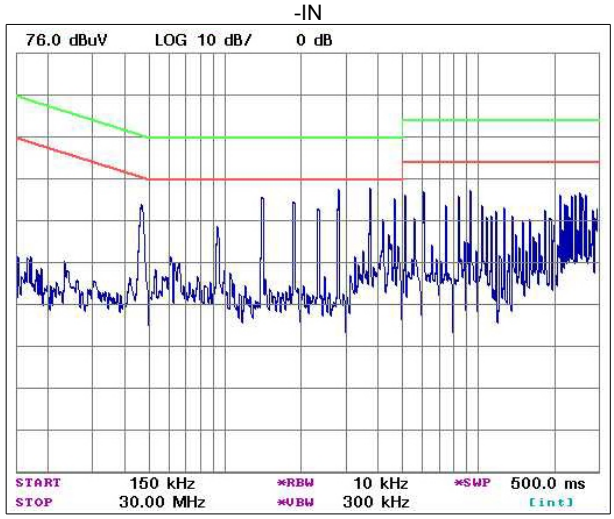
48V Models

E3248050N

+IN

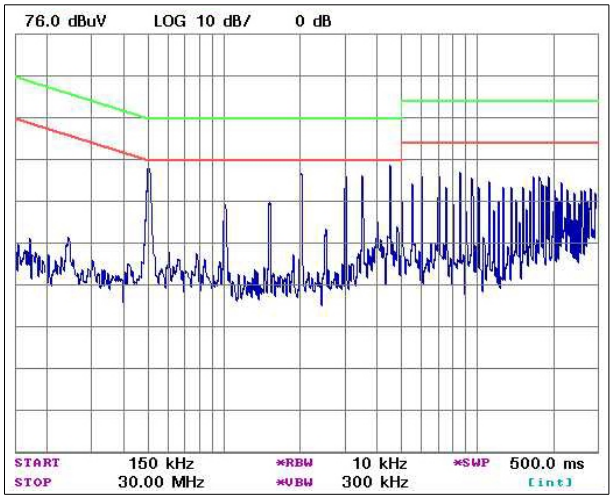


-IN

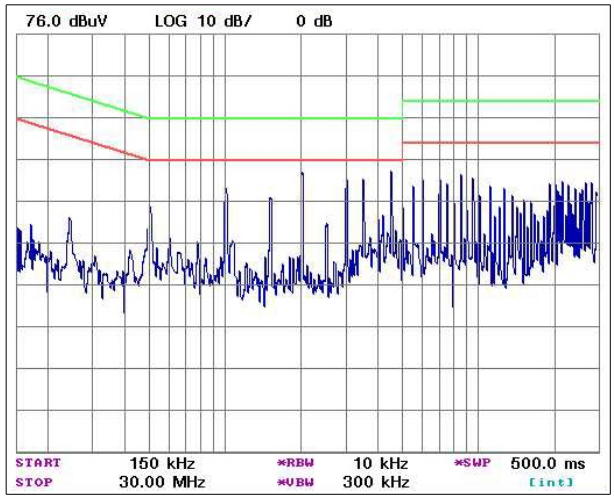


E3248120N

+IN

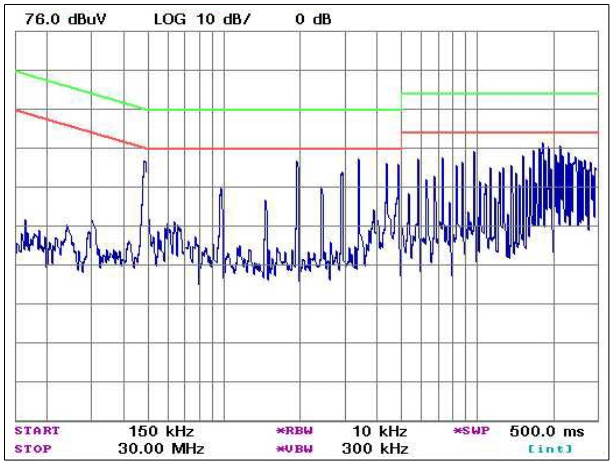


-IN

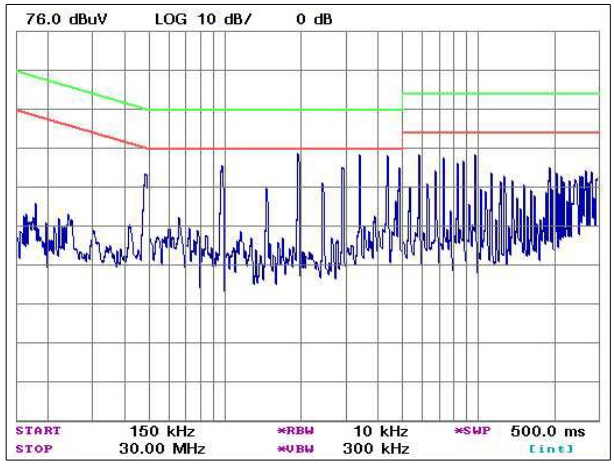


E3248240N

+IN



-IN



DROOP CURRENT SHARING

Fig. 1 shows schematic of the droop current sharing connection by using E32 modules. The droop current sharing function of E32 module allows directly connecting outputs of multiple modules in parallel without current sharing bus. The reliable current sharing is achieved not only by minimizing the output voltage error but also the balancing the impedance of distribution bus. On E32 module, the output voltage error between modules determines the output current error constantly as show in Fig. 2. However, as shown in Fig. 3, the ratio of the shared current error for each module is gradually approaching to zero while the total output current increases.

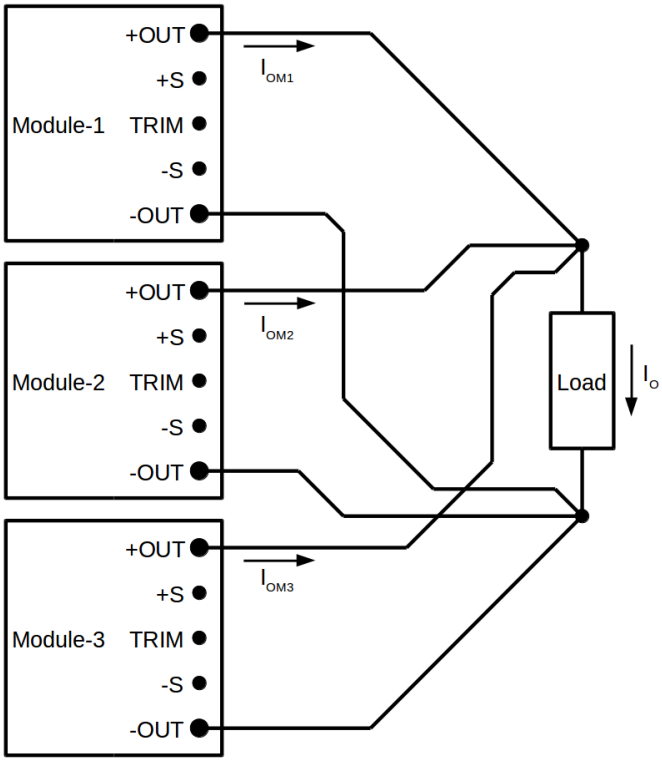


Fig. 1. Schematic of droop current sharing

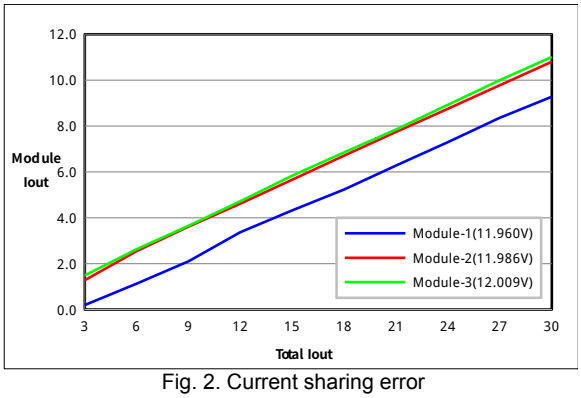


Fig. 2. Current sharing error

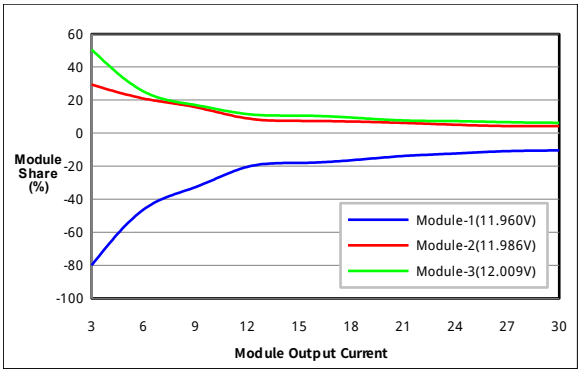


Fig. 3. Ratio of current sharing error

The bandwidth of the droop current sharing loop is comparable to that of the voltage loop, which can respond to high current slew rate load transient without high current peak deviation. Fig. 4 shows waveforms of two E32 modules in current sharing responding to a 0A to 20A step load, the maximum current slew rate is 2.5A/μS limited by the used electrical load for testing. The waveform shows that the current error of two paralleled modules in the time period of 0A load is relatively large due to a significantly output voltage error, which has been reduced with a very short of settling time in the time period of the 20A load current.

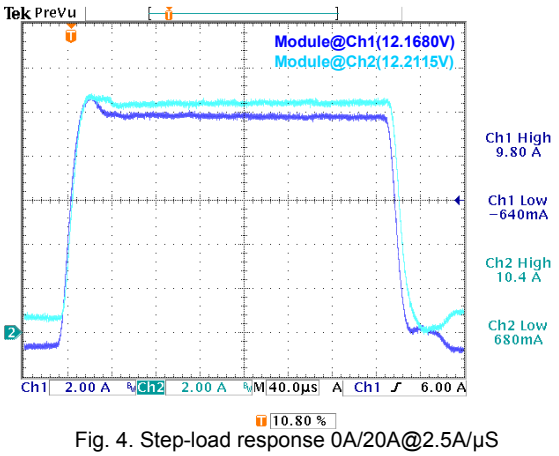


Fig. 4. Step-load response 0A/20A@2.5A/μS

NOTE:

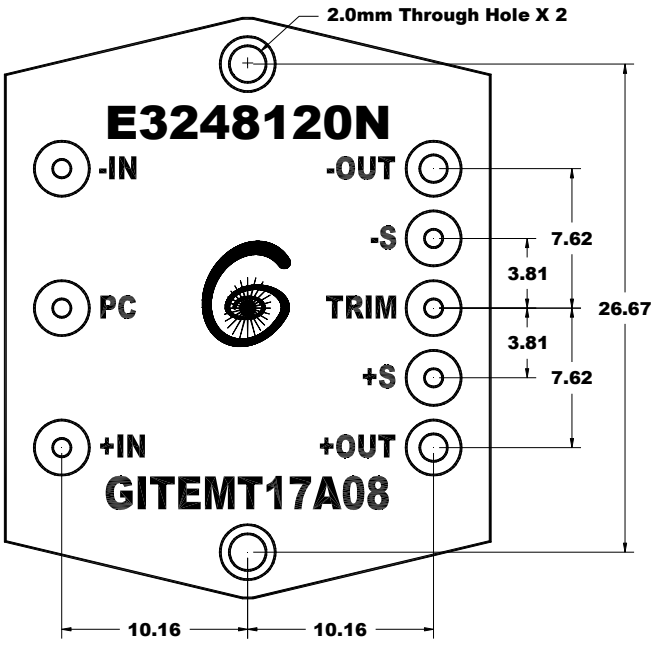
1. **It is recommended that the input should be protected by fuses or other protection devices.**
2. Specifications are subject to change without notice.
3. Printed or downloaded datasheets are not subject to Glary document control.
4. Product labels shown, including safety agency certificates, may vary based on the date of manufacture.
5. Information provided in this documentation is for ordering purposes only.
6. This product is not designed for use in critical life support systems, nuclear control systems or other such applications, which necessitate specific safety and regulatory standards other than the ones listed in this datasheet.

IMPORTANT

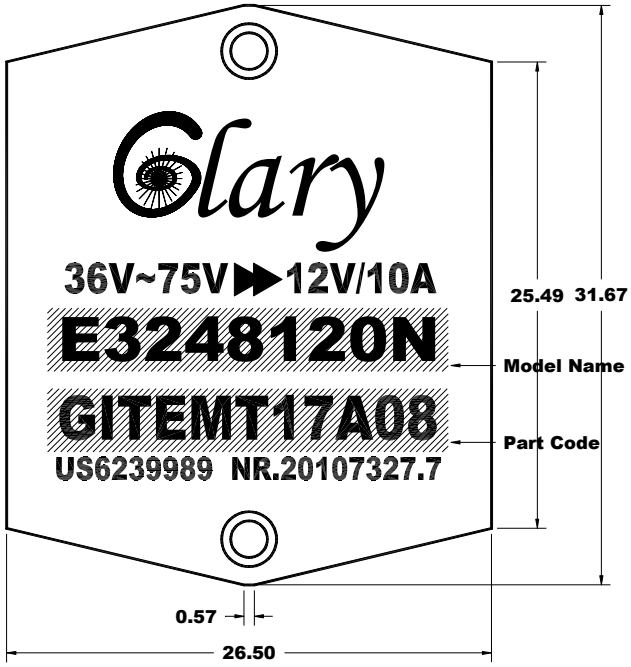
※ In order to secure effective usage of converter and the validity of Glary's service and warranty coverage, please refer to the application notes for general usage. For needs of usage beyond the application notes, please contact to Glary headquarter or our regional sales representative office for help.

MECHANICAL DRAWING

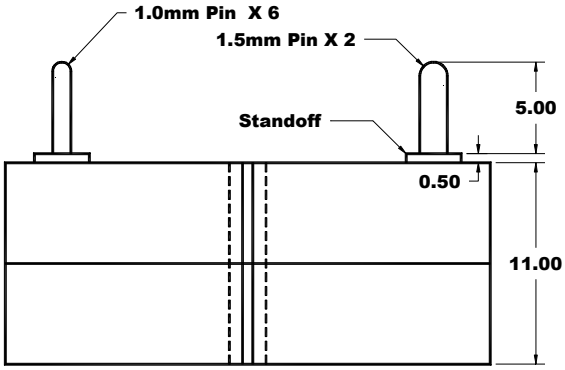
Bottom View



Top View



Side View



Dimensions and Pin Connections

Designation	Function Description	Pin #
-IN	Negative input	1
PC	Primary control: ON/OFF and Synchronization.	2
+IN	Positive input	3
+OUT	Positive output	4
+S	Positive remote sense	5
TRIM	Output voltage adjust	6
-S	Negative remote sense	7
-OUT	Negative output	8

Dimensions: mm

Tolerances: .x±0.5mm
.xx±0.25mm

Weight: 16g / Metal enclosed
Metallic case: Anode oxide aluminum alloy

Mounting inserts: Stainless steel for M2
Maximum torque: 1.0 in-lb (0.1Nm)

Pin material: Copper alloy or Brass

Pin plating: Golden over Nickel