

ERM 20W Series

20 Watts DC/DC Converter

Total Power: 20 Watts
Input Voltage: 9 to 36Vdc
18 to 75Vdc
40 to 160Vdc
of Outputs: Single, Dual

Special Features

- Industrial Standard 2" × 1" Package
- Ultra-wide 4:1 Input Voltage Range
- Fully Regulated Output Voltage
- I/O Isolation 3000Vac with Reinforced Insulation
- Operating Ambient Temp. Range -40 °C to +88°C (With derating)
- No Minimum Load Requirement
- Overload and Short Circuit Protection
- Remote On/Off, Output Voltage Trim
- Designed-in Conducted EMI meets EN55032/22 Class A & FCC Level A
- Vibration and Shock meets EN61373
- Fire Protection Test meet EN45545-2
- Railway EMC Standard meets EN50121-3-2

Safety

UL/cUL/IEC/EN62368-1 (60950-1)
EN50155(IEC60571)
CE Mark



Product Descriptions

The ERM 20W series is a new range of high performance 20W isolated dc-dc converter within encapsulated 2"x1" package which specifically design for railway applications. There are 18 models available for railway input voltage of 24(9~36)Vdc or 48(18~75)Vdc or 110(40~160)Vdc and tight output voltage regulation. Further features include over current, over voltage, short circuit protection, remote ON/OFF, output trim and EMI filter meets EN55032/22 & FCC Part15 Class A as well.

The ERM 20W series conform to vibration and thermal shock test meets EN61373, cooling, dry and damp heat test meets IEC/EN 60068-2-1,2,30 and railway EMC standard EN50121-3-2 and complies also with Railway Certification EN50155 (IEC60571).

The ERM 20W series offer a highly reliable solution for critical applications in railway systems, battery-powered equipment, measure instrumentation and many critical applications.

Model Numbers

Model ¹	Input Voltage	Output Voltage	Minimum Load	Maximum Load	Efficiency
ERM04A18	9-36Vdc	5Vdc	0A	4A	87%
ERM01B18	9-36Vdc	12Vdc	0A	1.67A	87%
ERM01C18	9-36Vdc	15Vdc	0A	1.33A	87%
ERM01H18	9-36Vdc	24Vdc	0A	0.833A	87%
ERM01BB18	9-36Vdc	±12Vdc	0A	±0.833A	86%
ERM01CC18	9-36Vdc	±15Vdc	0A	±0.667A	86%
ERM04A18B	9-36Vdc	5Vdc	0A	4A	87%
ERM01B18B	9-36Vdc	12Vdc	0A	1.67A	87%
ERM01C18B	9-36Vdc	15Vdc	0A	1.33A	87%
ERM01H18B	9-36Vdc	24Vdc	0A	0.833A	87%
ERM01BB18B	9-36Vdc	±12Vdc	0A	±0.833A	86%
ERM01CC18B	9-36Vdc	±15Vdc	0A	±0.667A	86%
ERM04A36	18-75Vdc	5Vdc	0A	4A	87%
ERM01B36	18-75Vdc	12Vdc	0A	1.67A	88%
ERM01C36	18-75Vdc	15Vdc	0A	1.33A	88%
ERM01H36	18-75Vdc	24Vdc	0A	0.833A	88%
ERM01BB36	18-75Vdc	±12Vdc	0A	±0.833A	87%
ERM01CC36	18-75Vdc	±15Vdc	0A	±0.667A	87%
ERM04A36B	18-75Vdc	5Vdc	0A	4A	87%
ERM01B36B	18-75Vdc	12Vdc	0A	1.67A	88%
ERM01C36B	18-75Vdc	15Vdc	0A	1.33A	88%
ERM01H36B	18-75Vdc	24Vdc	0A	0.833A	88%
ERM01BB36B	18-75Vdc	±12Vdc	0A	±0.833A	87%
ERM01CC36B	18-75Vdc	±15Vdc	0A	±0.667A	87%

Model Numbers

Model ¹	Input Voltage	Output Voltage	Minimum Load	Maximum Load	Efficiency
ERM04A110	40-160Vdc	5Vdc	0A	4A	84%
ERM01B110	40-160Vdc	12Vdc	0A	1.67A	86%
ERM01C110	40-160Vdc	15Vdc	0A	1.33A	86%
ERM01H110	40-160Vdc	24Vdc	0A	0.833A	86%
ERM01BB110	40-160Vdc	±12Vdc	0A	±0.833A	86%
ERM01CC110	40-160Vdc	±15Vdc	0A	±0.667A	86%
ERM04A110B	40-160Vdc	5Vdc	0A	4A	84%
ERM01B110B	40-160Vdc	12Vdc	0A	1.67A	86%
ERM01C110B	40-160Vdc	15Vdc	0A	1.33A	86%
ERM01H110B	40-160Vdc	24Vdc	0A	0.833A	86%
ERM01BB110B	40-160Vdc	±12Vdc	0A	±0.833A	86%
ERM01CC110B	40-160Vdc	±15Vdc	0A	±0.667A	86%

Note1 - Suffix "B" means baseplate, see mechanical drawing.

Options

None

Electrical Specifications

Absolute Maximum Ratings

Stress in excess of those listed in the “Absolute Maximum Ratings” may cause permanent damage to the power supply. These are stress ratings only and functional operation of the unit is not implied at these or any other conditions above those given in the operational sections of this TRN. Exposure to any absolute maximum rated condition for extended periods may adversely affect the power supply’s reliability.

Table 1. Absolute Maximum Ratings:

Parameter	Model	Symbol	Min	Typ	Max	Unit
Input Surge Voltage 0.1 Sec.max	24V Input Models 48V Input Models 110V Input Models	$V_{IN,DC}$	-0.7 -0.7 -0.7	- - -	50 100 170	Vdc Vdc Vdc
Maximum Output Power	All models	$P_{O,max}$	-	-	20	W
Isolation Voltage Input to output (60 seconds) Input / Output to Case (60 seconds)	All models All models		3000 1500	- -	- -	Vac Vac
Isolation Resistance 500Vdc	All models		1000	-	-	Mohm
Isolation Capacitance 100KHz, 1V	All models		-	1500	-	pF
Operating Case Temperature	All models	T_{CASE}	-	-	+105	°C
Storage Temperature	All models	T_{STG}	-50		+125	°C
Humidity (non-condensing) Operating Non-operating	All models All models		- -	- -	95 95	% %
MTBF (MIL-HDBK-217F@25°C, Full load, Ground Benign)	All models		655,100	-	-	Hours

Note 1 - With Derating and under Natural Convection

Input Specifications

Table 2. Input Specifications:

Parameter		Condition	Symbol	Min	Typ	Max	Unit
Operating Input Voltage, DC	24V Input Models	All	$V_{IN,DC}$	9	24	36	Vdc
	48V Input Models			18	48	75	Vdc
	110V Input Models			40	110	160	Vdc
Start-Up Threshold Voltage	24V Input Models	All	$V_{IN,ON}$	-	-	9	Vdc
	48V Input Models			-	-	18	Vdc
	110V Input Models			-	-	40	Vdc
Under Voltage Shutdown	24V Input Models	All	$V_{IN,OFF}$	-	7.5	-	Vdc
	48V Input Models			-	16	-	Vdc
	110V Input Models			-	37	-	Vdc
Input Current	ERM04A18	$V_{IN,DC}=V_{IN,nom}$	$I_{IN,full\ load}$	-	958	-	mA
	ERM01B18			-	960	-	mA
	ERM01C18			-	955	-	mA
	ERM01H18			-	957	-	mA
	ERM01BB18			-	969	-	mA
	ERM01CC18			-	969	-	mA
	ERM04A36			-	479	-	mA
	ERM01B36			-	474	-	mA
	ERM01C36			-	472	-	mA
	ERM01H36			-	473	-	mA
	ERM01BB36			-	479	-	mA
	ERM01CC36			-	479	-	mA
	ERM04A110			-	216	-	mA
	ERM01B110			-	212	-	mA
	ERM01C110			-	211	-	mA
	ERM01H110			-	211	-	mA
	ERM01BB110			-	211	-	mA
	ERM01CC110			-	212	-	mA
Efficiency @Max. Load	ERM04A18	$V_{IN,DC}=V_{IN,nom}$ $I_O=I_{O,max}$ $T_A=25\text{ }^{\circ}\text{C}$	η	-	87	-	%
	ERM01B18			-	87	-	%
	ERM01C18			-	87	-	%
	ERM01H18			-	87	-	%
	ERM01BB18			-	86	-	%
	ERM01CC18			-	86	-	%
	ERM04A36			-	87	-	%
	ERM01B36			-	88	-	%
	ERM01C36			-	88	-	%
	ERM01H36			-	88	-	%
	ERM01BB36			-	87	-	%
	ERM01CC36			-	87	-	%
	ERM04A110			-	84	-	%
	ERM01B110			-	86	-	%
	ERM01C110			-	86	-	%
	ERM01H110			-	86	-	%
	ERM01BB110			-	86	-	%
	ERM01CC110			-	86	-	%

Input Specifications

Table 2. Input Specifications con't:

Parameter		Condition	Symbol	Min	Typ	Max	Unit
No Load Input Current (V _O On, I _O = 0A)	24V Input Models	$V_{IN,DC}=V_{IN,nom}$	I _{IN,no_load}	-	25	-	mA
	48V Input Models			-	15	-	mA
	110V Input Models			-	10	-	mA
Start Up Time		All		-	50	-	mSec
Input Filter		All	Internal Pi Type				

Output Specifications

Table 3. Output Specifications:

Parameter		Condition	Symbol	Min	Typ	Max	Unit
Output Voltage Set -Point		$V_{IN,DC}=V_{IN,nom}$ $I_O=I_{O,max}, T_A=25\text{ }^{\circ}\text{C}$	$\pm V_O$	-	-	± 1	%
Line Regulation		$V_{IN,DC}=V_{IN,min}$ to $V_{IN,max}$	$\pm \%V_O$	-	-	0.2	%
Load Regulation		$I_O=I_{O,min}$ to $I_{O,max}$	$\pm \%V_O$ $\pm \%V_O$	-	-	0.5 1.0	% %
Single Output Dual Output							
Output Current	ERM04A18	Convection Cooling	I_O	-	-	4	A
	ERM01B18			-	-	1.67	A
	ERM01C18			-	-	1.33	A
	ERM01H18			-	-	0.833	A
	ERM01BB18			-	-	± 0.833	A
	ERM01CC18			-	-	± 0.667	A
	ERM04A36			-	-	4	A
	ERM01B36			-	-	1.67	A
	ERM01C36			-	-	1.33	A
	ERM01H36			-	-	0.833	A
	ERM01BB36			-	-	± 0.833	A
	ERM01CC36			-	-	± 0.667	A
	ERM04A110			-	-	4	A
	ERM01B110			-	-	1.67	A
	ERM01C110			-	-	1.33	A
	ERM01H110			-	-	0.833	A
	ERM01BB110			-	-	± 0.833	A
	ERM01CC110			-	-	± 0.667	A
Load Capacitance	ERM04A18	All	C_O	-	-	6800	uF
	ERM01B18			-	-	1200	uF
	ERM01C18			-	-	750	uF
	ERM01H18			-	-	300	uF
	ERM01BB18			-	-	600 ¹	uF
	ERM01CC18			-	-	380 ¹	uF
	ERM04A36			-	-	6800	uF
	ERM01B36			-	-	1200	uF
	ERM01C36			-	-	750	uF
	ERM01H36			-	-	300	uF
	ERM01BB36			-	-	600 ¹	uF
	ERM01CC36			-	-	380 ¹	uF
	ERM04A110			-	-	6800	uF
	ERM01B110			-	-	1200	uF
	ERM01C110			-	-	750	uF
	ERM01H110			-	-	300	uF
	ERM01BB110			-	-	600 ¹	uF
	ERM01CC110			-	-	380 ¹	uF

Note 1 - For each output.

Output Specifications

Table 3. Output Specifications con't:

Parameter		Condition	Symbol	Min	Typ	Max	Unit
Trim Up/Down Range			%V _O	-	-	±10	%
Switching Frequency		All	f _{SW}	-	320	-	KHz
Temperature Coefficient		All	±%/°C	-	-	0.02	%/°C
Output Over Current Protection ¹		All	%I _{O,max}	-	150	-	%
Output Short Circuit Protection		All	Hiccup Mode 0.7Hz type, Automatic Recovery				
Output Ripple, pk-pk	5V Output Models	0 to 20MHz bandwidth Measure with a 10uF/25V MLCC	V _O	-	50	-	mV
	12V Output Models			-	100	-	mV
	15V Output Models			-	100	-	mV
	±12V Output Models			-	100	-	mV
	±15V Output Models			-	100	-	mV
	24V Output Models	0 to 20MHz bandwidth Measure with a 4.7uF/50V MLCC	V _O	-	150	-	mV
V _O Dynamic Response							
Peak Deviation		25% load change	±%V _O	-	3	5	%
Recovery Time ²			±%V _{SB}	-	-	300	uSec
Output Over Voltage	ERM04A18	All	V _O	-	6.2	-	Vdc
	ERM01B18			-	15	-	Vdc
	ERM01C18			-	18	-	Vdc
	ERM01H18			-	30	-	Vdc
	ERM01BB18			-	±15	-	Vdc
	ERM01CC18			-	±18	-	Vdc
	ERM04A36			-	6.2	-	Vdc
	ERM01B36			-	15	-	Vdc
	ERM01C36			-	18	-	Vdc
	ERM01H36			-	30	-	Vdc
	ERM01BB36			-	±15	-	Vdc
	ERM01CC36			-	±18	-	Vdc
	ERM04A110			-	6.2	-	Vdc
	ERM01B110			-	15	-	Vdc
	ERM01C110			-	18	-	Vdc
	ERM01H110			-	30	-	Vdc
	ERM01BB110			-	±15	-	Vdc
	ERM01CC110			-	±18	-	Vdc

Note 1 - Hiccup mode.

Note 2 - Transient recovery time is measured to within 1% error band for a step change in output load of 75% to 100%.

ERM04A18 Performance Curves

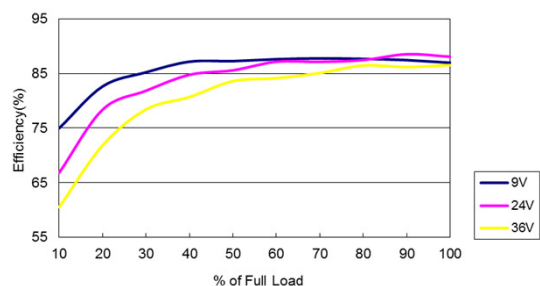


Figure 1: ERM04A18 Efficiency Versus Output Current Curve
Vin = 9 to 36Vdc Load: Io = 0 to 4A

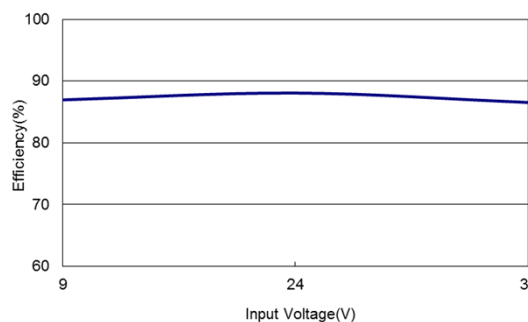


Figure 2: ERM04A18 Efficiency Versus Input Voltage Curve
Vin = 9 to 36Vdc Load: Io = 4A

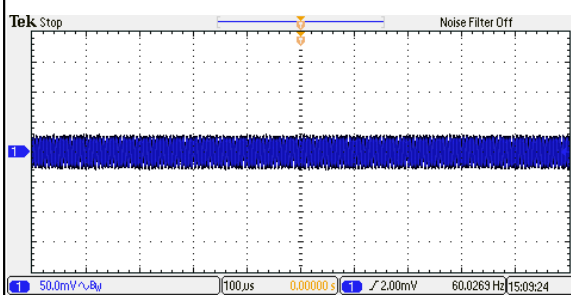


Figure 3: ERM04A18 Ripple and Noise Measurement
Vin = 24Vdc Load: Io = 4A
Ch 1: Vo

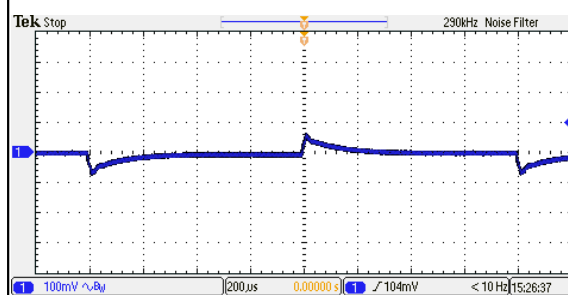


Figure 4: ERM04A18 Transient Response
Vin = 24Vdc Load: Io = 100% to 75% load change
Ch 1: Vo

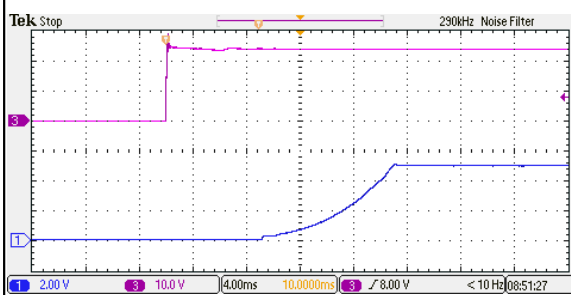


Figure 5: ERM04A18 Output Voltage Startup Characteristic by Vin
Vin = 24Vdc Load: Io = 4A
Ch1: Vin Ch3: Vo

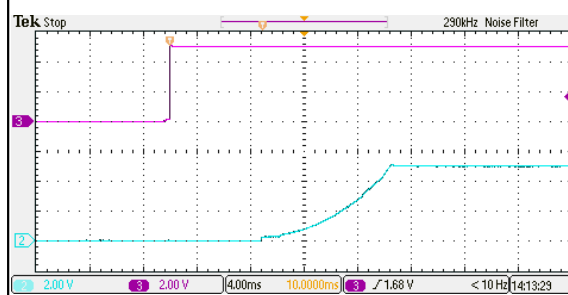


Figure 6: ERM04A18 Output Voltage Startup Characteristic by On/Off
Vin = 24Vdc Load: Io = 4A
Ch2: Vo Ch3: Vin

ERM04A18 Performance Curves

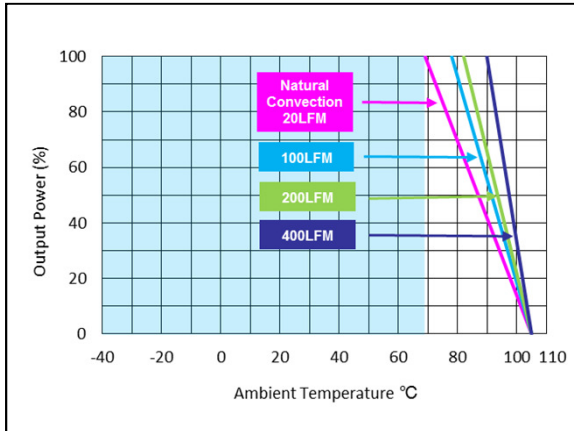


Figure 7: ERM04A18 Derating Output Current vs Ambient Temperature
Vin = 24Vdc
Without Heatsink

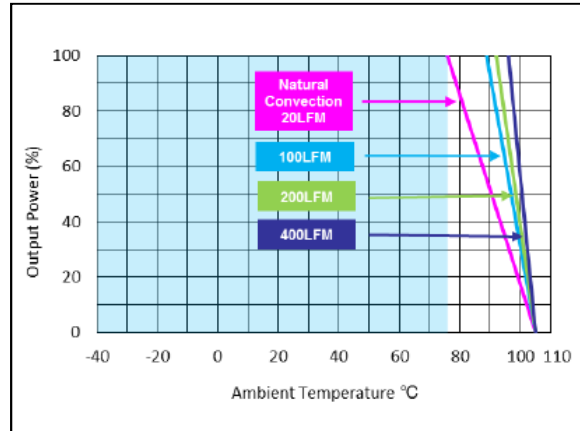


Figure 8: ERM04A18 Derating Output Current vs Ambient Temperature
Vin = 24Vdc
With Heatsink

ERM01B18 Performance Curves

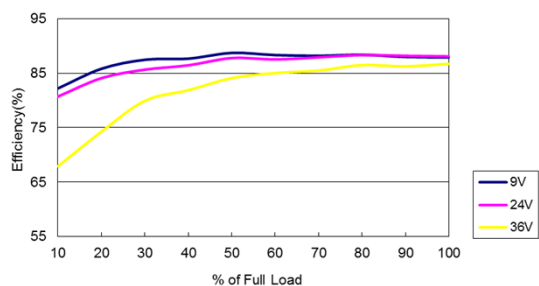


Figure 9: ERM01B18 Efficiency Versus Output Current Curve
Vin = 9 to 36Vdc Load: $I_o = 0$ to 1.67A

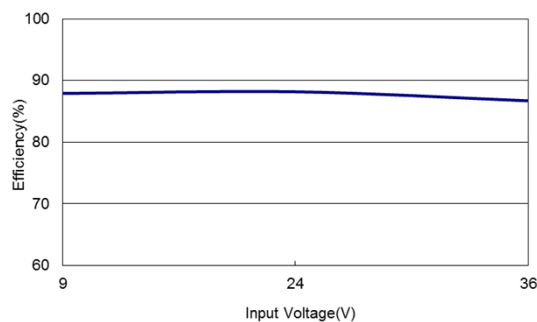


Figure 10: ERM01B18 Efficiency Versus Input Voltage Curve
Vin = 9 to 36Vdc Load: $I_o = 1.67A$

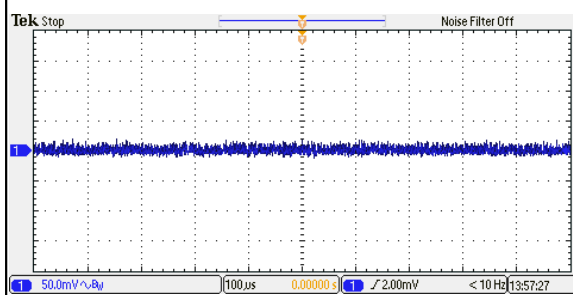


Figure 11: ERM01B18 Ripple and Noise Measurement
Vin = 24Vdc Load: $I_o = 1.67A$
Ch 1: Vo

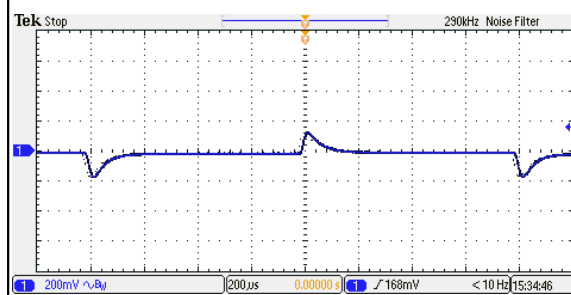


Figure 12: ERM01B18 Transient Response
Vin = 24Vdc Load: $I_o = 100\%$ to 75% load change
Ch 1: Vo

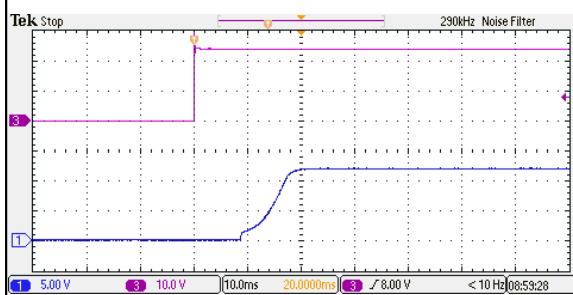


Figure 13: ERM01B18 Output Voltage Startup Characteristic by Vin
Vin = 24Vdc Load: $I_o = 1.67A$
Ch1: Vin Ch3: Vo

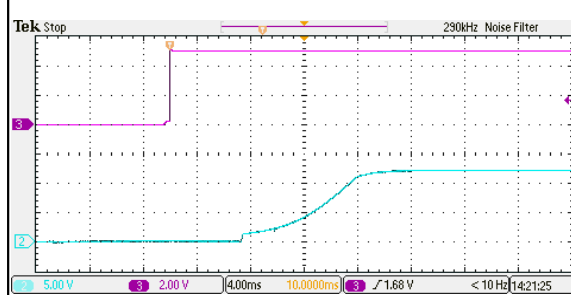


Figure 14: ERM01B18 Output Voltage Startup Characteristic by On/Off
Vin = 24Vdc Load: $I_o = 1.67A$
Ch2: Vo Ch3: Vin

ERM01B18 Performance Curves

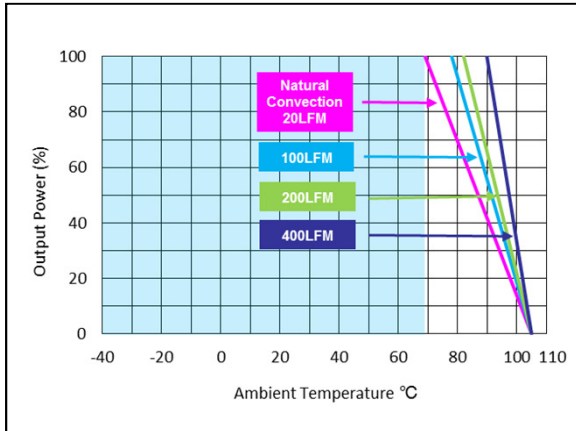


Figure 15: ERM01B18 Derating Output Current vs Ambient Temperature
Vin = 24Vdc
Without Heatsink

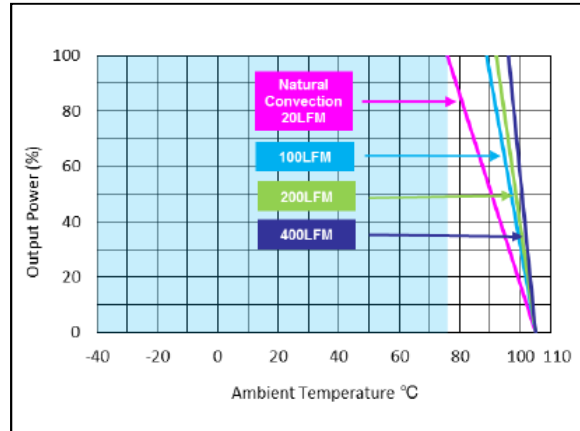


Figure 16: ERM01B18 Derating Output Current vs Ambient Temperature
Vin = 24Vdc
With Heatsink

ERM01C18 Performance Curves

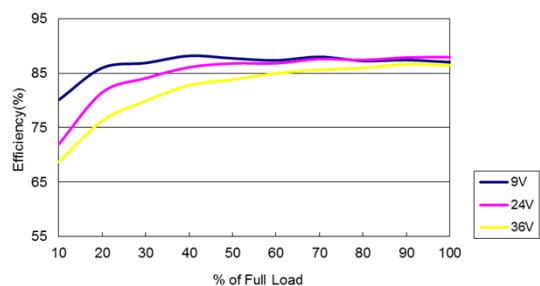


Figure 17: ERM01C18 Efficiency Versus Output Current Curve
Vin = 9 to 36Vdc Load: Io = 0 to 1.33A

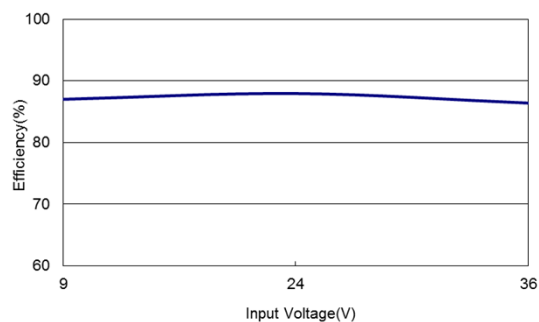


Figure 18: ERM01C18 Efficiency Versus Input Voltage Curve
Vin = 9 to 36Vdc Load: Io = 1.33A

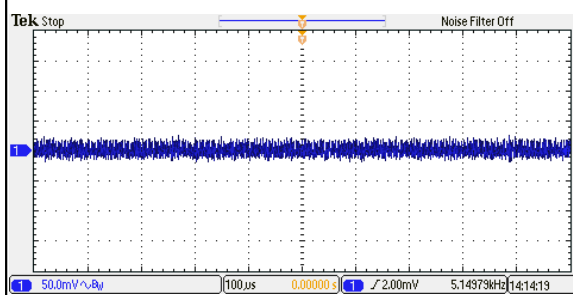


Figure 19: ERM01C18 Ripple and Noise Measurement
Vin = 24Vdc Load: Io = 1.33A
Ch 1: Vo

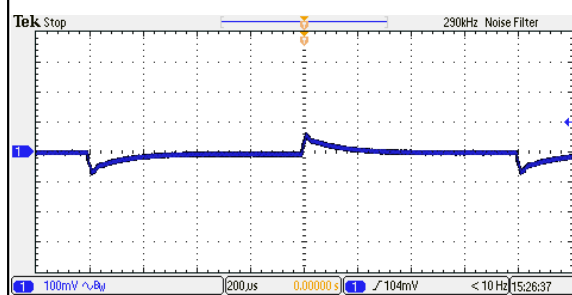


Figure 20: ERM01C18 Transient Response
Vin = 24Vdc Load: Io = 100% to 75% load change
Ch 1: Vo

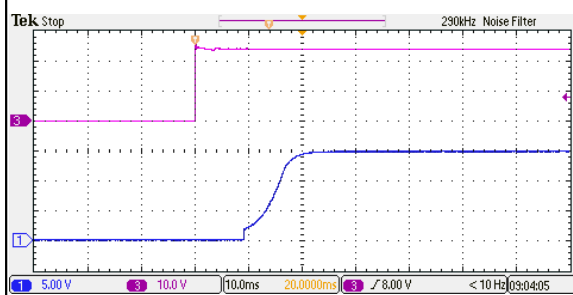


Figure 21: ERM01C18 Output Voltage Startup Characteristic by Vin
Vin = 24Vdc Load: Io = 1.33A
Ch1: Vin Ch3: Vo

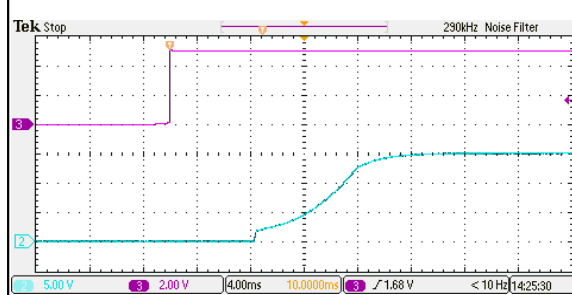
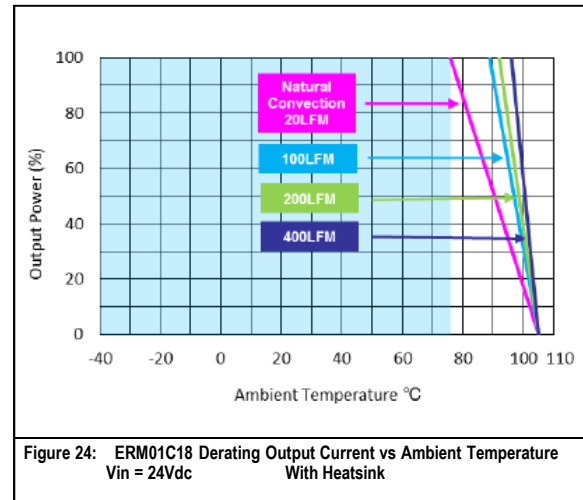
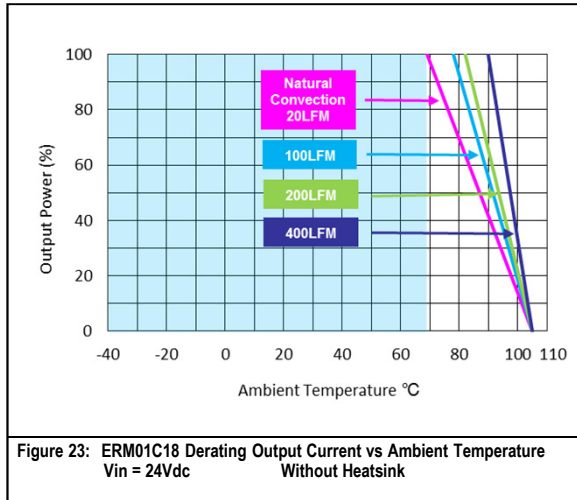


Figure 22: ERM01C18 Output Voltage Startup Characteristic by On/Off
Vin = 24Vdc Load: Io = 1.33A
Ch2: Vo Ch3: Vin

ERM01C18 Performance Curves



ERM01H18 Performance Curves

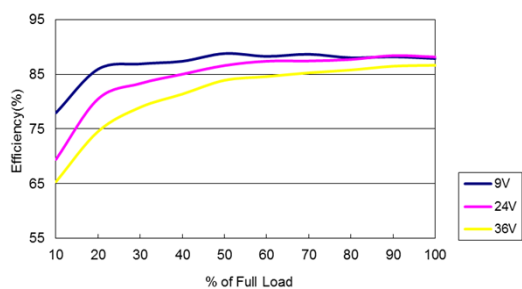


Figure 25: ERM01H18 Efficiency Versus Output Current Curve
Vin = 9 to 36Vdc Load: Io = 0 to 0.833A

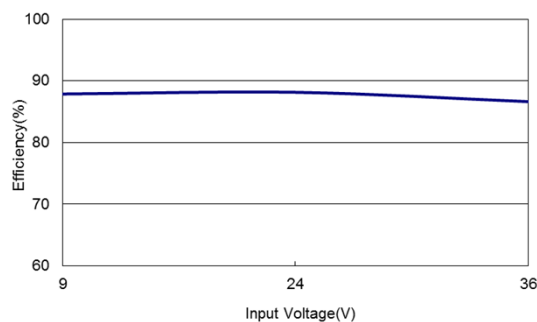


Figure 26: ERM01H18 Efficiency Versus Input Voltage Curve
Vin = 9 to 36Vdc Load: Io = 0.833A

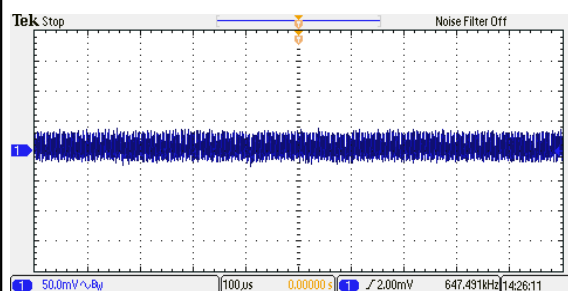


Figure 27: ERM01H18 Ripple and Noise Measurement
Vin = 24Vdc Load: Io = 0.833A
Ch 1: Vo

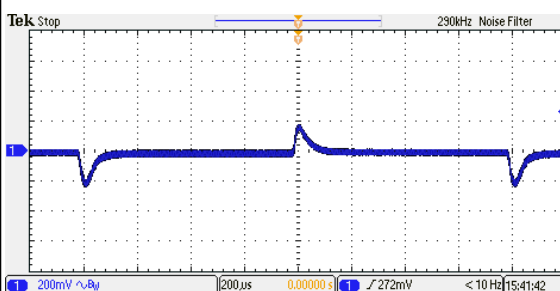


Figure 28: ERM01H18 Transient Response
Vin = 24Vdc Load: Io = 100% to 75% load change
Ch 1: Vo

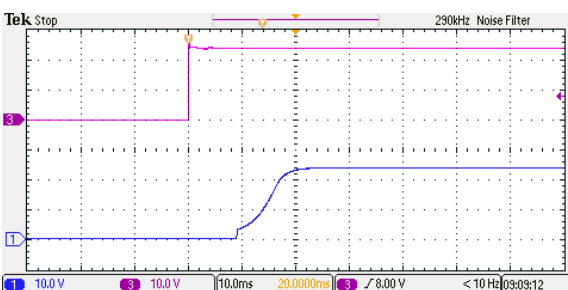


Figure 29: ERM01H18 Output Voltage Startup Characteristic by Vin
Vin = 24Vdc Load: Io = 0.833A
Ch1: Vin Ch3: Vo

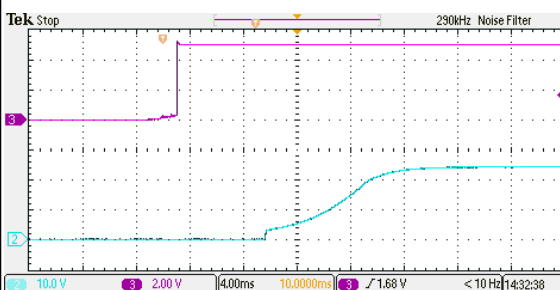
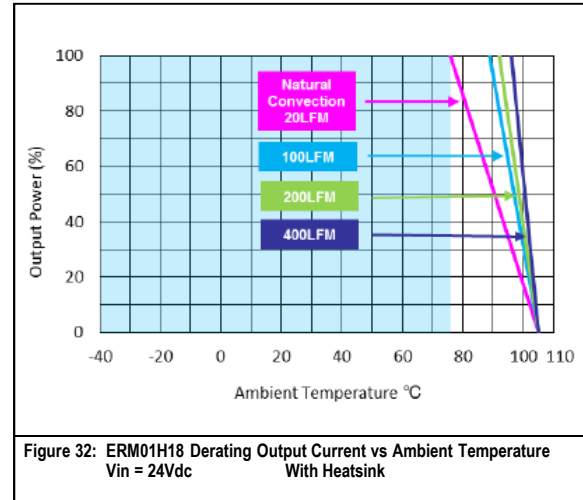
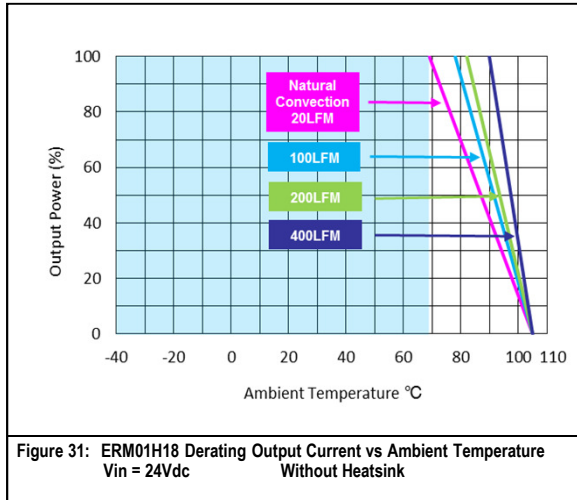


Figure 30: ERM01H18 Output Voltage Startup Characteristic by On/Off
Vin = 24Vdc Load: Io = 0.833A
Ch2: Vo Ch3: Vin

ERM01H18 Performance Curves



ERM01BB18 Performance Curves

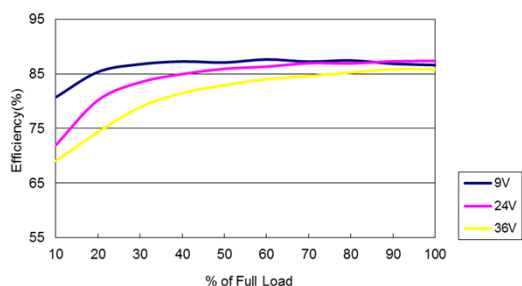


Figure 33: ERM01BB18 Efficiency Versus Output Current Curve
Vin = 9 to 36Vdc Load: Io = 0 to $\pm 0.833A$

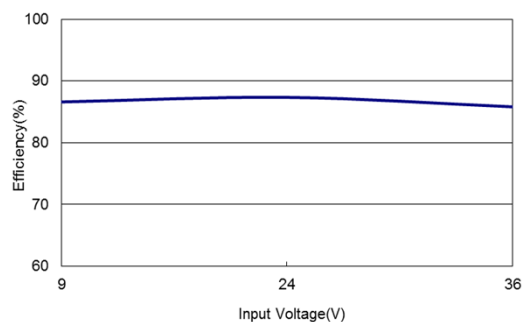


Figure 34: ERM01BB18 Efficiency Versus Input Voltage Curve
Vin = 9 to 36Vdc Load: Io = 0 to $\pm 0.833A$

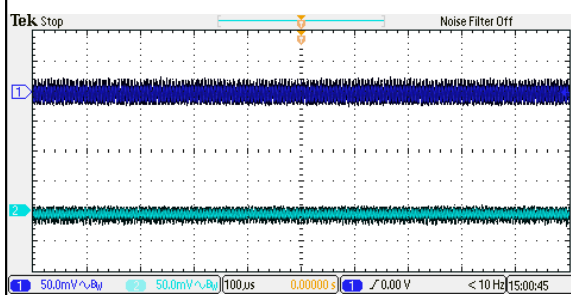


Figure 35: ERM01BB18 Ripple and Noise Measurement
Vin = 24Vdc Load: Io = $\pm 0.833A$
Ch 1: Vo1 Ch2: Vo2

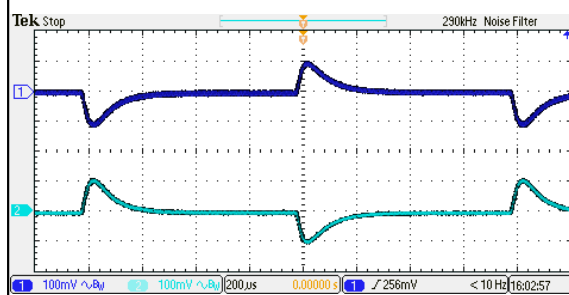


Figure 36: ERM01BB18 Transient Response Vin = 24Vdc
Vin = 24Vdc Load: Io = 100% to 75% load change
Ch 1: Vo1 Ch2: Vo2

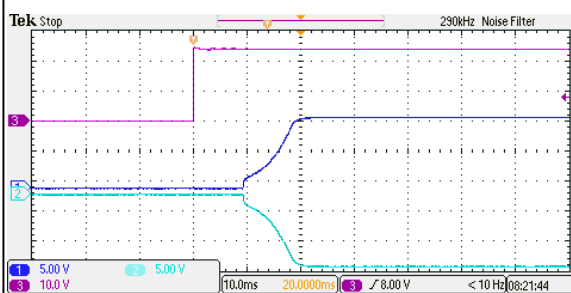


Figure 37: ERM01BB18 Output Voltage Startup Characteristic by Vin
Vin = 24Vdc Load: Io = $\pm 0.833A$
Ch1: Vo1 Ch2: Vo2 Ch3: Vin

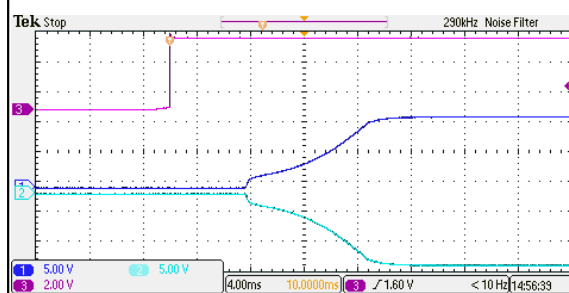


Figure 38: ERM01BB18 Output Voltage Startup Characteristic by On/Off
Vin = 24Vdc Load: Io = $\pm 0.833A$
Ch1: Vo1 Ch2: Vo2 Ch3: Vin

ERM01BB18 Performance Curves

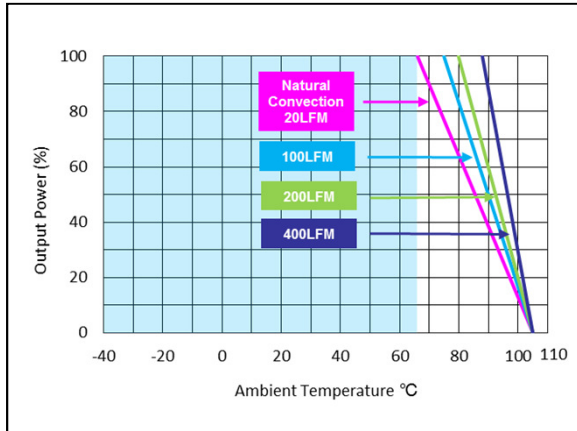


Figure 39: ERM01BB18 Derating Output Current vs Ambient Temperature
Vin = 24Vdc
Without Heatsink

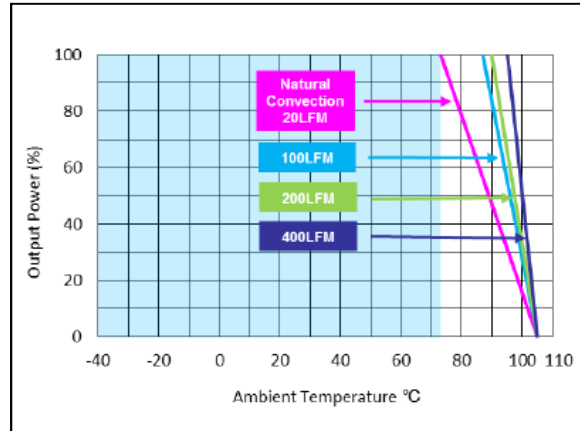


Figure 40: ERM01BB18 Derating Output Current vs Ambient Temperature
Vin = 24Vdc
With Heatsink

ERM01CC18 Performance Curves

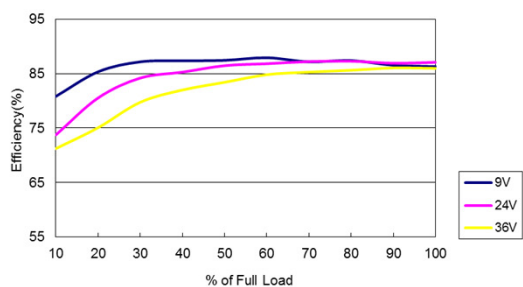


Figure 41: ERM01CC18 Efficiency Versus Output Current Curve
Vin = 9 to 36Vdc Load: Io = 0 to $\pm 0.667A$

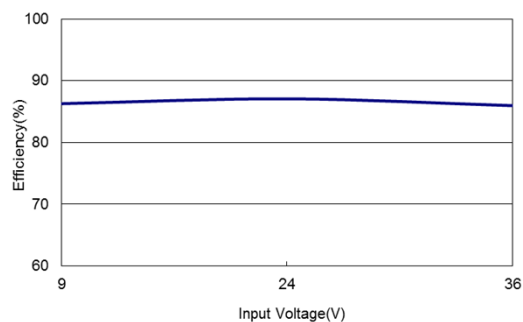


Figure 42: ERM01CC18 Efficiency Versus Input Voltage Curve
Vin = 9 to 36Vdc Load: Io = $\pm 0.667A$

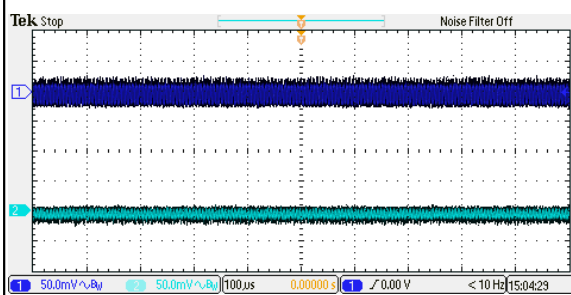


Figure 43: ERM01CC18 Ripple and Noise Measurement
Vin = 24Vdc Load: Io = $\pm 0.667A$
Ch 1: Vo1 Ch 2: Vo2

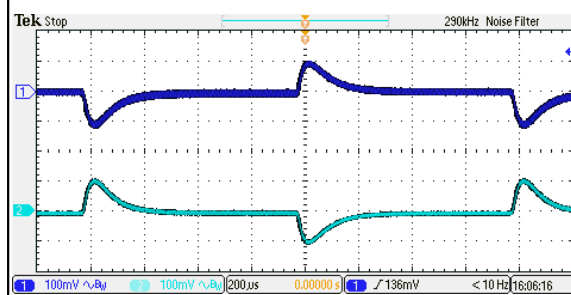


Figure 44: ERM01CC18 Transient Response
Vin = 24Vdc Load: Io = 100% to 75% load change
Ch 1: Vo1 Ch 2: Vo2

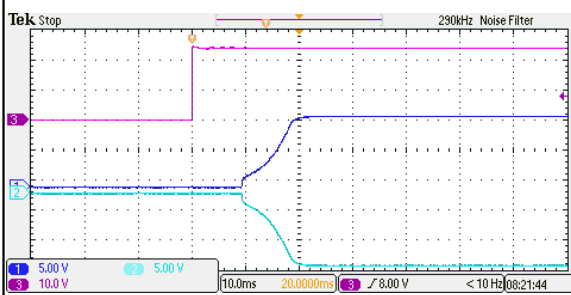


Figure 45: ERM01CC18 Output Voltage Startup Characteristic by Vin
Vin = 24Vdc Load: Io = $\pm 0.667A$
Ch1: Vo1 Ch2: Vo2 Ch3: Vin

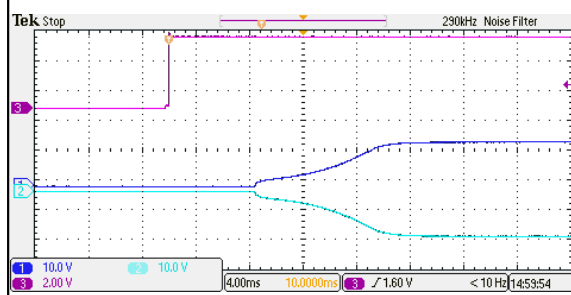


Figure 46: ERM01CC18 Output Voltage Startup Characteristic by On/Off
Vin = 24Vdc Load: Io = $\pm 0.667A$
Ch1: Vo1 Ch2: Vo2 Ch3: Vin

ERM01CC18 Performance Curves

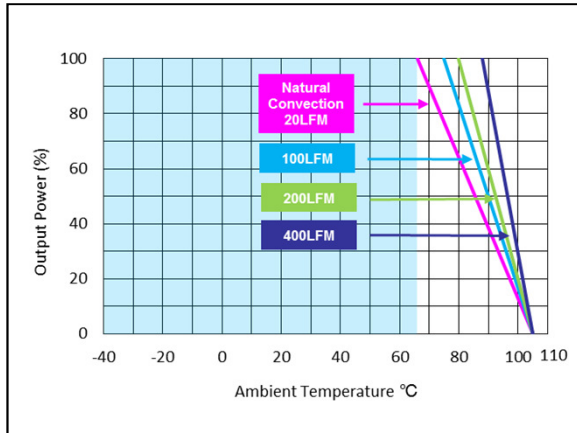


Figure 47: ERM01CC18 Derating Output Current vs Ambient Temperature
Vin = 24Vdc
Without Heatsink

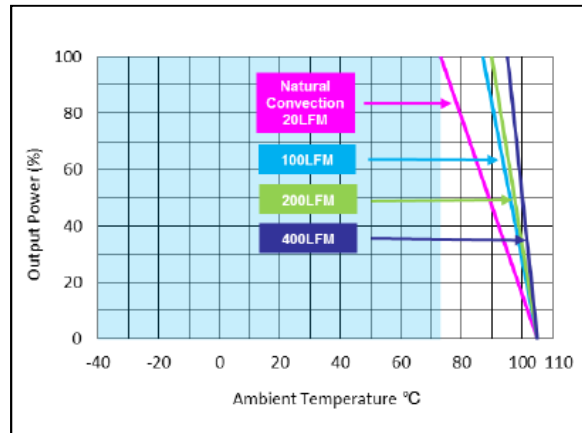


Figure 48: ERM01CC18 Derating Output Current vs Ambient Temperature
Vin = 24Vdc
With Heatsink

ERM04A36 Performance Curves

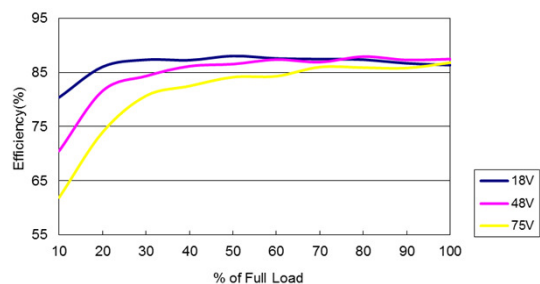


Figure 49: ERM04A36 Efficiency Versus Output Current Curve
Vin = 18 to 75Vdc Load: Io = 0 to 4A

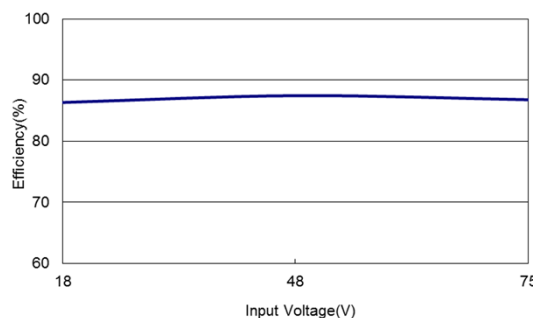


Figure 50: ERM04A36 Efficiency Versus Input Voltage Curve
Vin = 18 to 75Vdc Load: Io = 4A

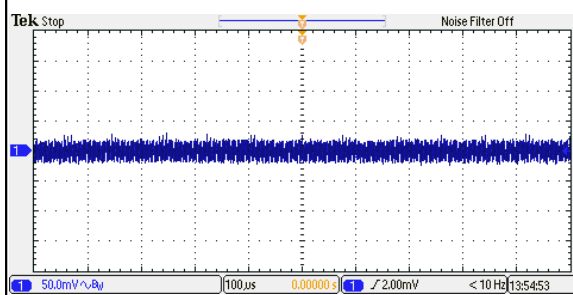


Figure 51: ERM04A36 Ripple and Noise Measurement
Vin = 48Vdc Load: Io = 4A
Ch 1: Vo

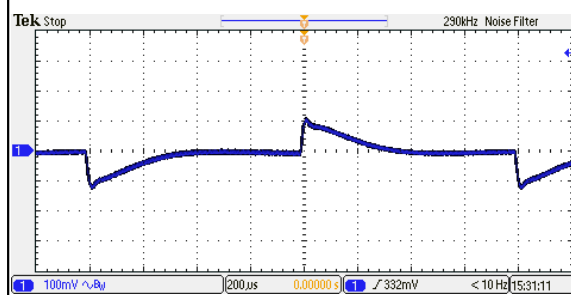


Figure 52: ERM04A36 Transient Response
Vin = 48Vdc Load: Io = 100% to 75% load change
Ch 1: Vo

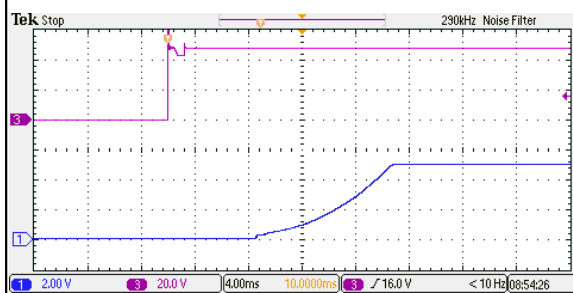


Figure 53: ERM04A36 Output Voltage Startup Characteristic by Vin
Vin = 48Vdc Load: Io = 4A
Ch1: Vo Ch3: Vin

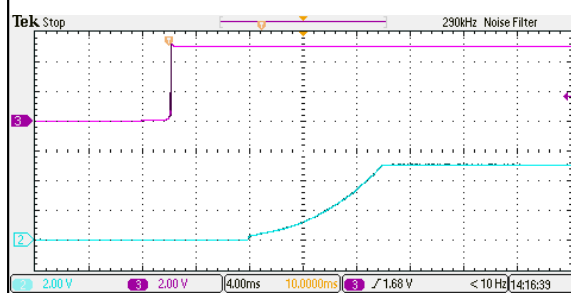


Figure 54: ERM04A36 Output Voltage Startup Characteristic by On/Off
Vin = 48Vdc Load: Io = 4A
Ch2: Vo Ch3: Vin

ERM04A36 Performance Curves

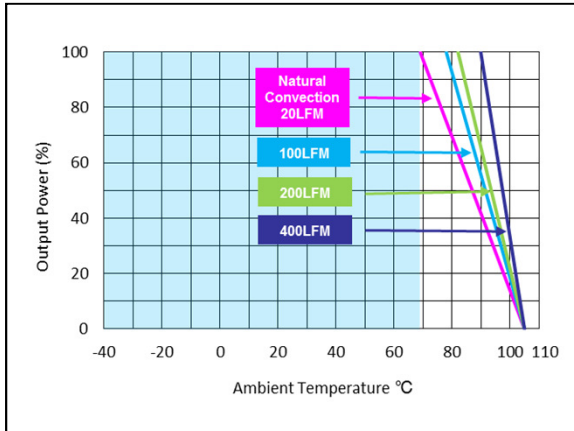


Figure 55: ERM04A36 Derating Output Current vs Ambient Temperature
Vin = 48Vdc
Without Heatsink

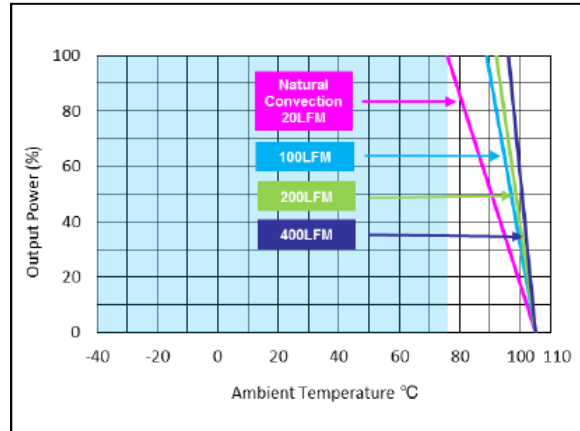


Figure 56: ERM04H36 Derating Output Current vs Ambient Temperature
Vin = 48Vdc
With Heatsink

ERM01B36 Performance Curves

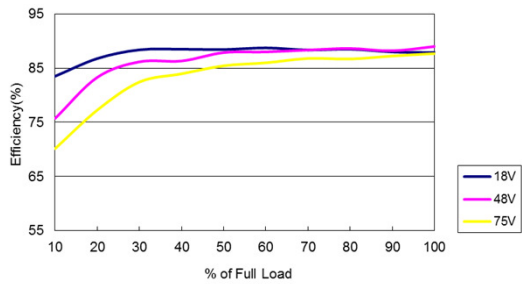


Figure 57: ERM01B36 Efficiency Versus Output Current Curve
Vin = 18 to 75Vdc Load: Io = 0 to 1.67A

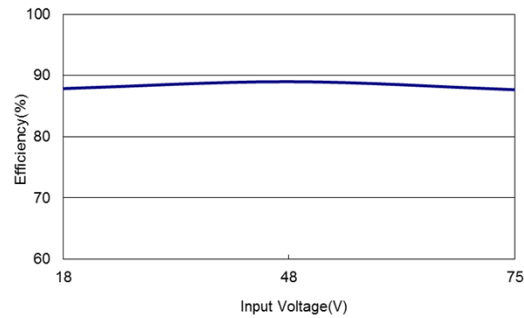


Figure 58: ERM01B36 Efficiency Versus Input Voltage Curve
Vin = 18 to 75Vdc Load: Io = 1.67A

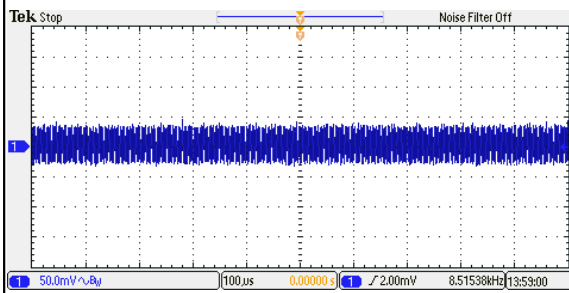


Figure 59: ERM01B36 Ripple and Noise Measurement
Vin = 48Vdc Load: Io = 1.67A
Ch 1: Vo

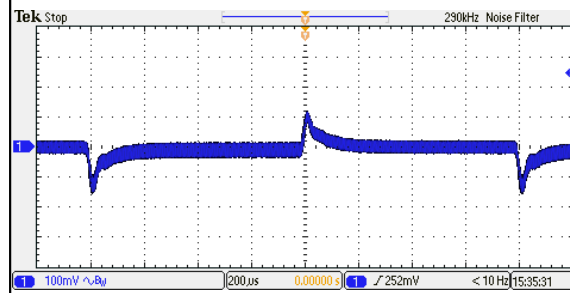


Figure 60: ERM01B36 Transient Response
Vin = 48Vdc Load: Io = 100% to 75% load change
Ch 1: Vo

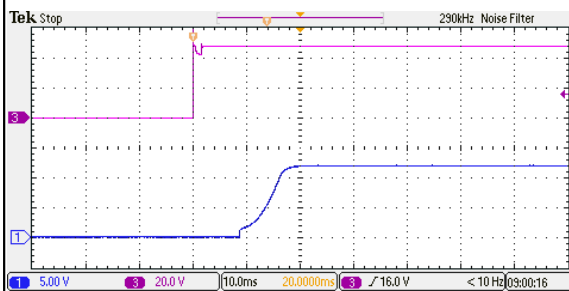


Figure 61: ERM01B36 Output Voltage Startup Characteristic by Vin
Vin = 48Vdc Load: Io = 1.67A
Ch1: Vo Ch3: Vin

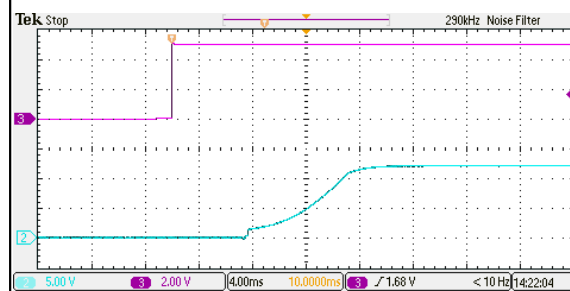


Figure 62: ERM01B36 Output Voltage Startup Characteristic by On/Off
Vin = 48Vdc Load: Io = 1.67A
Ch2: Vo Ch3: Vin

ERM01B36 Performance Curves

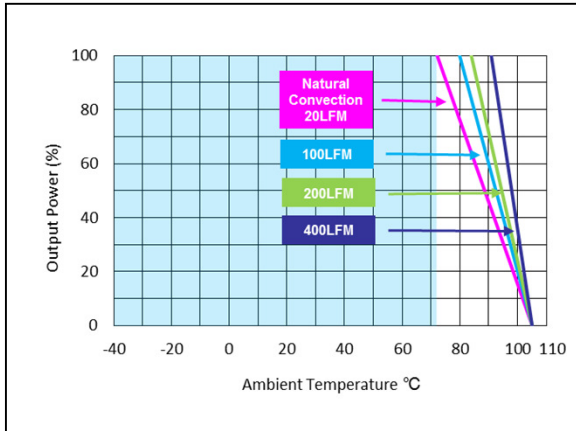


Figure 63: ERM01B36 Derating Output Current vs Ambient Temperature
Vin = 48Vdc
Without Heatsink

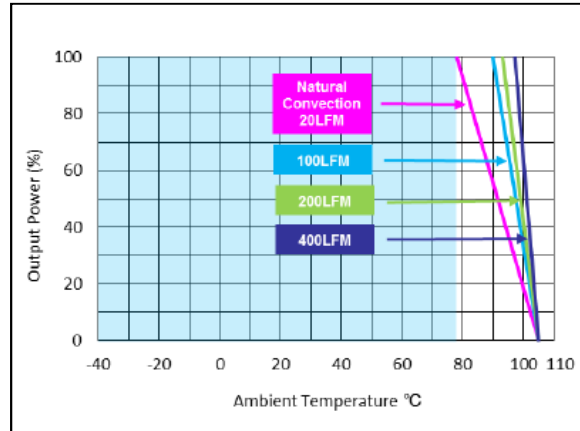


Figure 64: ERM01B36 Derating Output Current vs Ambient Temperature
Vin = 48Vdc
With Heatsink

ERM01C36 Performance Curves

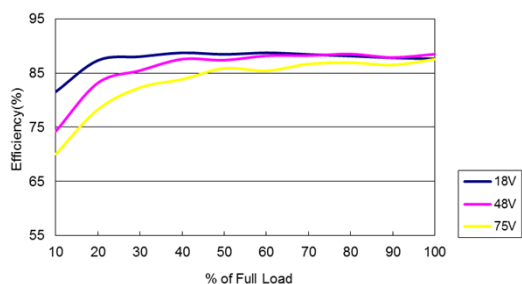


Figure 65: ERM01C36 Efficiency Versus Output Current Curve
Vin = 18 to 75Vdc Load: Io = 0 to 1.33A

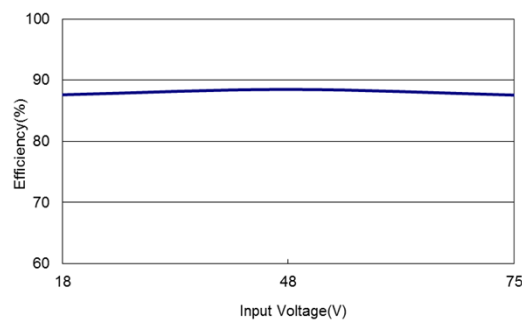


Figure 66: ERM01C36 Efficiency Versus Input Voltage Curve
Vin = 18 to 75Vdc Load: Io = 1.33A

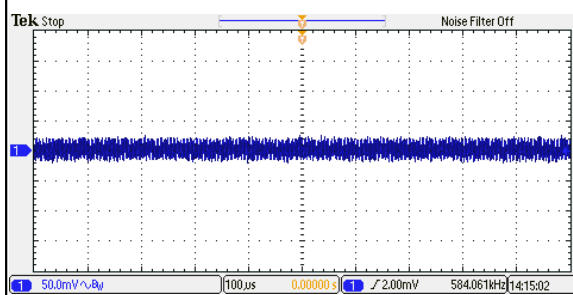


Figure 67: ERM01C36 Ripple and Noise Measurement
Vin = 48Vdc Load: Io = 1.33A
Ch 1: Vo

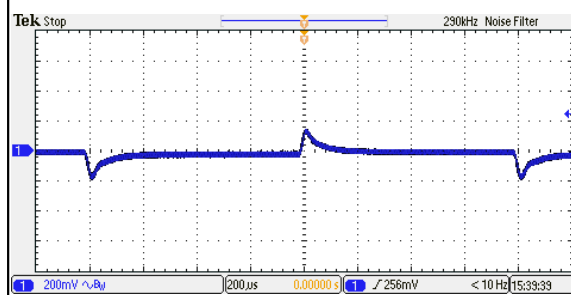


Figure 68: ERM01C36 Transient Response
Vin = 48Vdc Load: Io = 100% to 75% load change
Ch 1: Vo

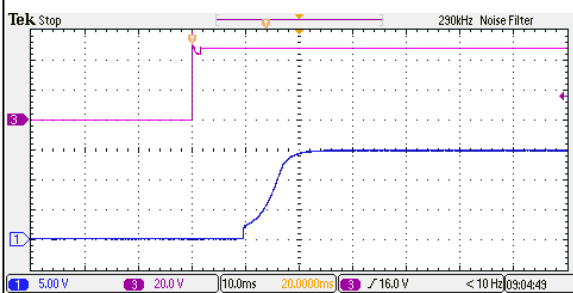


Figure 69: ERM01C36 Output Voltage Startup Characteristic by Vin
Vin = 48Vdc Load: Io = 1.33A
Ch1: Vo Ch3: Vin

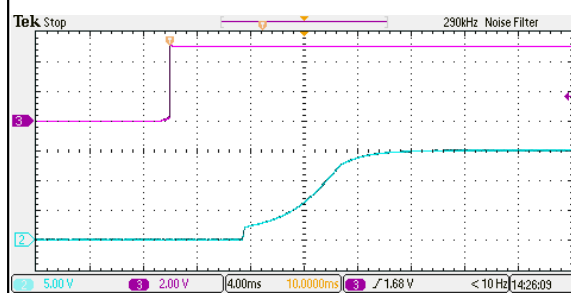
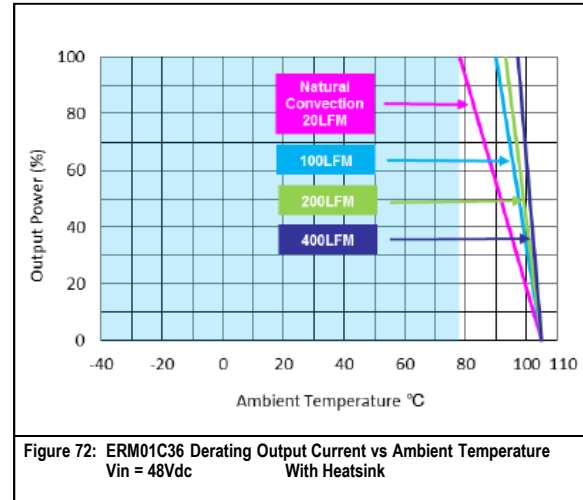
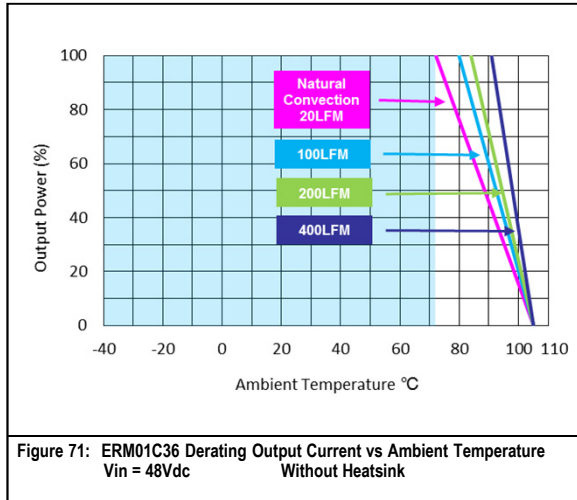


Figure 70: ERM01C36 Output Voltage Startup Characteristic by On/Off
Vin = 48Vdc Load: Io = 1.33A
Ch2: Vo Ch3: Vin

ERM01C36 Performance Curves



ERM01H36 Performance Curves

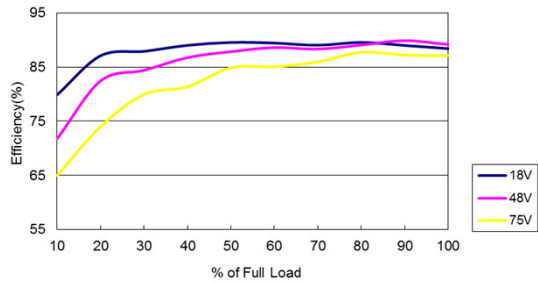


Figure 73: ERM01H36 Efficiency Versus Output Current Curve
Vin = 18 to 75Vdc Load: Io = 0 to 0.833A

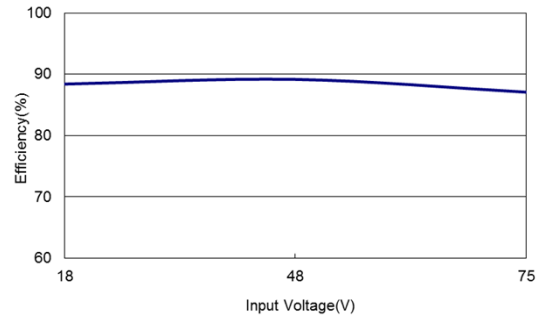


Figure 74: ERM01H36 Efficiency Versus Input Voltage Curve
Vin = 18 to 75Vdc Load: Io = 0.833A

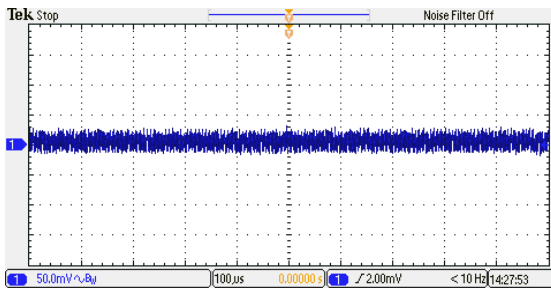


Figure 75: ERM01H36 Ripple and Noise Measurement
Vin = 48Vdc Load: Io = 0.833A
Ch 1: Vo

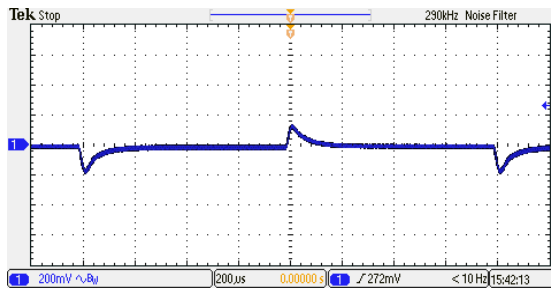


Figure 76: ERM01H36 Transient Response
Vin = 48Vdc Load: Io = 100% to 75% load change
Ch 1: Vo

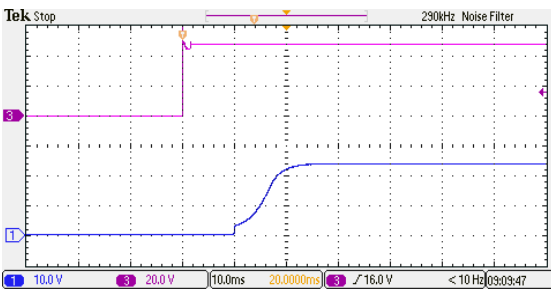


Figure 77: ERM01H36 Output Voltage Startup Characteristic by Vin
Vin = 48Vdc Load: Io = 0.833A
Ch1: Vo Ch3: Vin

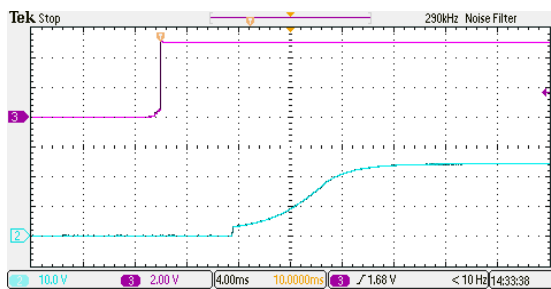
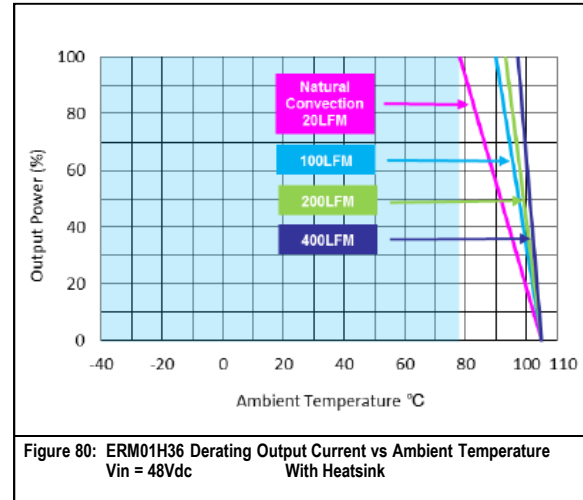
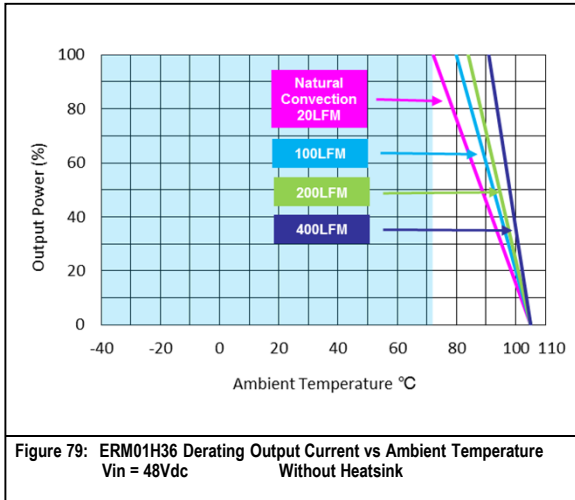


Figure 78: ERM01H36 Derating Output Current vs Ambient Temperature
Vin = 48Vdc
Ch2: Vo Ch3: Vin

ERM01H36 Performance Curves



ERM01BB36 Performance Curves

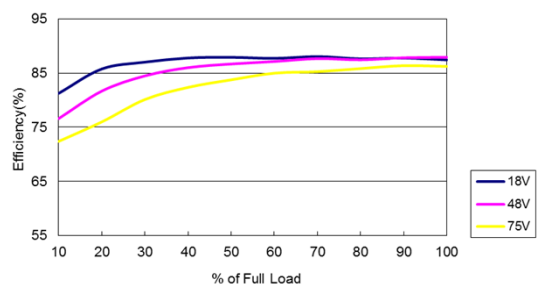


Figure 81: ERM01BB36 Efficiency Versus Output Current Curve
Vin = 18 to 75Vdc Load: Io = 0 to $\pm 0.833A$

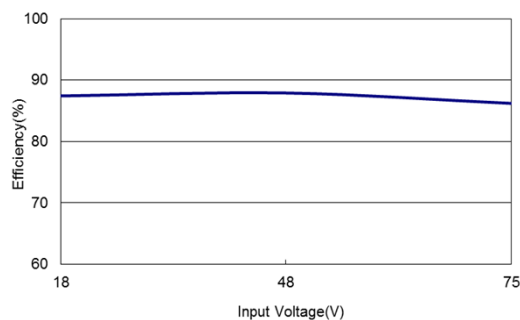


Figure 82: ERM01BB36 Efficiency Versus Input Voltage Curve
Vin = 18 to 75Vdc Load: Io = $\pm 0.833A$

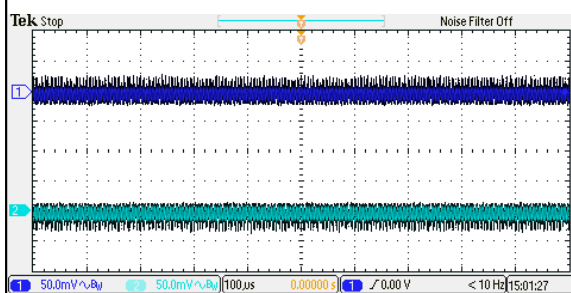


Figure 83: ERM01BB36 Ripple and Noise Measurement
Vin = 48Vdc Load: Io = $\pm 0.833A$
Ch 1: Vo

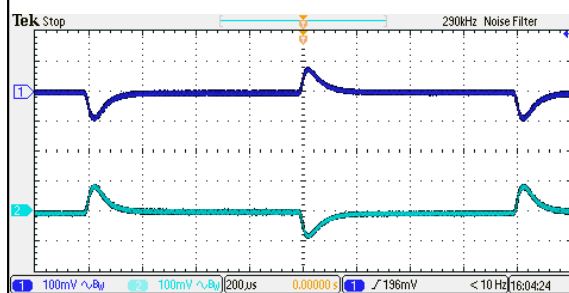


Figure 84: ERM01BB36 Transient Response
Vin = 48Vdc Load: Io = 100% to 75% load change
Ch 1: Vo

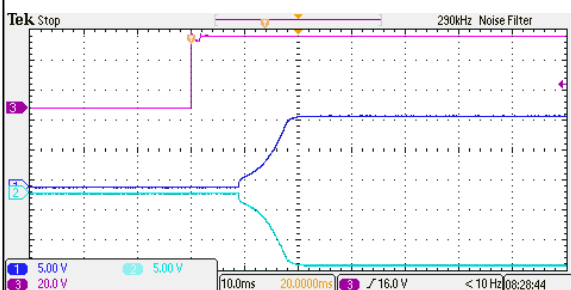


Figure 85: ERM01BB36 Output Voltage Startup Characteristic by Vin
Vin = 48Vdc Load: Io = $\pm 0.833A$
Ch1: Vo1 Ch2: Vo2 Ch3: Vin

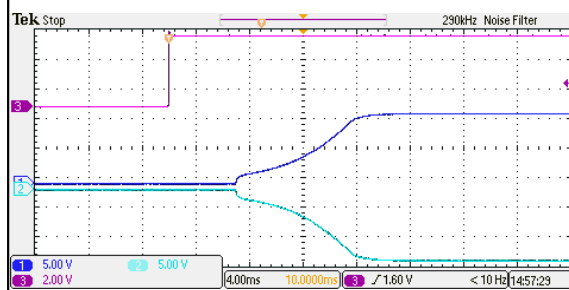
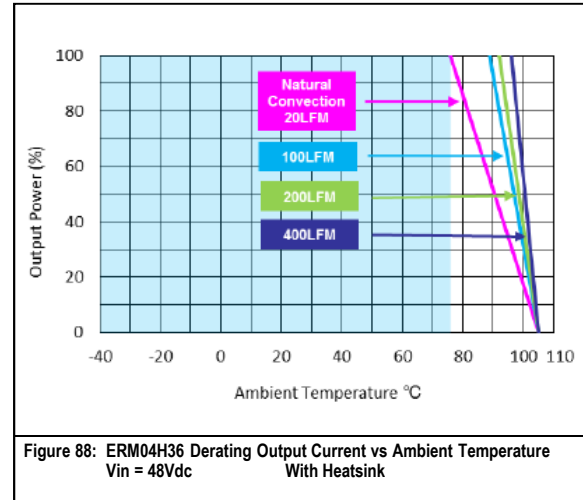
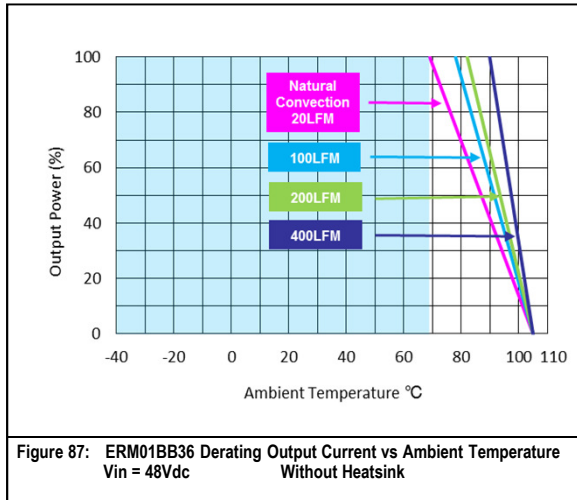


Figure 86: ERM01BB36 Output Voltage Startup Characteristic by On/Off
Vin = 48Vdc Load: Io = $\pm 0.833A$
Ch1: Vo1 Ch2: Vo2 Ch3: Vin

ERM01BB36 Performance Curves



ERM01CC36 Performance Curves

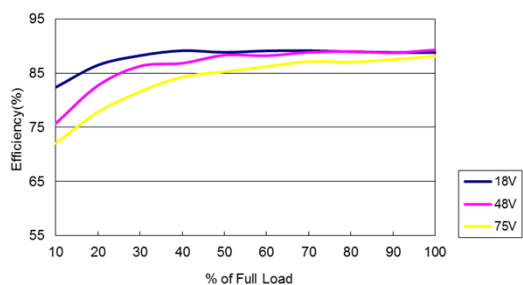


Figure 89: ERM01CC36 Efficiency Versus Output Current Curve
Vin = 18 to 75Vdc Load: Io = 0 to $\pm 0.667A$

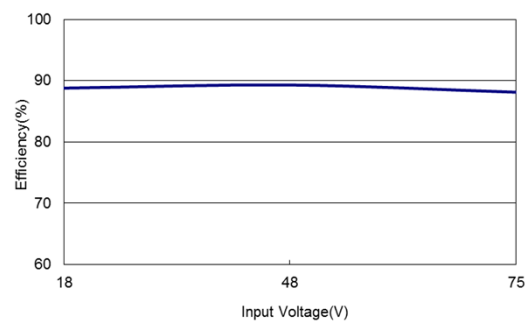


Figure 90: ERM01CC36 Efficiency Versus Input Voltage Curve
Vin = 18 to 75Vdc Load: Io = $\pm 0.667A$

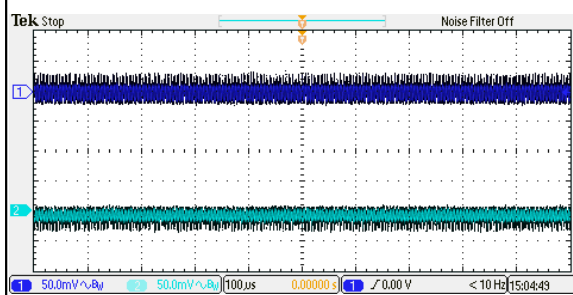


Figure 91: ERM01CC36 Ripple and Noise Measurement
Vin = 48Vdc Load: Io = $\pm 0.667A$
Ch 1: Vo1 Ch 2: Vo2

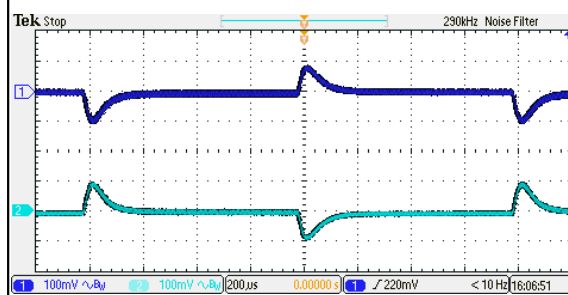


Figure 92: ERM01CC36 Transient Response
Vin = 48Vdc Load: Io = 100% to 75% load change
Ch 1: Vo1 Ch 2: Vo2

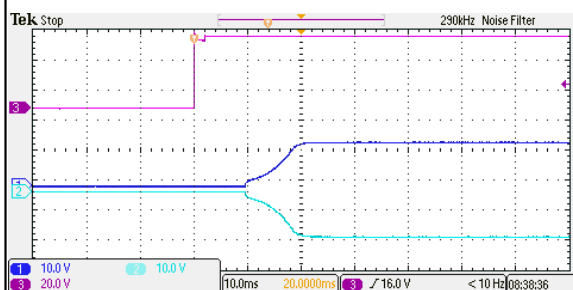


Figure 93: ERM01CC36 Output Voltage Startup Characteristic by Vin
Vin = 48Vdc Load: Io = $\pm 0.667A$
Ch1: Vo1 Ch2:Vo2 Ch3: Vin

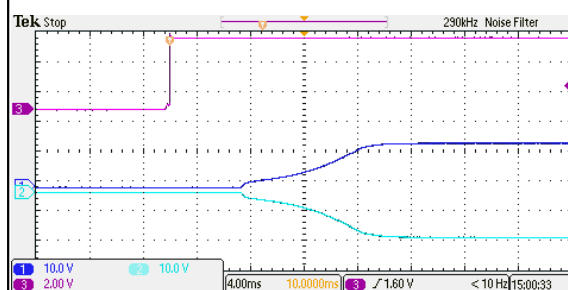


Figure 94: ERM01CC36 Output Voltage Startup Characteristic by On/Off
Vin = 48Vdc Load: Io = $\pm 0.667A$
Ch1: Vo1 Ch2:Vo2 Ch3: Vin

ERM01CC36 Performance Curves

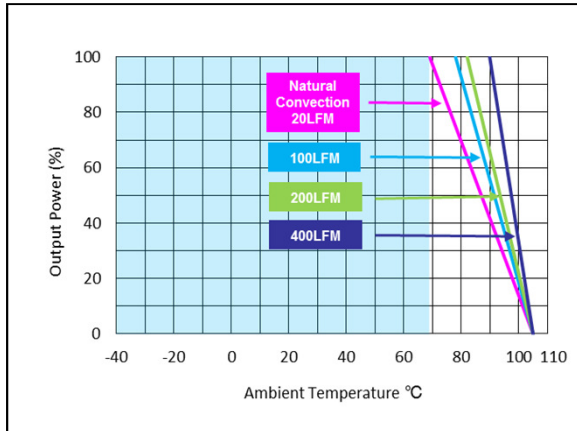


Figure 95: ERM01CC36 Derating Output Current vs Ambient Temperature
Vin = 48Vdc Without Heatsink

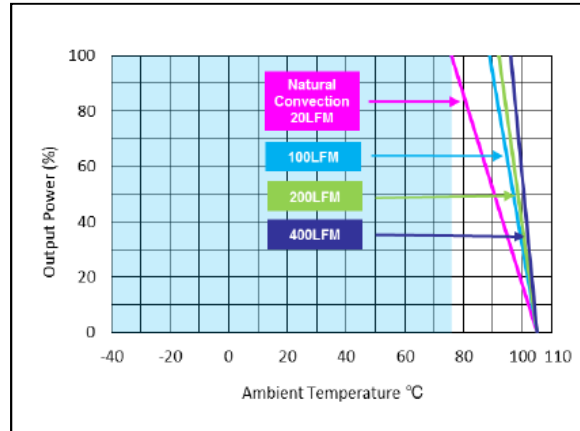


Figure 96: ERM04H36 Derating Output Current vs Ambient Temperature
Vin = 48Vdc With Heatsink

ERM04A110 Performance Curves

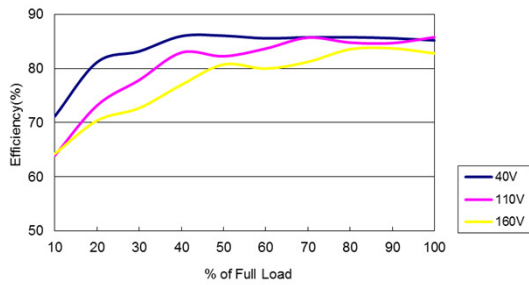


Figure 97: ERM04A110 Efficiency Versus Output Current Curve
Vin = 40 to 160Vdc Load: Io = 0 to 4A

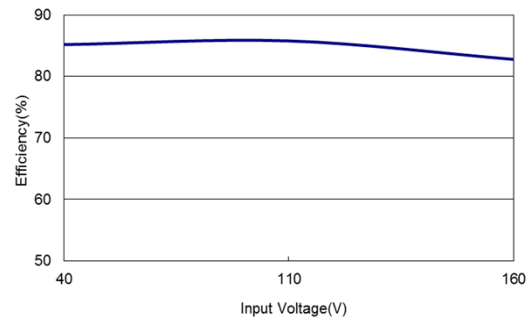


Figure 98: ERM04A110 Efficiency Versus Input Voltage Curve
Vin = 40 to 160Vdc Load: Io = 4A

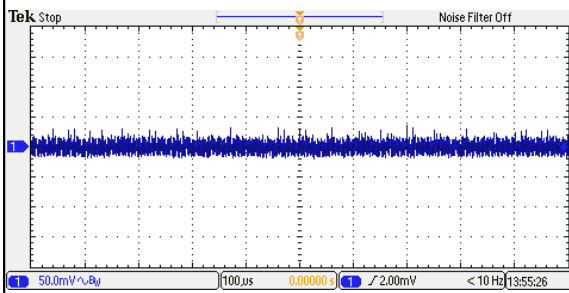


Figure 99: ERM04A110 Ripple and Noise Measurement
Vin = 110Vdc Load: Io = 4A
Ch 1: Vo

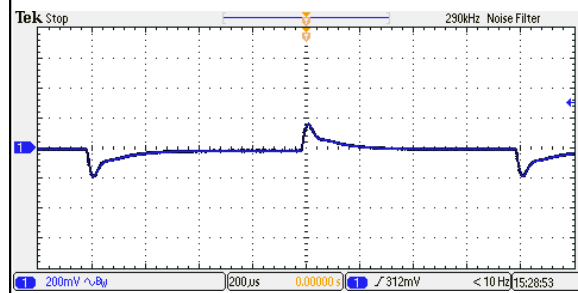


Figure 100: ERM04A110 Transient Response
Vin = 110Vdc Load: Io = 100% to 75% load change
Ch 1: Vo

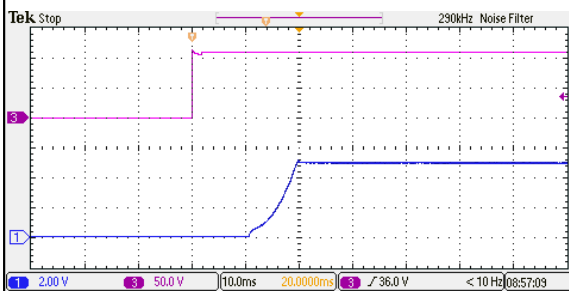


Figure 101: ERM04A110 Output Voltage Startup Characteristic by Vin
Vin = 110Vdc Load: Io = 4A
Ch1: Vo Ch3: Vin

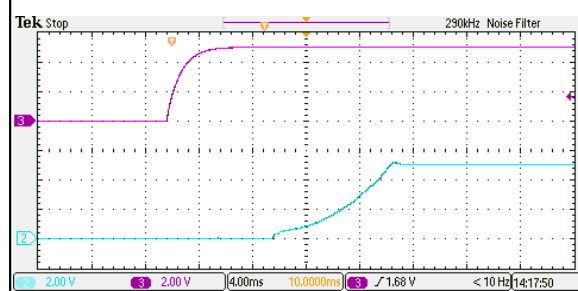


Figure 102: ERM04A110 Output Voltage Startup Characteristic by On/Off
Vin = 110Vdc Load: Io = 4A
Ch2: Vo Ch3: Vin

ERM04A110 Performance Curves

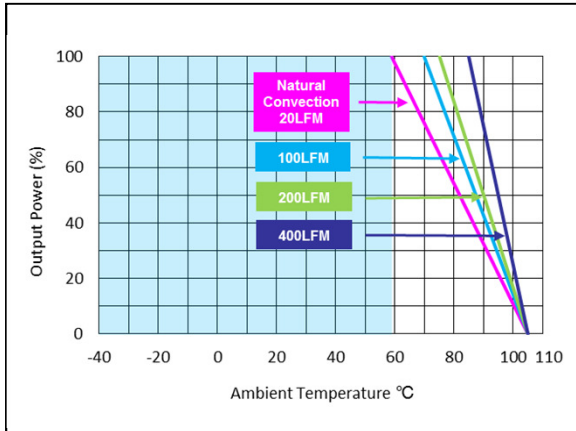


Figure 103: ERM04A110 Derating Output Current vs Ambient Temperature
Vin = 110Vdc Without Heatsink

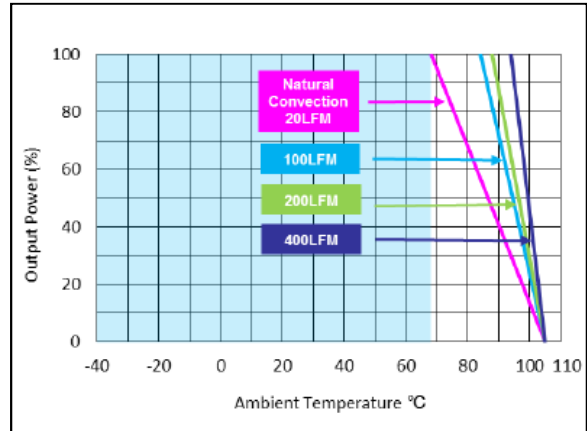


Figure 104: ERM04A110 Derating Output Current vs Ambient Temperature
Vin = 110Vdc With Heatsink

ERM01B110 Performance Curves

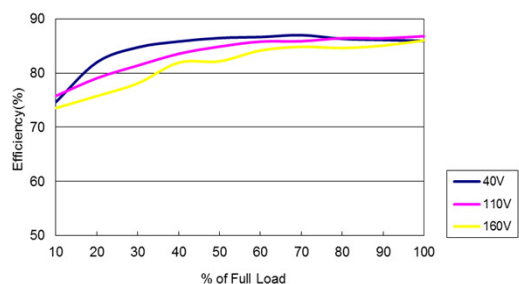


Figure 105: ERM01B110 Efficiency Versus Output Current Curve
Vin = 40 to 160Vdc Load: $I_o = 0$ to 1.67A

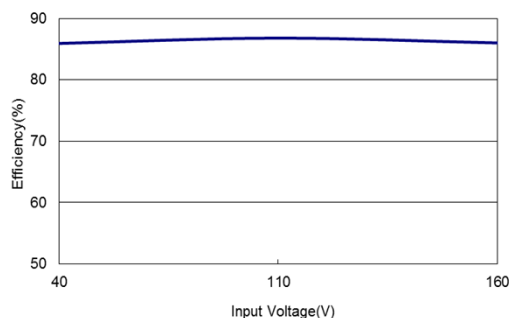


Figure 106: ERM01B110 Efficiency Versus Input Voltage Curve
Vin = 40 to 160Vdc Load: $I_o = 1.67A$

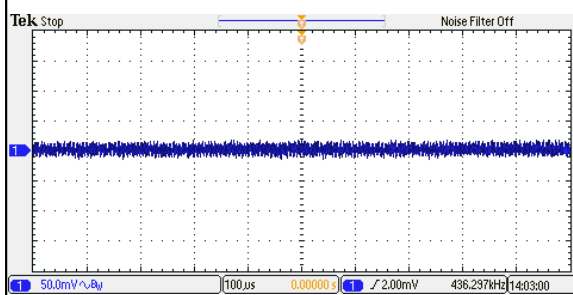


Figure 107: ERM01B110 Ripple and Noise Measurement
Vin = 110Vdc Load: $I_o = 1.67A$
Ch 1: Vo

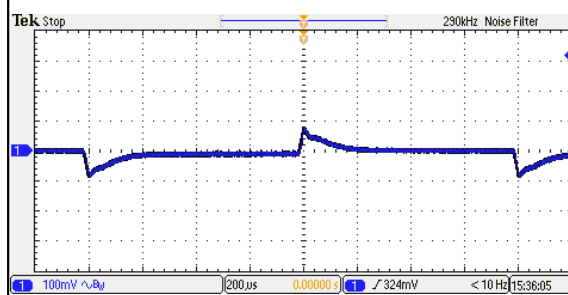


Figure 708: ERM01B110 Transient Response
Vin = 110Vdc Load: $I_o = 100\%$ to 75% load change
Ch 1: Vo

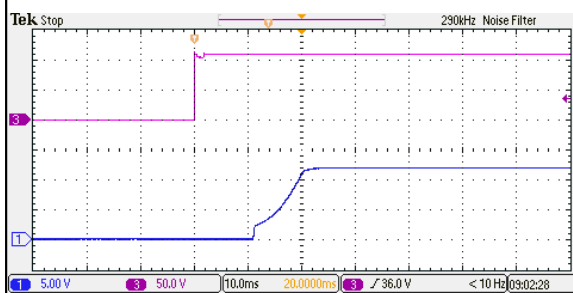


Figure 109: ERM01B110 Output Voltage Startup Characteristic by Vin
Vin = 110Vdc Load: $I_o = 1.67A$
Ch1: Vo Ch3: Vin

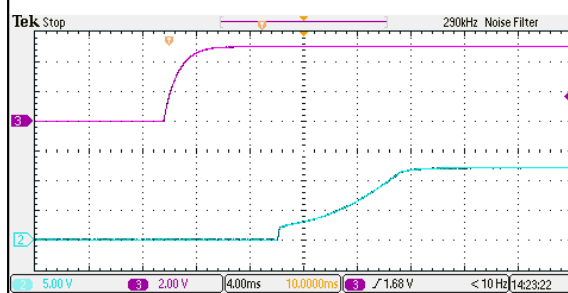


Figure 110: ERM01B110 Output Voltage Startup Characteristic by On/Off
Vin = 110Vdc Load: $I_o = 1.67A$
Ch2: Vo Ch3: Vin

ERM01B110 Performance Curves

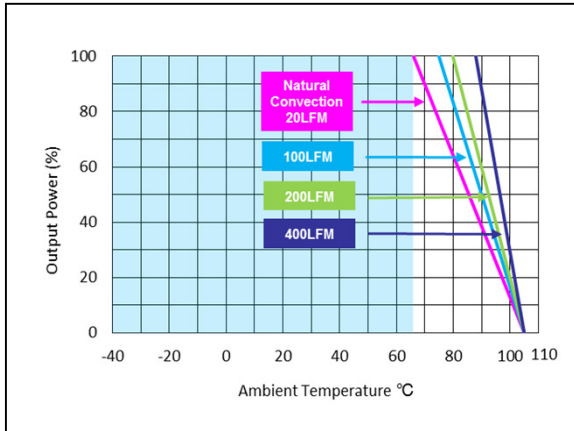


Figure 111: ERM01B110 Derating Output Current vs Ambient Temperature
Vin = 110Vdc Without Heatsink

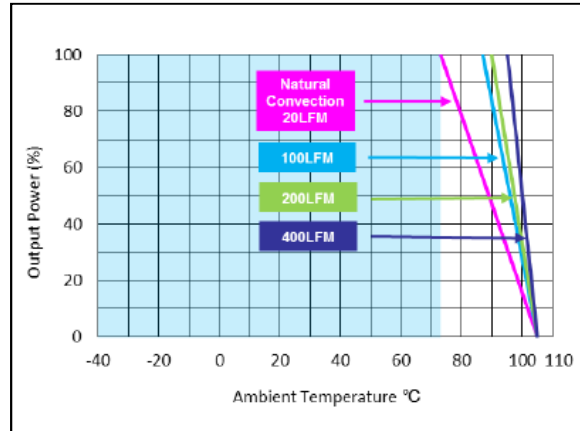


Figure 112: ERM01B110 Derating Output Current vs Ambient Temperature
Vin = 110Vdc With Heatsink

ERM01C110 Performance Curves

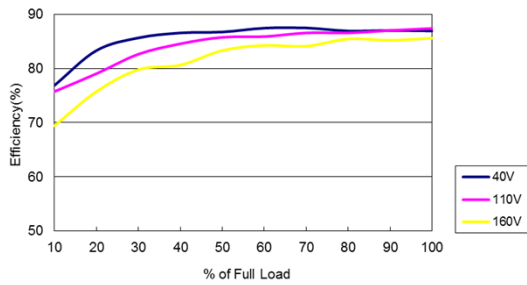


Figure 113: ERM01C110 Efficiency Versus Output Current Curve
in = 40 to 160Vdc Load: $I_o = 0$ to 1.33A

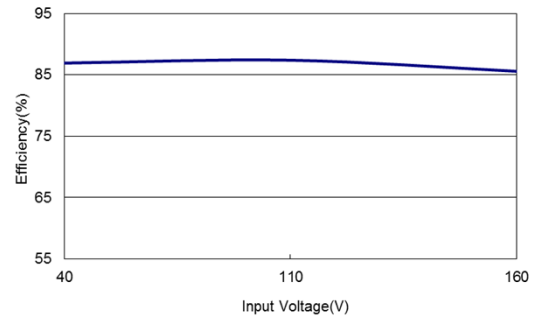


Figure 114: ERM01C110 Efficiency Versus Input Voltage Curve
 $V_{in} = 40$ to 160Vdc Load: $I_o = 1.33A$

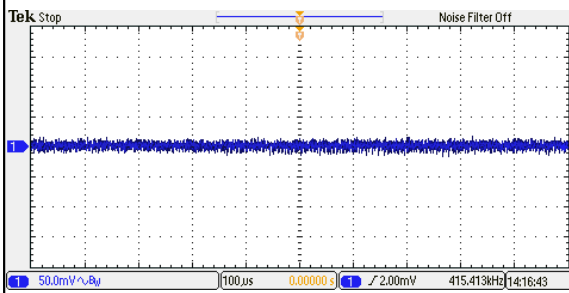


Figure 115: ERM01C110 Ripple and Noise Measurement
 $V_{in} = 110Vdc$ Load: $I_o = 1.33A$
Ch 1: V_o

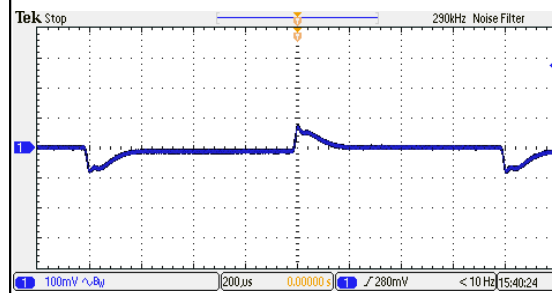


Figure 116: ERM01C110 Transient Response
 $V_{in} = 110Vdc$ Load: $I_o = 100\%$ to 75% load change
Ch 1: V_o

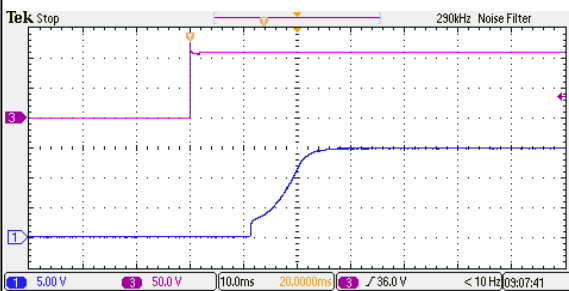


Figure 117: ERM01C110 Output Voltage Startup Characteristic by V_{in}
 $V_{in} = 110Vdc$ Load: $I_o = 1.33A$
Ch1: V_o Ch3: V_{in}

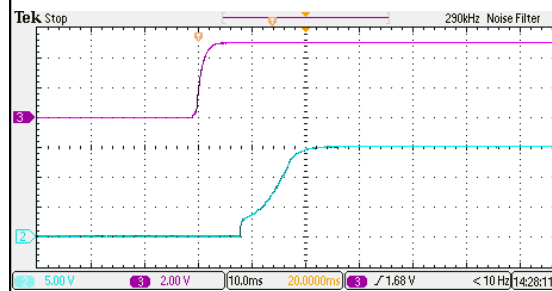
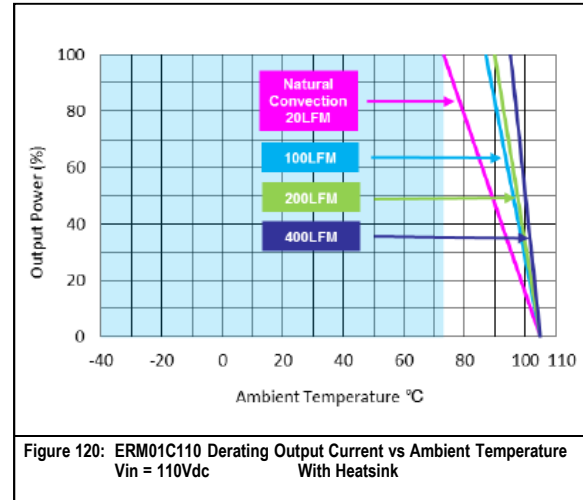
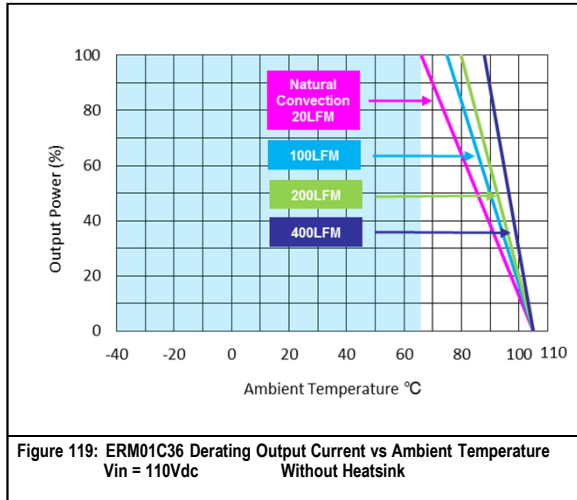


Figure 118: ERM01C110 Output Voltage Startup Characteristic by On/Off
 $V_{in} = 110Vdc$ Load: $I_o = 1.33A$
Ch2: V_o Ch3: V_{in}

ERM01C110 Performance Curves



ERM01H110 Performance Curves

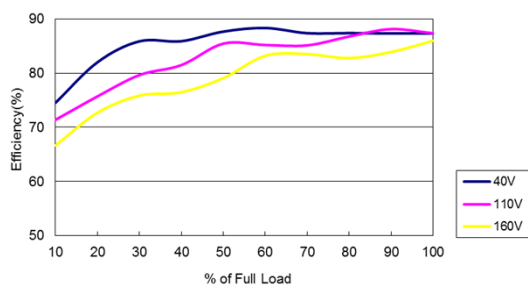


Figure 121: ERM01H36 Efficiency Versus Output Current Curve
Vin = 40 to 160Vdc Load: Io = 0 to 0.833A

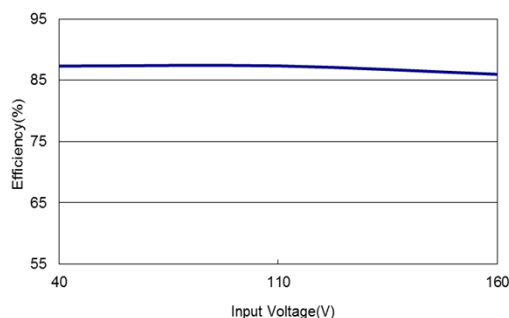


Figure 122: ERM01H36 Efficiency Versus Input Voltage Curve
Vin = 40 to 160Vdc Load: Io = 0.833A

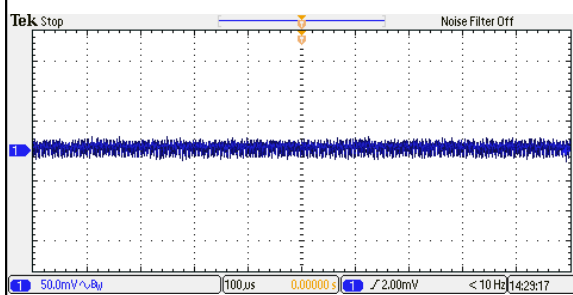


Figure 123: ERM01H36 Ripple and Noise Measurement
Vin = 110Vdc Load: Io = 0.833A
Ch 1: Vo

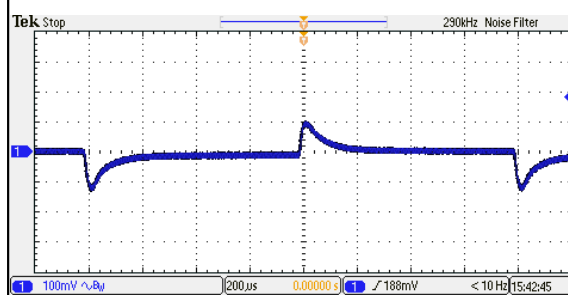


Figure 124: ERM01H36 Transient Response
Vin = 110Vdc Load: Io = 100% to 75% load change
Ch 1: Vo

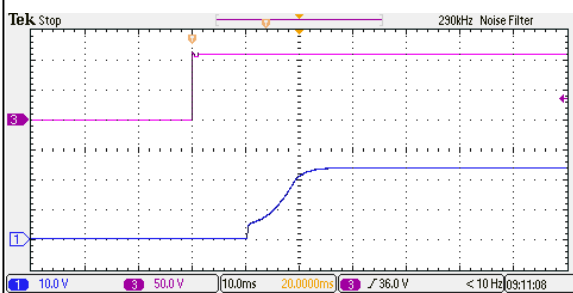


Figure 125: ERM01H36 Output Voltage Startup Characteristic by Vin
Vin = 110Vdc Load: Io = 0.833A
Ch1: Vo Ch3: Vin

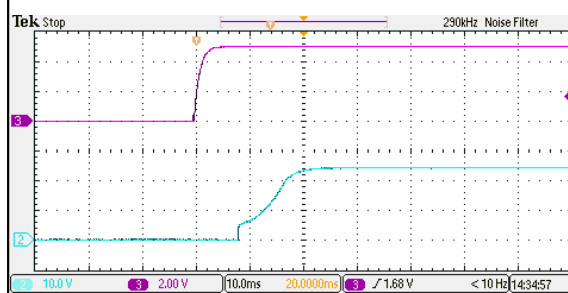


Figure 126: ERM01H36 Output Voltage Startup Characteristic by On/Off
Vin = 110Vdc Load: Io = 0.833A
Ch2: Vo Ch3: Vin

ERM01H110 Performance Curves

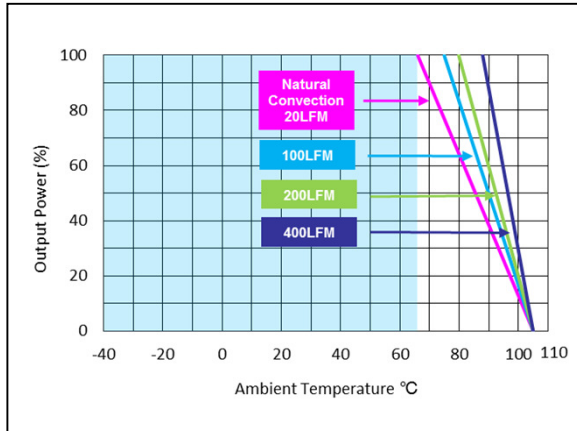


Figure 127: ERM01H36 Derating Output Current vs Ambient Temperature
Vin = 110Vdc
Without Heatsink

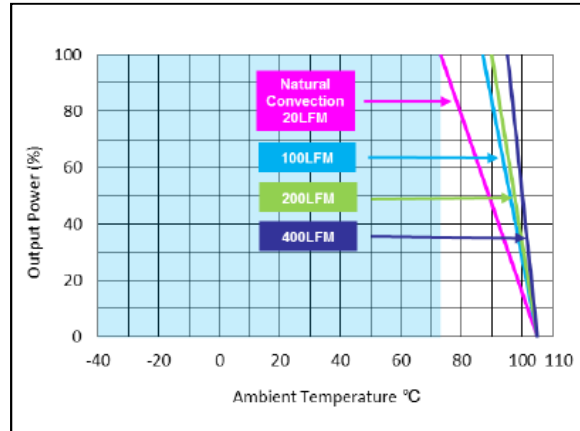


Figure 128: ERM01H110 Derating Output Current vs Ambient Temperature
Vin = 110Vdc
With Heatsink

ERM01BB110 Performance Curves

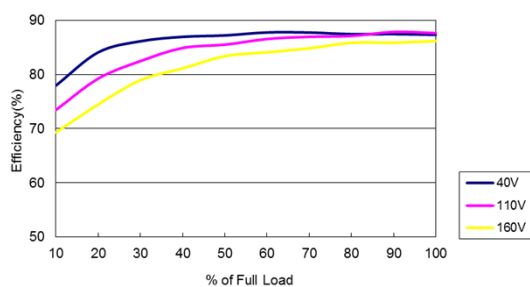


Figure 129: ERM01BB110 Efficiency Versus Output Current Curve
Vin = 40 to 160Vdc Load: $I_o = 0$ to $\pm 0.833A$

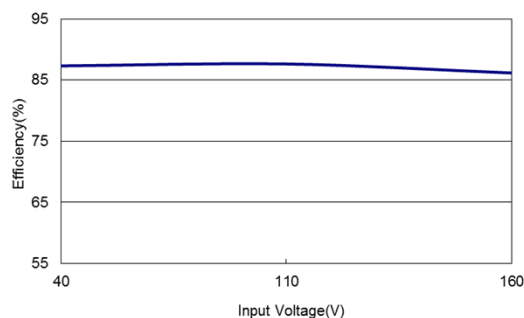


Figure 130: ERM01BB110 Efficiency Versus Input Voltage Curve
Vin = 40 to 160Vdc Load: $I_o = \pm 0.833A$

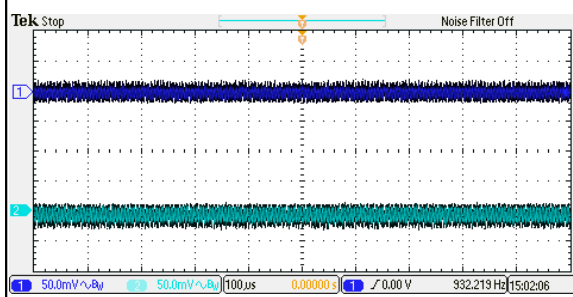


Figure 131: ERM01BB110 Ripple and Noise Measurement
Vin = 110Vdc Load: $I_o = \pm 0.833A$
Ch1: Vo1 Ch2: Vo2

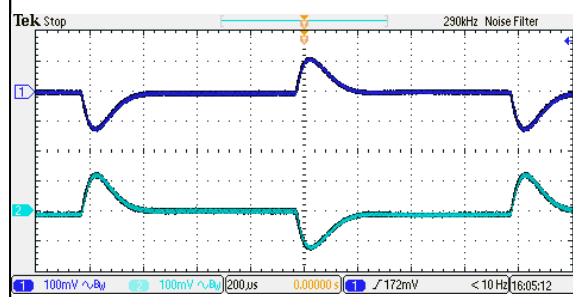


Figure 132: ERM01BB110 Transient Response
Vin = 110Vdc Load: $I_o = 100\%$ to 75% load change
Ch1: Vo1 Ch2: Vo2

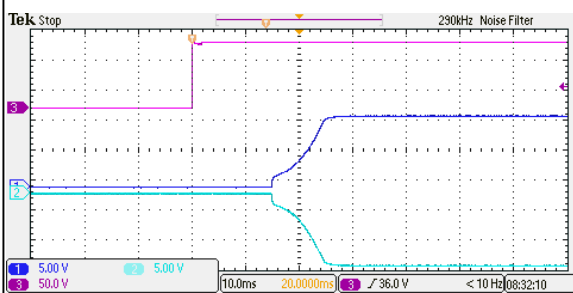


Figure 133: ERM01BB36 Output Voltage Startup Characteristic by Vin
Vin = 110Vdc Load: $I_o = \pm 0.833A$
Ch1: Vo1 Ch2: Vo2 Ch3: Vin

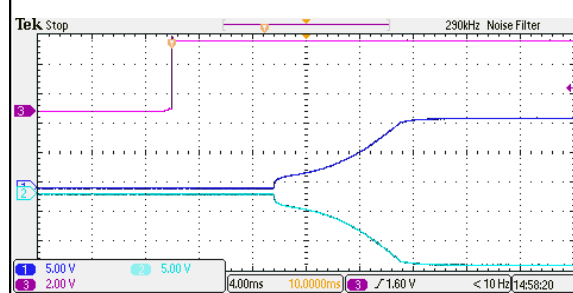
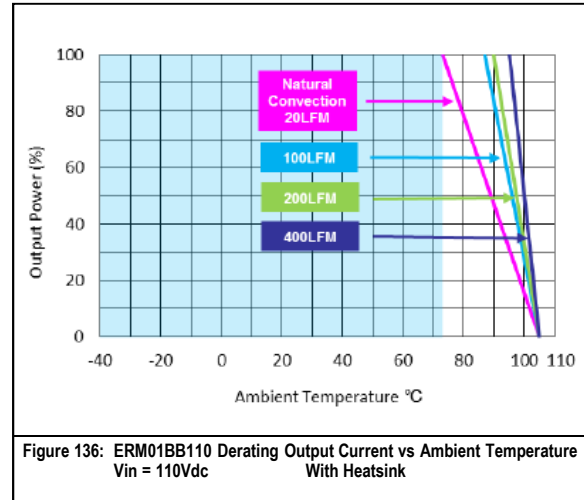
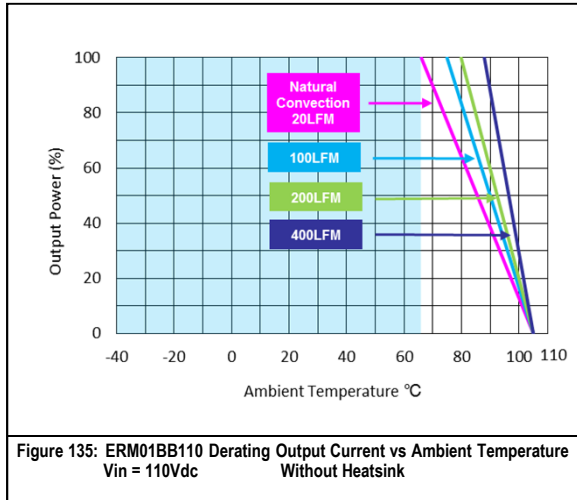


Figure 134: ERM01BB36 Output Voltage Startup Characteristic by On/Off
Vin = 110Vdc Load: $I_o = \pm 0.833A$
Ch1: Vo1 Ch2: Vo2 Ch3: Vin

ERM01BB110 Performance Curves



ERM01CC110 Performance Curves

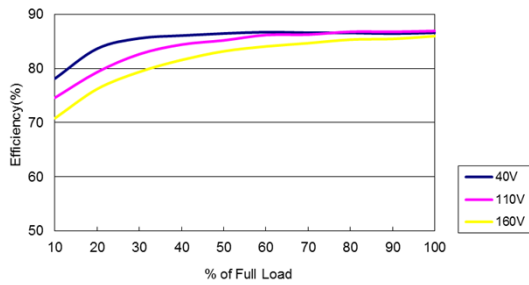


Figure 137: ERM01CC110 Efficiency Versus Output Current Curve
Vin = 40 to 160Vdc Load: Io = 0 to $\pm 0.667A$

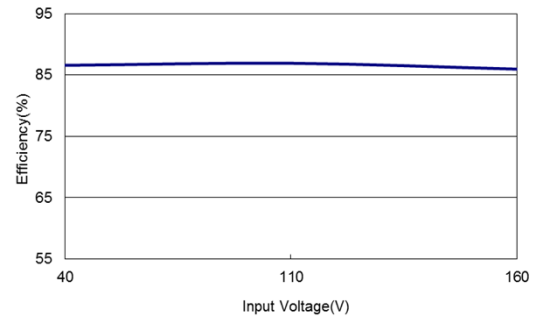


Figure 138: ERM01CC110 Efficiency Versus Input Voltage Curve
Vin = 40 to 160Vdc Load: Io = $\pm 0.667A$

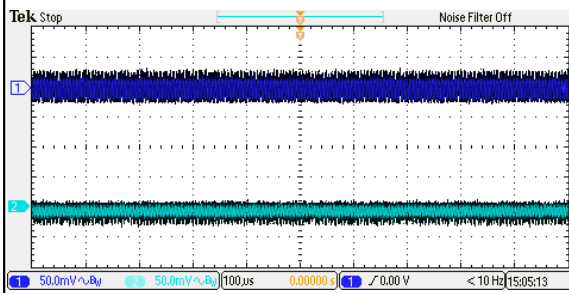


Figure 139: ERM01CC110 Ripple and Noise Measurement
Vin = 110Vdc Load: Io = $\pm 0.667A$
Ch 1: Vo1 Ch 2: Vo2

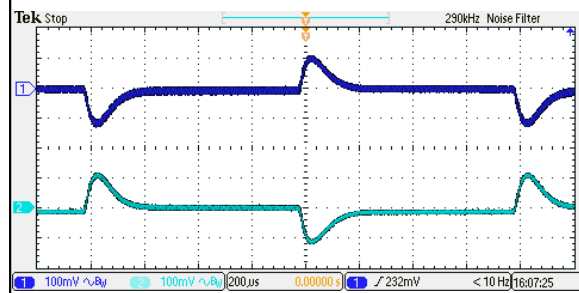


Figure 140: ERM01CC110 Transient Response
Vin = 110Vdc Load: Io = 100% to 75% load change
Ch 1: Vo1 Ch 2: Vo2

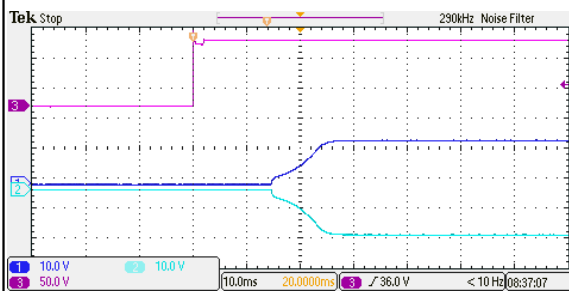


Figure 141: ERM01CC110 Output Voltage Startup Characteristic by Vin
Vin = 110Vdc Load: Io = $\pm 0.667A$
Ch1: Vo1 Ch2:Vo2 Ch3: Vin

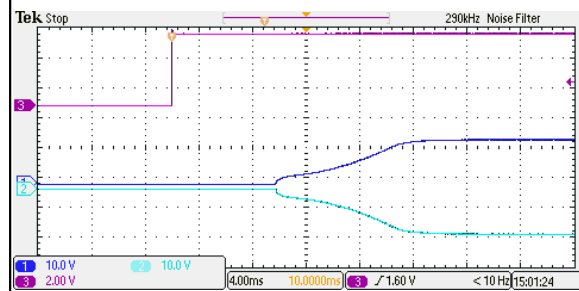
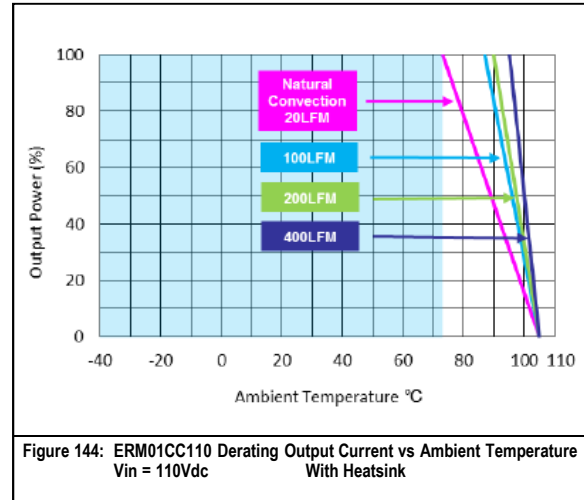
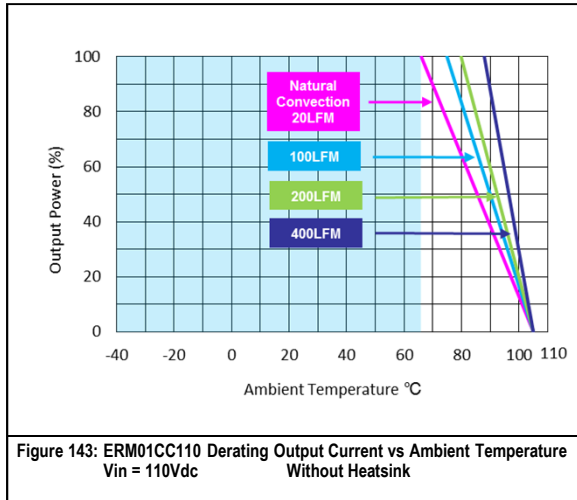


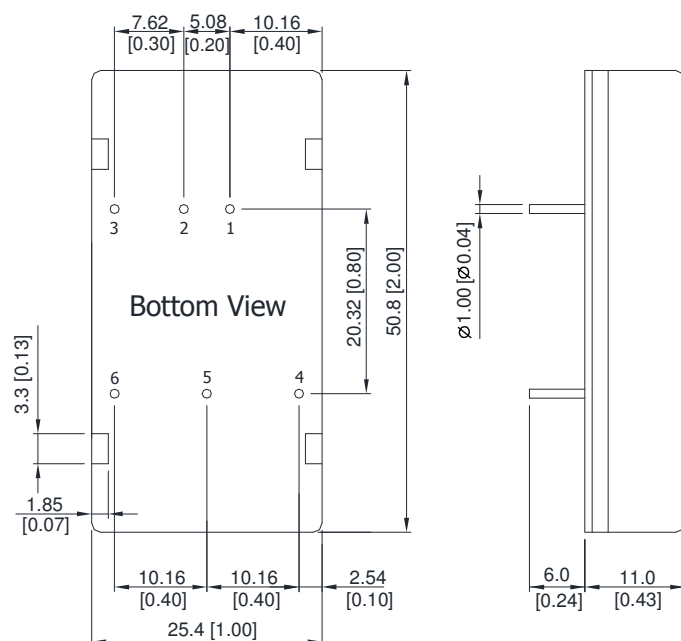
Figure 142: ERM01CC110 Output Voltage Startup Characteristic by On/Off
Vin = 110Vdc Load: Io = $\pm 0.667A$
Ch1: Vo1 Ch2:Vo2 Ch3: Vin

ERM01CC110 Performance Curves



Mechanical Specifications

Mechanical Outlines – Without Heatsink



Pin Connections

Pin	Single Output	Dual Output
1	+Vin	+Vin
2	-Vin	-Vin
3	Remote On/Off	Remote On/Off
4	+Vout	+Vout
5	Trim	Common
6	-Vout	-Vout

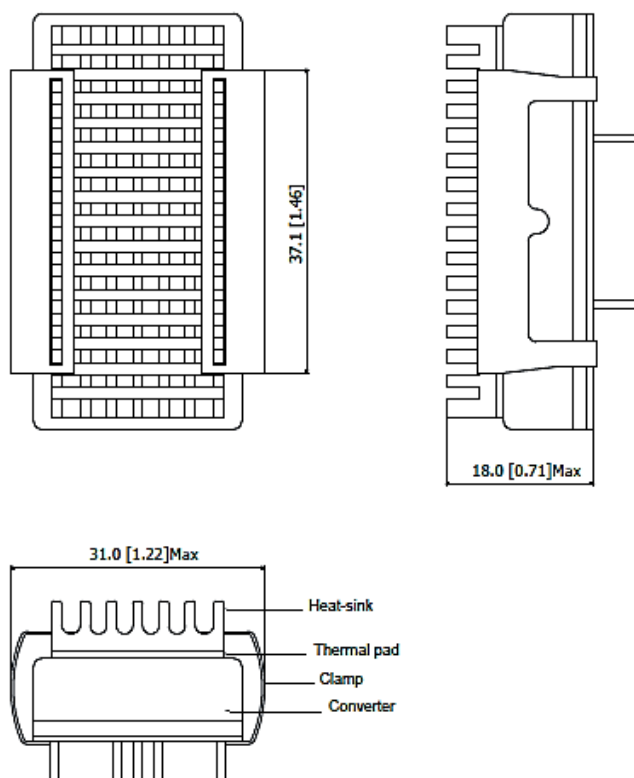
Note:

1. All dimensions in mm (inches)
2. Tolerance: $X.X \pm 0.75$ ($X.XX \pm 0.03$)
 $X.XX \pm 0.25$ ($X.XXX \pm 0.01$)
3. Pin diameter 1.0 ± 0.05 (0.04 ± 0.002)

Physical Characteristics

Case Size	50.8x25.4x11.0 mm (2.0x1.0x0.43 inches)
Case Material	Red Copper, Powder Coating
Base Material	FR4 PCB (flammability to UL 94V-0 rated)
Insulated Frame Material	Non-Conductive Black Plastic (flammability to UL 94V-0 rated)
Pin Material	Tinned Copper
Potting Material	Epoxy (flammability to UL 94V-0 rated)
Weight	40.5g

Mechanical Outlines – With Heatsink(“B Suffix”)



Note:

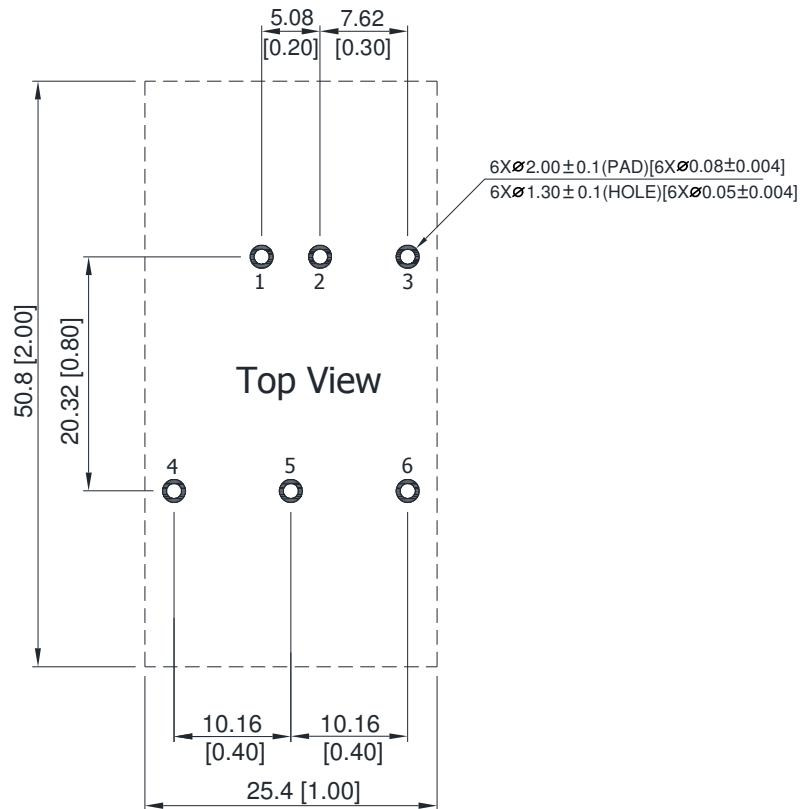
- 1.All dimensions in mm (inches)
- 2.Tolerance: $X.X \pm 0.75$ ($X.XX \pm 0.03$)
 $X.XX \pm 0.25$ ($X.XXX \pm 0.01$)
- 3.Pin diameter 1.0 ± 0.05 (0.04 ± 0.002)

Physical Characteristics	
Heatsink Size	37.1x31.0x18.0 mm (1.46x1.22x0.71 inches)
Heatsink Material	Aluminum
Finish	Black Anodized coating
Weight	9.0g

The advantages of adding a heatsink are:

1. To improve heat dissipation and increase the stability and reliability of the DC/DC converters at high operating temperatures.
2. To increase Operating temperature of the DC/DC converter, please refer to Derating Curve.

Recommended Pad Layout



Environmental Specifications

EMC Immunity

ERM 20W series power supply is designed to meet the following EMC immunity specifications.

Table 4. EMC Specifications:

Parameter	Standards & Level		Performance
General	Compliance with EN50121-3-2 Railway Applications		
EMI	Conduction	EN55032, EN55022, FCC part15	Class A
EMS	EN55024		
	ESD	EN61000-4-2 Air $\pm 8\text{kV}$, Contact $\pm 6\text{kV}$	Criteria A
	Radiated immunity	EN61000-4-3 10V/m	Criteria A
	Fast transient ¹	EN61000-4-4 $\pm 2\text{KV}$	Criteria A
	Surge ¹	EN61000-4-5 $\pm 2\text{KV}$	Criteria A
	Conducted immunity	EN61000-4-6 10Vrms	Criteria A
	PFMF	EN61000-4-8 3A/M	Criteria A

Note1 - To meet EN61000-4-4 & EN61000-4-5, an external capacitor across the input pins is required.

Suggested capacitor: 24V input models: CHEMI-CON KY Series 390 μF /63V.

48V input models: CHEMI-CON KY Series 330 μF /100V.

110V input models: CHEMI-CON KXJ Series 390 μF /200V.

Safety Certifications

The ERM 20W series power supply is intended for inclusion in other equipment and the installer must ensure that it is in compliance with all the requirements of the end application. This product is only for inclusion by professional installers within other equipment and must not be operated as a stand alone product.

Table 5. Safety Certifications:

Document	Description
cUL/UL 60950-1 (UL certificate)	US Requirements
IEC/EN 60950-1 (CB-report)	European Requirements (All CENELEC Countries)
cUL/UL 62368-1 (UL certificate)	US Requirements
IEC/EN 62368-1 (CB-report)	European Requirements (All CENELEC Countries)
CE mark	

Operating Temperature

Table 6. Operating Temperature:

Parameter	Model / Condition	Min		Max		Unit
		Without Heatsink	With Heatsink	Without Heatsink	With Heatsink	
Operating Temperature Range Natural Convection ¹ Nominal Vin, Load 100% Inom. (for Power Derating see relative Derating Curves)	ERM01B36 ERM01C36 ERM01H36	-40		72	78	°C
	ERM04A18 ERM01B18 ERM01C18 ERM01H18 ERM04A36 ERM01BB36 ERM01CC36			69	76	°C
	ERM01BB18 ERM01CC18 ERM01B110 ERM01C110 ERM01H110 ERM01BB110 ERM01CC110			66	73	°C
	ERM04A110			59	68	°C
Thermal Impedance	Natural Convection	12.1	9.8	-	-	°C/W
	100LFM	9.2	5.4	-	-	°C/W
	200LFM	7.8	4.5	-	-	°C/W
	400LFM	5.2	3.0	-	-	°C/W
Cooling Test	Compliance to IEC/EN60068-2-1					
Dry Heat	Compliance to IEC/EN60068-2-2					
Damp Heat	Compliance to IEC/EN60068-2-30					
Shock & Vibrate Test	Compliance to IEC/EN 61373					
RFI	Six-Sided Shielded, Metal Case					
Lead Temperature (1.5mm from case for 10Sec.)		-		260		°C

Note1 - The "natural convection" is about 20LFM but is not equal to still air (0 LFM).

MTBF and Reliability

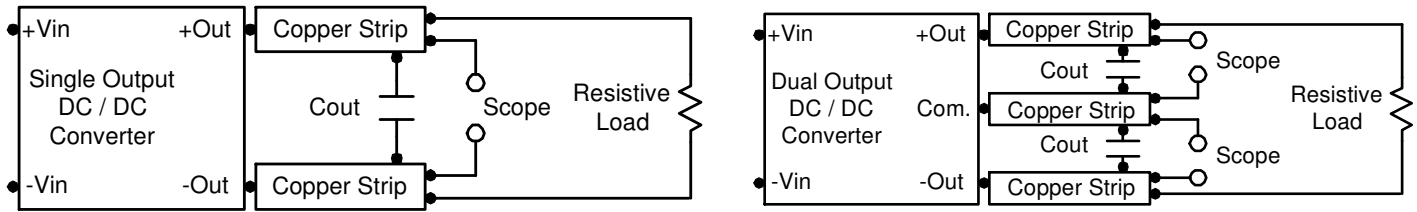
The MTBF of ERM 20W series of DC/DC converters has been calculated using MIL-HDBK 217F NOTICE2, Operating Temperature 25 °C, Ground Benign.

Model	MTBF	Unit
ERM04A18	873,800	Hours
ERM01B18	1,180,000	
ERM01C18	1,179,000	
ERM01H18	1,179,000	
ERM01BB18	1,042,000	
ERM01CC18	1,041,000	
ERM04A36	873,000	
ERM01B36	1,290,000	
ERM01C36	1,290,000	
ERM01H36	1,289,000	
ERM01BB36	1,142,000	
ERM01CC36	1,142,000	
ERM04A110	665,100	
ERM01B110	927,700	
ERM01C110	939,300	
ERM01H110	1,051,000	
ERM01BB110	1,041,000	
ERM01CC110	1,041,000	

Application Notes

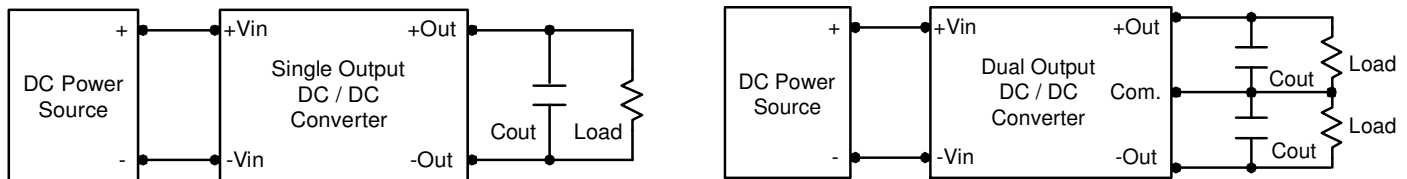
Peak-to-Peak Output Noise Measurement Test

Use a 1 μ F ceramic capacitor and a 10 μ F tantalum capacitor. Scope measurement should be made by using a BNC socket, measurement bandwidth is 0-20MHz. Position the load between 50 mm and 75 mm from the DC/DC Converter.



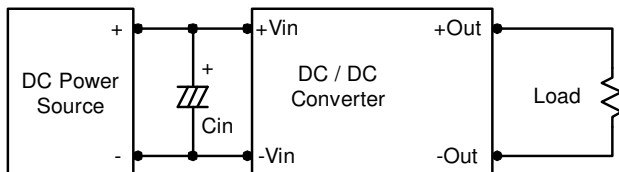
Output Ripple Reduction

A good quality low ESR capacitor placed as close as practicable across the load will give the best ripple and noise performance. To reduce output ripple, it is recommended to use 4.7 μ F capacitors at the output.



Input Source Impedance

The power module should be connected to a low ac-impedance input source. Highly inductive source impedances can affect the stability of the power module. In applications where power is supplied over long lines and output loading is high, it may be necessary to use a capacitor at the input to ensure startup. Capacitor mounted close to the power module helps ensure stability of the unit, it is recommended to use a good quality low Equivalent Series Resistance (ESR < 1.0 Ω at 100 KHz) capacitor of a 4.7 μ F for the 24V input devices, a 2.2 μ F for the 48V devices and a 1 μ F for the 110V devices.



Output Over Current Protection

To provide hiccup mode protection in a fault (output overload) condition, the unit is equipped with internal current limiting circuitry and can endure overload for an unlimited duration.

Overvoltage Protection

The ERM 20W series has limitation of maximum connected capacitance at the output. The power module may be operated in current limiting mode during start-up, affecting the ramp-up and the startup time. The maximum capacitance can be found in the data sheet.

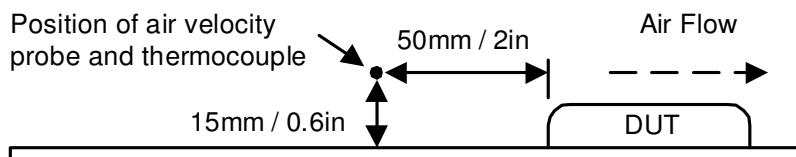
Maximum Capacitive Load

The ERM 20W series has limitation of maximum connected capacitance at the output. The power module may be operated in current limiting mode during start-up, affecting the ramp-up and the startup time. The maximum capacitance can be found in the data sheet.

Thermal Considerations

Many conditions affect the thermal performance of the power module, such as orientation, airflow over the module and board spacing. To avoid exceeding the maximum temperature rating of the components inside the power module, the case temperature must be kept below 105°C.

The derating curves are determined from measurements obtained in a test setup.



Remote On/Off

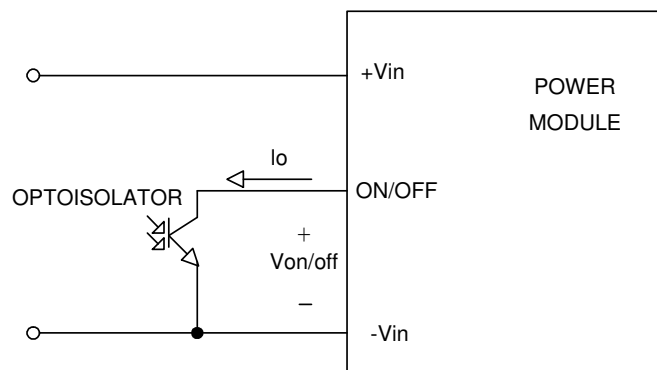
Positive logic remote on/off turns the module on during a logic high voltage on the remote on/off pin, and off during a logic low. To turn the power module on and off, the user must supply a switch to control the voltage between the on/off terminal and the -Vin terminal. The switch can be an open collector or equivalent. A logic low is 0V to 1.2V. A logic high is 3.5V to 12V. The maximum sink current at the on/off terminal (Pin 3) during a logic low is -100 μ A.

Table 7. Remote On/Off Control:

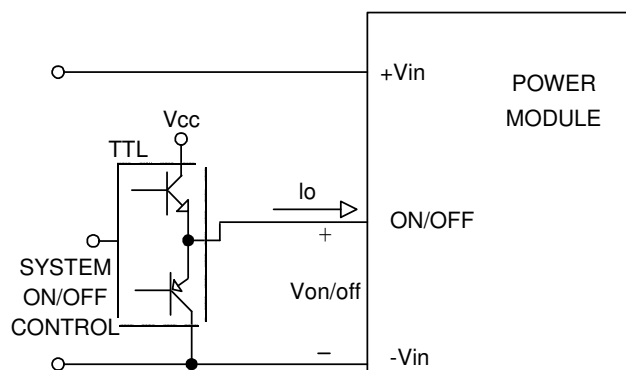
Parameter	Condition	Symbol	Min	Typ	Max	Unit
Converter On	3.5V ~ 12V or Open Circuit					
Converter Off	0V ~ 1.2V or Short Circuit					
Control Input Current (on)	Vctrl = 5.0V		---	0.5	---	mA
Control Input Current (off)	Vctrl = 0V		---	-0.5	---	mA
Control Common	Referenced to Negative Input					
Standby Input Current	Nominal Vin		---	2.5	---	mA

Remote On/Off Implementation

The positive logic remote ON/OFF control circuit is included. Turns the module ON during logic High on the ON/Off pin and turns OFF during logic Low. The ON/OFF input signal (Von/off) that referenced to GND. If not using the remote on/off feature, please open circuit between on/off pin and -Vin pin to turn the module on.



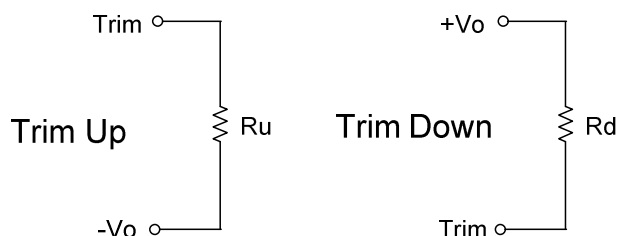
Isolated-Closure Remote ON/OFF



Level Control Using TTL Output

External Output Trimming

The ERM 20W series Output voltage can be externally trimmed by using the method shown below:



5V Output Models Trim Table:

Trim down	1	2	3	4	5	6	7	8	9	10	%
Vout=	Vox0.99	Vox0.98	Vox0.97	Vox0.96	Vox0.95	Vox0.94	Vox0.93	Vox0.92	Vox0.91	Vox0.90	Vdc
Rd=	156.81	70.69	41.99	27.64	19.03	13.29	9.18	6.11	3.72	1.80	KOhm
Trim up	1	2	3	4	5	6	7	8	9	10	%
Vout=	Vox1.01	Vox1.02	Vox1.03	Vox1.04	Vox1.05	Vox1.06	Vox1.07	Vox1.08	Vox1.09	Vox1.10	Volts
Ru=	119.77	53.70	31.67	20.66	14.05	9.65	6.50	4.14	2.31	0.84	KOhm

12V Output Models Trim Table:

Trim down	1	2	3	4	5	6	7	8	9	10	%
Vout=	Vox0.99	Vox0.98	Vox0.97	Vox0.96	Vox0.95	Vox0.94	Vox0.93	Vox0.92	Vox0.91	Vox0.90	Vdc
Rd=	419.81	187.68	110.30	71.61	48.40	32.93	21.87	13.58	7.13	1.98	KOhm
Trim up	1	2	3	4	5	6	7	8	9	10	%
Vout=	Vox1.01	Vox1.02	Vox1.03	Vox1.04	Vox1.05	Vox1.06	Vox1.07	Vox1.08	Vox1.09	Vox1.10	Volts
Ru=	344.74	154.37	90.92	59.19	40.15	27.46	18.39	11.59	6.31	2.07	KOhm

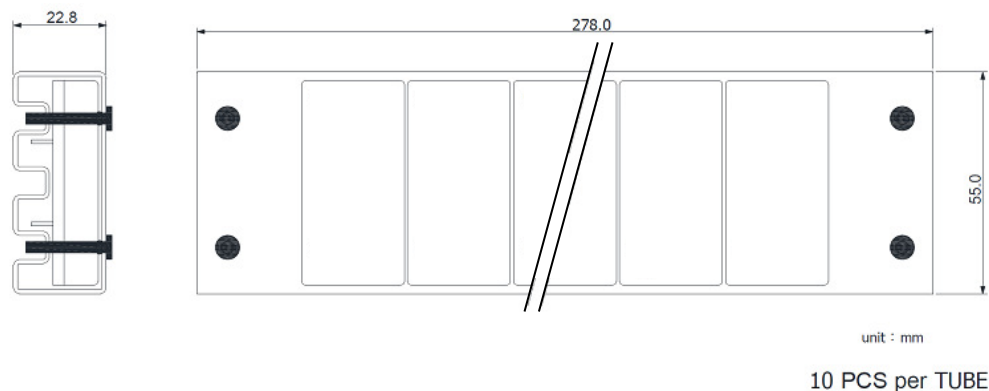
15V Output Models Trim Table:

Trim down	1	2	3	4	5	6	7	8	9	10	%
Vout=	Vox0.99	Vox0.98	Vox0.97	Vox0.96	Vox0.95	Vox0.94	Vox0.93	Vox0.92	Vox0.91	Vox0.90	Vdc
Rd=	602.92	269.91	158.91	103.41	70.10	47.90	32.05	20.15	10.90	3.50	KOhm
Trim up	1	2	3	4	5	6	7	8	9	10	%
Vout=	Vox1.01	Vox1.02	Vox1.03	Vox1.04	Vox1.05	Vox1.06	Vox1.07	Vox1.08	Vox1.09	Vox1.10	Volts
Ru=	482.88	215.89	126.89	82.40	55.70	37.90	25.18	15.65	8.23	2.30	KOhm

24V Output Models Trim Table:

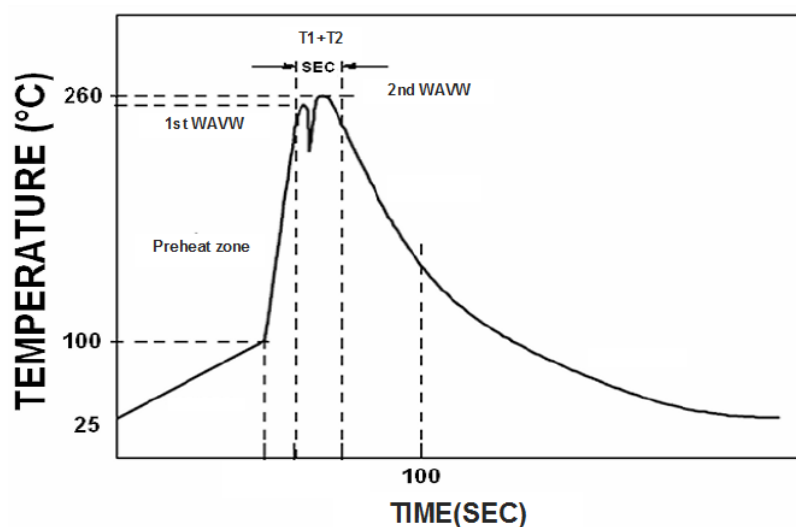
Trim down	1	2	3	4	5	6	7	8	9	10	%
Vout=	Vox0.99	Vox0.98	Vox0.97	Vox0.96	Vox0.95	Vox0.94	Vox0.93	Vox0.92	Vox0.91	Vox0.90	Vdc
Rd=	598.97	267.93	157.59	102.42	69.31	47.25	31.48	19.66	10.46	3.11	KOhm
Trim up	1	2	3	4	5	6	7	8	9	10	%
Vout=	Vox1.01	Vox1.02	Vox1.03	Vox1.04	Vox1.05	Vox1.06	Vox1.07	Vox1.08	Vox1.09	Vox1.10	Volts
Ru=	486.83	217.87	128.21	83.38	56.49	38.56	25.75	16.14	8.67	2.69	KOhm

Packaging Information



Soldering and Reflow Considerations

Lead free wave solder profile for ERM 20W Series.



Zone	Reference Parameter
Preheat zone	Rise temp speed: 3°C/sec max.
	Preheat temp: 100~130°C
Actual heating	Peak temp: 250~260°C
	Peak time(T1+T2): 4~6 sec

Reference Solder: Sn-Ag-Cu: Sn-Cu: Sn-Ag
Hand Welding: Soldering iron: Power 60W
Welding Time: 2~4 sec
Temp.: 380~400 °C

Record of Revision and Changes

Issue	Date	Description	Originators
1.0	05.01.2017	First Issue	E. Bai

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