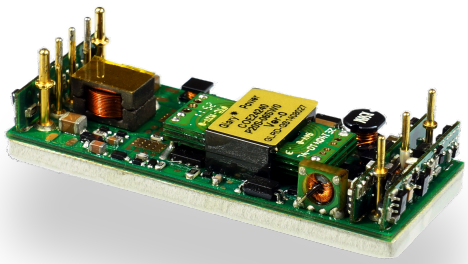
Efficiency >93% | 142W/in³ | Open Frame Package | Remote ON OFF | 4.8Mhrs MTBF

OCP | OTP | OVP | INPUT 2:1

c UL us E219417 | CE | Pb | RoHS 2002/95/EC



Efficiency >93% | 102W/in³ | Full Metal Package | Remote ON OFF | 4.8Mhrs MTBF

OCP | OTP | OVP | INPUT 2:1

c UL us E219417 | CE | Pb | RoHS 2002/95/EC

The **COE Series** provides three outputs including 12V/11A, 5V/25A and 3.3V/30A from 18~36V or 36~75V input ranges with eighth brick pin assignment. The module is designed with patented ***"Buck-Reset Forward"*** topology, which efficiently drives ***Synchronous-Rectifier*** at high frequency to achieve 93% of efficiency. The low profile design allow it can be an open frame construction with minimized shadow effect of airflow, or a metal enclosed package to get better environmental resistances. A proprietary ultra-fast current limiting technology is also embedded to eliminate high short circuit current tail caused by the mechanism of ***"Short-Circuit-Current-Runaway"***. Therefore, the **COE Series** can protect its output by not using traditional hiccup protection method to keep its high driving capability without reliability impact, and makes it even more suitable for powering the non-Ohmic loads such as motors or solenoids. Not only focusing on the conversion performances, the **COE Series** is also designed for achieving higher reliability. All the power semiconductor chips are attached onto an Aluminum base-plate to mitigate the hot spots by spreading the heat to other areas, and further result in lower thermal resistance and lower temperature, which effectively simplify the system power design of Telecom, Servers, Networking equipments and other industrial applications.

MODEL NUMBER SYSTEM

COE24120	a	b	c	d		-	XX	XX	X
Model Name	Enable Logic	Pin Length	Standoff Height	Base-Plate / module thickness			Setting	Suffix	Version
COE24120	**P:** Positive **N:** Negative	**0:** 0.12" **1:** 0.16" **2:** 0.20" **3:** 0.24"	**0:** 0.02" **1:** 0.08" **2:** 0.16"	Open-Frame(**c**= 0, 1 and 2)	Metal-Enclosed (**c**= 0 only)	-	For customer function only	For marketing purpose only	
				M: 1.0mm Metal Plate / 0.34" S: 3.0mm Metal Plate / 0.42" A: 3.0mm Sink-Plate / 0.42" B: 5.0mm Sink-Plate / 0.50"	U: 3.0mm Metal Plate / 0.48" V: 5.0mm Metal Plate / 0.56" W: 3.0mm Sink-Plate / 0.48"				

The selected option codes for the "**abcd**" section in the model number determine what options will be applied in production. For example, the **COE24120P20U-XXXXX** module is configured to has positive enable logic, 0.20" pin length, 0.02" standoff height and 3.0mm metal-plate, which result in 0.48" of the module thickness. The total height is 0.50" obtained by summing up the 0.02" standoff height and the 0.48" module thickness.

MODEL LIST (Contact factory for 1.5V, 1.8V, 2.5V and other special input / output)

Model Name	Maximum Input		Maximum Output		Efficiency
COE24033	18V-36V	111W	3.3V/30A	100W	90.0%
COE24050	18V-36V	138W	5.0V/25A	125W	90.5%
COE24120	18V-36V	143W	12V/11A	132W	92.0%

Model Name	Maximum Input		Maximum Output		Efficiency
COE48033	36V-75V	111W	3.3V/30A	100W	90.0%
COE48050	36V-75V	137W	5.0V/25A	125W	91.5%
COE48120	36V-75V	142W	12V/11A	132W	93.0%

COMMON SPECIFICATIONS

Absolute Maximum Ratings

Temperature	Operation Storage	-40°C to +110°C -55°C to +125°C
Input Voltage Range	Operation: 48V Models 24V Models Transient (100mS): 48V Models 24V Models	 -0.5V to +80Vdc -0.5V to +40Vdc 100V Maximum 50V Maximum
Isolation Voltage	Input to Output Input to Case Output to Case	2.0kV Minimum 1.0kV Minimum 1.0kV (0.5kV for Open-frame) Minimum
Remote Control		-0.5V to +12Vdc

General Parameters

MTBF	Bellcore TR-332 issue 6	4.80×10^6 hrs @GB/25°C (COE48050)
OTP	T_{AVG} or T_C	110°C ±5°C for standard setting
Weight	3.0mm (Open-frame) 3.0mm/5.0mm Base-plate (Metal-enclosed)	32g 55g/65g

Control Functions

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	48V Models 24V Models	+36V to +75Vdc +18V to +36Vdc
Power ON Voltage Ranges	48V Models 24V Models	+34.0V to +36.0Vdc +17.0V to +18.0Vdc
Power OFF Voltage Ranges	48V Models 24V Models	+31.2V to +33.2Vdc +15.6V to +16.6Vdc
Off State Input Current	V_{NOM}	6mA Max
Latch-State Input Current	V_{NOM}	8mA Max
Input Capacitance	48V Models 24V Models	20.0uF Max 40.0uF Max

Output Limitations

Model Name	Capacitive Load C_E	Pre-biased Voltage V_B	Reverse Current I_B	Short Circuit Output Current I_S	Note
COE24033	<22000uF@110mΩ Load	<3.1V	<100mA@V_B	<60A @ 2mΩ Load	
COE24050	<10000uF@200mΩ Load	<4.75V	<100mA@V_B	<50A @ 2mΩ Load	
COE24120	<1000uF@1100mΩ Load	<11.4V	<100mA@V_B	<25A @ 2mΩ Load	
COE48033	<22000uF@110mΩ Load	<3.1V	<100mA@V_B	<60A @ 2mΩ Load	
COE48050	<10000uF@200mΩ Load	<4.75V	<100mA@V_B	<50A @ 2mΩ Load	
COE48120	<1000uF@1100mΩ Load	<11.4V	<100mA@V_B	<25A @ 2mΩ Load	

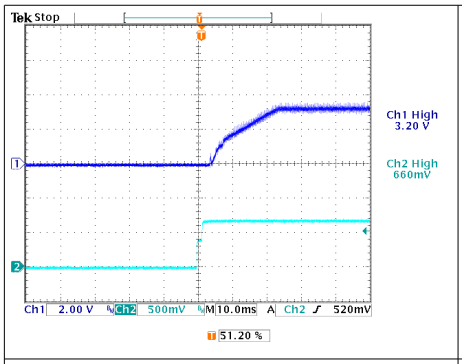
Model Name: COE24033

MODEL PARAMETERS

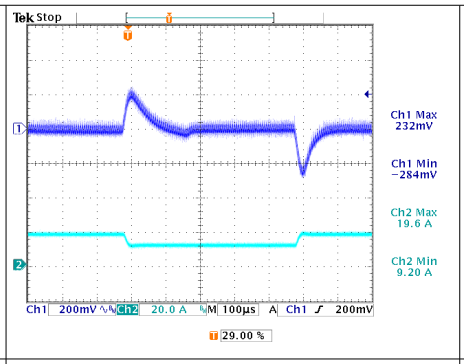
General		
Conversion Efficiency	Typical	See efficiency plots
Switching Frequency	Typical	330KHz

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	0%~100%	±0.2%
Temperature Drift	-40°C ~100°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}	108%~125%
Voltage Trim	V_{NOM}, 10% Load	±10%
Step Load (2.5A/μS)	50%~75% Load	±6%Vo/500μS
Start-Up Delay Time	V_{NOM}, Full Load	20mS/250mS

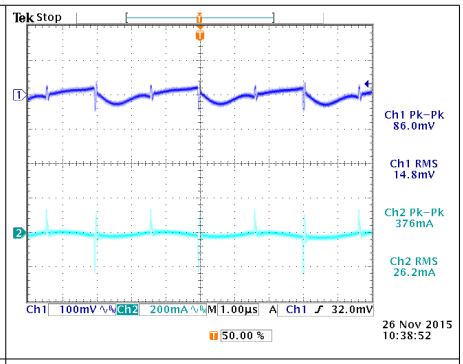
TYPICAL WAVES AND CURVES



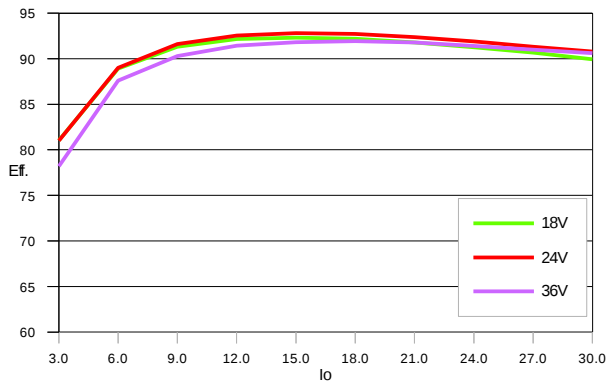
Start-up waveform of COE24033
(V_{IN}: 24V, Load: 30A)



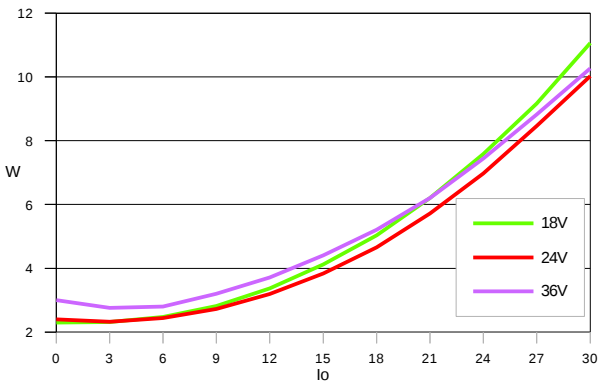
Transient response of COE24033
(V_{IN}: 24V, Load: 22.5A/15A@2.5A/μS)



Input/Output ripples of COE24033
(V_{IN}: 24V, Load: 30A, L_{IN}=10uH)



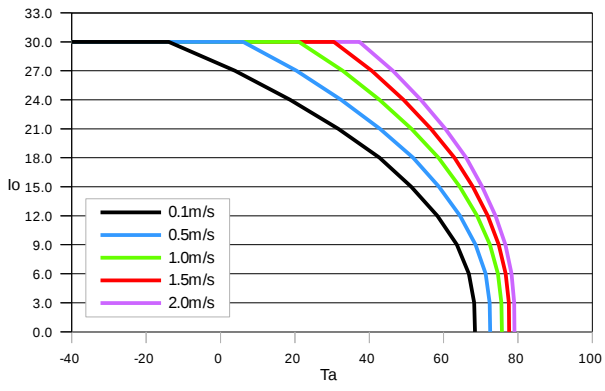
Efficiency plot of COE24033



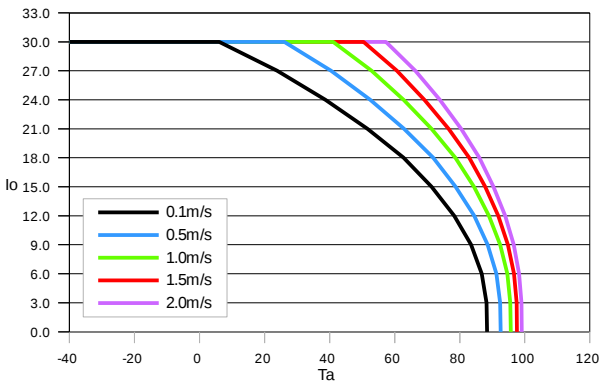
Power loss curves of COE24033

Model Name: COE24033

DERATING CURVES

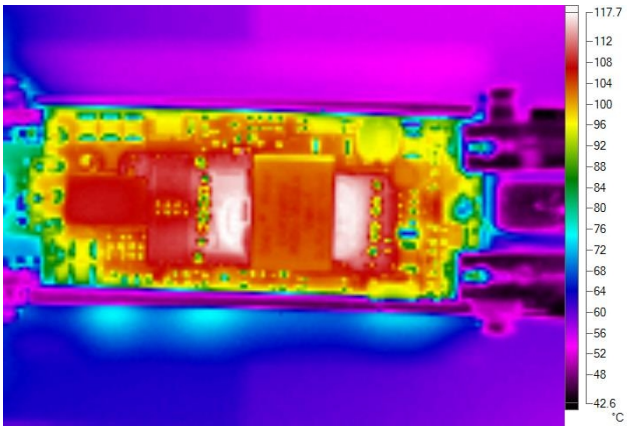


Calculated derating of COE24033 (T_C= 90ºC)

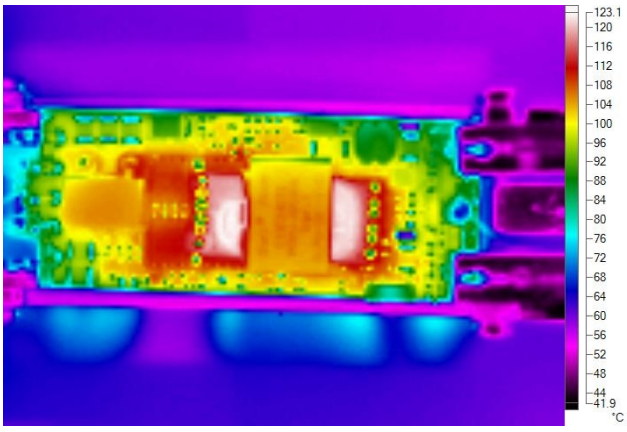


Calculated derating of COE24033 (T_C= 110ºC)

REFERENCED THERMAL IMAGES



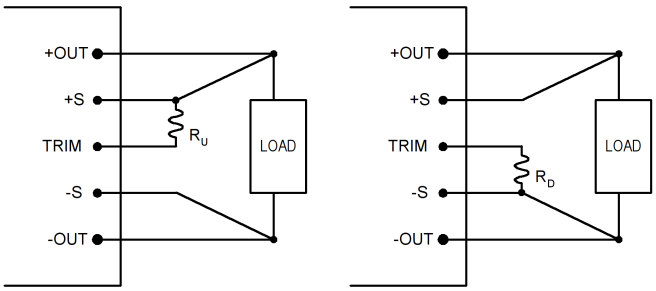
COE24033 (Io= 19.5A@57˚C/0.1m/Sec.)



COE24033 (Io= 24A@62˚C/2.0m/Sec.)

TRIM AND TRIM TABLE

The output of the 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)	42.81	21.41	14.27	10.70	8.56	7.13	6.12	5.35	4.76	4.28	-	-	-	-	-	-	-	-	-	-

Trim Down	-1%	-2%	-3%	-4%	-5%	-6%	-7%	-8%	-9%	-10%	-	-	-	-	-	-	-	-	-	-
R_D (KΩ)	10.15	4.81	3.03	2.14	1.60	1.25	0.99	0.80	0.65	0.53	-	-	-	-	-	-	-	-	-	-

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

Model Name: COE24050

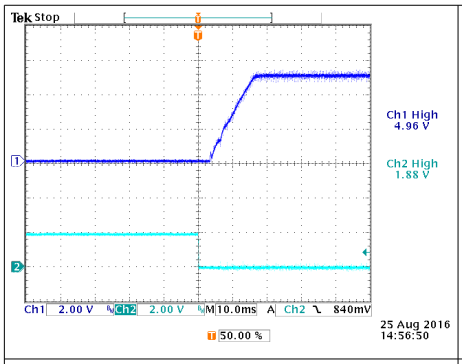
MODEL PARAMETERS

General		
Conversion Efficiency	Typical	See efficiency plots
Switching Frequency	Typical	330KHz

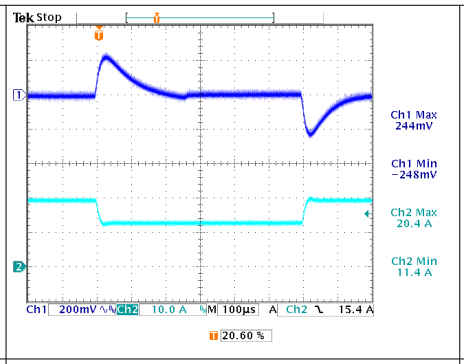
25GP0

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	0%~100%	±0.2%
Temperature Drift	-40°C ~100°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}	108%~125%
Voltage Trim	V_{NOM}, 10% Load	±10%
Step Load (2.5A/μS)	50%~75% Load	±6%Vo/500μS
Start-Up Delay Time	V_{NOM}, Full Load	20mS/250mS

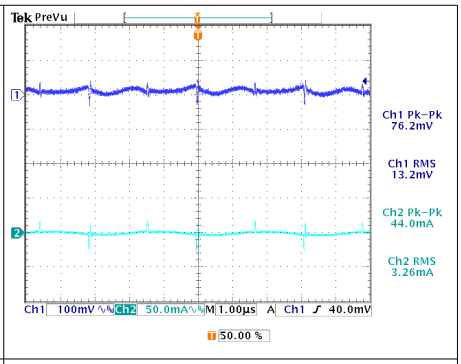
TYPICAL WAVES AND CURVES



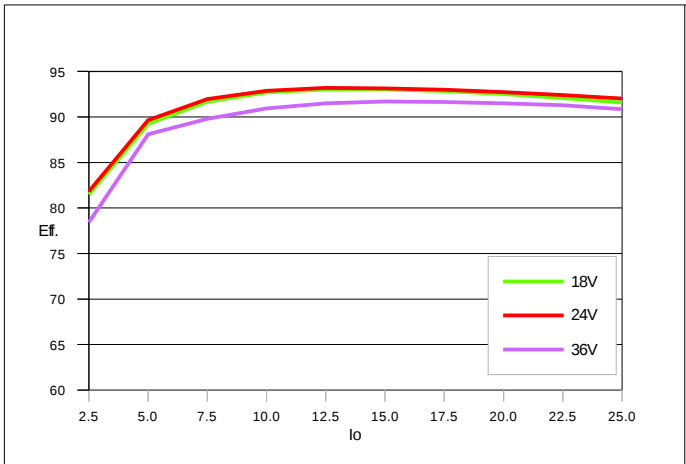
Start-up waveform of COE24050
(V_{IN}: 24V, Load: 25A)



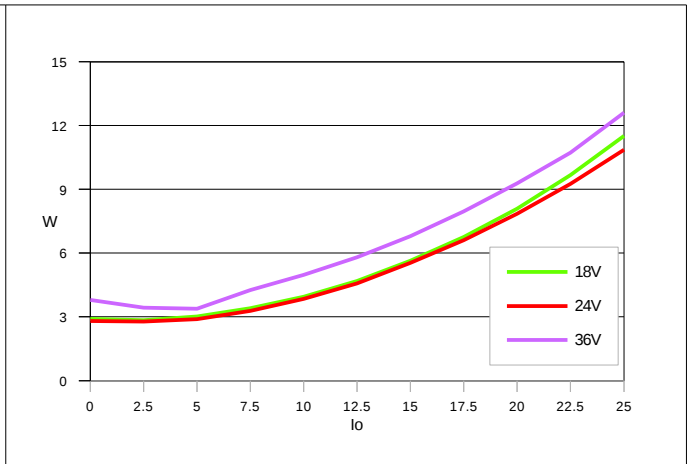
Transient response of COE24050
(V_{IN}: 24V, Load: 18.75A/12.5A@2.5A/μS)



Input/Output ripples of COE24050
(V_{IN}: 24V, Load: 25A, L_{IN}=10uH)



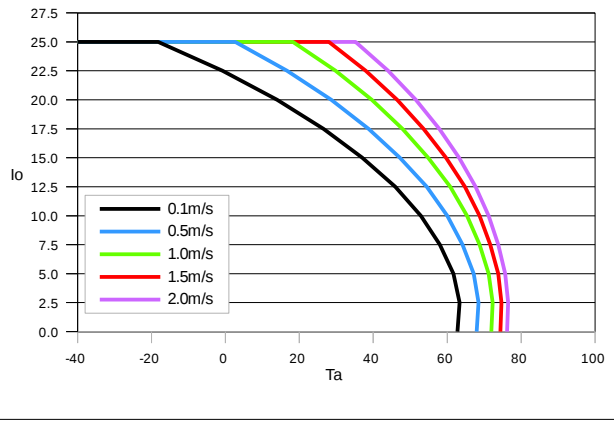
Efficiency plot of COE24050



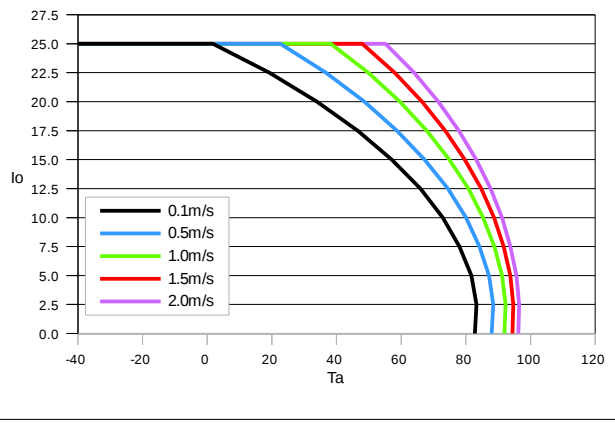
Power loss curves of COE24050

Model Name: COE24050

DERATING CURVES

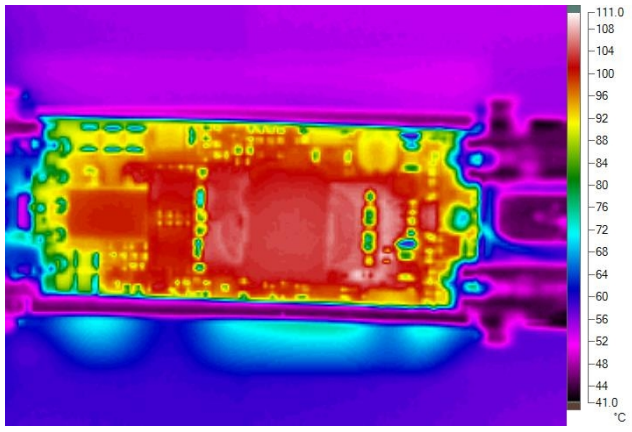


Calculated derating of COE24050 (T_C= 90ºC)

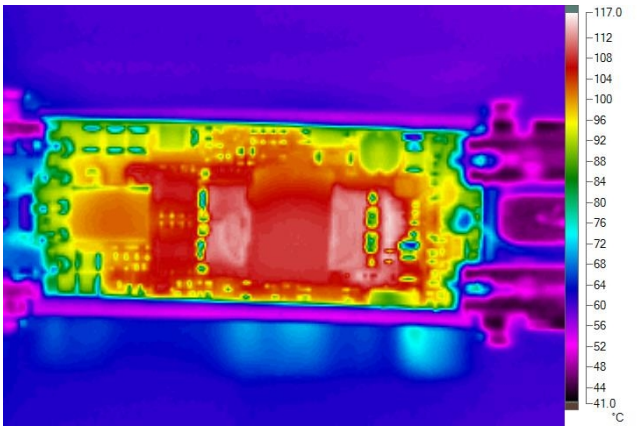


Calculated derating of COE24050 (T_C= 110ºC)

REFERENCED THERMAL IMAGES



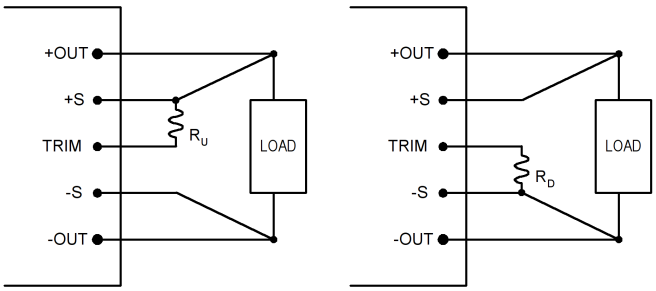
COE24050 (Io= 13.5A@57˚C/0.1m/Sec.)



COE24050 (Io= 18A@64˚C/2.0m/Sec.)

TRIM AND TRIM TABLE

The output of the 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)	63.40	32.20	21.47	16.10	12.88	10.73	9.20	8.05	7.16	6.44	-	-	-	-	-	-	-	-	-	-

Trim Down	-1%	-2%	-3%	-4%	-5%	-6%	-7%	-8%	-9%	-10%	-	-	-	-	-	-	-	-	-	-
R_D (KΩ)	15.11	7.15	4.50	3.18	2.38	1.85	1.47	1.19	0.97	0.79	-	-	-	-	-	-	-	-	-	-

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

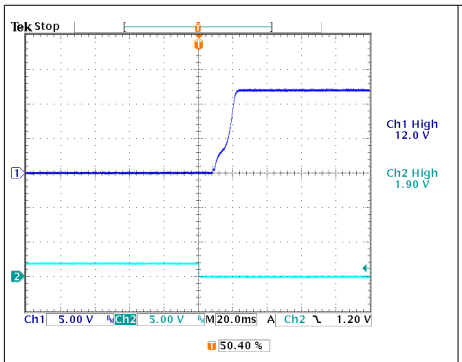
Model Name: COE24120

MODEL PARAMETERS

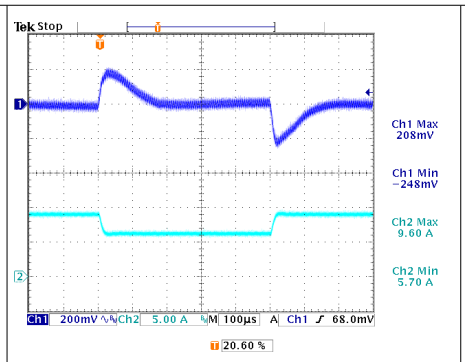
General		
Conversion Efficiency	Typical	See efficiency plots
Switching Frequency	Typical	330KHz

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	0%~100%	±0.2%
Temperature Drift	-40°C ~100°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}	108%~125%
Voltage Trim	V_{NOM}, 10% Load	±10%
Step Load (2.5A/μS)	50%~75% Load	±6%Vo/500μS
Start-Up Delay Time	V_{NOM}, Full Load	20mS/250mS

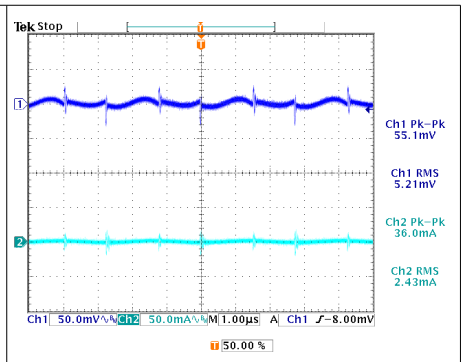
TYPICAL WAVES AND CURVES



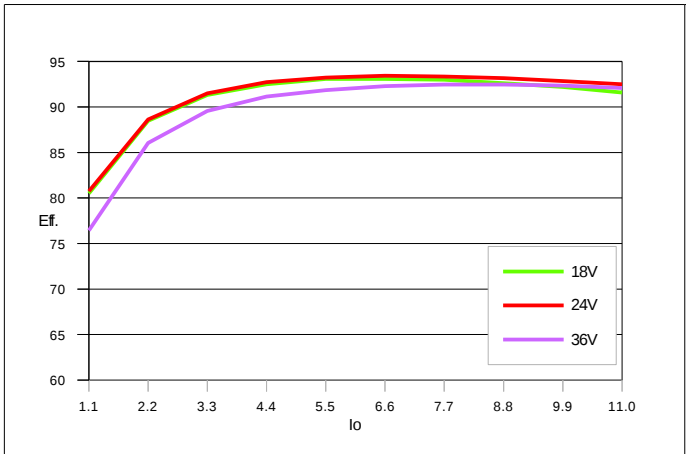
Start-up waveform of COE24120
(V_{IN}: 24V, Load: 11A)



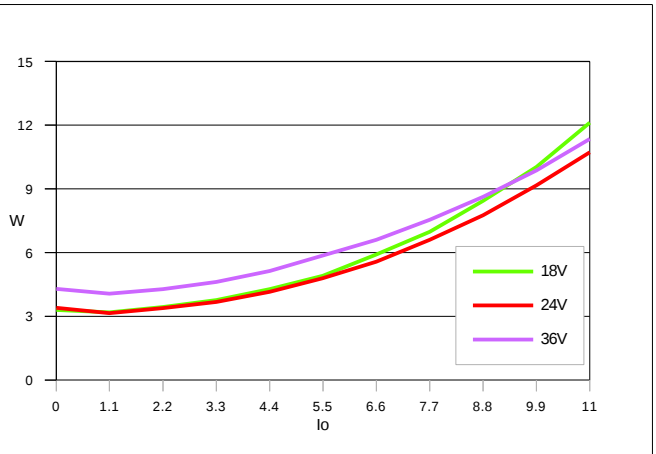
Transient response of COE24120
(V_{IN}: 24V, Load: 8.25A/5.5A@2.5A/μS)



Input/Output ripples of COE24120
(V_{IN}: 24V, Load: 11A, L_{IN}=10uH)



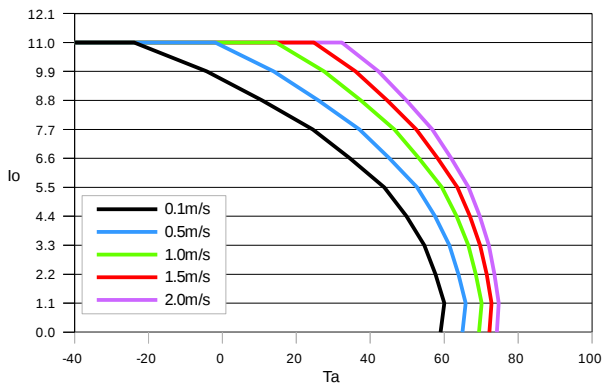
Efficiency plot of COE24120



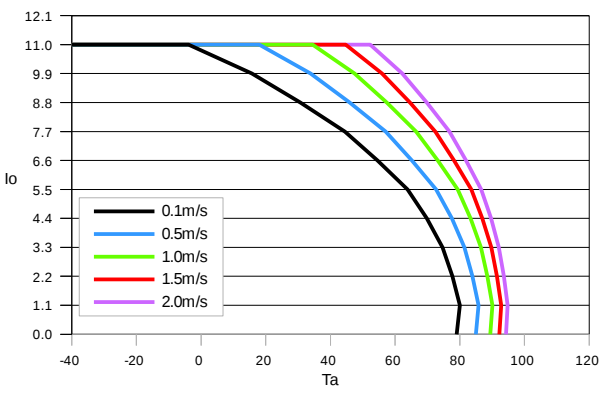
Power loss curves of COE24120

Model Name: COE24120

DERATING CURVES

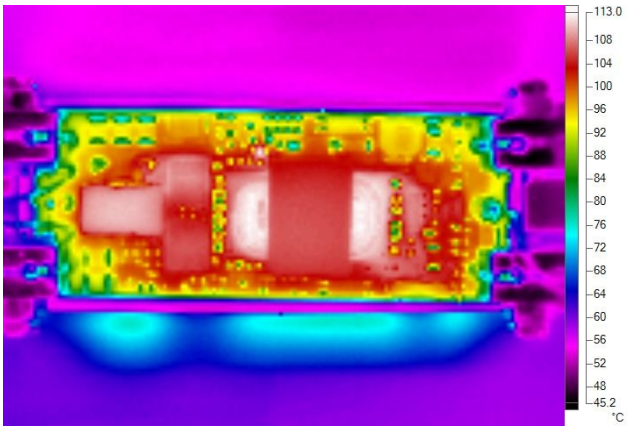


Calculated derating of COE24120 (T_C= 90ºC)

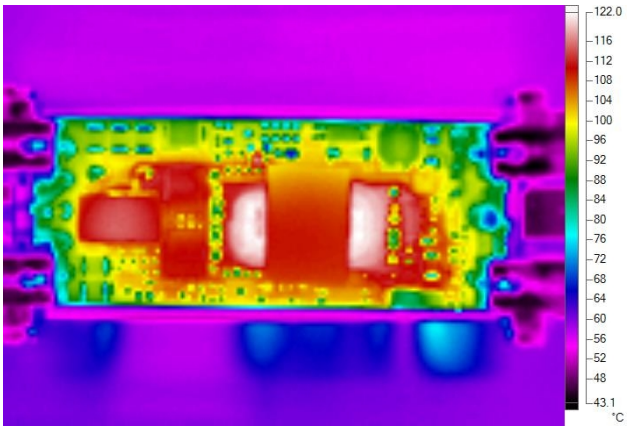


Calculated derating of COE24120 (T_C= 110ºC)

REFERENCED THERMAL IMAGES



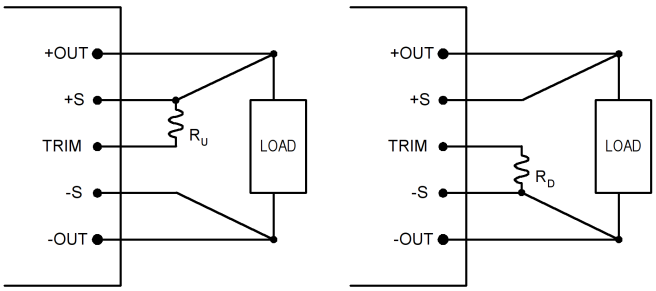
COE24120 (Io= 7.0A@55˚C/0.1m/Sec.)



COE24120 (Io= 9.0A@59˚C/2.0m/Sec.)

TRIM AND TRIM TABLE

The output of the 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)	159.0	79.50	53.00	39.75	31.80	26.50	22.71	19.87	17.67	15.90	-	-	-	-	-	-	-	-	-	-

Trim Down	-1%	-2%	-3%	-4%	-5%	-6%	-7%	-8%	-9%	-10%	-	-	-	-	-	-	-	-	-	-
R_D (KΩ)	39.00	18.50	11.67	8.25	6.20	4.83	3.86	3.13	2.56	2.10	-	-	-	-	-	-	-	-	-	-

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

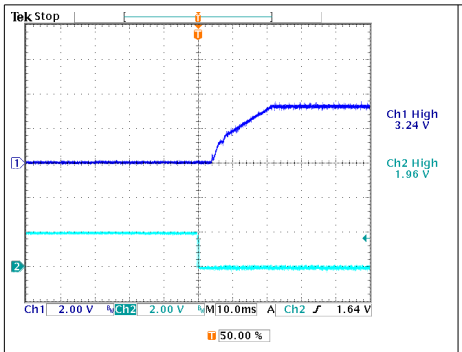
Model Name: COE48033

MODEL PARAMETERS

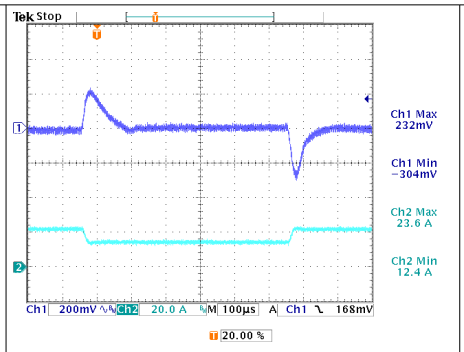
General		
Conversion Efficiency	Typical	See efficiency plots
Switching Frequency	Typical	330KHz

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	0%~100%	±0.2%
Temperature Drift	-40°C ~100°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}	108%~125%
Voltage Trim	V_{NOM}, 10% Load	±10%
Step Load (2.5A/μS)	50%~75% Load	±6%Vo/500μS
Start-Up Delay Time	V_{NOM}, Full Load	20mS/250mS

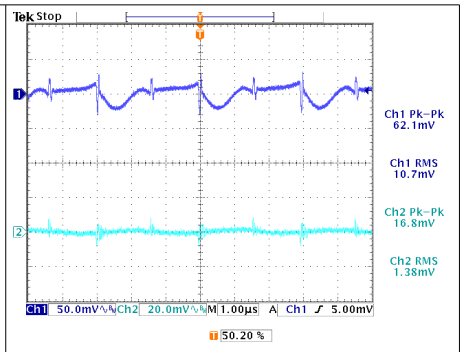
TYPICAL WAVES AND CURVES



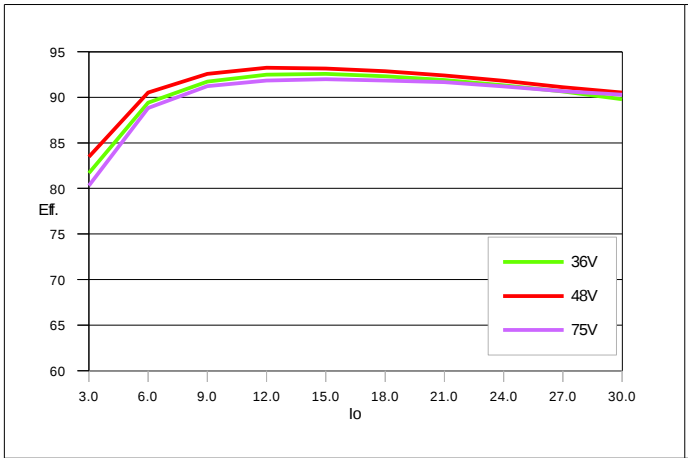
Start-up waveform of COE48033
(V_{IN}: 48V, Load: 30A)



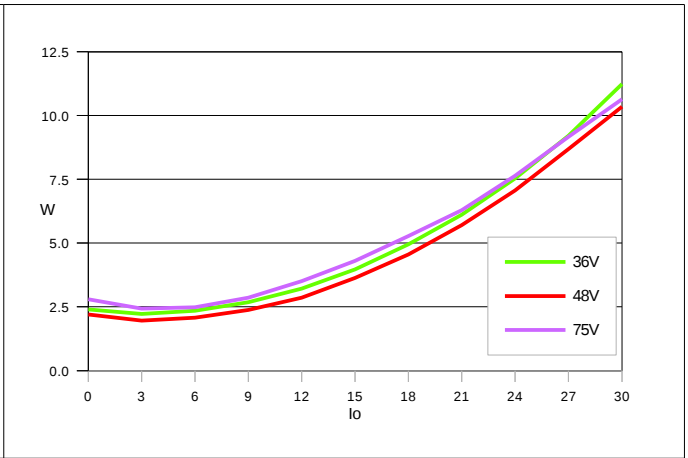
Transient response of COE48033
(V_{IN}: 48V, Load: 22.5A/15A@2.5A/μS)



Input/Output ripples of COE48033
(V_{IN}: 48V, Load: 30A, L_{IN}=10uH)



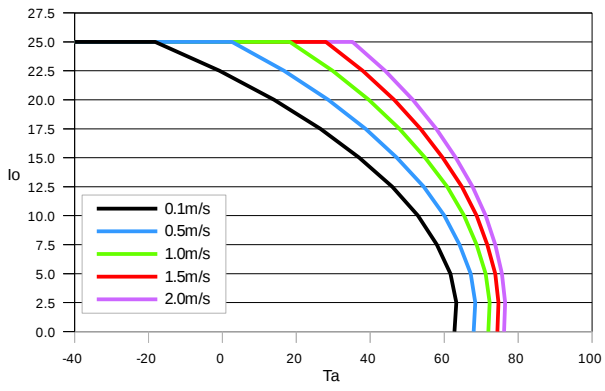
Efficiency plot of COE48033



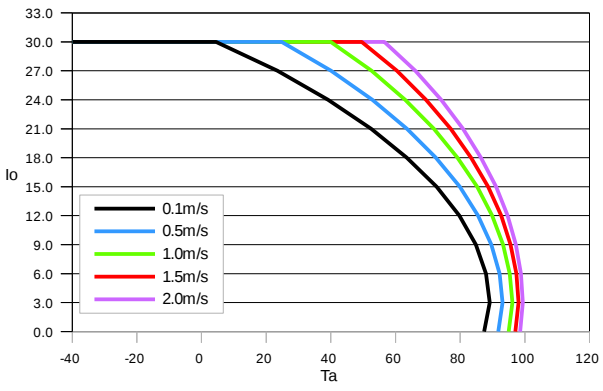
Power loss curves of COE48033

Model Name: COE48033

DERATING CURVES

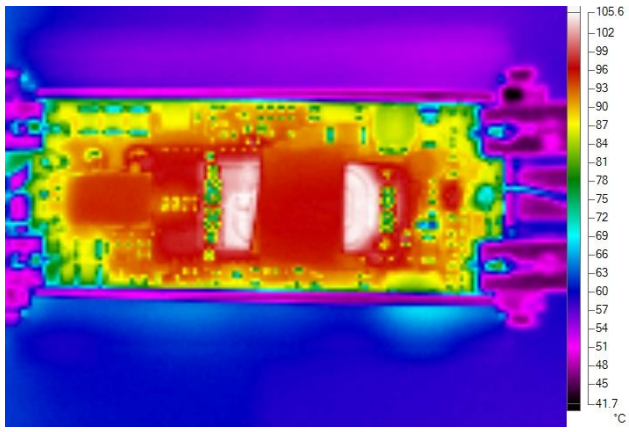


Calculated derating of COE48033 (T_C= 90ºC)

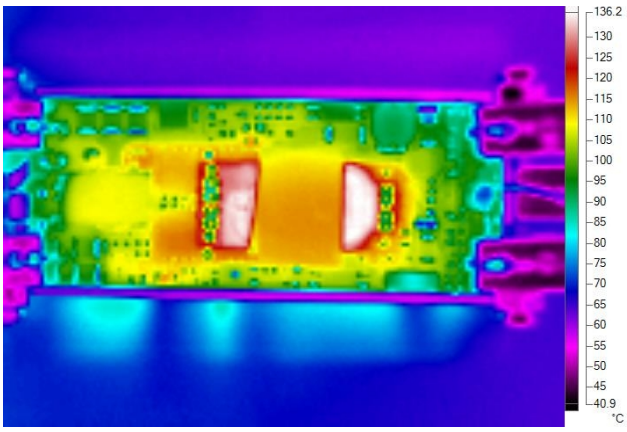


Calculated derating of COE48033 (T_C= 110ºC)

REFERENCED THERMAL IMAGES



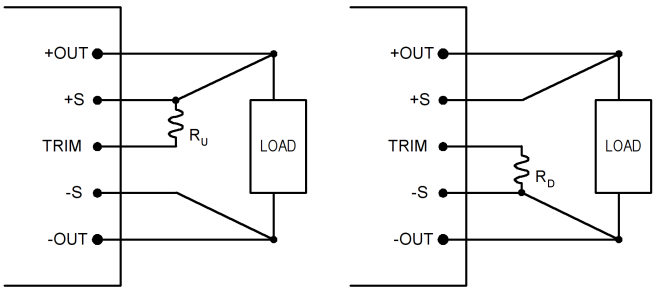
COE48033 (Io= 17.8A@62˚C/0.1m/Sec.)



COE48033 (Io= 27A@70˚C/2.0m/Sec.)

TRIM AND TRIM TABLE

The output of the 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)	42.81	21.41	14.27	10.70	8.56	7.13	6.12	5.35	4.76	4.28	-	-	-	-	-	-	-	-	-	-

Trim Down	-1%	-2%	-3%	-4%	-5%	-6%	-7%	-8%	-9%	-10%	-	-	-	-	-	-	-	-	-	-
R_D (KΩ)	10.15	4.81	3.03	2.14	1.60	1.25	0.99	0.80	0.65	0.53	-	-	-	-	-	-	-	-	-	-

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

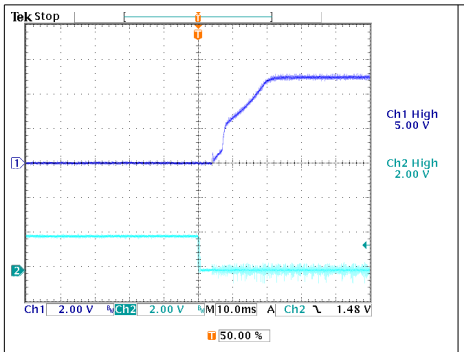
Model Name: COE48050

MODEL PARAMETERS

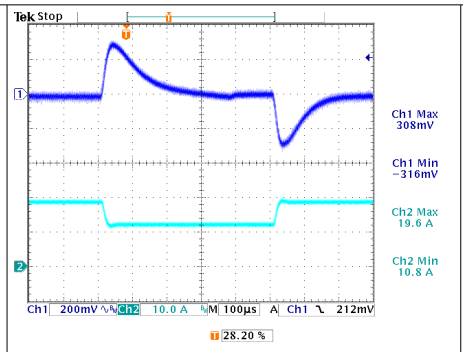
General		
Conversion Efficiency	Typical	See efficiency plots
Switching Frequency	Typical	330KHz

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	0%~100%	±0.2%
Temperature Drift	-40°C ~100°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}	108%~125%
Voltage Trim	V_{NOM}, 10% Load	±10%
Step Load (2.5A/μS)	50%~75% Load	±6%Vo/500μS
Start-Up Delay Time	V_{NOM}, Full Load	20mS/250mS

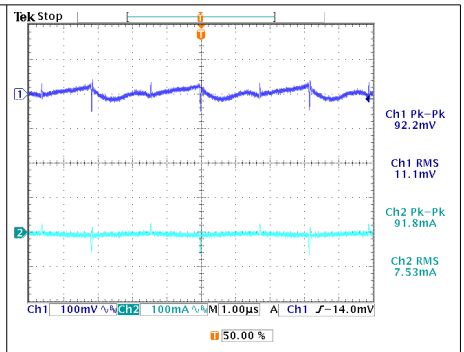
TYPICAL WAVES AND CURVES



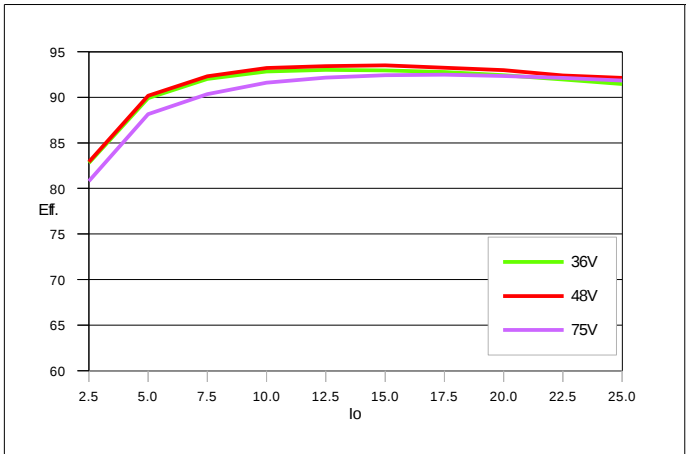
Start-up waveform of COE48050
(V_{IN}: 48V, Load: 25A)



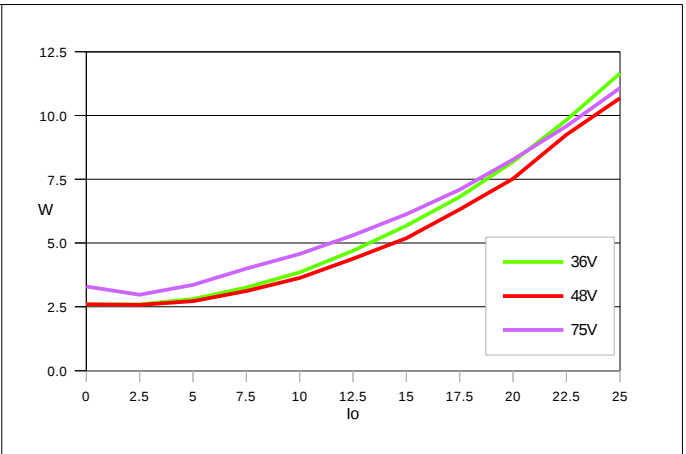
Transient response of COE48050
(V_{IN}: 48V, Load: 18.75A/12.5A@2.5A/μS)



Input/Output ripples of COE48050
(V_{IN}: 48V, Load: 25A, L_{IN}=10uH)



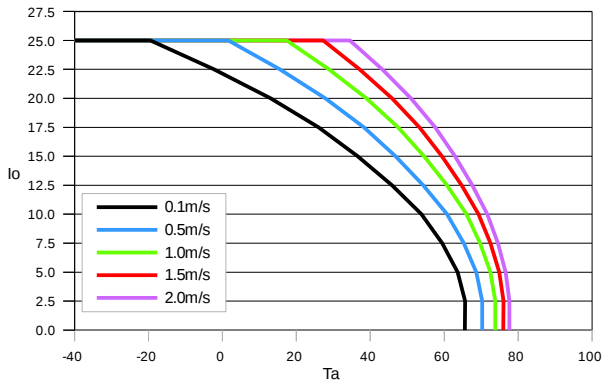
Efficiency plot of COE48050



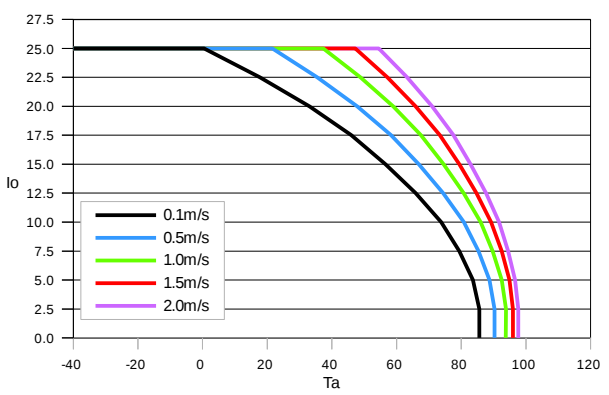
Power loss curves of COE48050

Model Name: COE48050

DERATING CURVES

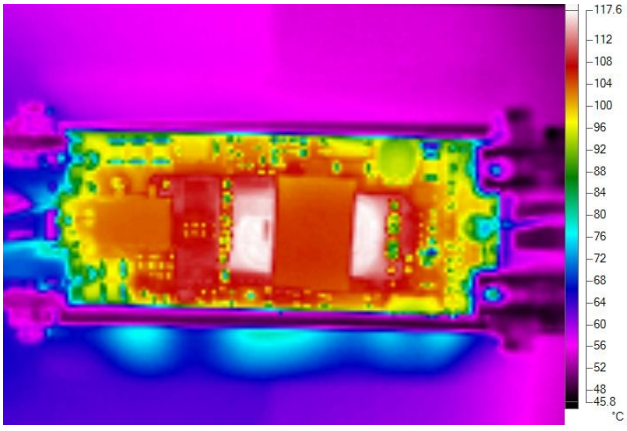


Calculated derating of COE48050 (T_C= 90ºC)

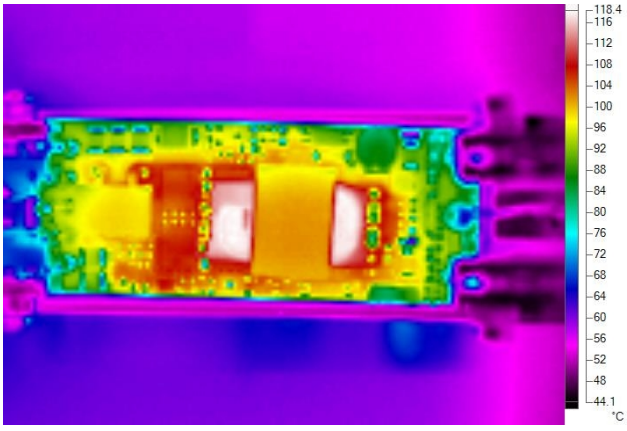


Calculated derating of COE48050 (T_C= 110ºC)

REFERENCED THERMAL IMAGES



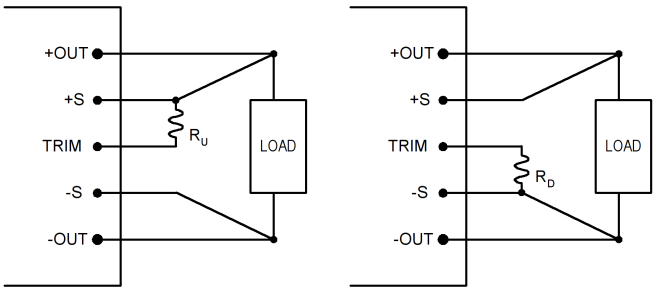
COE48050 (Io= 15.2A@57˚C/0.1m/Sec.)



COE48050 (Io= 18.8A@60˚C/2.0m/Sec.)

TRIM AND TRIM TABLE

The output of the 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)	63.40	32.20	21.47	16.10	12.88	10.73	9.20	8.05	7.16	6.44	-	-	-	-	-	-	-	-	-	-

Trim Down	-1%	-2%	-3%	-4%	-5%	-6%	-7%	-8%	-9%	-10%	-	-	-	-	-	-	-	-	-	-
R_D (KΩ)	15.11	7.15	4.50	3.18	2.38	1.85	1.47	1.19	0.97	0.79	-	-	-	-	-	-	-	-	-	-

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

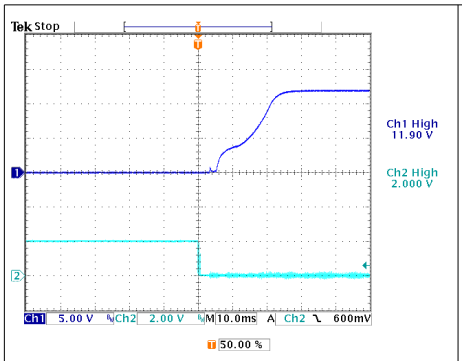
Model Name: COE48120

MODEL PARAMETERS

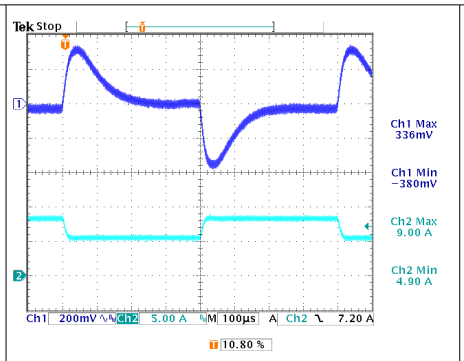
General		
Conversion Efficiency	Typical	See efficiency plots
Switching Frequency	Typical	330KHz

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	0%~100%	±0.2%
Temperature Drift	-40°C ~100°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}	108%~125%
Voltage Trim	V_{NOM}, 10% Load	±10%
Step Load (2.5A/μS)	50%~75% Load	±6%Vo/500μS
Start-Up Delay Time	V_{NOM}, Full Load	20mS/250mS

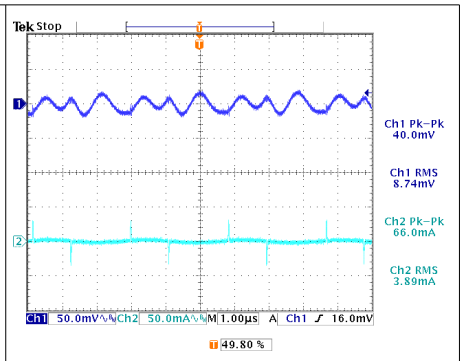
TYPICAL WAVES AND CURVES



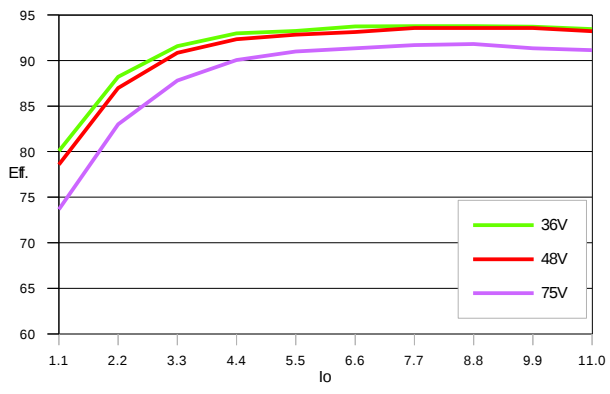
Start-up waveform of COE48120
(V_{IN}: 48V, Load: 11A)



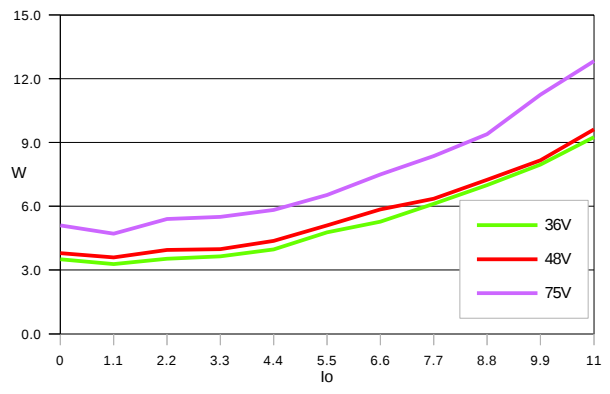
Transient response of COE48120
(V_{IN}: 48V, Load: 8.25A/5.5A@2.5A/μS)



Input/Output ripples of COE48120
(V_{IN}: 48V, Load: 11A, L_{IN}=10uH)



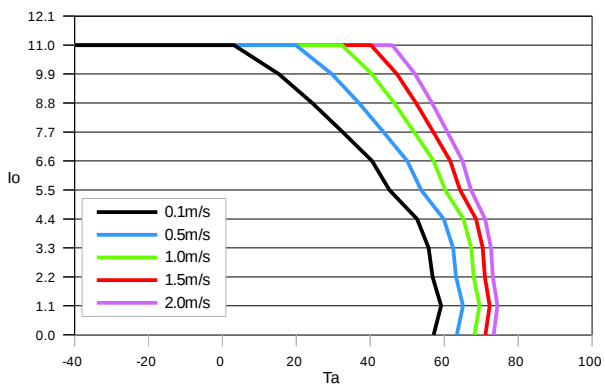
Efficiency plot of COE48120



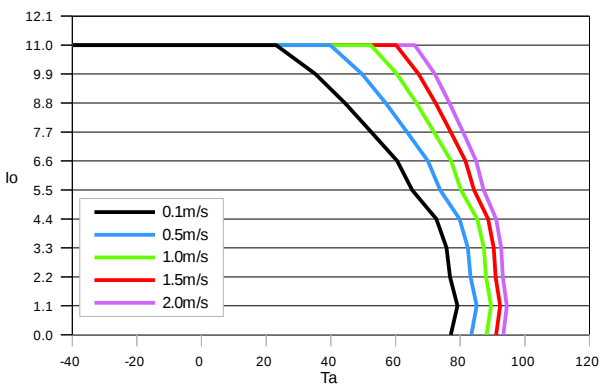
Power loss curves of COE48120

Model Name: COE48120

DERATING CURVES

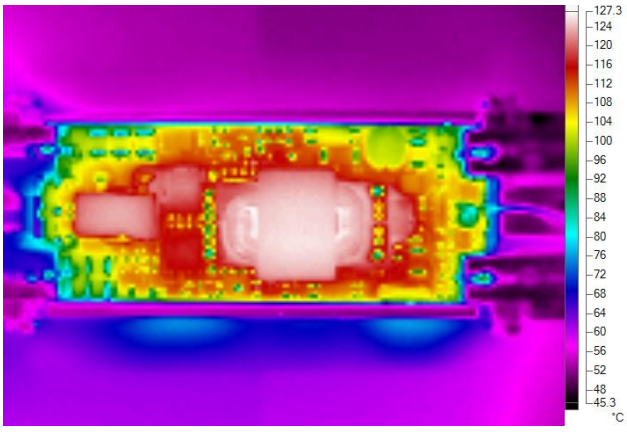


Calculated derating of COE48120 (T_C= 90ºC)

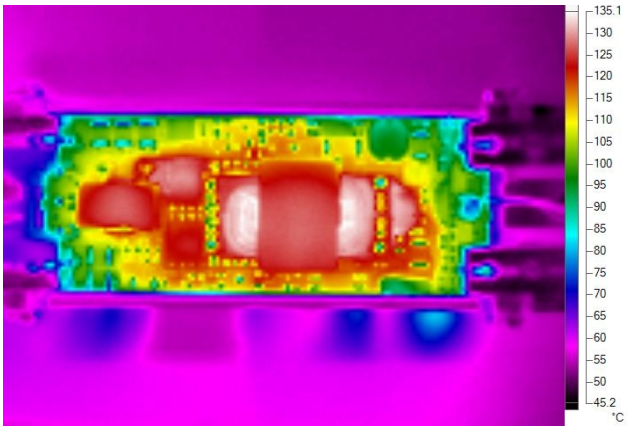


Calculated derating of COE48120 (T_C= 110ºC)

REFERENCED THERMAL IMAGES



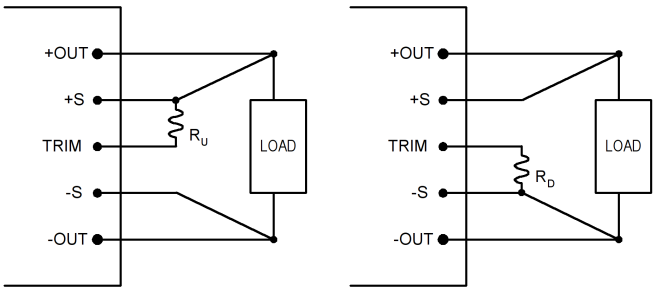
COE48120 (Io= 8.0A@51˚C/0.1m/Sec.)



COE48120 (Io= 8.0A@51˚C/2.0m/Sec.)

TRIM AND TRIM TABLE

The output of the 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.

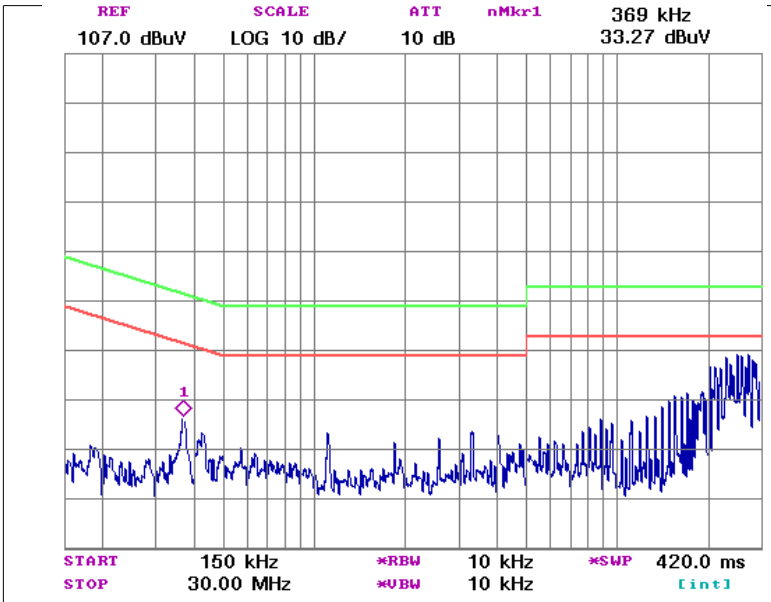


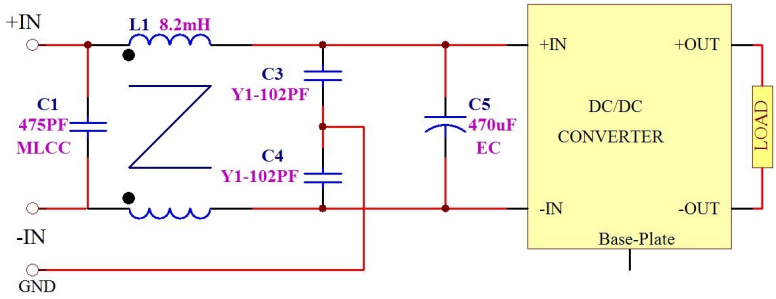
Trim Up	+1%	+2%	+3%	+4%	+5%	+6%	+7%	+8%	+9%	+10%	-	-	-	-	-	-	-	-	-	-
R_U (KΩ)	159.0	79.50	53.00	39.75	31.80	26.50	22.71	19.87	17.67	15.90	-	-	-	-	-	-	-	-	-	-

Trim Down	-1%	-2%	-3%	-4%	-5%	-6%	-7%	-8%	-9%	-10%	-	-	-	-	-	-	-	-	-	-
R_D (KΩ)	39.00	18.50	11.67	8.25	6.20	4.83	3.86	3.13	2.56	2.10	-	-	-	-	-	-	-	-	-	-

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

REFERENCED EMC CIRCUIT





Measured conductive level of COE48050abcd-XXXXX and referenced filter circuit

Referenced EMC Performance

The tested result shown in left-hand side is obtained by loading the power module with a resistive load only. It can be used as a design reference for customer system. However! The performance of customer's system depends on the whole system design. It should be noted that modifications on the circuit parameters and fine adjustment of the final layout would affect the final EMC performance greatly.

Bandwidth of EMC Components

No components are ideal for infinite frequency range. The bandwidth of EMC components should be taking into consideration when designing an EMC filter circuit. To connect ceramic capacitor with electrolytic capacitor in parallel and connect low inductance inductor in series with high inductance inductor could get a better bandwidth.

NOTE:

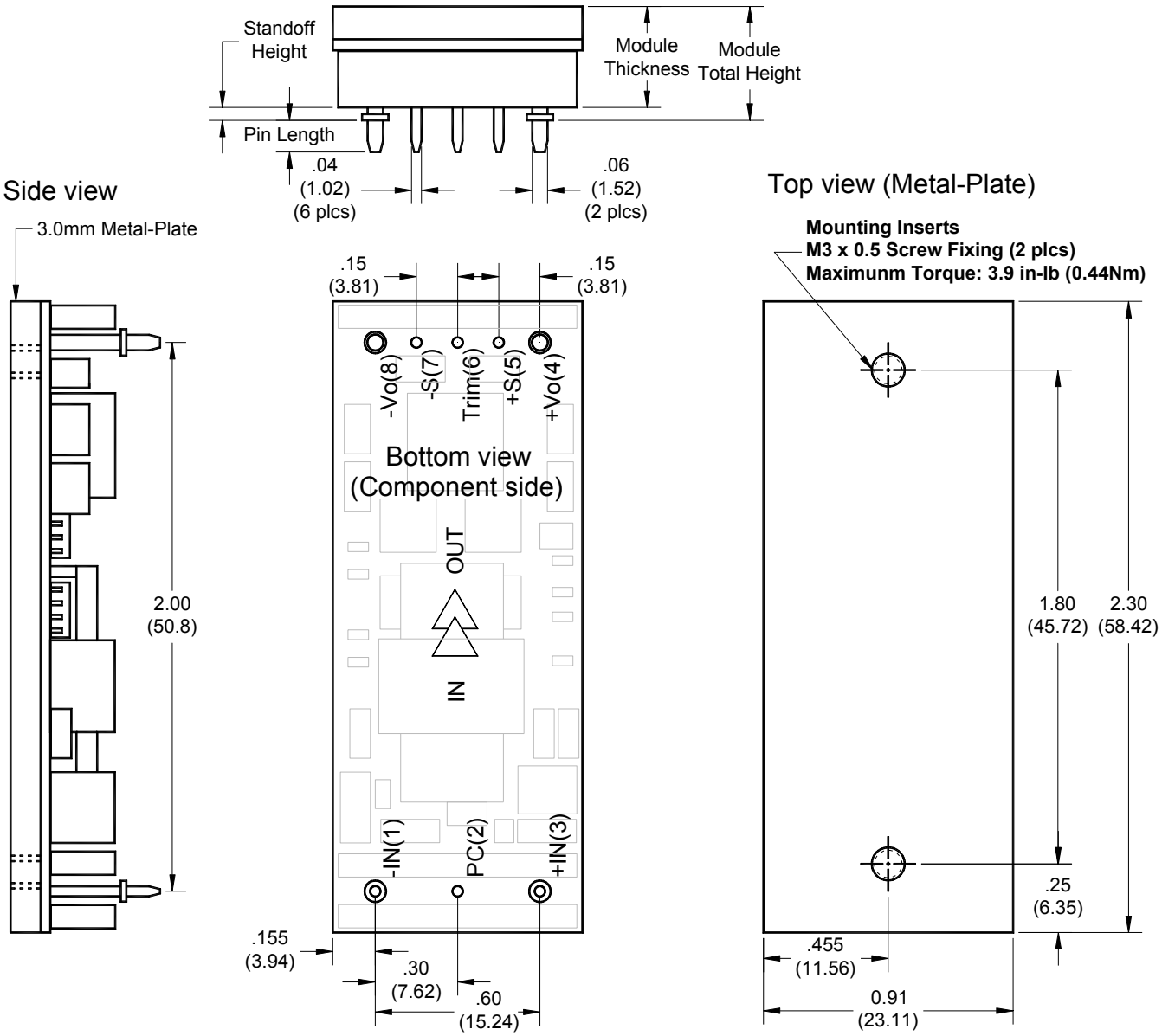
1. **It is recommended that the input should be protected by fuses or other protection devices.**
2. All specifications are typical at nominal input, full load and 25°C unless otherwise noted.
3. Specifications are subject to change without notice.
4. Printed or downloaded datasheets are not subject to Qingsan document control.
5. Product labels shown, including safety agency certificates, may vary based on the date of manufacture.
6. Information provided in this documentation is for ordering purposes only.
7. 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 than the ones listed in this datasheet.

IMPORTANT

※ General specifications and the performances are related to standard series only, no special customer specification display here except requested items.

※ In order to secure effective usage of converter and the validity of Qingsan'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 Qingsan headquarter or our regional sales representative office for help.

OPEN-FRAME



Dimensions and Pin Connections

Designation	Function Description	Pin #
-IN	Negative input	**1**
PC	Remote control. To turn-on and turn-off output.	**2**
+IN	Positive input	**3**
+Vo	Positive output	**4**
+S	Positive remote sense	**5**
TRIM	Output voltage adjust	**6**
-S	Negative remote sense	**7**
-Vo	Negative output	**8**

Dimensions: inches (mm)

Tolerances: .xx±0.02 (.x±0.5)
.xxx±0.01 (.x±0.25)

Weight: 32g / 3.0mm metal plate
Base plate: Anode oxide aluminum alloy

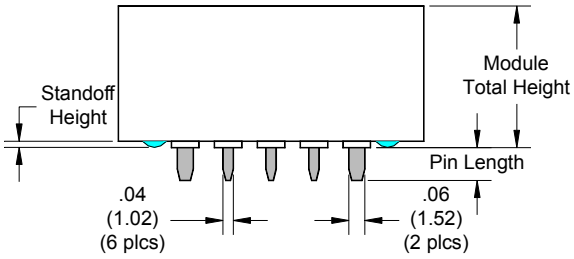
Mounting inserts: Stainless steel for M3

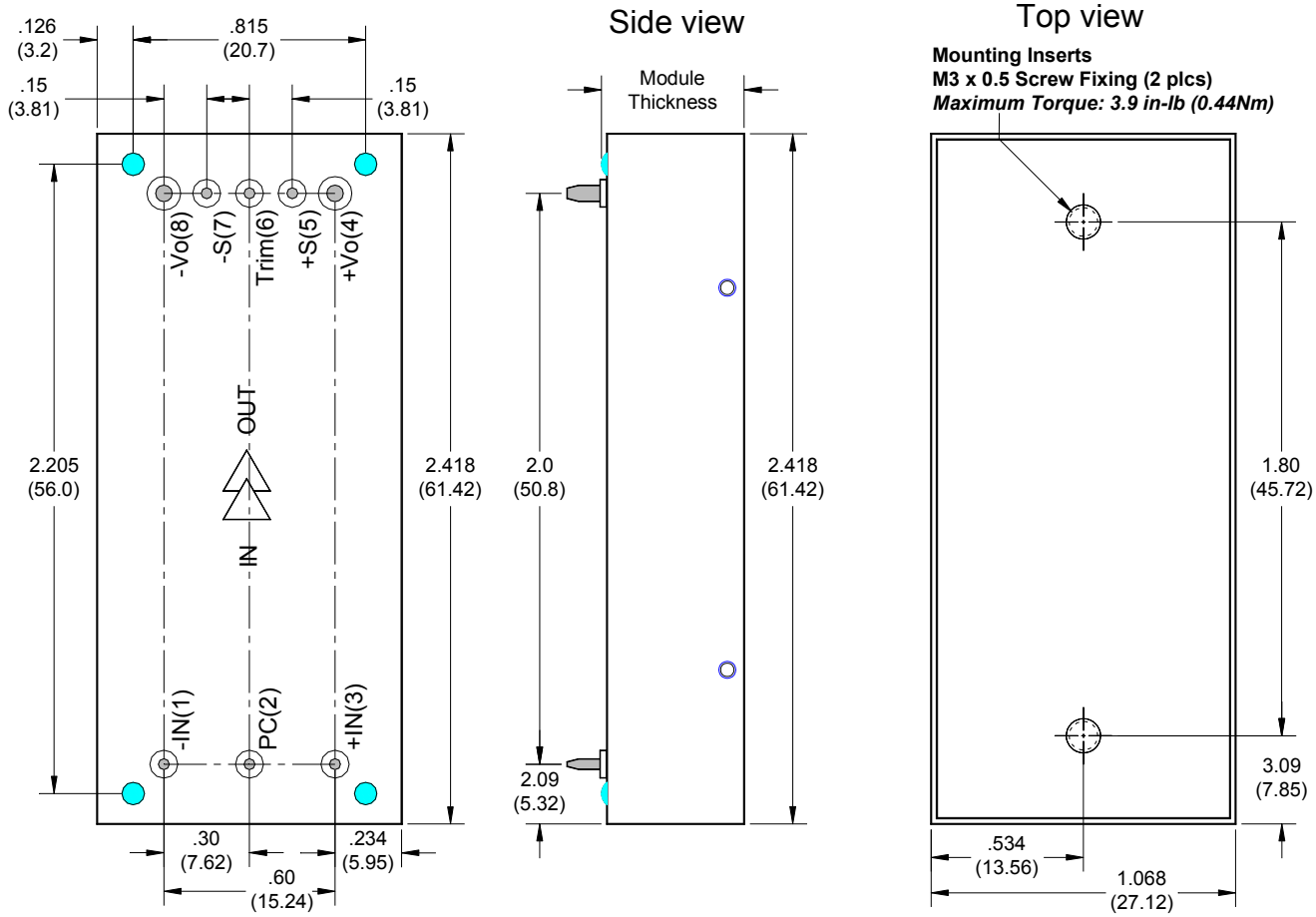
Maximum torque: 3.9 in-lb (0.44Nm)

Pin material: Copper alloy or Brass

Pin plating: Golden over Nickel

METAL-ENCLOSED





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TRIM	Output voltage adjust	**6**
-S	Negative remote sense	**7**
-Vo	Negative output	**8**

Dimensions: inches (mm)
Tolerances: .xx±0.02 (.x±0.5)
.xxx±0.01 (.x±0.25)
Weight: 55g / 3.0mm metal plate
65g / 5.0mm metal plate
Base plate: Anode oxide aluminum alloy
Mounting inserts: Stainless steel for M3
Maximum torque: 3.9 in-lb (0.44Nm)
Pin material: Copper alloy or Brass
Pin plating: Golden over Nickel