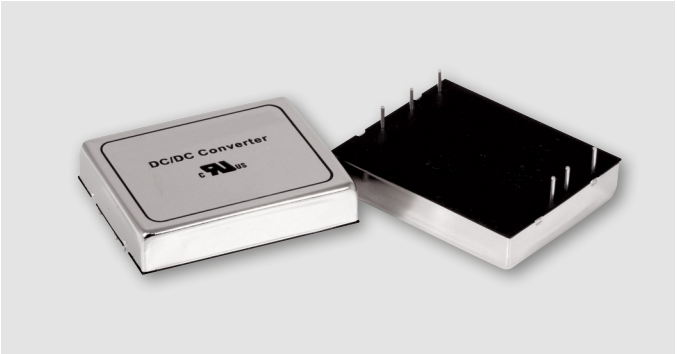
P R
B X

POWERBOX Industrial Line
T20 Series
20W 2:1 and 4:1 Single Output
DC/DC Converter
Manual



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Introduction

The T20 -single series offer 20 Watts of output power from a 2.00 x 1.60 x 0.40 inch package. The T20-single series with 2:1 wide input voltage of 9~18VDC, 18~36VDC and 36~75VDC and 4:1 wide input voltage of 9~36VDC and 18~75VDC.

DC/DC Converter Features

- Low profile 2.00x1.60x0.40 inch
- 2:1 wide input voltage of 9~18, 18~36 and 36~75VDC
- 4:1 ultra wide input voltage of 9~36 and 18~75VDC
- 20 watts output power
- Input to output isolation 1600VDC
- Operating case temperature range 100°C , max.
- Over-current protection, auto-recovery
- Output over-voltage protection
- ISO 9001 certified manufacturing facilities
- UL60950-1, EN60950-1 and IEC60950-1 licensed
- CE mark meet 2006/95/EC, 93/68/EEC and 2004/108/EC
- RoHS Directive compliant

Output Specifications

Parameters	Model	Min	Typ	Max	Unit
Output voltage range	□□S33	3.267	3.30	3.333	VDC
	□□S05	4.95	5.00	5.05	VDC
	□□S12	11.88	12.00	12.12	VDC
	□□S15	14.85	15.00	15.15	VDC
Line regulation (LL to HL at full load)	All	-0.5		+0.5	%
Load regulation (min to 100% full load)	All	-0.5		+0.5	%
Output ripple and noise (20MHz bandwidth)	All			75	mVp-p
Temperature coefficient	All	-0.02		+0.02	%/°C
Output voltage overshoot (Vin(min) to Vin(max) full load; Ta=25°C)	All			5	% of Vout
Transient response recovery time (25% load step change)	All		250		µs
Output current	□□S33	215		4000	mA
	□□S05	280		4000	mA
	□□S12	134		1670	mA
	□□S15	106		1330	mA
Output over voltage protection (zener diode clamp)	□□S33		3.9		VDC
	□□S05		6.2		VDC
	□□S12		15		VDC
	□□S15		18		VDC
Output over current protection	All		150		% of FL
Output short circuit protection	All	Hiccups, automatics recovery			
Output capacitor load	□□S33			13000	µs
	□□S05			6800	µs
	□□S12			2200	µs
	□□S15			755	µs

Input Specifications

Parameters	Model	Min	Typ	Max	Unit
Operating input voltage	12S□□	9	12	18	VDC
	24S□□(W)	18(9)	24	36	VDC
	48S□□(W)	36(18)	48	75	VDC
Input voltage					
Continuous	12S□□			18	VDC
	24S□□(W)			36	VDC
	48S□□(W)			75	VDC
Transient (100mS maximum)	12S□□			36	VDC
	24S□□(W)			50	VDC
	48S□□(W)			100	VDC
Input reflected ripple current	All		25		mAp-p
Start up time (nominal input and constant resistive load power up)	All		20	40	mS
Remote on/off					
Positive logic					
DC/DC On	All	3.5		12	VDC
DC/DC Off	All	0		1.2	VDC

General Specifications

Parameters	Model	Min	Typ	Max	Unit
Efficiency, test at Vin, nom and full load	12S33		77		%
	12S05		80		%
	12S12		83		%
	12S15		84		%
	24S33(W)		79(76)		%
	24S05(W)		81(79)		%
	24S12(W)		86(81)		%
	24S15(W)		86(81)		%
	48S33W)		79(77)		%
	48S05(W)		82(80)		%
	48S12(W)		86(82)		%
	48S15(W)		86(82)		%
Isolation resistance	All	10^9			Ω
Isolation capacitance	All			300	pF
Switching frequency	All	270	300	330	kHz
Transient response recovery time (25% load step change)	All		250		uS
Weight	All		48		g
MTBF MIL-HDBK-217F	All		1.922×10^6		hours
Case material	All	Nickel-coated copper			
Base material	All	Non-conductive black plastic			
Potting material	All	Epoxy (UL94 V-0)			
Dimensions	All	50.8 x 40.6 x 10.2 mm (2.00 x 1.60 x 0.40 inch)			

Environmental Specifications

Parameters	Model	Min	Typ	Max	Unit
Operating ambient temperature (with derating)*	All	-40		85	°C
Maximum case temperature	All			100	°C
Storage temperature range	All	-55		105	°C
Thermal impedance					
Natural convection	All		10		°C/W
Natural convection with heat-sink	All		8.24		°C/W
Relative humidity	All	5		95	% RH
Thermal shock	All	MIL-STD-810F			
Vibration	All	MIL-STD-810F			

*Test condition with vertical direction by natural convection (20LFM)

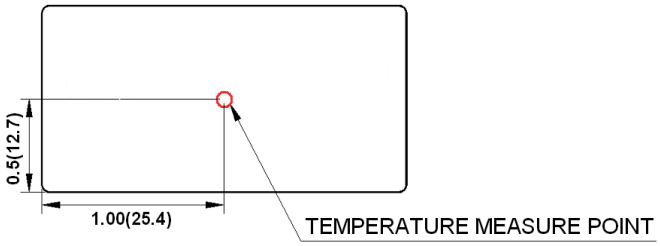
EMC Characteristics

Parameters	Standard	Condition		Level
EMI	EN55022			Class A
ESD	EN61000-4-2	Air	±8kV	Perf. Criteria A
		Contact	±6kV	
Radiated Immunity	EN61000-4-3		10V/m	Perf. Criteria A
Fast transient**	EN61000-4-4		±2kV	Perf. Criteria A
Surge**	EN61000-4-5		±1kV	Perf. Criteria A
Conducted immunity	EN61000-4-6		10V r.m.s	Perf. Criteria A
Power frequency magnetic field	EN61000-4-8	100A/m continuous; 1000A/m 1 second		Perf. Criteria A

*An external input filter capacitor is required if the module has to meet EN61000-4-4, EN61000-4-5.
The filter capacitor Powerbox suggest: Nippon chemi-con KY series, 220μF/100V, ESR 48mΩ.

Thermal Consideration

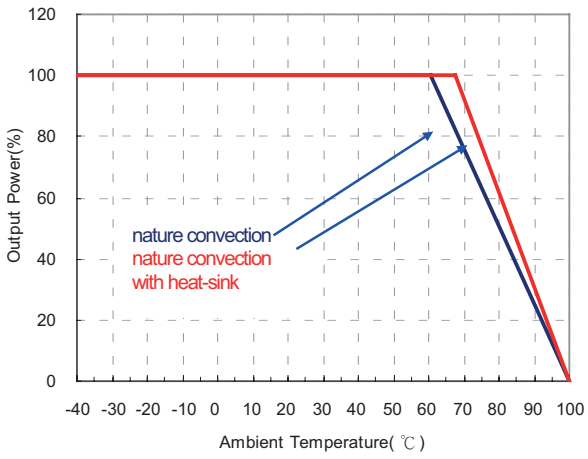
The power module operates in a variety of thermal environments. However, sufficient cooling should be provided to help ensure reliable operation of the unit. Heat is removed by conduction, convection, and radiation to the surrounding environment. Proper cooling can be verified by measuring the point as the figure below. The temperature at this location should not exceed 100°C. When operating, adequate cooling must be provided to maintain the test point temperature at or below 100°C. Although the maximum point temperature of the power modules is 100°C, you can limit this Temperature to a lower value for extremely high reliability.



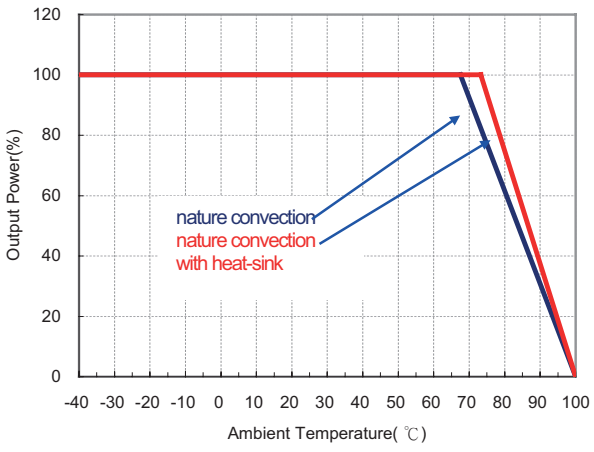
Measurement shown in inch(mm) TOP VIEW

Following are de-rating curve for PME20-12S33, PME20-24S05, PME20-48S15, PME20-24S33W, PME20-48S12W

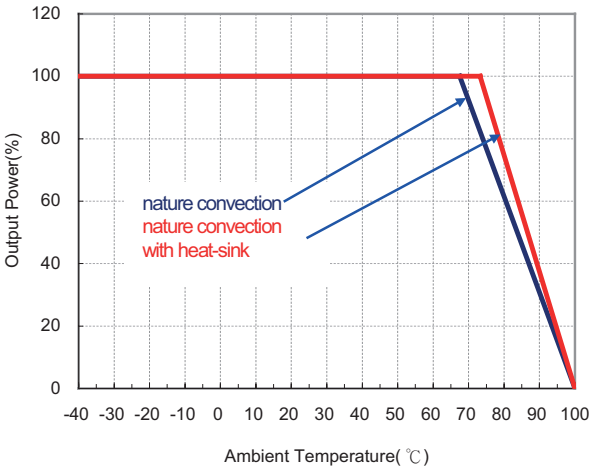
PME20-12S33 Derating Curve



PME20-24S05 Derating Curve



PME20-48S15 Derating Curve



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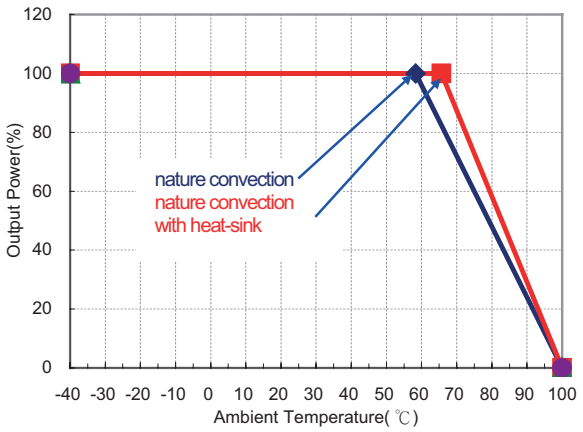

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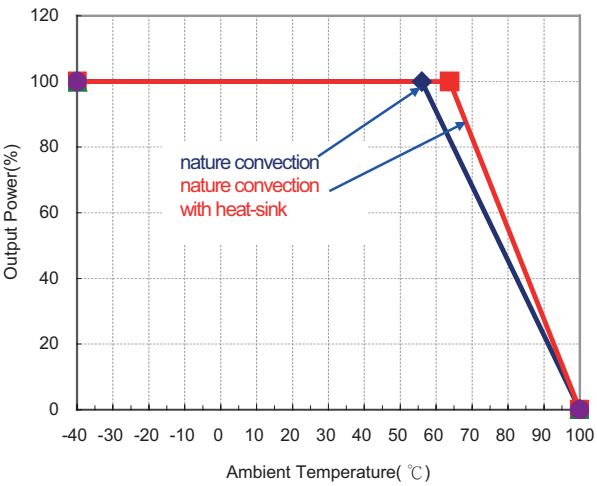


Output Over Current Protection

When excessive output currents occur in the system, circuit protection is required on all power supplies. Normally, overload current is maintained at approximately 150 percent of rated current for T20-S SERIES.

Hiccup-mode is a method of operation in a power supply whose purpose is to protect the power supply from being damaged during an over-current fault condition. It also enables the power supply to restart when the fault is removed. There are other ways of protecting the power supply when it is over-loaded, such as the maximum current limiting or current foldback methods.

One of the problems resulting from over current is that excessive heat may be generated in power devices, especially MOSFET and Schottky diodes and the temperature of those devices may exceed their specified limits. A protection mechanism has to be used to prevent those power devices from being damaged.

The operation of hiccup is as follows. When the current sense circuit sees an over-current event, the controller shuts off the power supply for a given time and then tries to start up the power supply again. If the over-load condition has been removed, the power supply will start up and operate normally, otherwise, the controller will see another over-current event and shut off the power supply again, repeating the previous cycle. Hiccup operation has none of the drawbacks of the other two protection methods, although its circuit is more complicated because it requires a timing circuit. The excess heat due to overload lasts for only a short duration in the hiccup cycle, hence the junction temperature of the power devices is much lower.

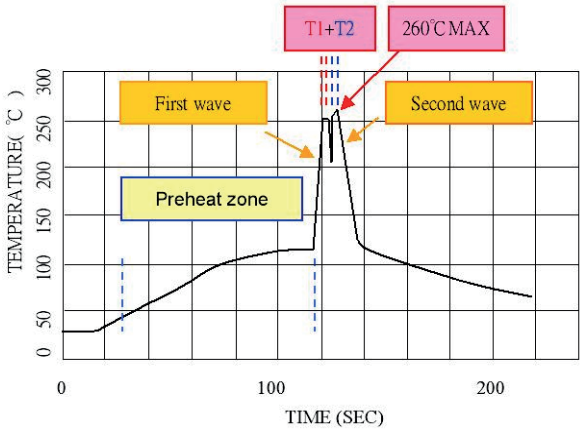
The hiccup operation can be done in various ways. For example, one can start hiccup operation any time an over-current event is detected, or prohibit hiccup during a designated start-up is usually larger than during normal operation and it is easier for an over-current event is detected, or prohibit hiccup during a designated start-up interval (usually a few milliseconds). The reason for the latter operation is that during start-up, the power supply needs to provide extra current to charge up the output capacitor. Thus the current demand during start-up is usually larger than during normal operation and it is easier for an over-current event to occur. If the power supply starts to hiccup once there is an over-current, it might never start up successfully. Hiccup mode protection will give the best protection for a power supply against over current situations, since it will limit the average current to the load at a low level, so reducing power dissipation and case temperature in the power devices.

Short Circuit Protection

Continuous, hiccup and auto-recovery mode.
During short circuit, converter still shut down. The average current during this condition will be very low and the device can be safety in this condition.

Soldering and Reflow Considerations

Lead free wave solder profile for T20 DIP type

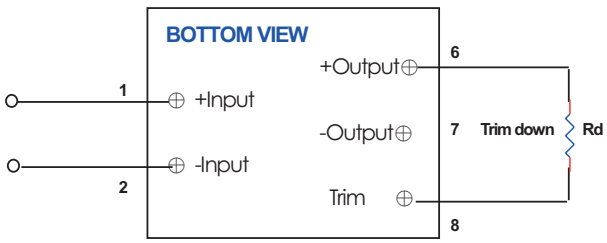


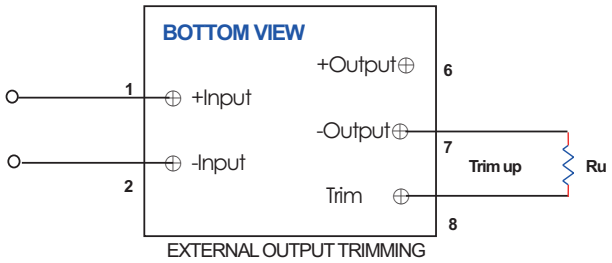
Zone	Reference Parameter
Preheat zone	Rise temp. speed : 3°C / sec max.
	Preheat temp. : 100~130°C
Actual heating	Peak temp. : 250~260°C
	Peak time (T1+T2 time) : 4~6 sec

Reference Solder : Sn-Ag-Cu , Sn-Cu
Hand Welding: Soldering iron : Power 90W
Welding Time : 2~4 sec
Temp. : 380~400°C

External Trim Adjustment

Output voltage set point adjustment allows the user to increase or decrease the output voltage set point of a module. This is accomplished by connecting an external resistor between the TRIM pin and either the +Vout or -Vout pins. With an external resistor between the TRIM and +Vout pin, the output voltage set point decreases. With an external resistor between the TRIM and -Vout pin, the output voltage set point increases. The external TRIM resistor needs to be at least 1/16W resistors.





EXTERNAL OUTPUT TRIMMING

Trim Table

PME20-□□S33

Trim down	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**%**
Vout=	3.266	3.233	3.200	3.167	3.134	3.101	3.068	3.035	3.002	2.969	Volts
Rx=	69.470	31.235	18.490	12.117	8.294	5.745	3.924	2.559	1.497	0.647	K Ohms
Trim up	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**%**
Vout=	3.332	3.365	3.398	3.431	3.464	3.497	3.530	3.563	3.596	3.629	Volts
Rx=	57.930	26.165	15.577	10.283	7.106	4.988	3.476	2.341	1.459	0.753	K Ohms

PME20-□□S05

Trim down	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**%**
Vout=	4.952	4.902	4.852	4.802	4.752	4.702	4.652	4.602	4.552	4.502	Volts
Rx=	45.533	20.612	12.306	8.152	5.660	3.999	2.812	1.922	1.230	0.676	K Ohms
Trim up	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**%**
Vout=	5.052	5.102	5.152	5.202	5.252	5.302	5.352	5.402	5.452	5.502	Volts
Rx=	36.570	16.580	9.917	6.585	4.586	3.253	2.302	1.588	1.032	0.588	K Ohms

PME20-□□S12

Trim down	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**%**
Vout=	11.887	11.767	11.647	11.527	11.407	11.287	11.166	11.046	10.926	10.806	Volts
Rx=	460.659	207.779	123.486	81.340	56.052	39.193	27.151	18.120	11.095	5.476	K Ohms
Trim up	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**%**
Vout=	12.127	12.247	12.367	12.487	12.607	12.727	12.847	12.967	13.088	13.208	Volts
Rx=	368.241	166.121	98.747	65.060	44.848	31.374	21.749	14.530	8.916	4.424	K Ohms

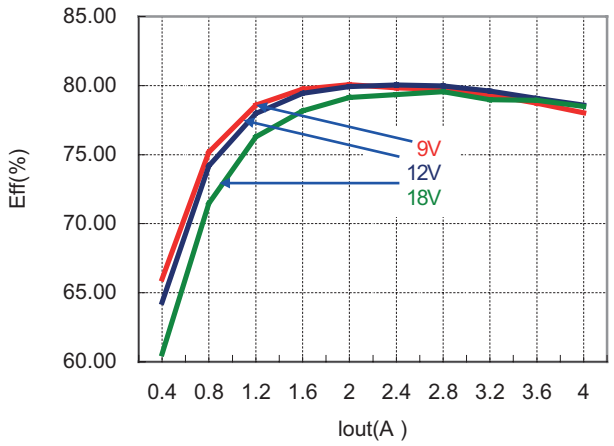
PME20-□□S15

Trim down	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**%**
Vout=	14.808	14.658	14.509	14.359	14.209	14.060	13.910	13.761	13.611	13.462	Volts
Rx=	499.816	223.408	131.272	85.204	57.563	39.136	25.974	16.102	8.424	2.282	K Ohms
Trim up	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**%**
Vout=	15.107	15.256	15.406	15.556	15.705	15.855	16.004	16.154	16.304	16.453	Volts
Rx=	404.184	180.592	106.061	68.796	46.437	31.531	20.883	12.898	6.687	1.718	K Ohms

Efficiency

a. Efficiency with load change under different line condition at room temperature

PME20-12S33



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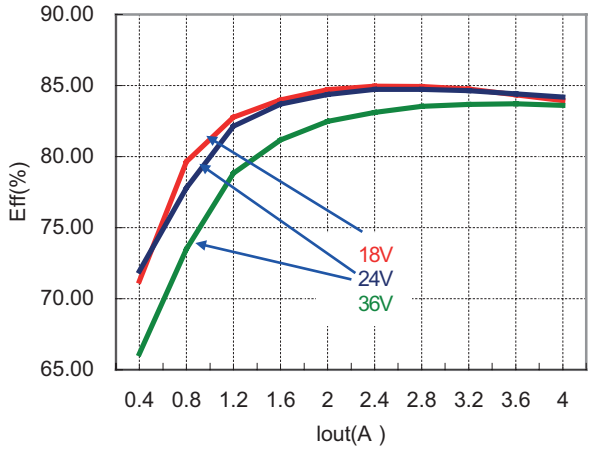

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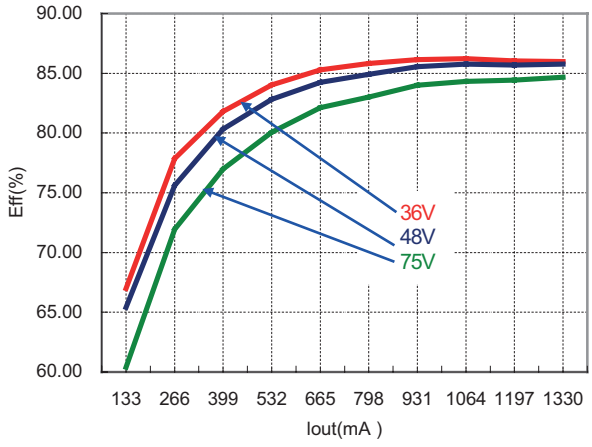

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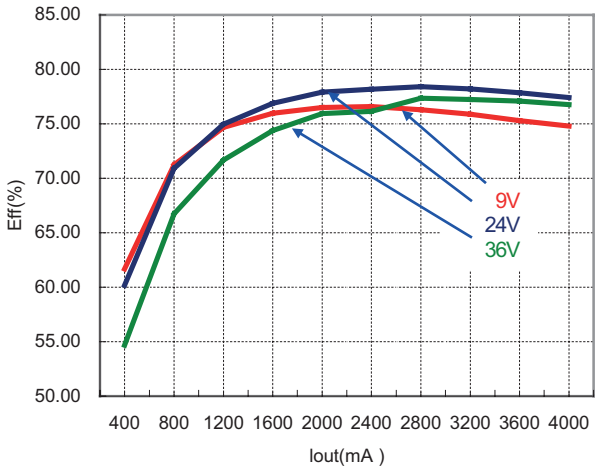

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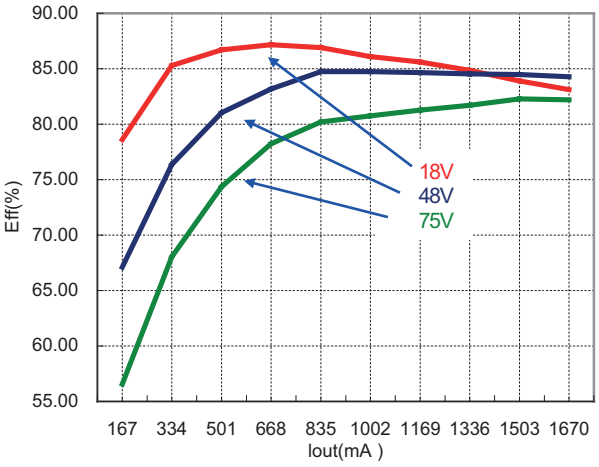
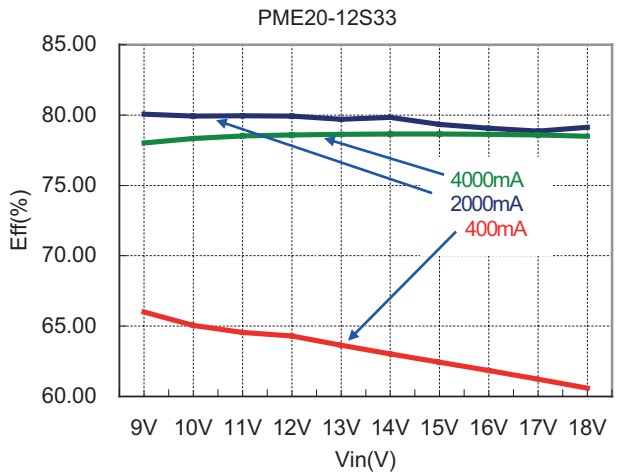
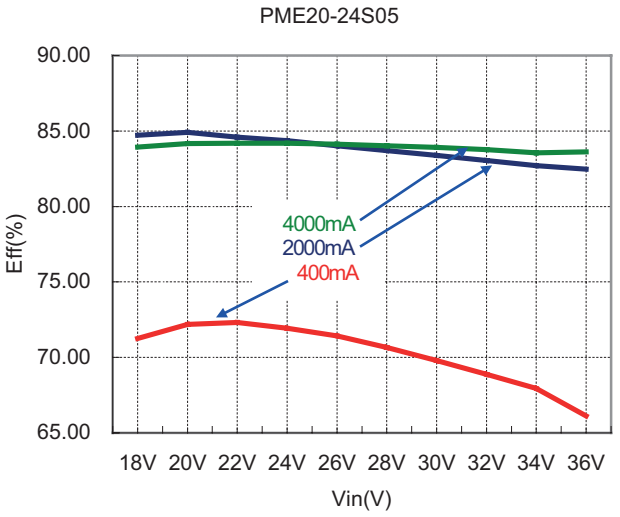
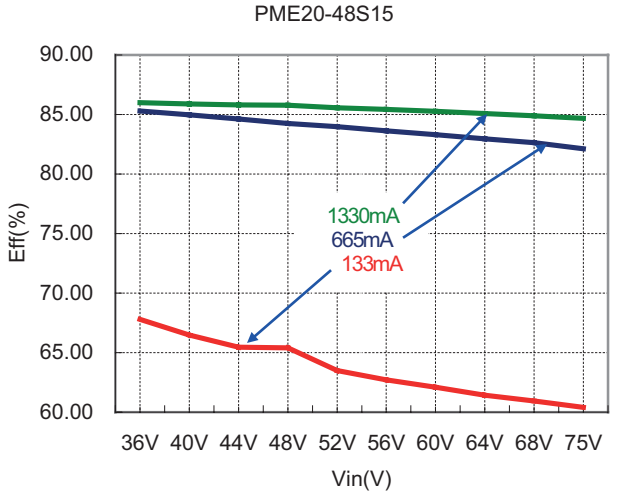
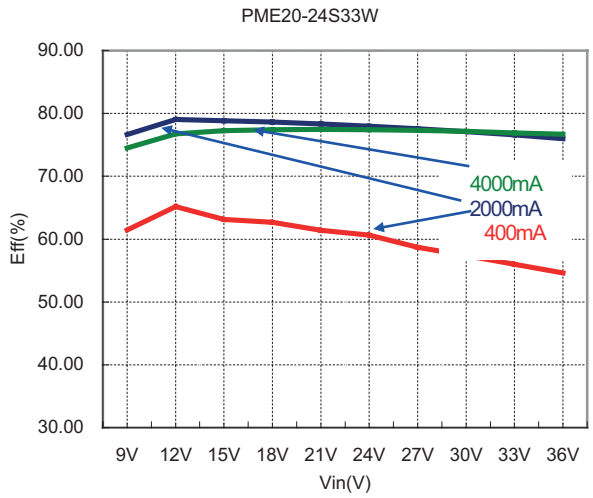


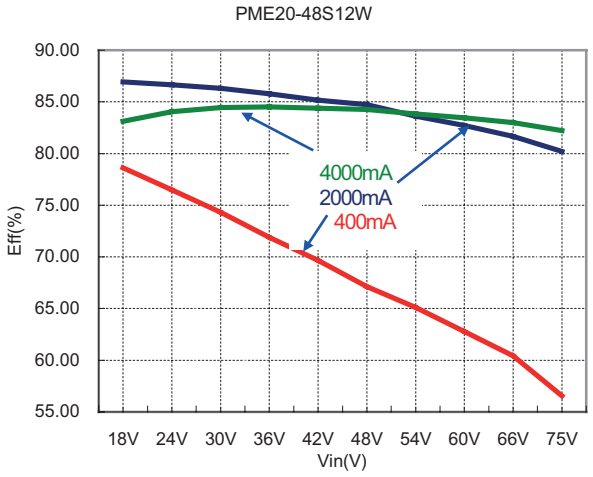
b. Efficiency with line change under different load condition at room temperature



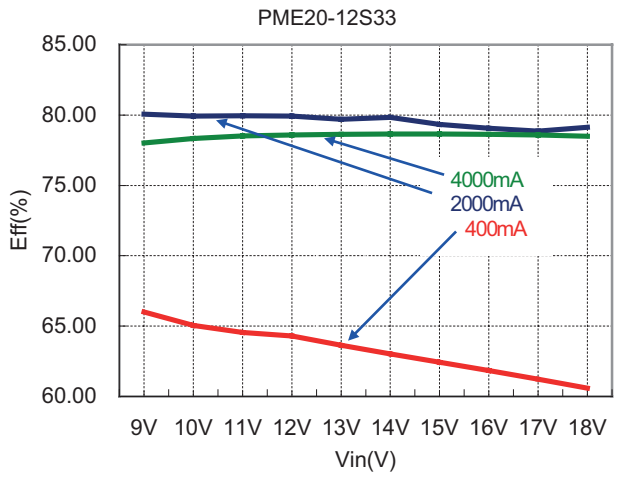


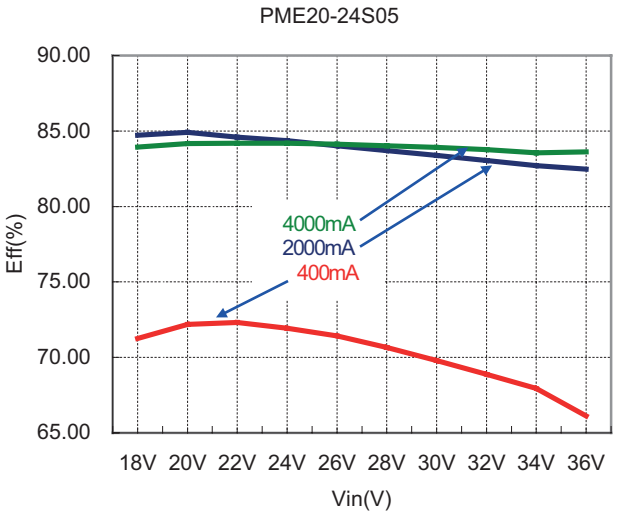


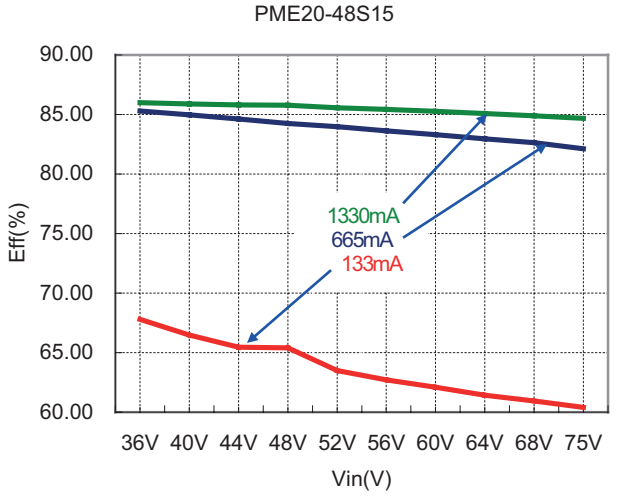

PME20-24S33W
90.00
80.00
70.00
60.00
50.00
40.00
30.00
Eff(%)
4000mA
2000mA
400mA
9V 12V 15V 18V 21V 24V 27V 30V 33V 36V
Vin(V)


PME20-48S12W
90.00
85.00
80.00
75.00
70.00
65.00
60.00
55.00
Eff(%)
4000mA
2000mA
400mA
18V 24V 30V 36V 42V 48V 54V 60V 66V 75V
Vin(V)

c. Efficiency with line change under different load condition at room temperature

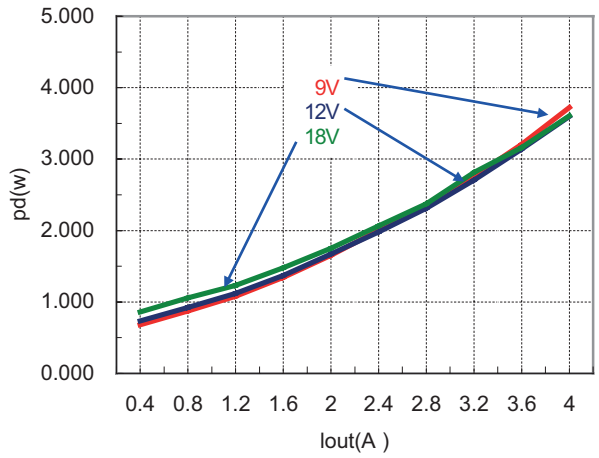






Power dissipation curve

PME20-12S33



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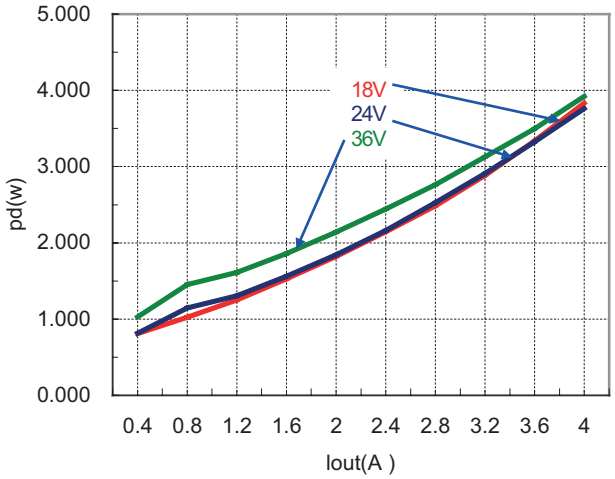

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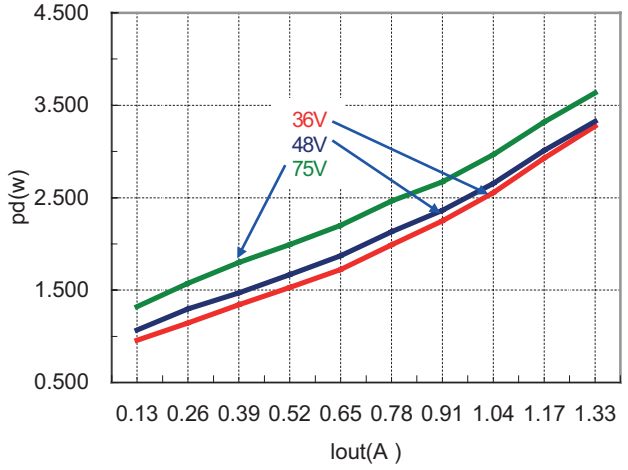
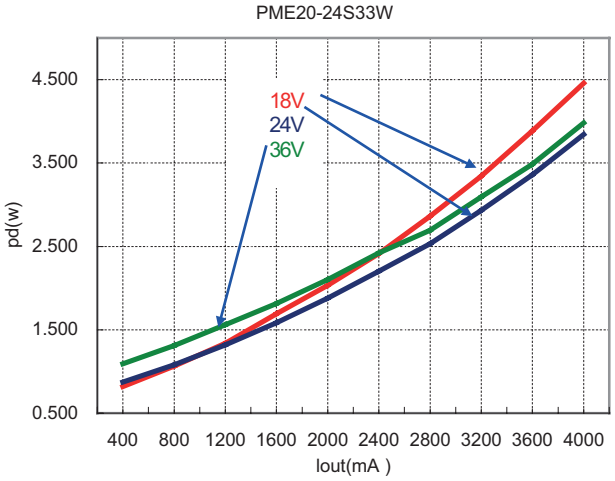
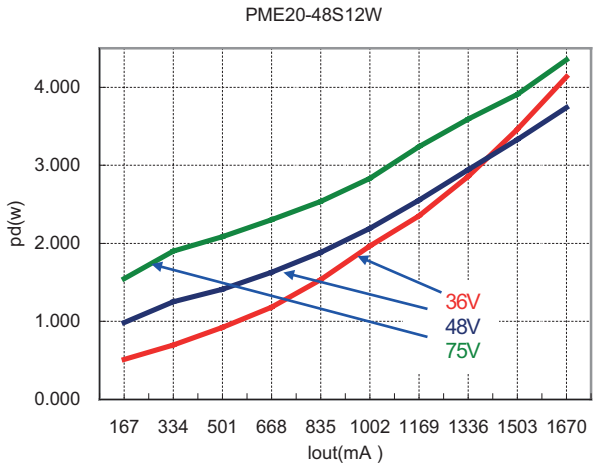
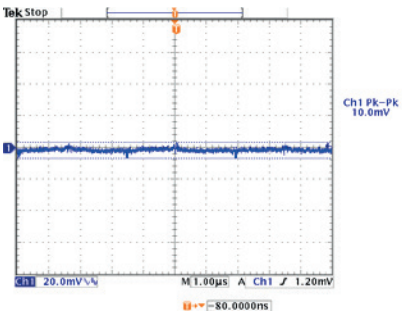



PME20-24S33W
4.500
3.500
2.500
1.500
0.500
pd(w)
18V
24V
36V
400 800 1200 1600 2000 2400 2800 3200 3600 4000
Iout(mA)


PME20-48S12W
4.000
3.000
2.000
1.000
0.000
pd(w)
36V
48V
75V
167 334 501 668 835 1002 1169 1336 1503 1670
Iout(mA)

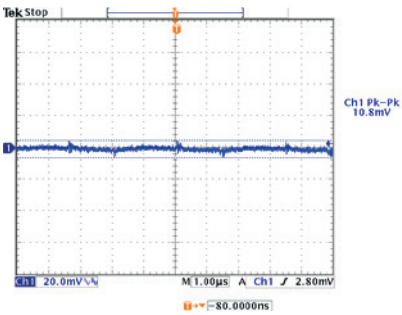
Output ripple & noise

PME20-12S33



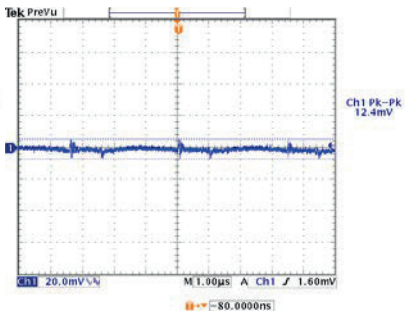
Low Line, Full Load

Ripple noise=10.0mV



Normal Line, Full Load

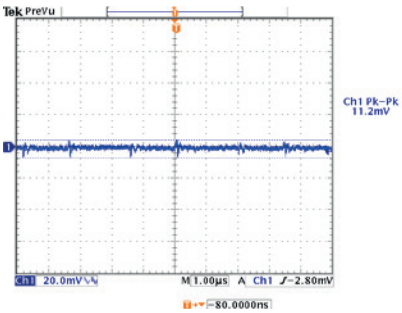
Ripple noise=10.8mV



High Line, Full Load

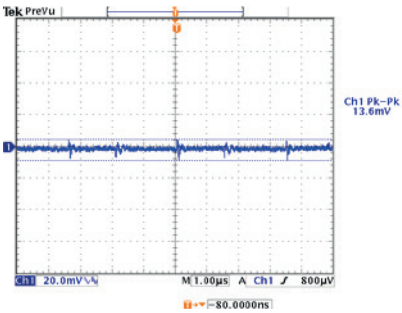
Ripple noise=12.4mV

PME20-24S05



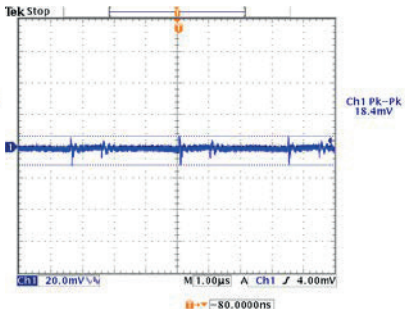
Low Line, Full Load

Ripple noise=11.2mV



Normal Line, Full Load

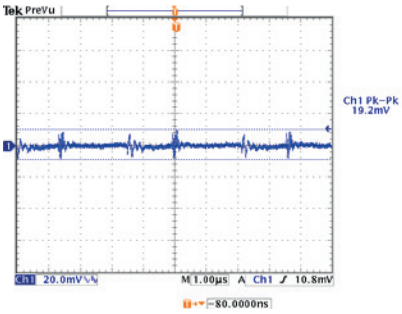
Ripple noise=13.6mV



High Line, Full Load

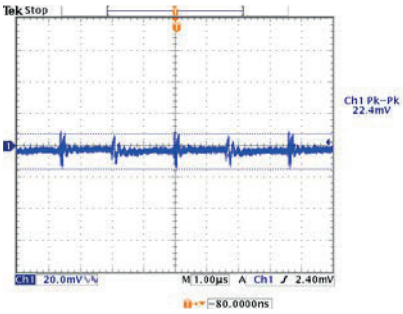
Ripple noise=18.4mV

PME20-48S15



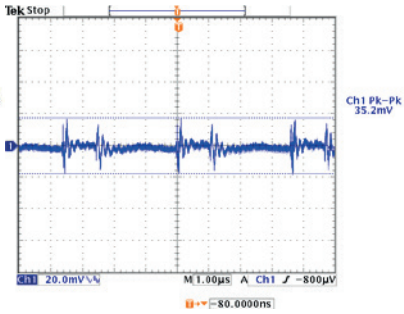
Low Line, Full Load

Ripple noise=19.2mV



Normal Line, Full Load

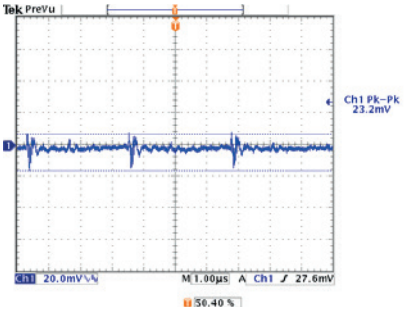
Ripple noise=22.4mV



High Line, Full Load

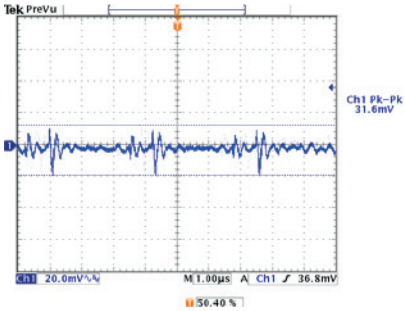
Ripple noise=35.2mV

PME20-24S33W



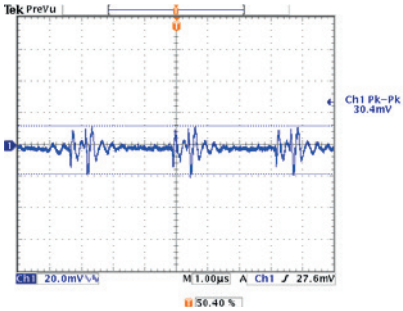
Low Line, Full Load

Ripple noise=23.2mV



Normal Line, Full Load

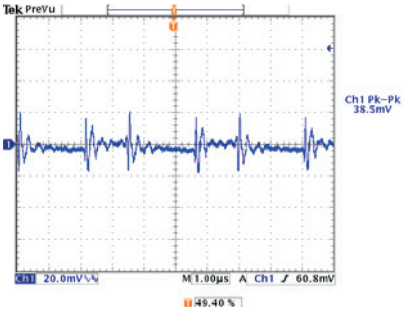
Ripple noise=31.5mV



High Line, Full Load

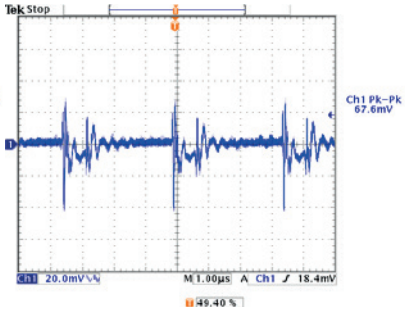
Ripple noise=30.4mV

PME20-48S12W



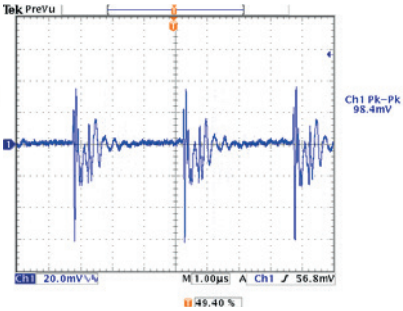
Low Line, Full Load

Ripple noise=38.5mV



Normal Line, Full Load

Ripple noise=67.6mV

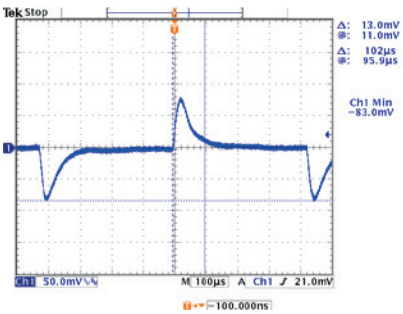


High Line, Full Load

Ripple noise=98.4mV

Transient peak and response

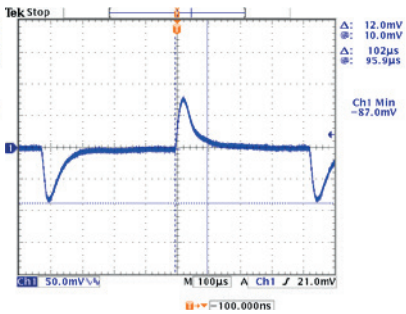
PME20-12S33



Low Line, Full Load

Transient Peak 83.0mV

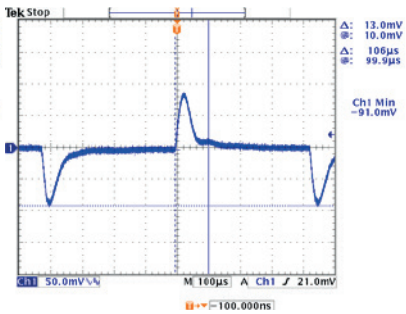
Transient Response 102uS



Normal Line, Full Load

Transient Peak 87.0mV

Transient Response 102uS

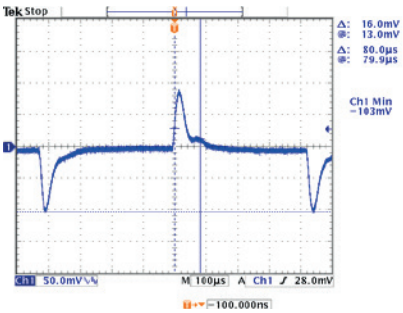


High Line, Full Load

Transient Peak 91.0mV

Transient Response 106uS

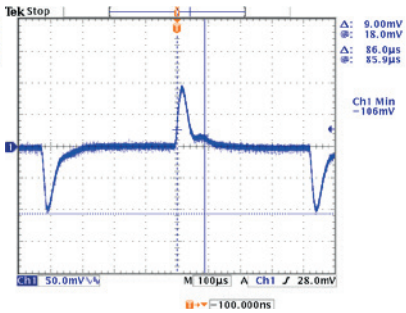
PME20-24S05



Low Line, Full Load

Transient Peak 103mV

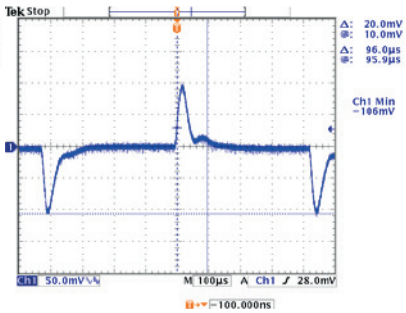
Transient Response 80uS



Normal Line, Full Load

Transient Peak 106mV

Transient Response 86uS

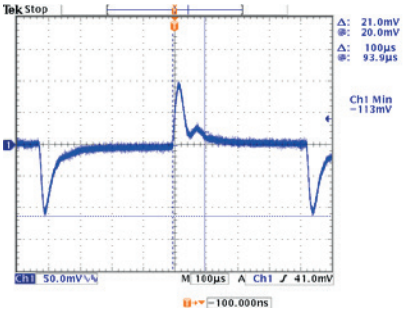


High Line, Full Load

Transient Peak 106mV

Transient Response 96uS

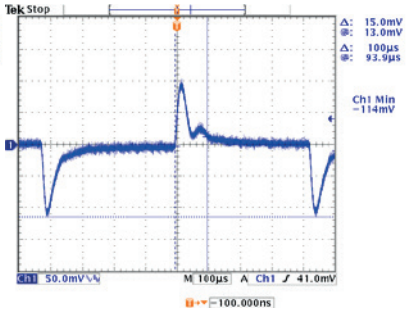
PME20-48S15



Low Line, Full Load

Transient Peak 113mV

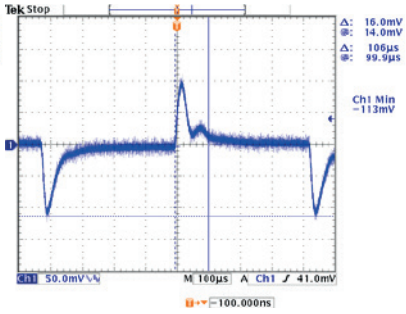
Transient Response 100uS



Normal Line, Full Load

Transient Peak 114mV

Transient Response 100uS

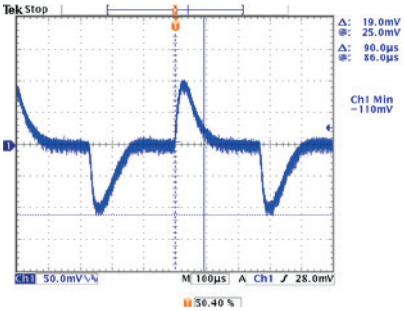


High Line, Full Load

Transient Peak 113mV

Transient Response 106uS

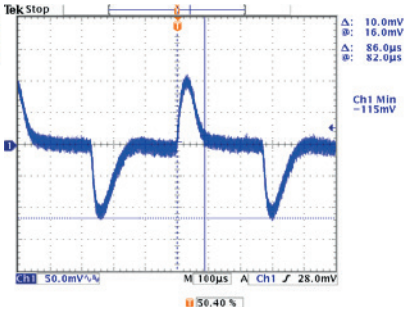
PME20-24S33W



Low Line, Full Load

Transient Peak 110mV

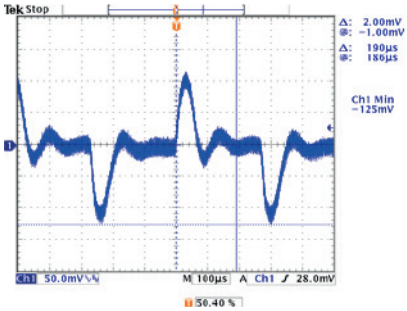
Transient Response 90Us



Normal Line, Full Load

Transient Peak 115mV

Transient Response 86uS

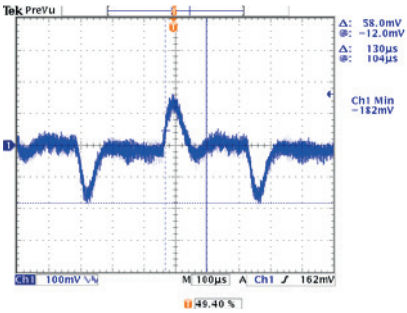


High Line, Full Load

Transient Peak 125mV

Transient Response 190uS

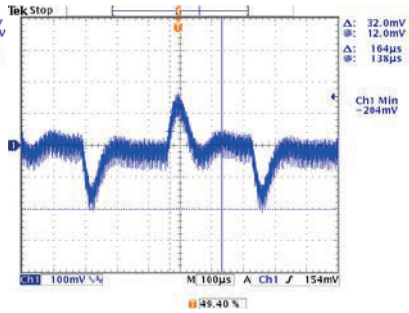
PME20-48S12W



Low Line, Full Load

Transient Peak 182mV

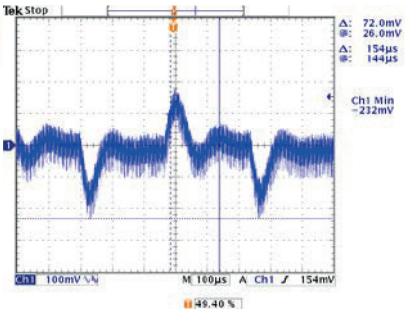
Transient Response 130uS



Normal Line, Full Load

Transient Peak 204mV

Transient Response 164uS



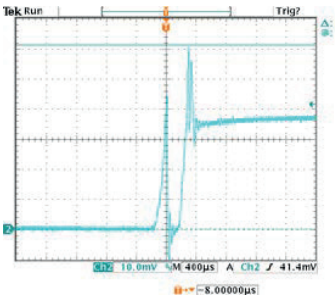
High Line, Full Load

Transient Peak 232mV

Transient Response 154uS

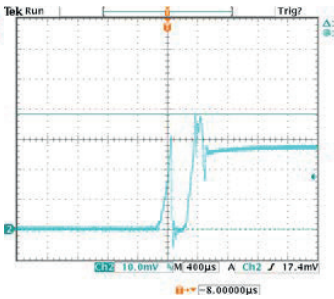
Inrush current

PME20-12S33



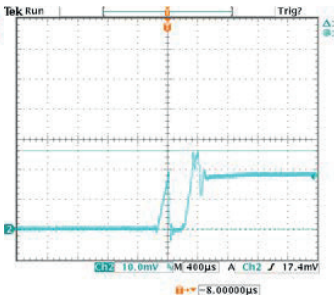
Low Line, Full Load

Inrush current=(61.2/10) X500mA=3060mA



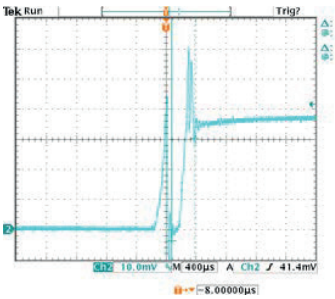
Normal Line, Full Load

Inrush current=(38.2/10) x500mA=1910mA



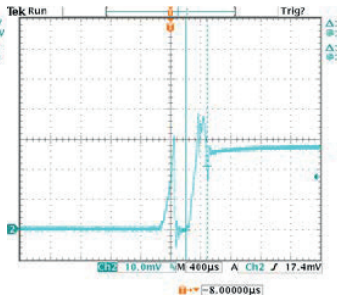
High Line, Full Load

Inrush current=(26.2/10) x500mA=1310mA



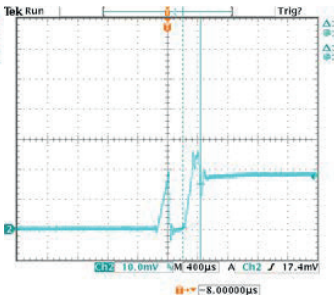
Low Line, Full Load

Duration: 304uS



Normal Line, Full Load

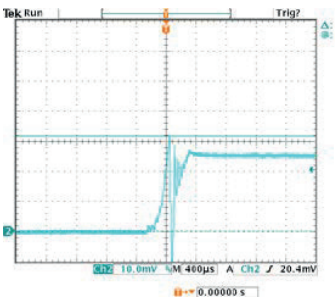
Duration: 288uS



High Line, Full Load

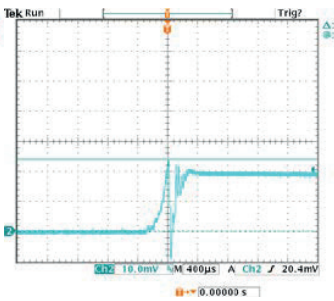
Duration: 240uS

PME20-24S05



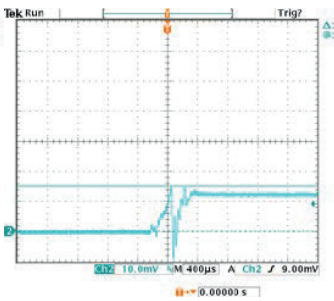
Low Line, Full Load

Inrush current=(31.6/10) X500mA=1580mA



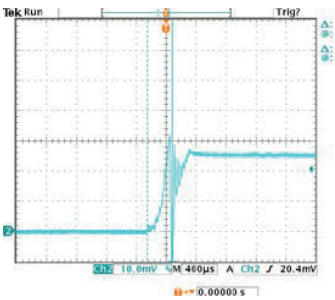
Normal Line, Full Load

Inrush current=(23.8/10) x500mA=1190mA



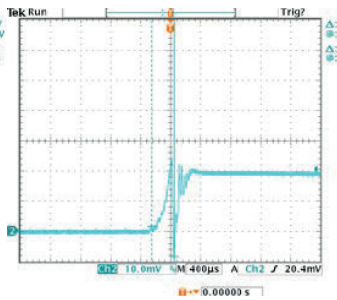
High Line, Full Load

Inrush current=(15.0/10) x500mA=750mA



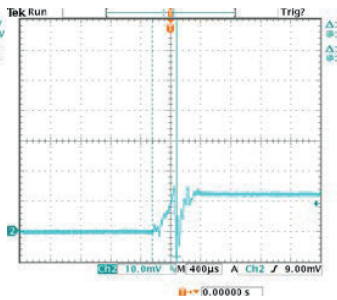
Low Line, Full Load

Duration: 336uS



Normal Line, Full Load

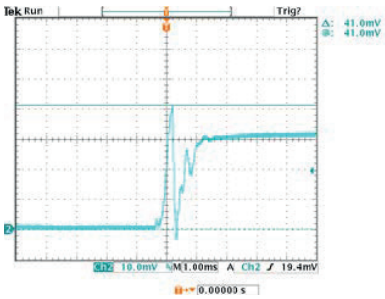
Duration: 304uS



High Line, Full Load

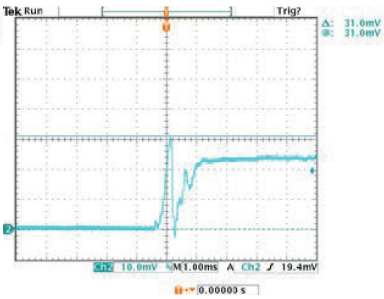
Duration: 328uS

PME20-48S15



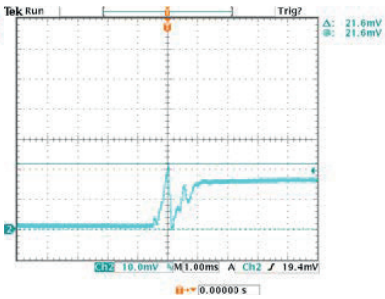
Low Line, Full Load

Inrush current=(41.0/10) X200mA=820mA



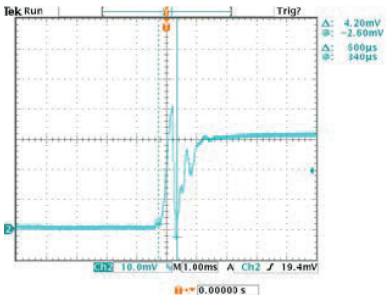
Normal Line, Full Load

Inrush current=(31.0/10) x200mA=620mA



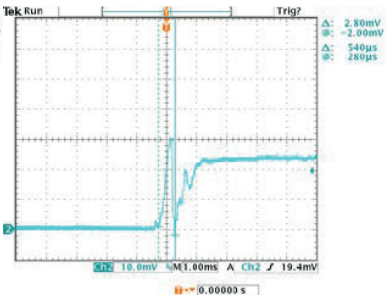
High Line, Full Load

Inrush current=(21.6/10) x200mA=432mA



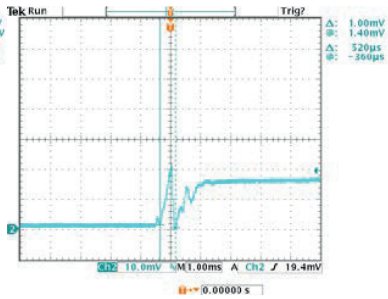
Low Line, Full Load

Duration: 600uS



Normal Line, Full Load

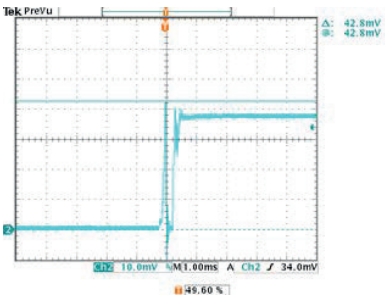
Duration: 540uS



High Line, Full Load

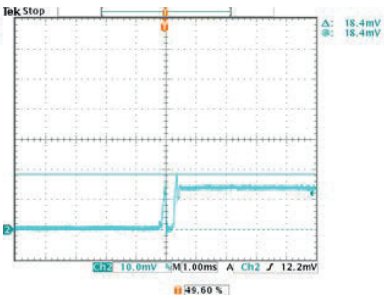
Duration: 520uS

PME20-24S33W



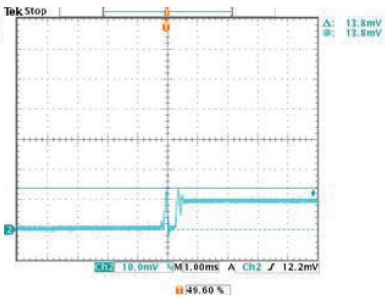
Low Line, Full Load

Inrush current=(42.8/10) X500mA=2140mA



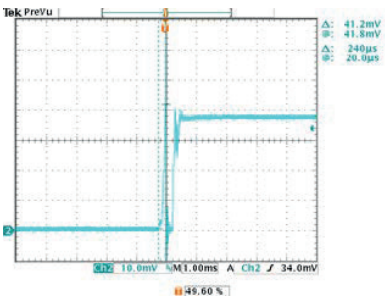
Normal Line, Full Load

Inrush current=(18.4/10) x500mA=920mA



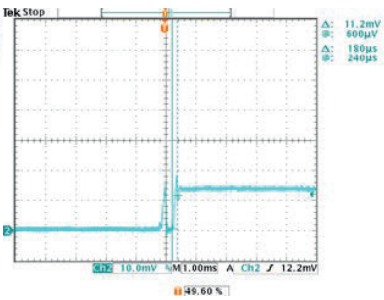
High Line, Full Load

Inrush current=(13.8/10) x500mA=690mA



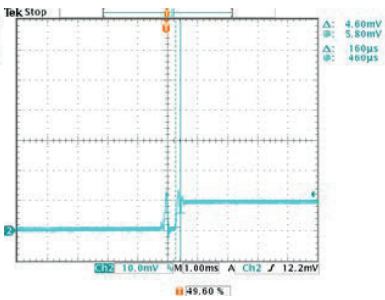
Low Line, Full Load

Duration: 240uS



Normal Line, Full Load

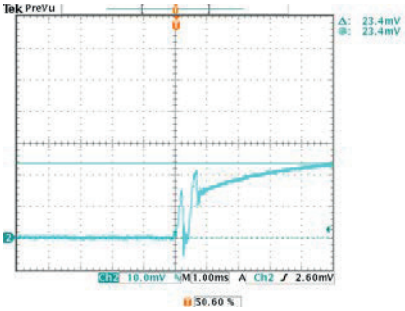
Duration: 180uS



High Line, Full Load

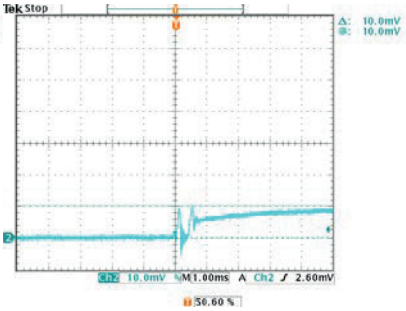
Duration: 160uS

PME20-48S12W



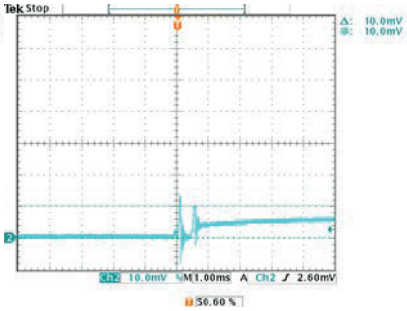
Low Line, Full Load

Inrush current=(23.4/10) X500mA=1170mA



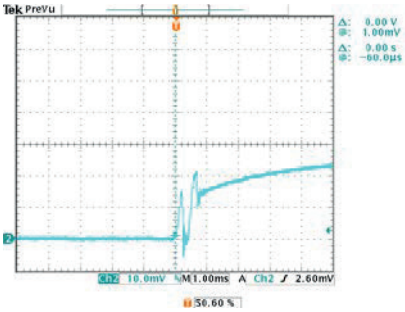
Normal Line, Full Load

Inrush current=(10/10) x500mA=500mA



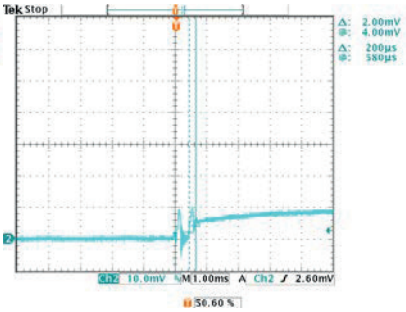
High Line, Full Load

Inrush current=(1010) x500mA=500mA



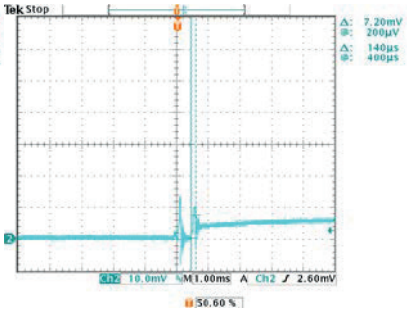
Low Line, Full Load

Duration: 0uS



Normal Line, Full Load

Duration: 200uS

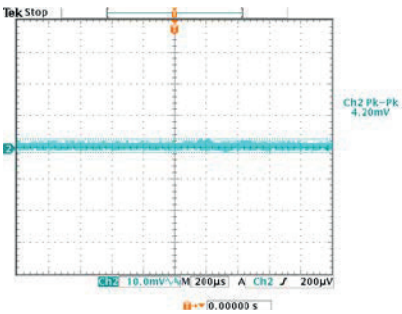


High Line, Full Load

Duration: 140uS

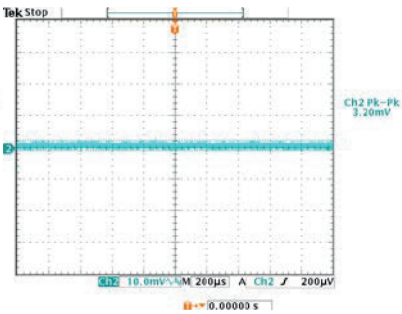
Input ripple current

PME20-12S33



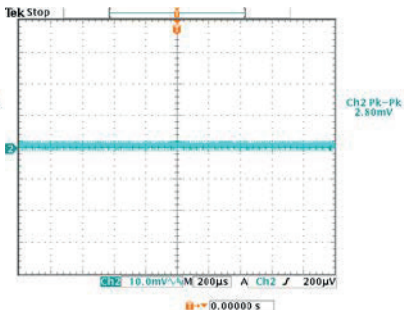
Low Line, Full Load

Ripple current=(4.2/10) x20=8.4mA



Normal Line, Full Load

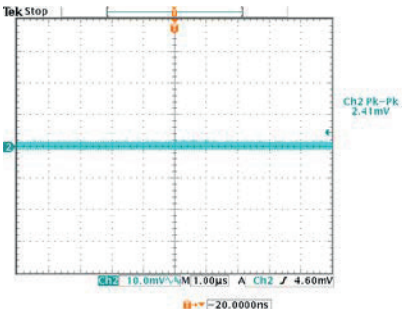
Ripple current=(3.2/10) x20=6.4mA



High Line, Full Load

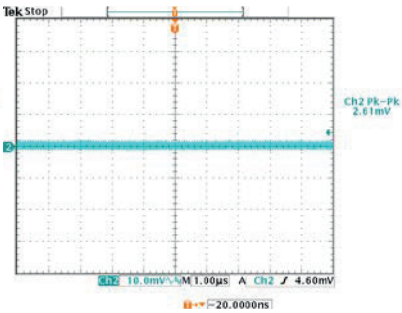
Ripple current=(2.8/10) x20=5.6mA

PME20-24S05



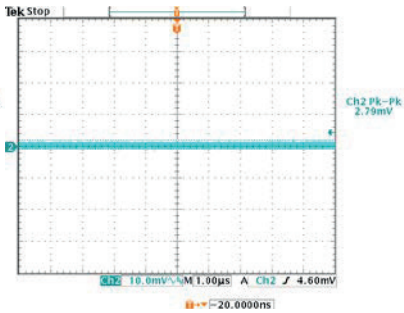
Low Line, Full Load

Ripple current=(2.41/10) x20=4.82mA



Normal Line, Full Load

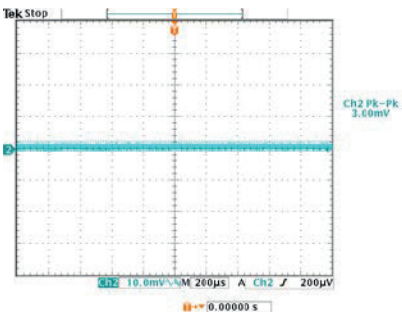
Ripple current=(2.61/10) x20=5.22mA



High Line, Full Load

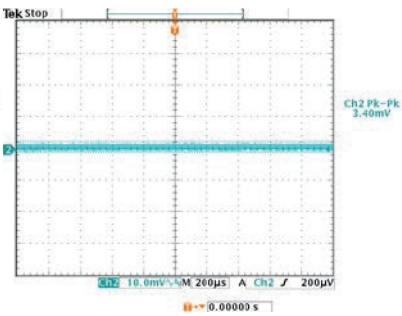
Ripple current=(2.79/10) x20=5.58mA

PME20-48S15



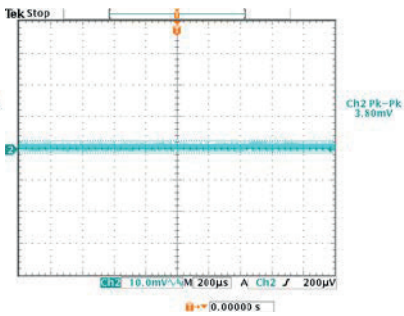
Low Line, Full Load

Ripple current=(3.0/10) x20=6mA



Normal Line, Full Load

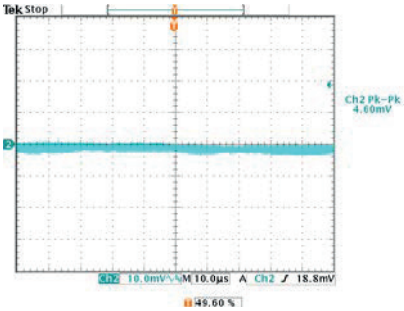
Ripple current=(3.4/10) x20=6.8mA



High Line, Full Load

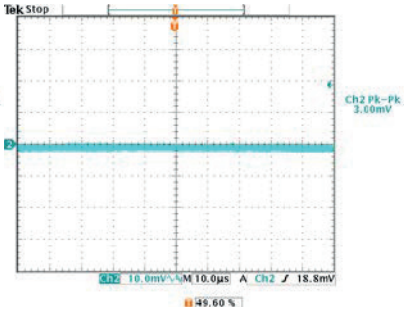
Ripple current=(3.8/10) x20=7.6mA

PME20-24S33W



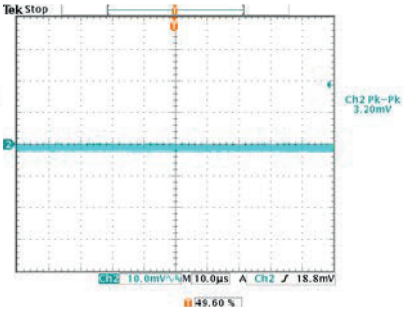
Low Line, Full Load

Ripple current=(4.6/10) x10=4.6mA



Normal Line, Full Load

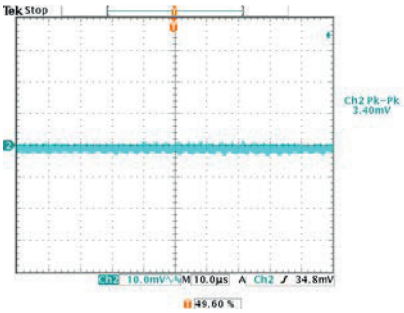
Ripple current=(3.0/10) x10=3.0mA



High Line, Full Load

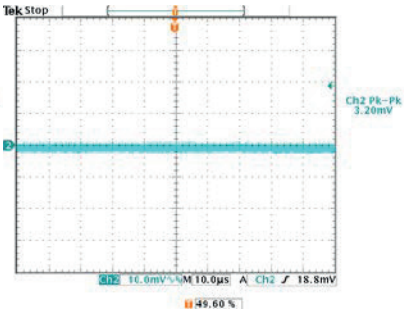
Ripple current=(3.2/10) x10=3.2mA

PME20-48S12W



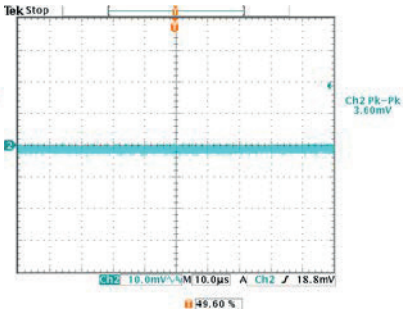
Low Line, Full Load

Ripple current=(3.4/10) x10=3.4mA



Normal Line, Full Load

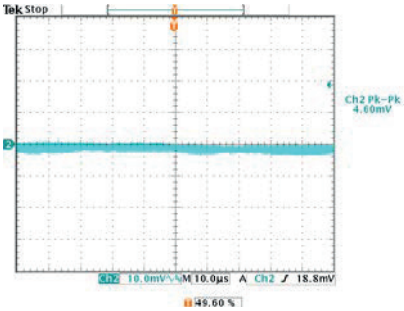
Ripple current=(3..2/10) x10=3.2mA



High Line, Full Load

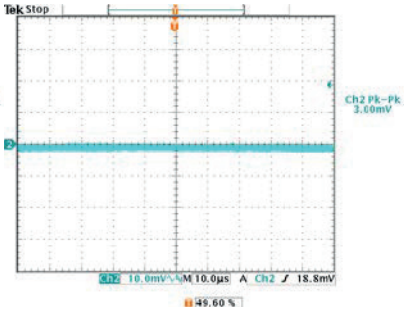
Ripple current=(3.6/10) x10=3.6mA

PME20-24S33W



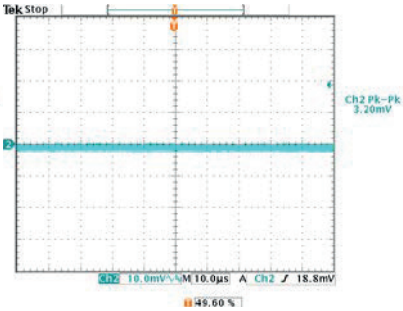
Low Line, Full Load

Ripple current=(4.6/10) x10=4.6mA



Normal Line, Full Load

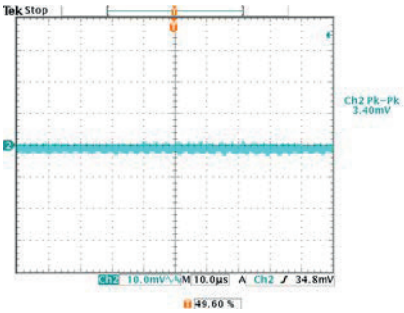
Ripple current=(3.0/10) x10=3.0mA



High Line, Full Load

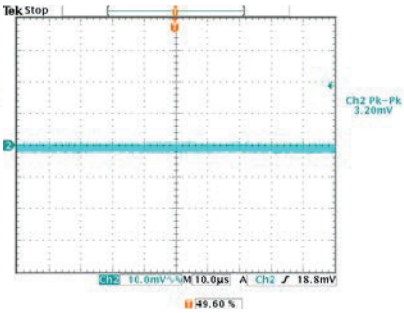
Ripple current=(3.2/10) x10=3.2mA

PME20-48S12W



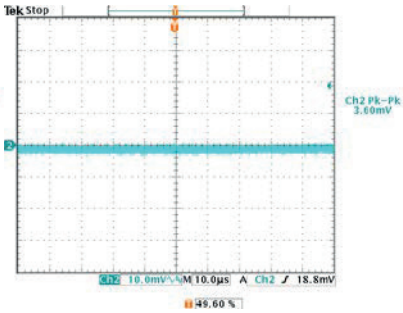
Low Line, Full Load

Ripple current=(3.4/10) x10=3.4mA



Normal Line, Full Load

Ripple current=(3..2/10) x10=3.2mA

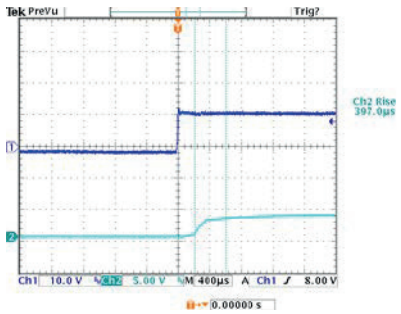


High Line, Full Load

Ripple current=(3.6/10) x10=3.6mA

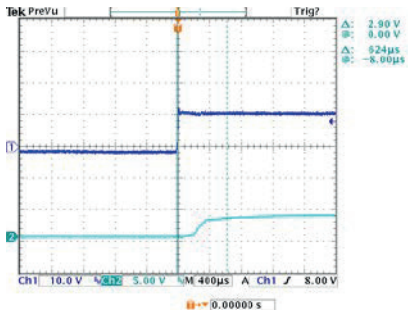
Delay time and rise time

PME20-12S33



Normal Line, Full Load

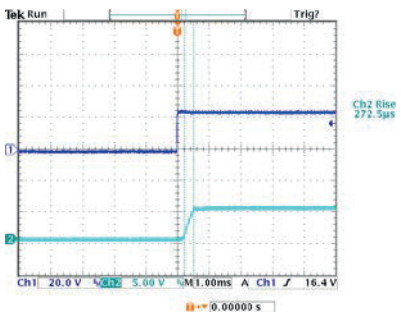
Rise Time=397.0uS



Normal Line, Full Load

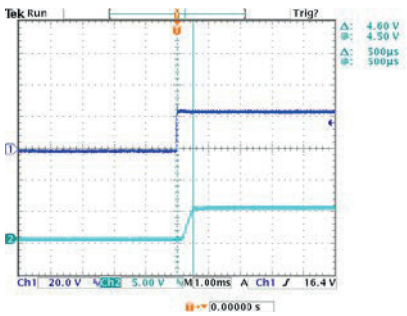
Delay Time= 624uS

PME20-24S05



Normal Line, Full Load

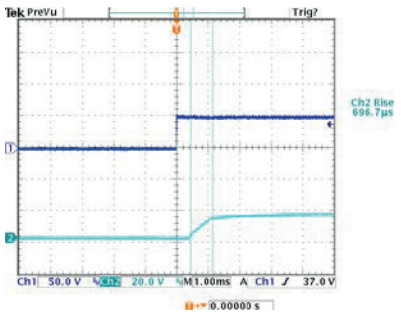
Rise Time=272.5uS



Normal Line, Full Load

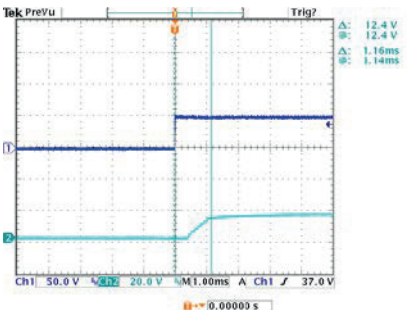
Delay Time= 500uS

PME20-48S15



Normal Line, Full Load

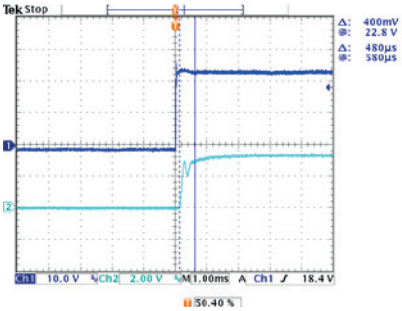
Rise Time=696.7uS



Normal Line, Full Load

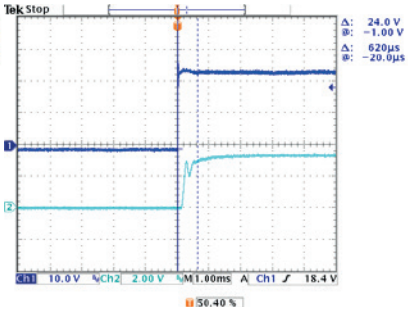
Delay Time=1.16mS

PME20-24S33W



Normal Line, Full Load

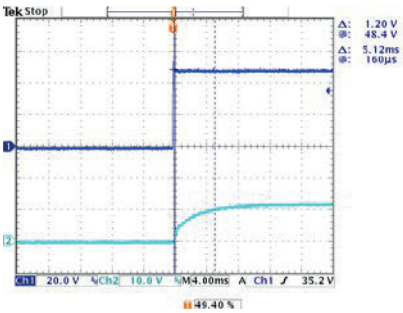
Rise Time=480uS



Normal Line, Full Load

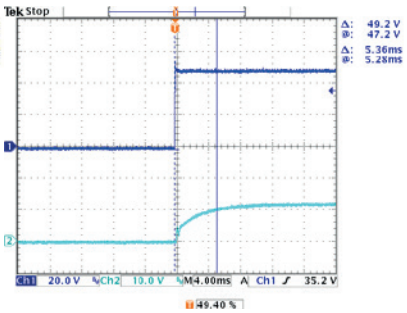
Delay Time=620uS

PME20-48S12W



Normal Line, Full Load

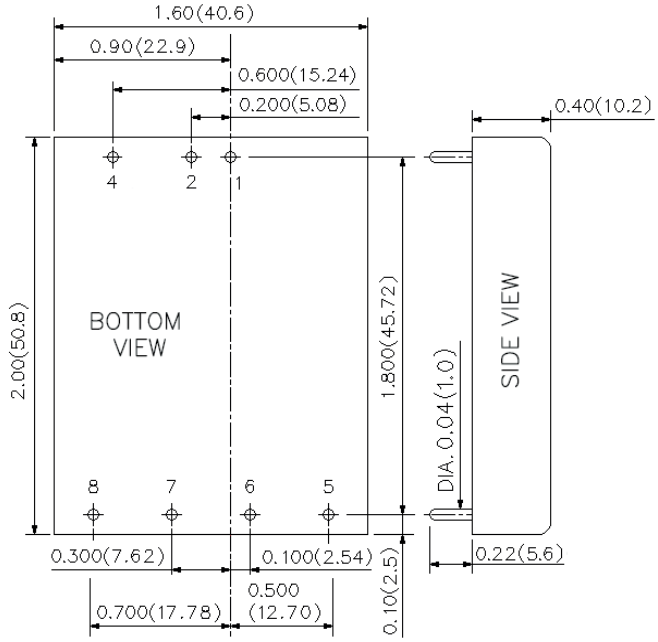
Rise Time=5.12mS



Normal Line, Full Load

Delay Time=5.36mS

Mechanical Drawing



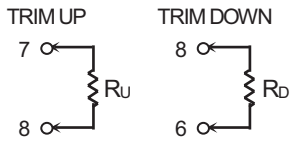
1. All dimensions in Inch (mm)
Tolerance: X.XX±0.02 (X.X±0.5)
X.XXX±0.01 (X.XX±0.25)
2. Pin pitch tolerance ±0.01(0.25)
3. Pin dimension tolerance ±0.004 (0.1

Pin Connection

Pin	Define
1	+INPUT
2	-INPUT
4	CTRL
5	NO PIN
6	+OUTPUT
7	-OUTPUT
8	TRIM

External Output Trimming

Output can be externally trimmed by using the method shown below:



Safety and Installation Instruction

Isolation consideration

The T20 series features 1600VDC isolation from input to output, input to case, and output to case. The input to output resistance is greater than 109 ohms. Nevertheless, if the system using the power module needs to receive safety agency approval, certain rules must be followed in the design of the system using the model. In particular, all of the creepage and clearance requirements of the end-use safety requirement must be observed. These documents include UL-60950-1, EN60950-1 and CSA 22.2-960, although specific applications may have other or additional requirements.

Fusing Consideration

Caution: This power module is not internally fused. An input line fuse must always be used. This encapsulated power module can be used in a wide variety of applications, ranging from simple stand-alone operation to an integrated part of a sophisticated power architecture. To maximum flexibility, internal fusing is not included, however, to achieve maximum safety and system protection, always use an input line fuse. The safety agencies require a slow-blow fuse with maximum rating of 6.3 A. Based on the information provided in this data sheet on inrush energy and maximum dc input current, the same type of fuse with lower rating can be used. Refer to the fuse manufacturer's data for further information.

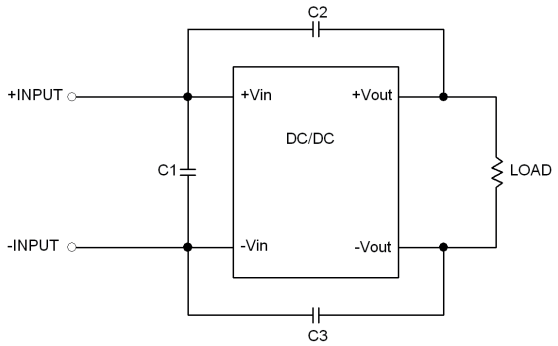
Minimum Load Requirement

10%(of full load) minimum load required. The 10% minimum load requirement is in order to meet all performance specifications. The T20 Series does not properly maintain regulation and operate with no load condition. The output voltage drops off about 10%.

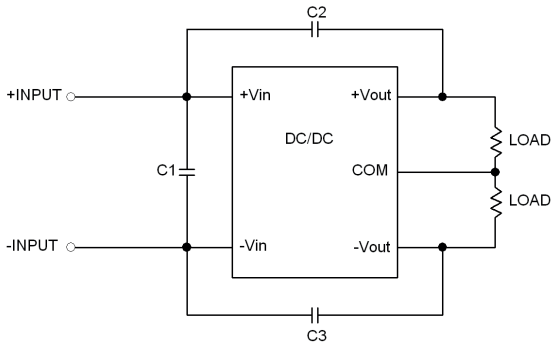
MTBF and Reliability

The MTBF of T20-S series of DC/DC converters has been calculated using MIL-HDBK-217F, Ta = 25°C, FULL LOAD. The resulting figure for MTBF is 1.922× 10^6 hours.

Recommended external EMI filter for EN55022 Class A



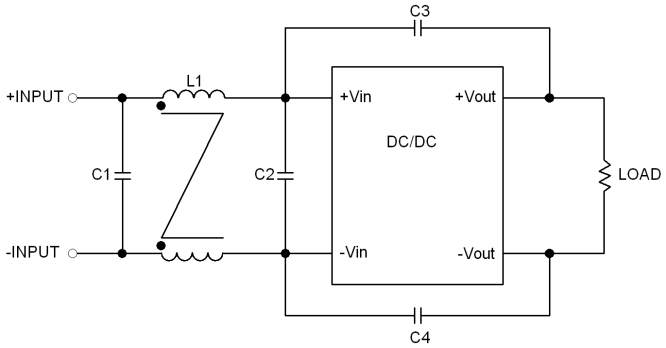
Single Output



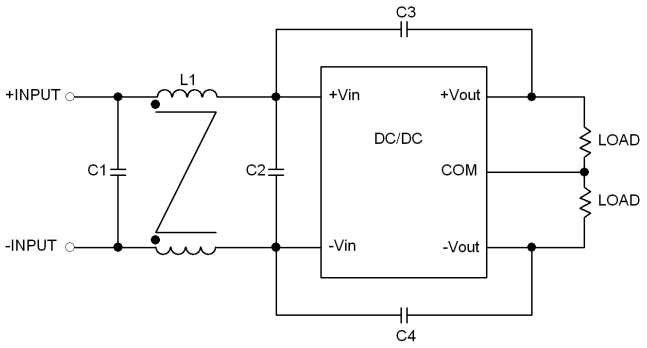
Dual Output

Model	C1	C2	C3
PME20-12□□□	6.8μF/50V	1000pF/2kV	1000pF/2kV
	1812 MLCC	1808 MLCC	1808 MLCC
PME20-24□□□	N/A	1000pF/2kV	1000pF/2kV
		1808 MLCC	1808 MLCC
PME20-48□□□	2.2μF/100V	1000pF/2kV	1000pF/2kV
	1812 MLCC	1808 MLCC	1808 MLCC

Recommended external EMI filter for EN55022 Class B



Single Output



Dual Output

Model	C1	C2	C3, C4	L1
PME20-12□□□	4.7μF/50V	N/A	1000pF/2kV	450μH
	1812 MLCC		1808 MLCC	Common Shoke PMT-048
PME20-24□□□	4.7μF/50V	N/A	1000pF/2kV	450μH
	1812 MLCC		1808 MLCC	Common Shoke PMT-048
PME20-48□□□	2.2μF/100V	2.2μF/100V	1000pF/2kV	450μH
	1812 MLCC	1812 MLCC	1808 MLCC	Common Shoke PMT-048