TEN 25WI Series

25-30W, Ultra-Wide Input Range, Single & Dual Output DC/DC Converters

Features

- Efficiency up to 89%
- 1500VDC Isolation
- MTBF > 450,000 Hours
- Complies with EN55022 Class A
- Six-Sided Shielding
- Remote On/Off Control
- Over Voltage Protection
- Over Temperature Protection
- Output Trim
- Soft Start
- UL60950-1 Safety Approval
- 3 Years Product Warranty

Applications

- Distributed power architectures
- Workstations
- Computer equipment
- Communications equipment

General Description

TRACO's TEN-25WI-Series power modules are low-profile dc-dc converters that operate over input voltage ranges of 10-40VDC and 18-75VDC which provide precisely regulated output voltages of 3.3V, 5V, 12V, 15V, ±12V and ±15VDC, specially addressing data communication equipments, mobile battery driven equipments, distributed power systems, telecommunication equipments, mixed analog/digital subsystems, process/machine control equipments, computer peripheral systems and industrial robot systems.

Packing up to 30W of power into a 2x1.6x0.37inch package, with efficiencies as high as 89%, the TEN 25WI includes continuous short circuit protection, overvoltage protection, over temperature protection, output trim function, remote on/off, six-sided shielded case and EN55022 Class A conducted noise compliance minimize design-in time, cost and eliminate the need for external filtering.

Table of contents

Absolute Maximum Rating..... P2
Output Specification..... P2
Input Specification..... P3
General Specification..... P4
Characteristic Curves..... P5
Testing Configurations..... P29
EMC Considerations..... P30
Input Source Impedance..... P32
Output Over Current Protection..... P32
Output Over Voltage Protection..... P32
Remote ON/OFF Control..... P33
Heat Sink Consideration..... P34
Mechanical Data..... P35
Recommended Pad Layout Single & Dual P35
Packaging Information..... P36
Soldering and Reflow Consideration..... P36
Part Number Structure..... P37
Safety and Installation Instruction..... P38
MTBF and Reliability..... P38

Absolute Maximum Rating				
Parameter	**Model**	**Min**	**Max**	**Unit**
Input Voltage Input Surge Voltage (1 sec.)	 24VDC Input Models 48VDC Input Models	 -0.7 -0.7	 50 100	VDC
Operating Ambient Temperature Without Derating With Derating	 All	 -40 -40	 +50 +85	℃
Operating Case Temperature	All		+105	℃
Storage Temperature	All	-50	+125	℃

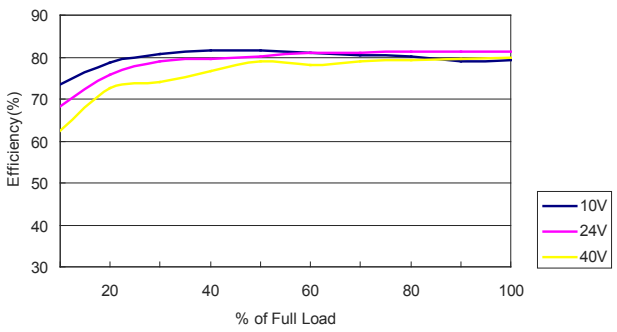
Output Specification					
Parameter	**Model**	**Min**	**Nominal**	**Max**	**Unit**
Output Voltage (V_{in}=$V_{in\ nom}$; Full Load; T_A=25℃)	TEN 25-xx10WI TEN 25-xx11WI TEN 25-xx12WI TEN 25-xx13WI TEN 25-xx22WI TEN 25-xx23WI	3.267 4.95 11.88 14.85 ±11.88 ±14.85	3.3 5 12 15 ±12 ±15	3.333 5.05 12.12 15.15 ±12.12 ±15.15	VDC
Output Regulation Line ($V_{in\ min}$ to $V_{in\ max}$ at Full Load)	All		±0.2	±0.5	%
Output Regulation Load (50% to 100% of Full Load)			±0.3	±1.0	%
Output Ripple & Noise Peak-to-Peak (5Hz to 20MHz bandwidth)			55	80	mV pk-pk
Temperature Coefficient			±0.01	±0.02	%/℃
Dynamic Load Response (V_{in} = $V_{in\ nom}$; TA=25℃ Load step change form 25% Load Step Change Peak Deviation Setting Time	All		 ±2%Vo 150	 ±4%Vo 300	 mV μS
Output Current	TEN 25-xx10WI TEN 25-xx11WI TEN 25-xx12WI TEN 25-xx13WI TEN 25-xx22WI TEN 25-xx23WI	400 350 166 133 ±83 ±65		5500 5000 2500 2000 ±1250 ±1000	mA
Output Over Current Protection	All	120		180	%FL
Output Short Circuit Protection	All	Continuous			

Input Specification					
Parameter	**Model**	**Min**	**Nominal**	**Max**	**Unit**
Operating Input Voltage	24V Input Models 48V Input Models	10 18	24 48	40 75	VDC
Under Voltage Lockout Turn-on Threshold	24V Input Models 48V Input Models	9.4 17	9.7 17.5	10 18	VDC
Under Voltage Lockout Turn-off Threshold	24V Input Models 48V Input Models	9 16	9.3 16.5	9.5 17	VDC
Input reflected ripple current (0 to 500KHz, 4.7µH source impedance)	24V Input Models 48V Input Models		50 25		mA pk-pk
Input Current (Maximum value at V_{in}= $V_{in\ nom}$;Full Load)	TEN 25-2410WI TEN 25-2411WI TEN 25-2412WI TEN 25-2413WI TEN 25-2422WI TEN 25-2423WI		922 1225 1404 1404 1404 1404		mA
	TEN 25-4810WI TEN 25-4811WI TEN 25-4812WI TEN 25-4813WI TEN 25-4822WI TEN 25-4823WI		461 613 702 702 702 702		
Input Standby Current (Typical value at V_{in} = $V_{in\ nom}$; No Load)	TEN 25-2410WI TEN 25-2411WI TEN 25-2412WI TEN 25-2413WI TEN 25-2422WI TEN 25-2423WI		20		mA
	TEN 25-4810WI TEN 25-4811WI TEN 25-4812WI TEN 25-4813WI TEN 25-4822WI TEN 25-4823WI		10		
Remote ON/OFF Control (The On/Off pin voltage is referenced to-V_{in}) Positive logic On/Off pin High Voltage (Remote ON) On/Off pin Low Voltage (Remote OFF) Remote Off Stand by Input Current Control Pin Input Current (Remote ON) Control Pin Input Current (Remote OFF)	All	 2.5 -1 	 2 	 100 1 5 5 -100	 VDC VDC mA uA uA
Output Voltage Trim (% of nominal output voltage)	All	±9	±10	±11	%

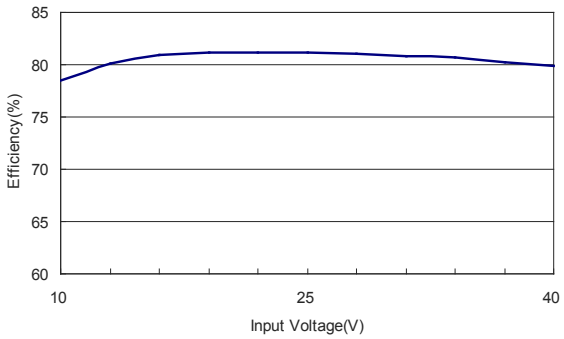
General Specification					
Parameter	**Model**	**Min**	**Nominal**	**Max**	**Unit**
Efficiency (V_{in} =$V_{in\ nom}$; Full Load; T_A =25°C)	TEN 25-2410WI		82		%
	TEN 25-2411WI		85		
	TEN 25-2412WI		89		
	TEN 25-2413WI		89		
	TEN 25-2422WI		89		
	TEN 25-2423WI		89		
	TEN 25-4810WI		82		
	TEN 25-4811WI		85		
	TEN 25-4812WI		89		
	TEN 25-4813WI		89		
	TEN 25-4822WI		89		
	TEN 25-4823WI		89		
Isolation Voltage Input to Output (for 60 seconds)		1500			VDC
Isolation Resistance	All	1000			MΩ
Isolation Capacitance			1200	1500	pF
Switching Frequency		290	330	360	KHz
MTBF MIL-STD-217F, TC=25°C		450,000			Hours

Characteristic Curves

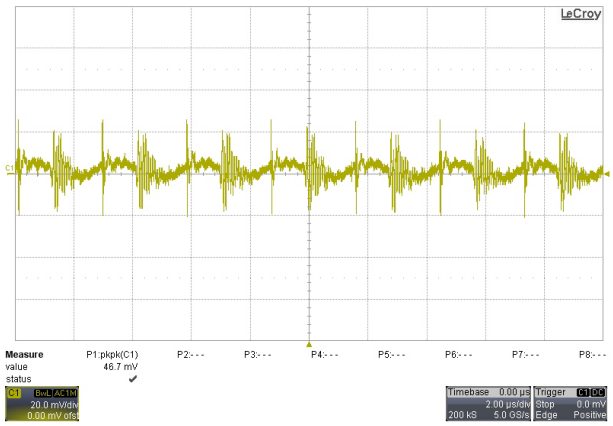
All test conditions are at 25°C The figures are identical for TEN 25-2410WI



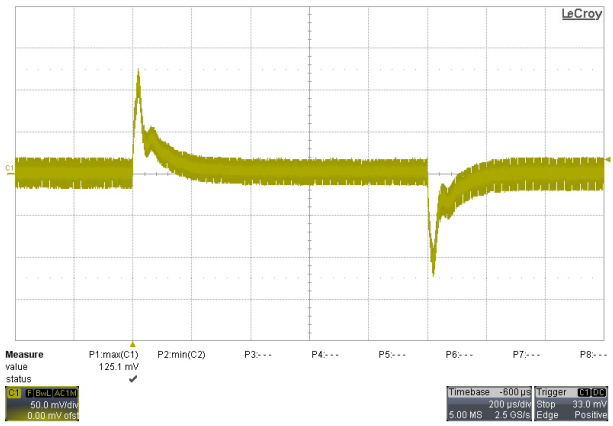
Efficiency Versus Output Current



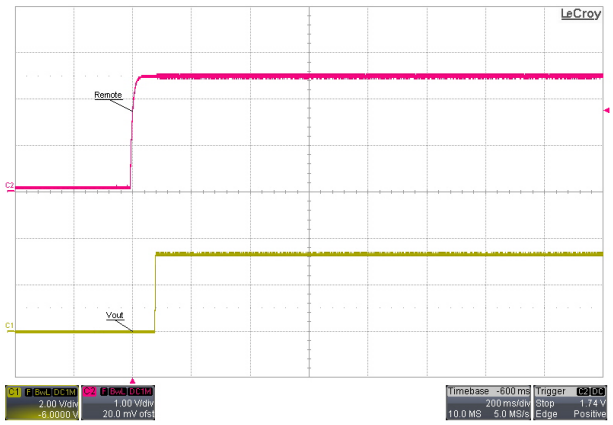
Efficiency Versus Input Voltage
Full Load



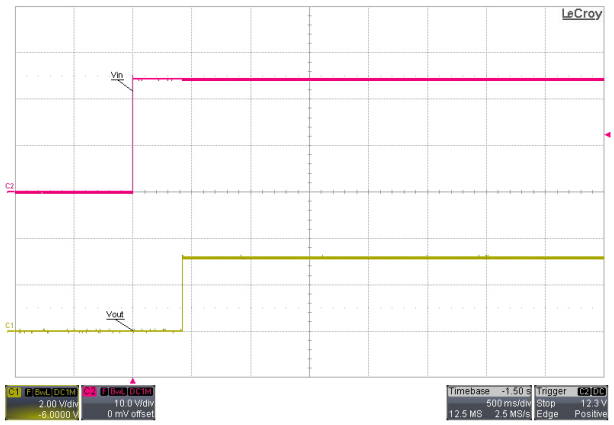
Typical Output Ripple and Noise.
V_{in} =$V_{in\ nom}$; Full Load; T_A



Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; V_{in} =$V_{in\ nom}$



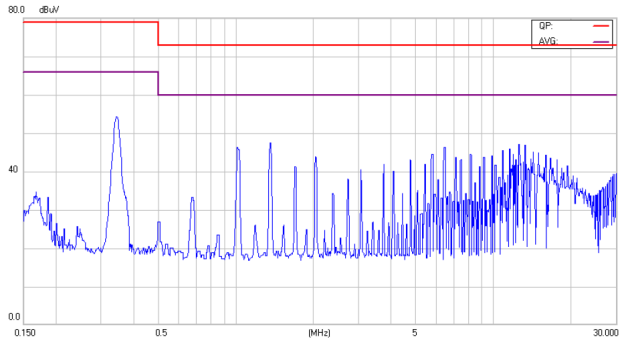
ON/OFF Voltage Start-Up and Output Rise Characteristic
V_{in} =$V_{in\ nom}$; Full Load



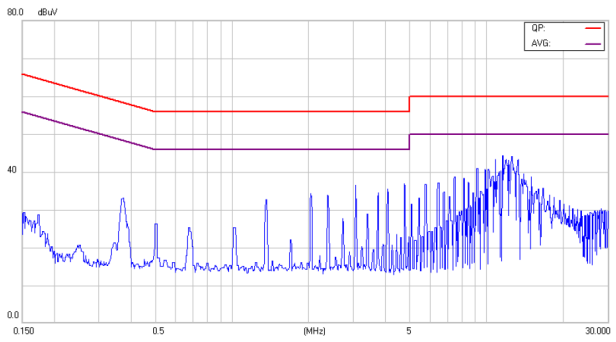
Typical Input Start-Up and Output Rise Characteristic
V_{in} =$V_{in\ nom}$; Full Load

Characteristic Curves

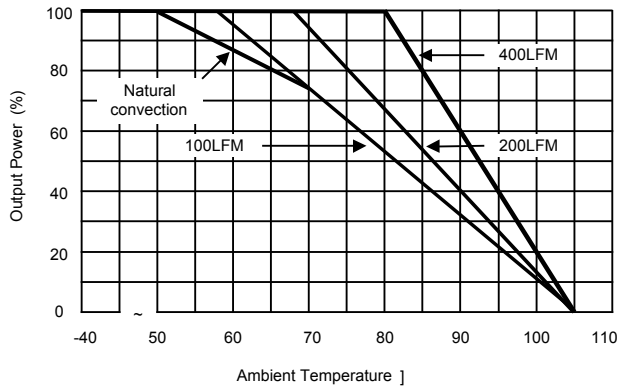
All test conditions are at 25°C The figures are identical for TEN 25-2410WI(Continued)



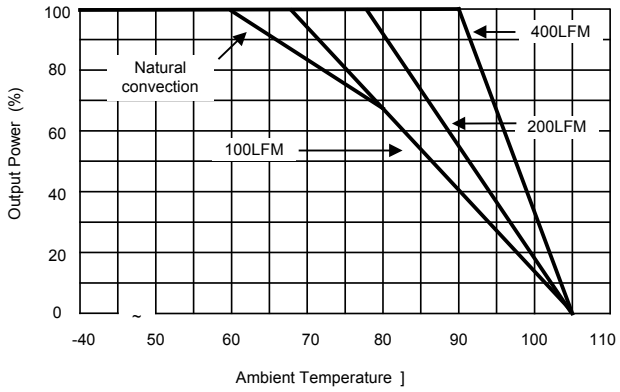
Conduction Emission of EN55022 Class A
V_{in} =$V_{in\ nom}$; Full Load



Conduction Emission of EN55022 Class B
V_{in} =$V_{in\ nom}$; Full Load



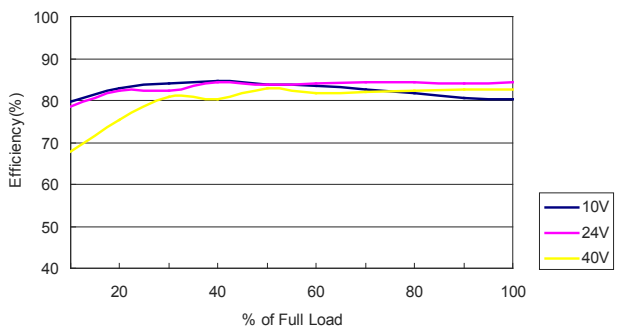
Derating Output Current Versus Ambient Temperature and Airflow
V_{in} =$V_{in\ nom}$ (without heatsink)



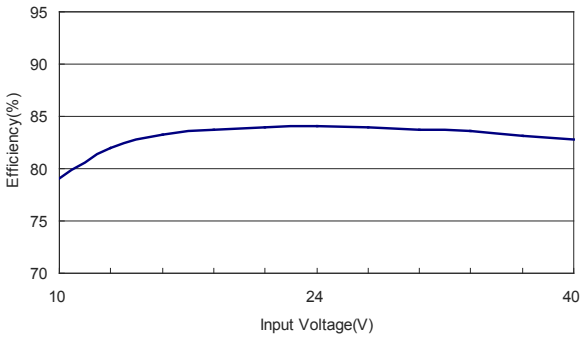
Derating Output Current Versus Ambient Temperature and Airflow
V_{in} =$V_{in\ nom}$ (with heatsink)

Characteristic Curves

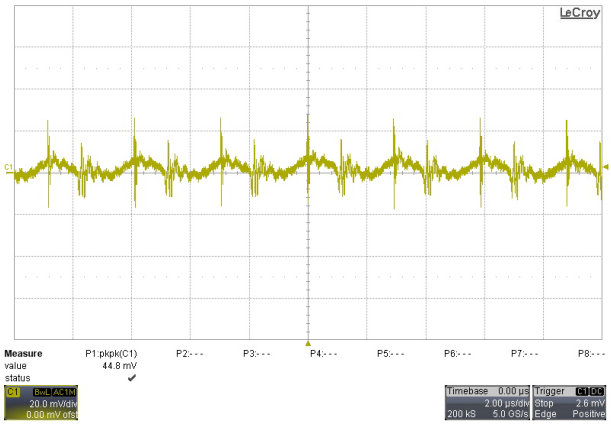
All test conditions are at 25°C The figures are identical for TEN 25-2411WI



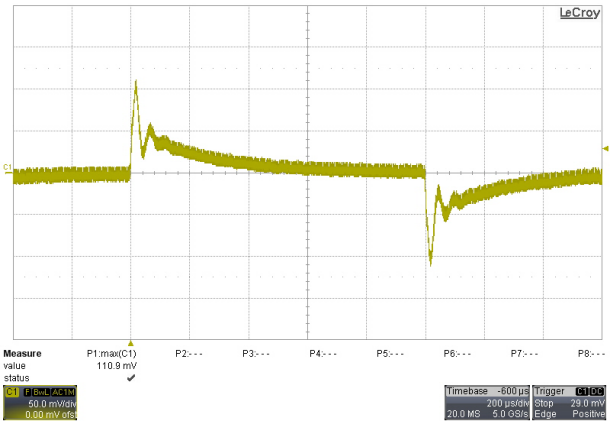
Efficiency Versus Output Current



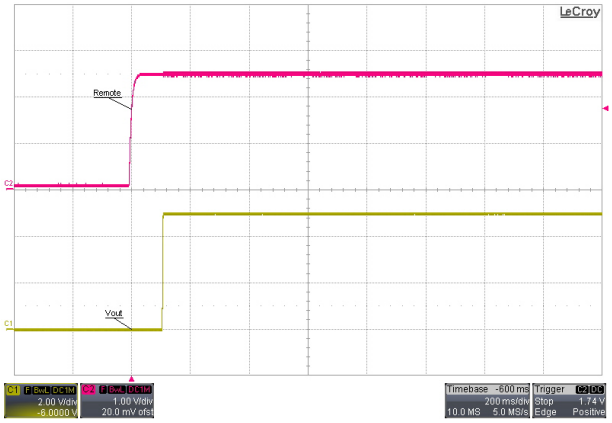
Efficiency Versus Input Voltage
Full Load



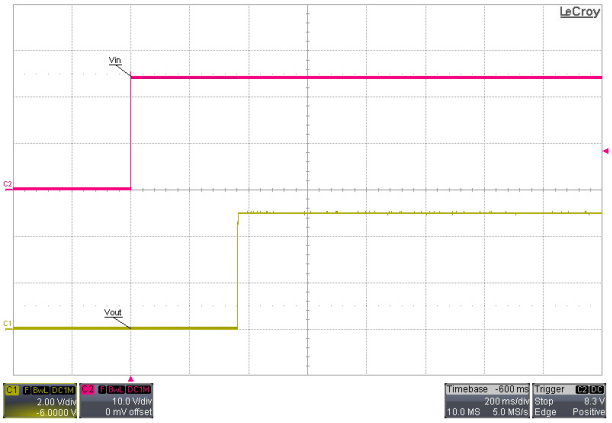
Typical Output Ripple and Noise.
V_{in} =$V_{in\ nom}$; Full Load;



Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; V_{in} =$V_{in\ nom}$



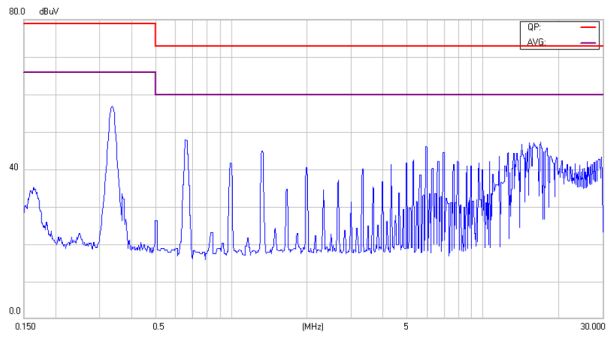
ON/OFF Voltage Start-Up and Output Rise Characteristic
V_{in} =$V_{in\ nom}$; Full Load



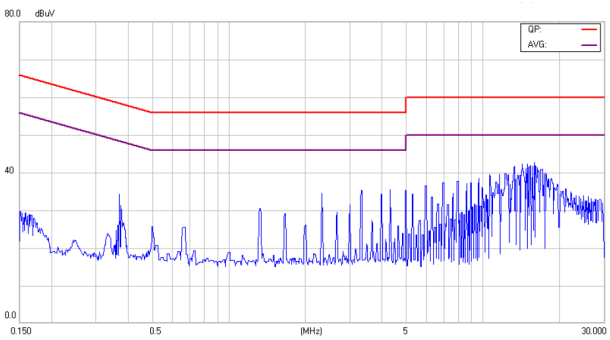
Typical Input Start-Up and Output Rise Characteristic
V_{in} =$V_{in\ nom}$; Full Load

Characteristic Curves

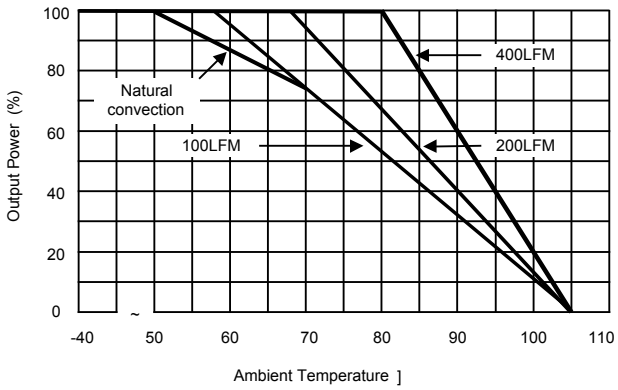
All test conditions are at 25°C The figures are identical for TEN 25-2411WI(Continued)



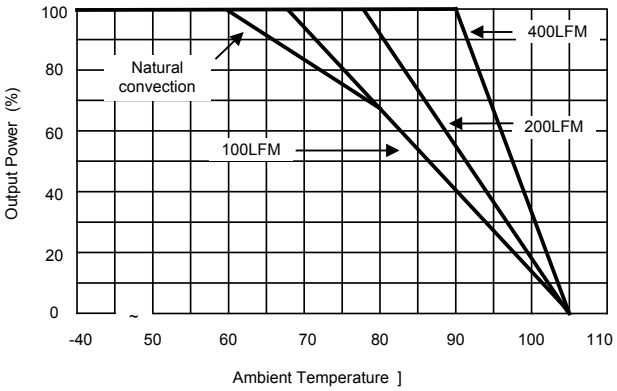
Conduction Emission of EN55022 Class A
V_{in} =$V_{in\ nom}$; Full Load



Conduction Emission of EN55022 Class B
V_{in} =$V_{in\ nom}$; Full Load



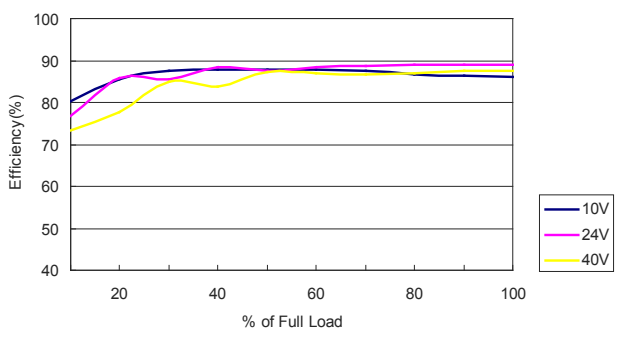
Derating Output Current Versus Ambient Temperature and Airflow
V_{in} =$V_{in\ nom}$ (without heatsink)



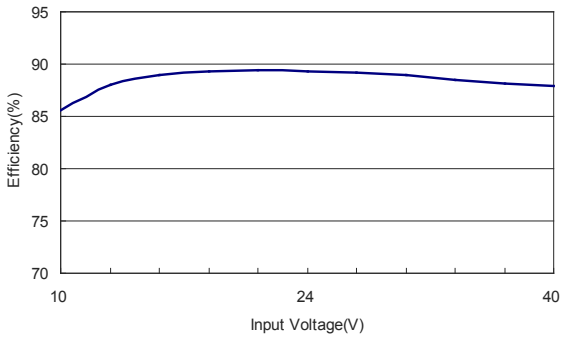
Derating Output Current Versus Ambient Temperature and Airflow
V_{in} =$V_{in\ nom}$ (with heatsink)

Characteristic Curves

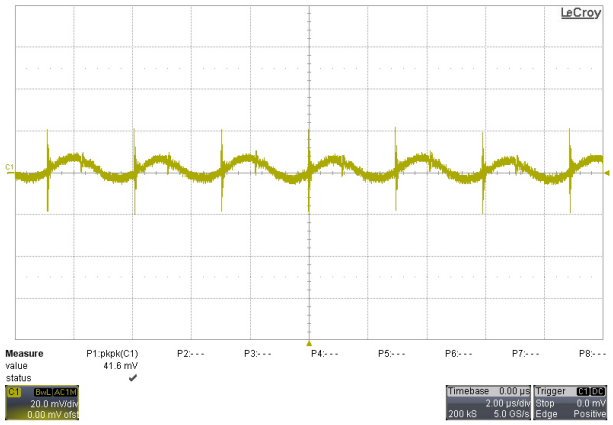
All test conditions are at 25°C The figures are identical for TEN 25-2412WI



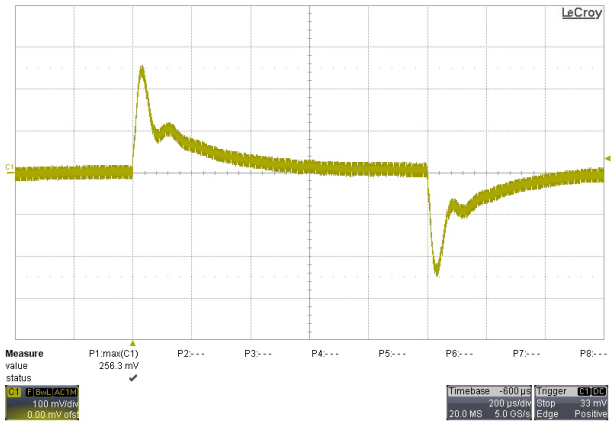
Efficiency Versus Output Current



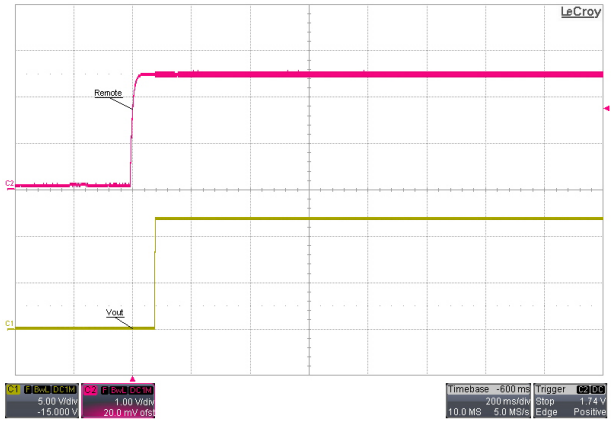
Efficiency Versus Input Voltage
Full Load



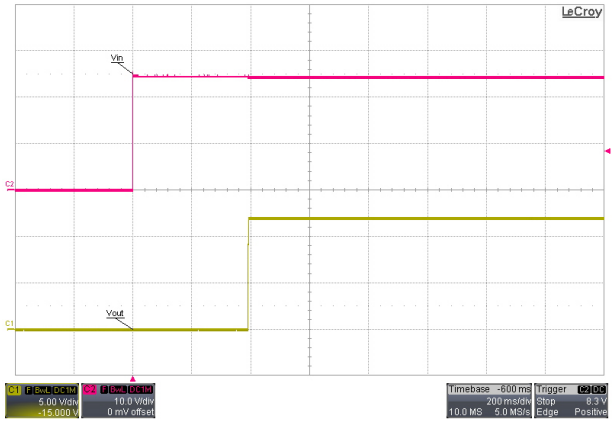
Typical Output Ripple and Noise.
V_{in} =$V_{in\ nom}$; Full Load; T_A



Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; V_{in} =$V_{in\ nom}$



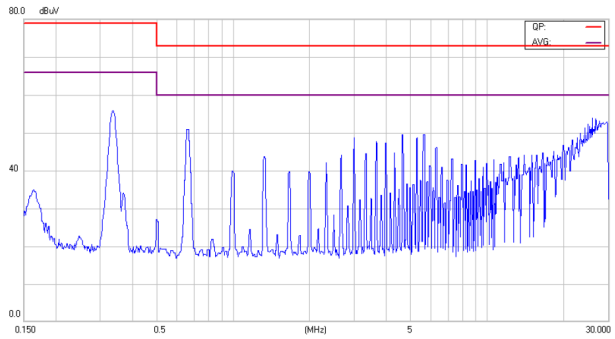
ON/OFF Voltage Start-Up and Output Rise Characteristic
V_{in} =$V_{in\ nom}$; Full Load



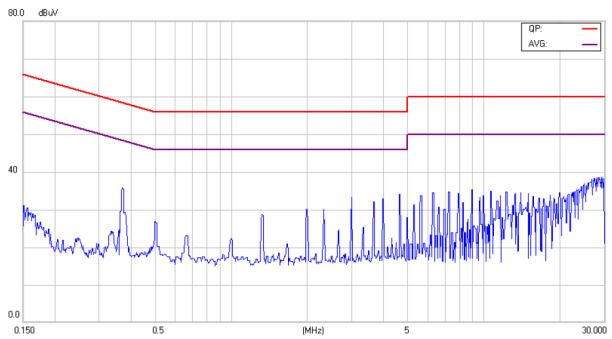
Typical Input Start-Up and Output Rise Characteristic
V_{in} =$V_{in\ nom}$; Full Load

Characteristic Curves

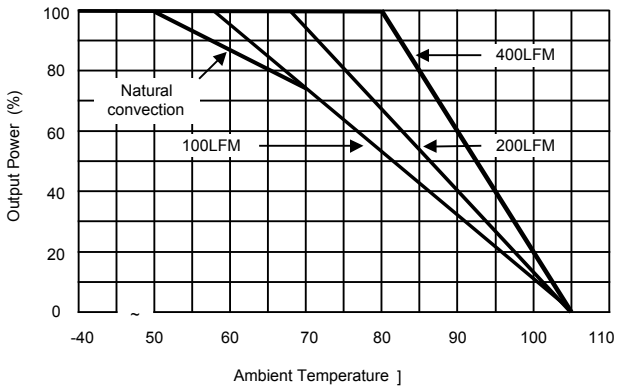
All test conditions are at 25°C The figures are identical for TEN 25-2412WI(Continued)



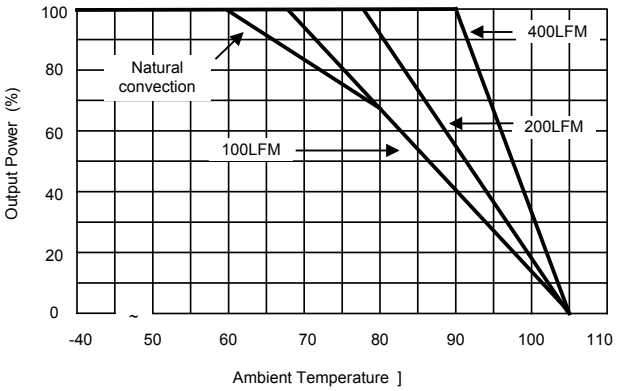
Conduction Emission of EN55022 Class A
V_{in} =$V_{in\ nom}$; Full Load



Conduction Emission of EN55022 Class B
V_{in} =$V_{in\ nom}$; Full Load



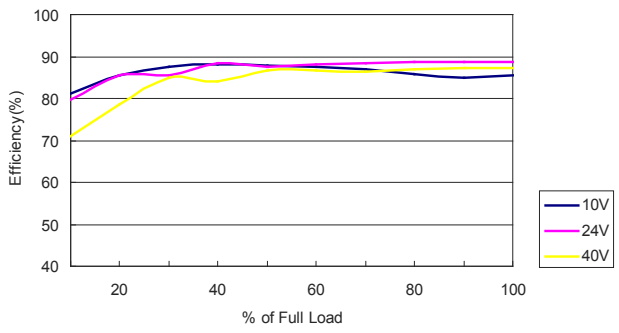
Derating Output Current Versus Ambient Temperature and Airflow
V_{in} =$V_{in\ nom}$ (without heatsink)



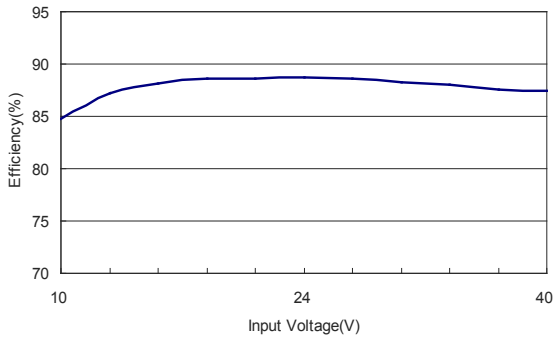
Derating Output Current Versus Ambient Temperature and Airflow
V_{in} =$V_{in\ nom}$ (with heatsink)

Characteristic Curves

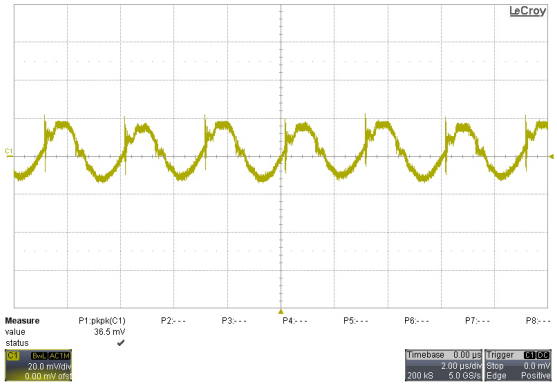
All test conditions are at 25°C The figures are identical for TEN 25-2413WI



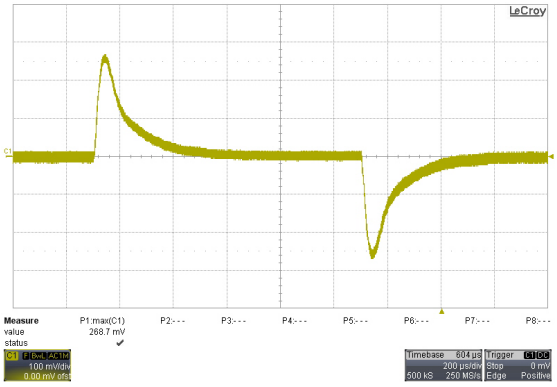
Efficiency Versus Output Current



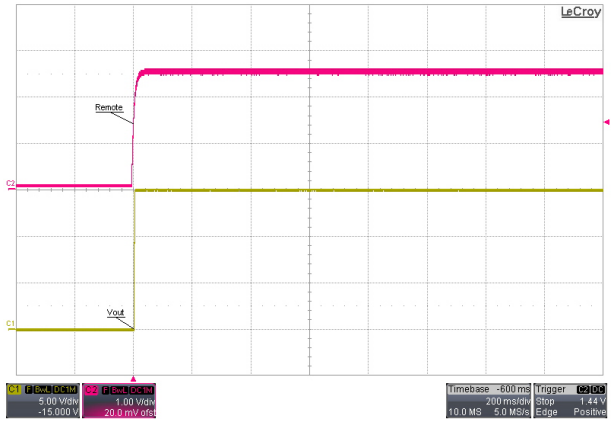
Efficiency Versus Input Voltage
Full Load



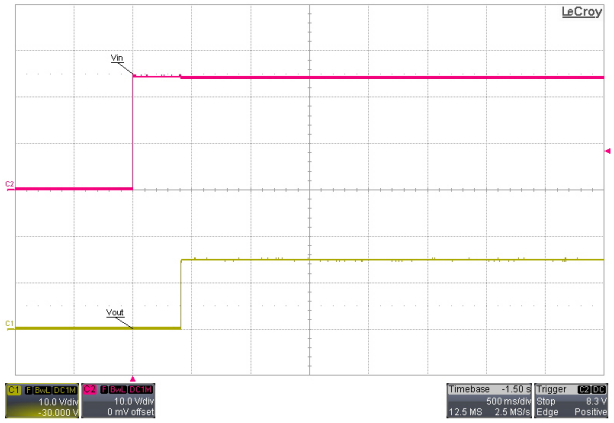
Typical Output Ripple and Noise.
V_{in} =$V_{in\ nom}$; Full Load; T_A



Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; V_{in} =$V_{in\ nom}$



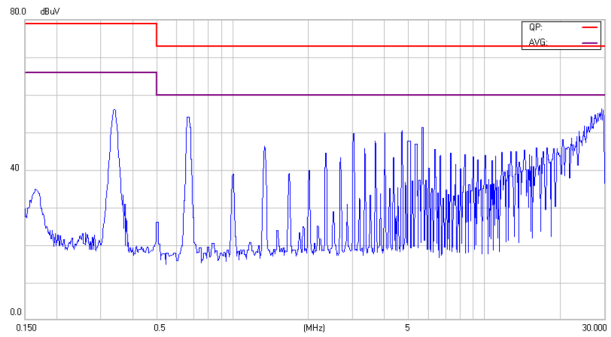
ON/OFF Voltage Start-Up and Output Rise Characteristic
V_{in} =$V_{in\ nom}$; Full Load



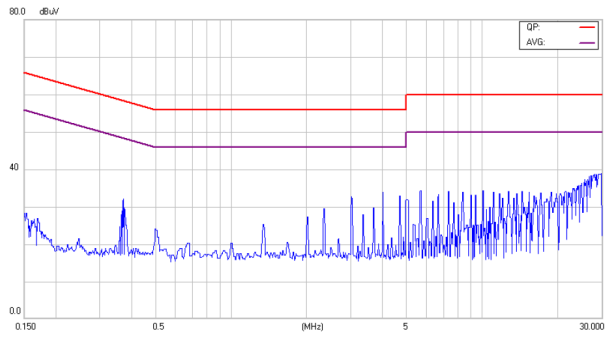
Typical Input Start-Up and Output Rise Characteristic
V_{in} =$V_{in\ nom}$; Full Load

Characteristic Curves

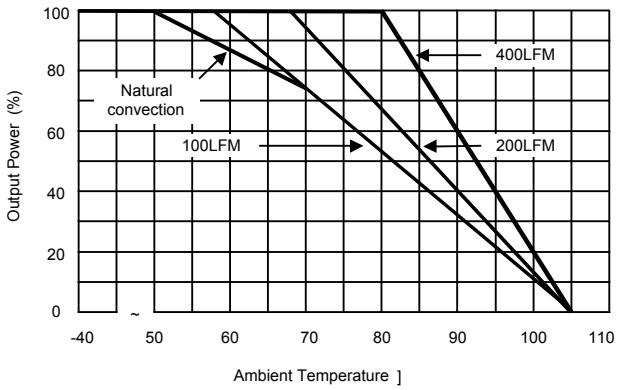
All test conditions are at 25°C The figures are identical for TEN 25-2413WI(Continued)



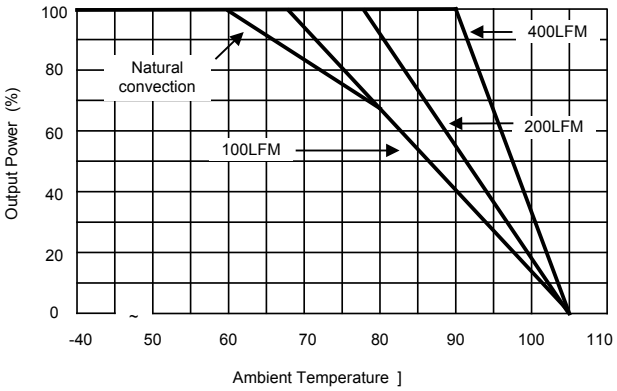
Conduction Emission of EN55022 Class A
V_{in} =$V_{in\ nom}$; Full Load



Conduction Emission of EN55022 Class B
V_{in} =$V_{in\ nom}$; Full Load



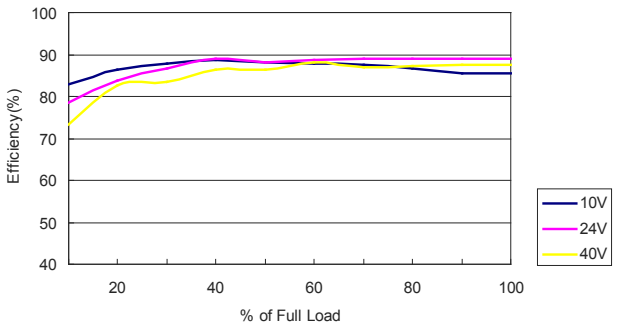
Derating Output Current Versus Ambient Temperature and Airflow
V_{in} =$V_{in\ nom}$ (without heatsink)



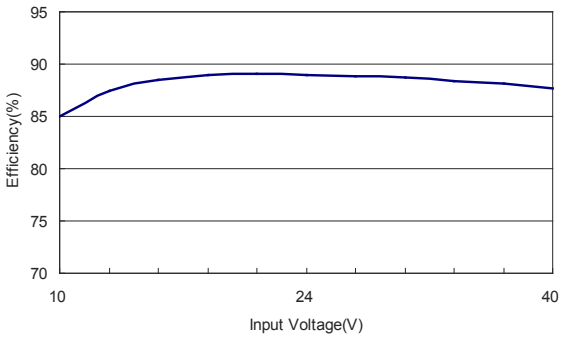
Derating Output Current Versus Ambient Temperature and Airflow
V_{in} =$V_{in\ nom}$ (with heatsink)

Characteristic Curves

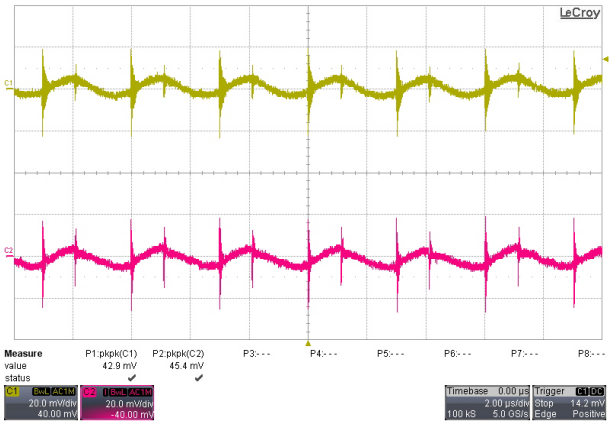
All test conditions are at 25°C The figures are identical for TEN 25-2422WI



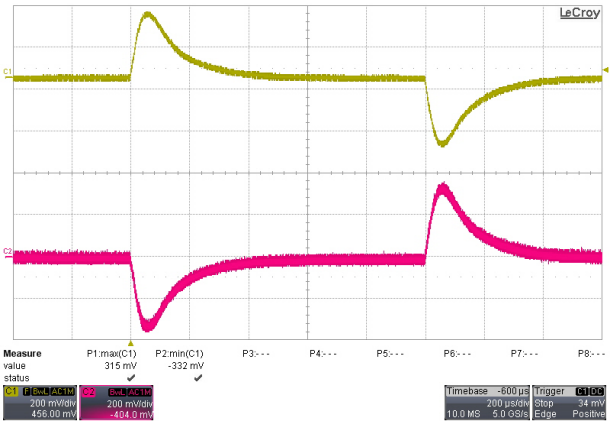
Efficiency Versus Output Current



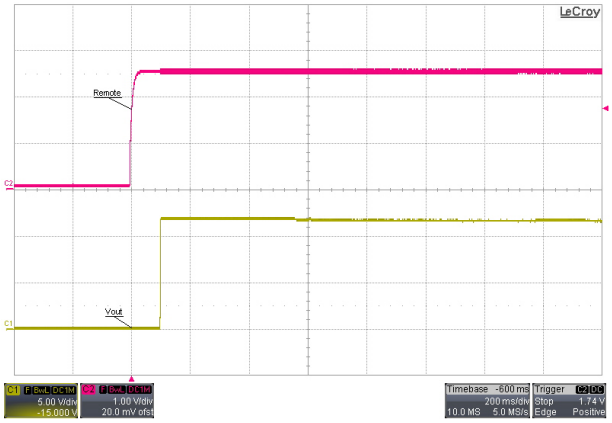
Efficiency Versus Input Voltage
Full Load



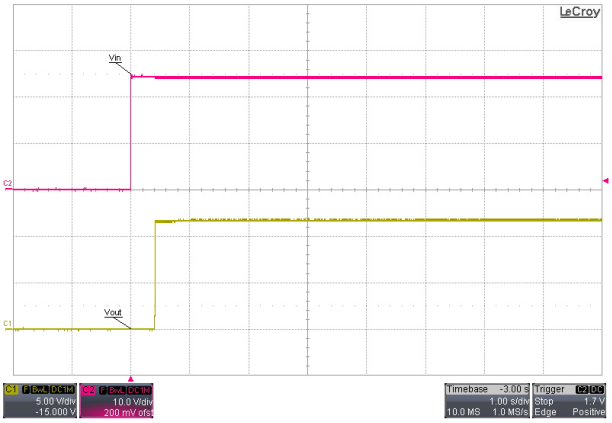
Typical Output Ripple and Noise.
V_{in} =$V_{in\ nom}$; Full Load; T_A



Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; V_{in} =$V_{in\ nom}$



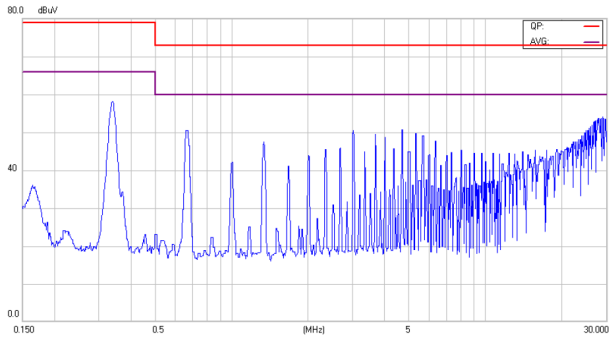
ON/OFF Voltage Start-Up and Output Rise Characteristic
V_{in} =$V_{in\ nom}$; Full Load



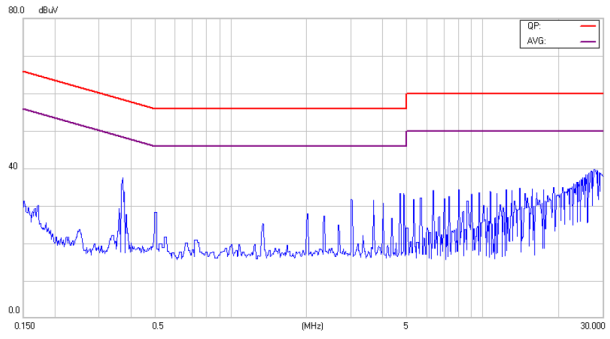
Typical Input Start-Up and Output Rise Characteristic
V_{in} =$V_{in\ nom}$; Full Load

Characteristic Curves

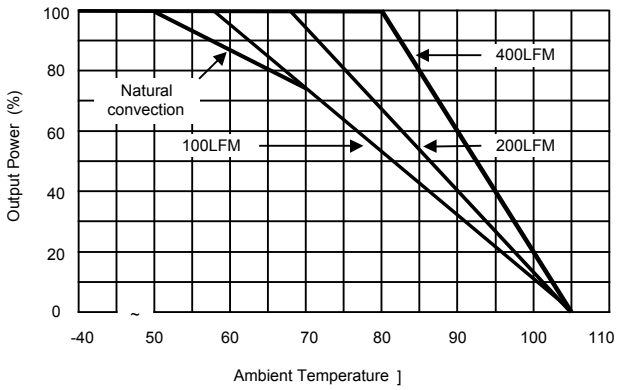
All test conditions are at 25°C The figures are identical for TEN 25-2422WI(Continued)



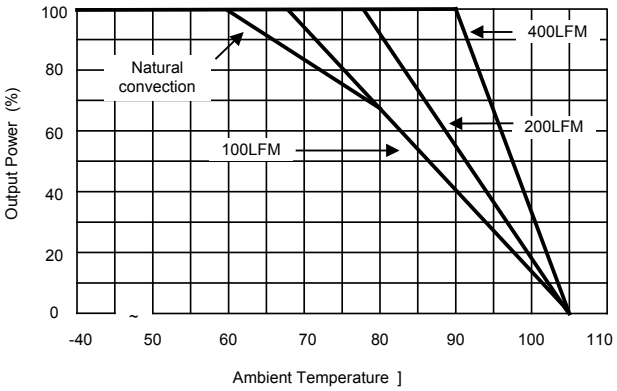
Conduction Emission of EN55022 Class A
V_{in} =$V_{in\ nom}$; Full Load



Conduction Emission of EN55022 Class B
V_{in} =$V_{in\ nom}$; Full Load



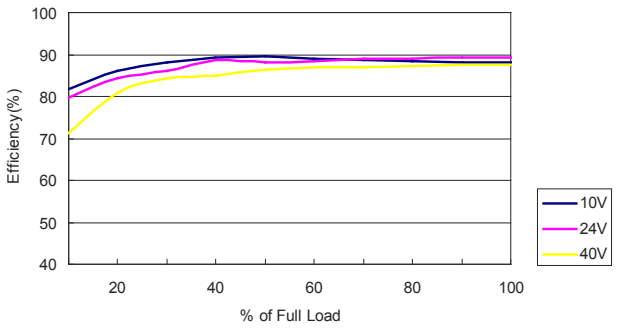
Derating Output Current Versus Ambient Temperature and Airflow
V_{in} =$V_{in\ nom}$ (without heatsink)



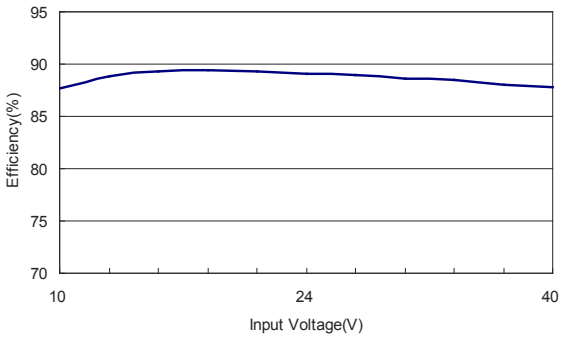
Derating Output Current Versus Ambient Temperature and Airflow
V_{in} =$V_{in\ nom}$ (with heatsink)

Characteristic Curves

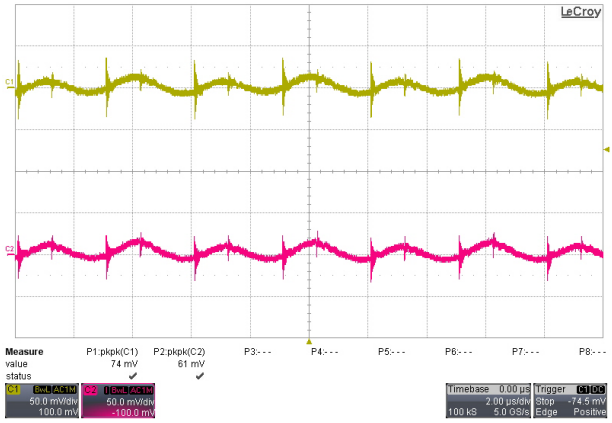
All test conditions are at 25°C The figures are identical for TEN 25-2423WI



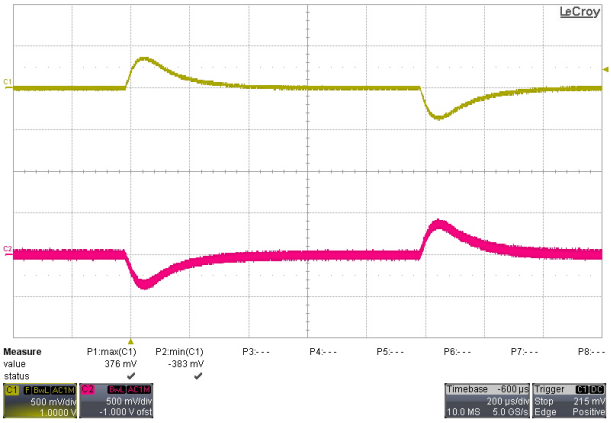
Efficiency Versus Output Current



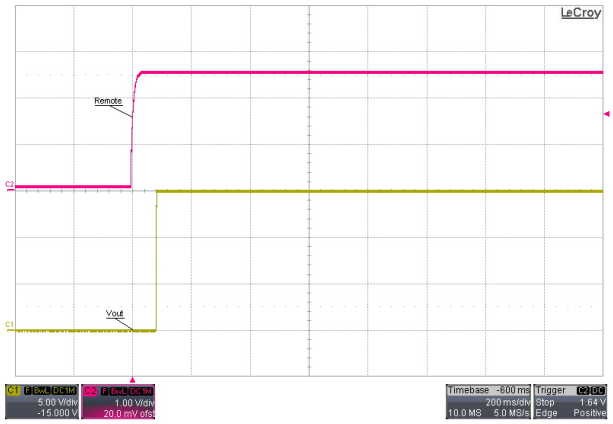
Efficiency Versus Input Voltage
Full Load



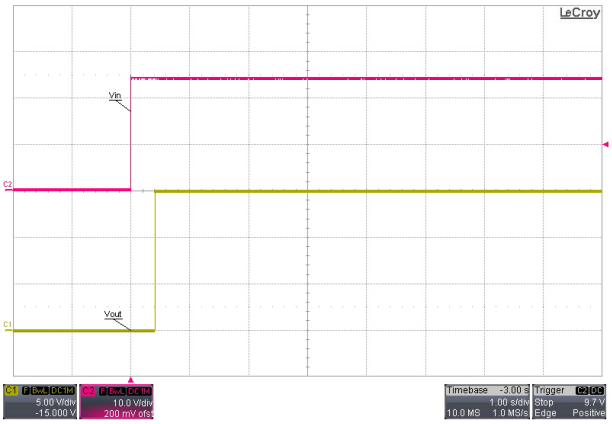
Typical Output Ripple and Noise.
V_{in} =$V_{in\ nom}$; Full Load; T_A



Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; V_{in} =$V_{in\ nom}$



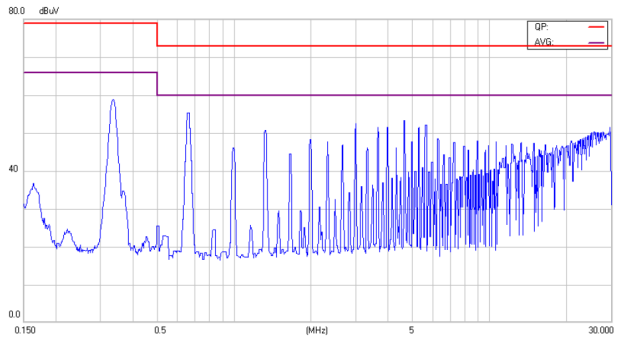
ON/OFF Voltage Start-Up and Output Rise Characteristic
V_{in} =$V_{in\ nom}$; Full Load



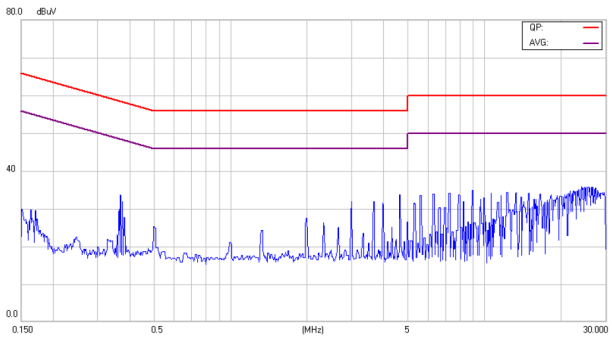
Typical Input Start-Up and Output Rise Characteristic
V_{in} =$V_{in\ nom}$; Full Load

Characteristic Curves

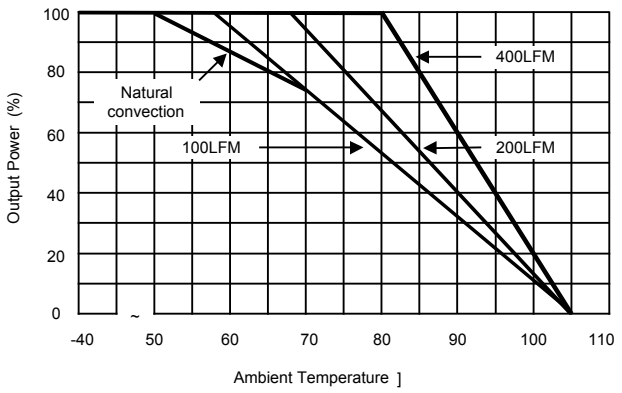
All test conditions are at 25°C The figures are identical for TEN 25-2423WI(Continued)



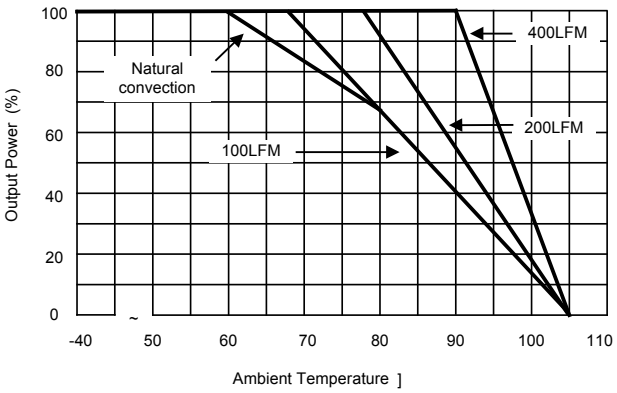
Conduction Emission of EN55022 Class A
V_{in} =$V_{in\ nom}$; Full Load



Conduction Emission of EN55022 Class B
V_{in} =$V_{in\ nom}$; Full Load



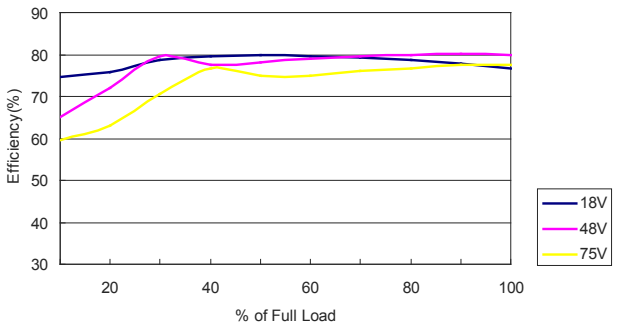
Derating Output Current Versus Ambient Temperature and Airflow
V_{in} =$V_{in\ nom}$ (without heatsink)



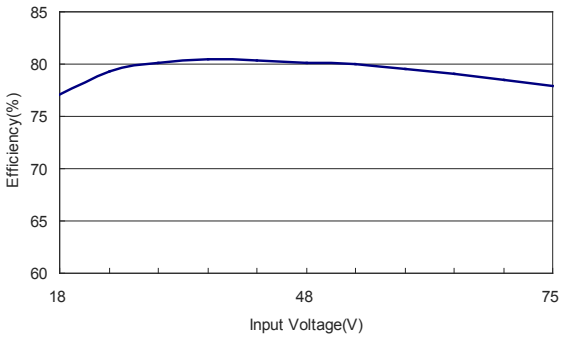
Derating Output Current Versus Ambient Temperature and Airflow
V_{in} =$V_{in\ nom}$ (with heatsink)

Characteristic Curves

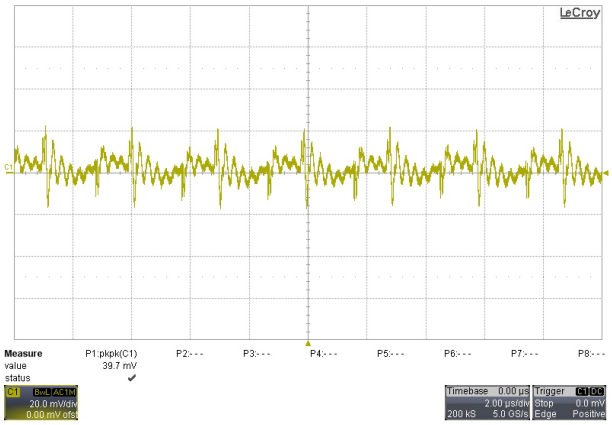
All test conditions are at 25°C The figures are identical for TEN 25-4810WI



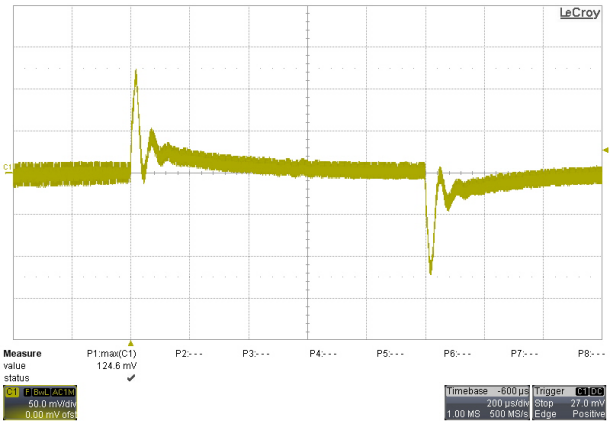
Efficiency Versus Output Current



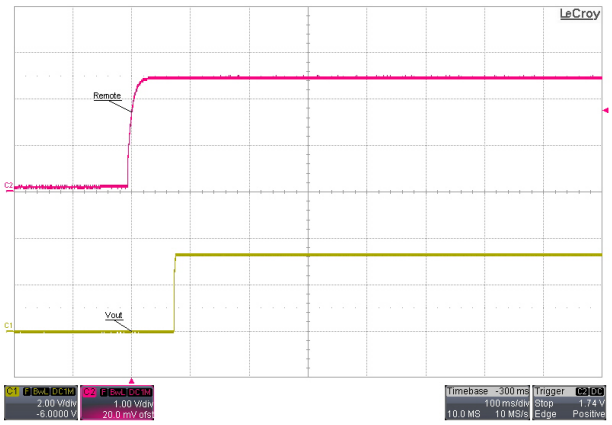
Efficiency Versus Input Voltage
Full Load



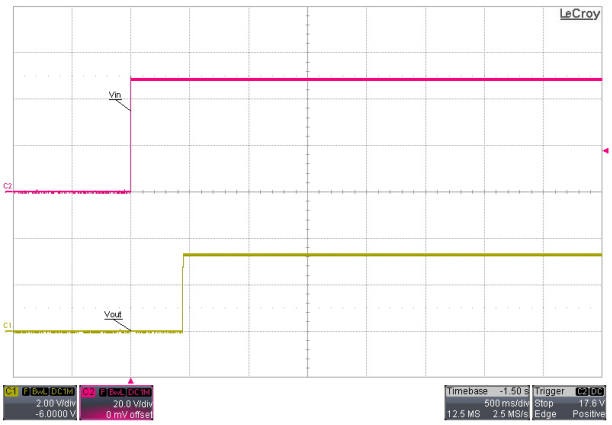
Typical Output Ripple and Noise.
V_{in} =$V_{in\ nom}$; Full Load; T_A



Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; V_{in} =$V_{in\ nom}$



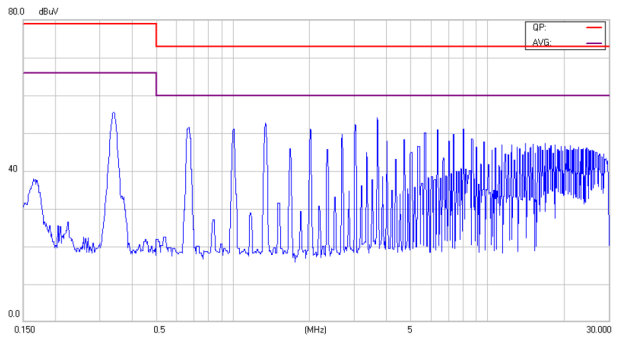
ON/OFF Voltage Start-Up and Output Rise Characteristic
V_{in} =$V_{in\ nom}$; Full Load



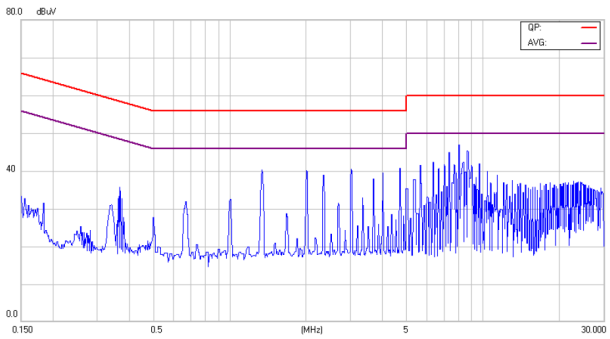
Typical Input Start-Up and Output Rise Characteristic
V_{in} =$V_{in\ nom}$; Full Load

Characteristic Curves

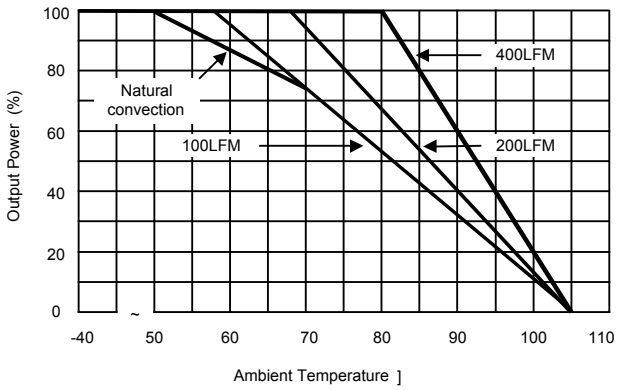
All test conditions are at 25°C The figures are identical for TEN 25-4810WI(Continued)



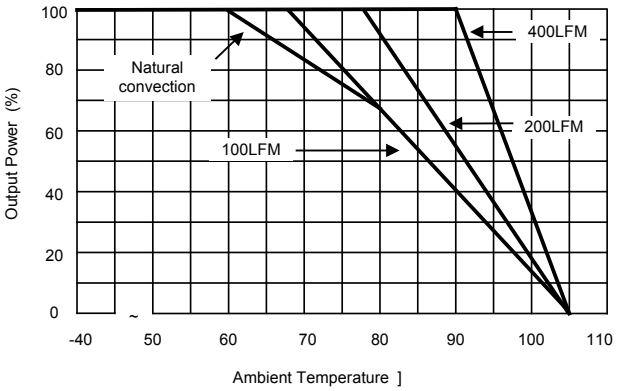
Conduction Emission of EN55022 Class A
V_{in} =$V_{in\ nom}$; Full Load



Conduction Emission of EN55022 Class B
V_{in} =$V_{in\ nom}$; Full Load



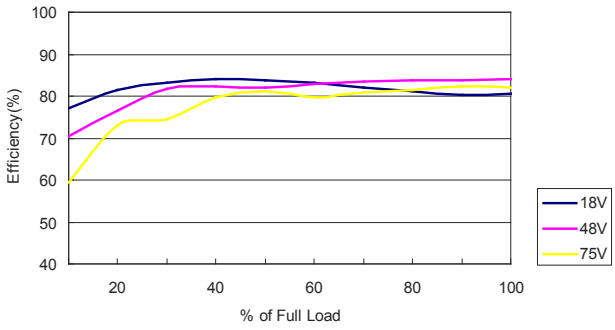
Derating Output Current Versus Ambient Temperature and Airflow
V_{in} =$V_{in\ nom}$ (without heatsink)



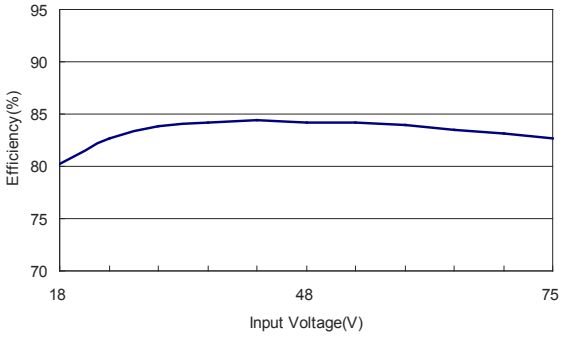
Derating Output Current Versus Ambient Temperature and Airflow
V_{in} =$V_{in\ nom}$ (with heatsink)

Characteristic Curves

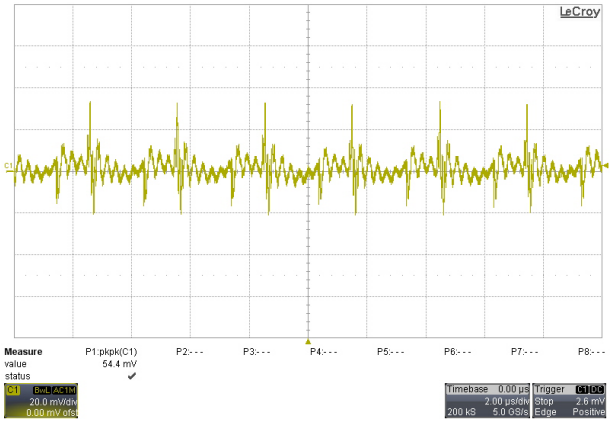
All test conditions are at 25°C The figures are identical for TEN 25-4811WI



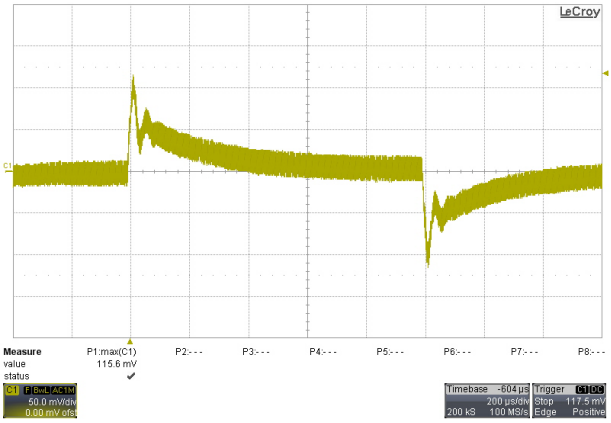
Efficiency Versus Output Current



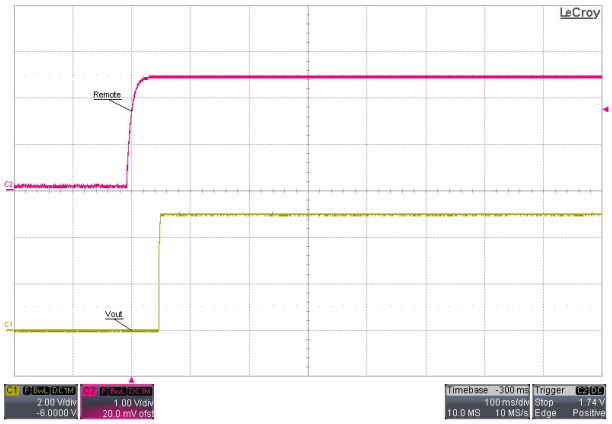
Efficiency Versus Input Voltage
Full Load



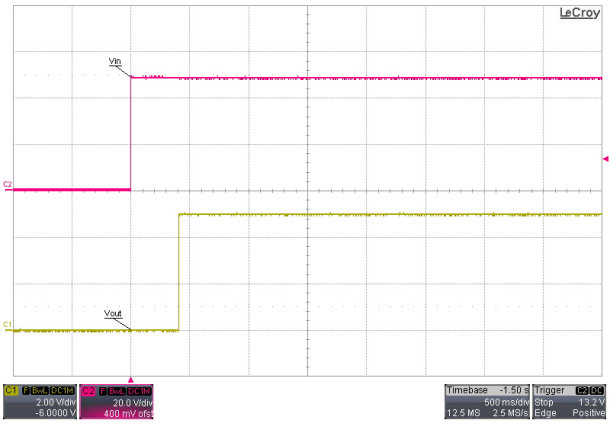
Typical Output Ripple and Noise.
V_{in} =$V_{in\ nom}$; Full Load; T_A



Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; V_{in} =$V_{in\ nom}$



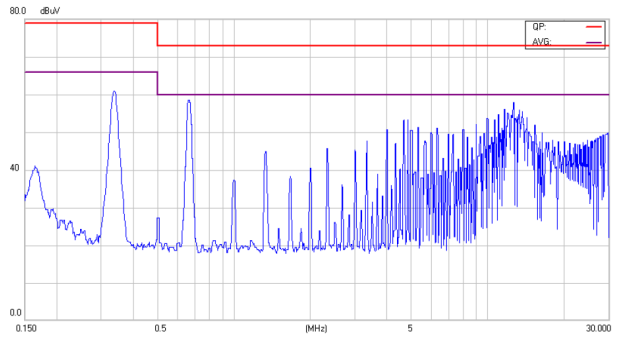
ON/OFF Voltage Start-Up and Output Rise Characteristic
V_{in} =$V_{in\ nom}$; Full Load



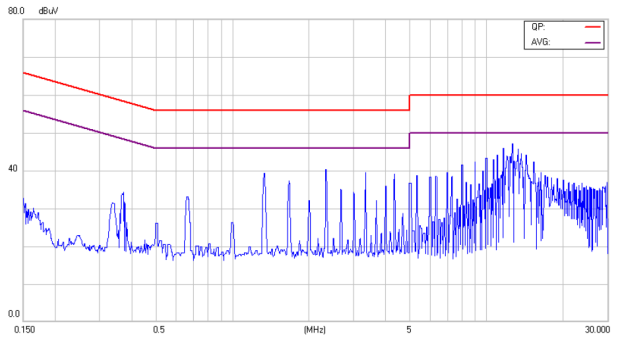
Typical Input Start-Up and Output Rise Characteristic
V_{in} =$V_{in\ nom}$; Full Load

Characteristic Curves

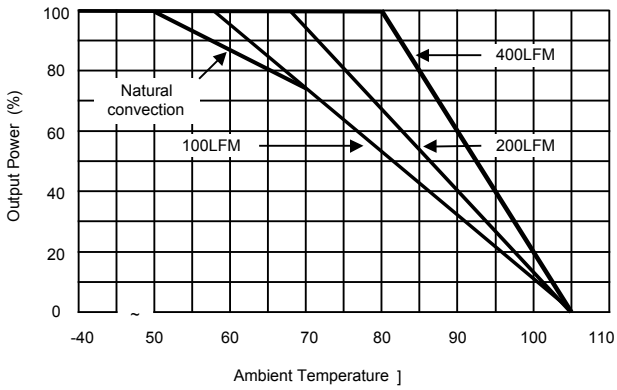
All test conditions are at 25°C The figures are identical for TEN 25-4811WI(Continued)



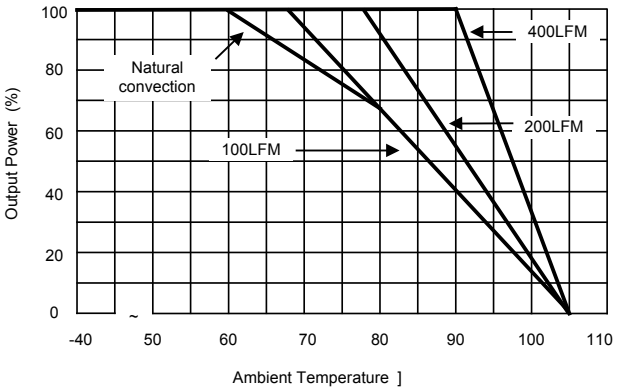
Conduction Emission of EN55022 Class A
V_{in} =$V_{in\ nom}$; Full Load



Conduction Emission of EN55022 Class B
V_{in} =$V_{in\ nom}$; Full Load



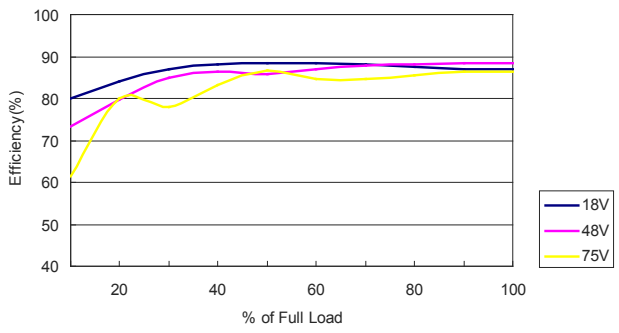
Derating Output Current Versus Ambient Temperature and Airflow
V_{in} =$V_{in\ nom}$ (without heatsink)



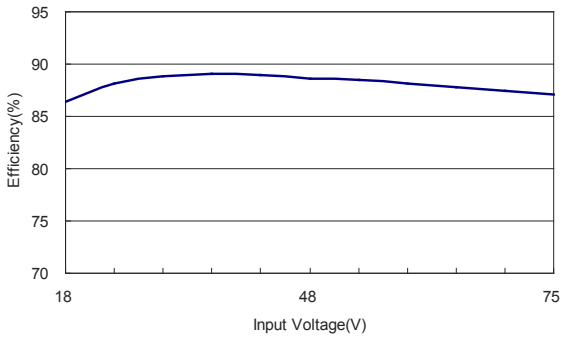
Derating Output Current Versus Ambient Temperature and Airflow
V_{in} =$V_{in\ nom}$ (with heatsink)

Characteristic Curves

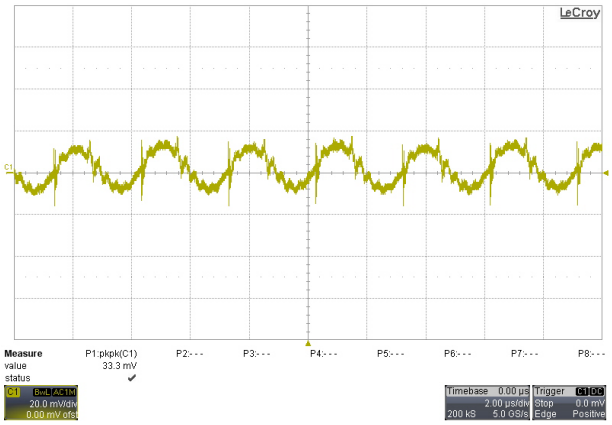
All test conditions are at 25°C The figures are identical for TEN 25-4812WI



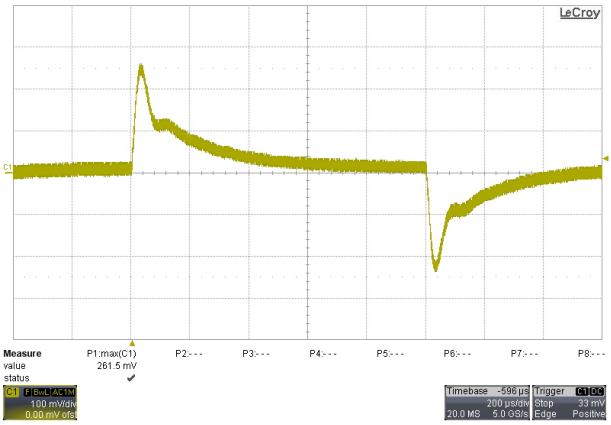
Efficiency Versus Output Current



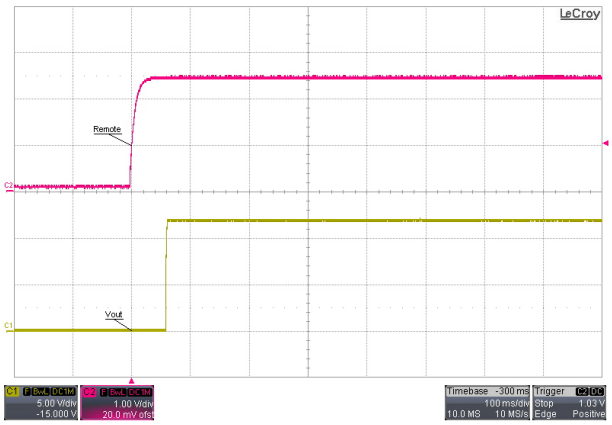
Efficiency Versus Input Voltage
Full Load



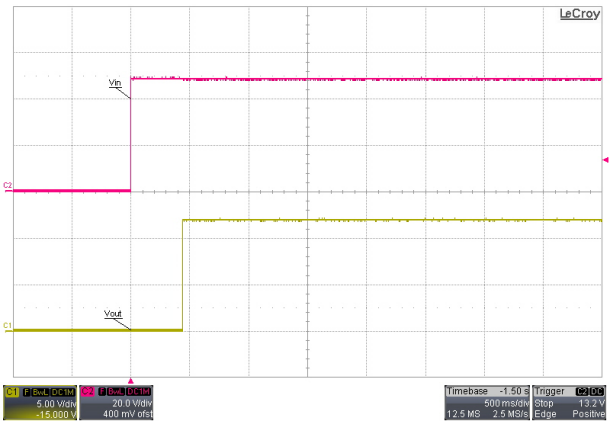
Typical Output Ripple and Noise.
V_{in} =$V_{in\ nom}$; Full Load; T_A



Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; V_{in} =$V_{in\ nom}$



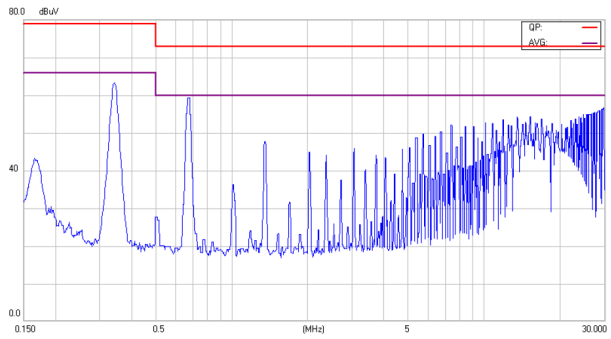
ON/OFF Voltage Start-Up and Output Rise Characteristic
V_{in} =$V_{in\ nom}$; Full Load



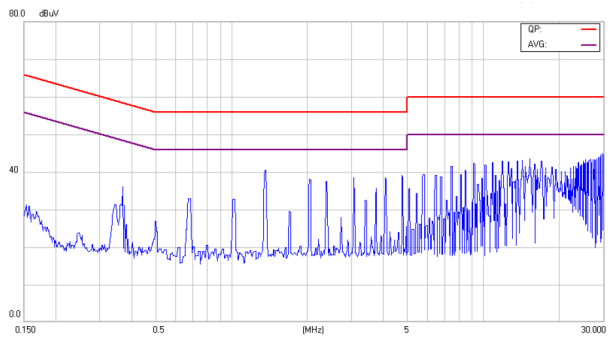
Typical Input Start-Up and Output Rise Characteristic
V_{in} =$V_{in\ nom}$; Full Load

Characteristic Curves

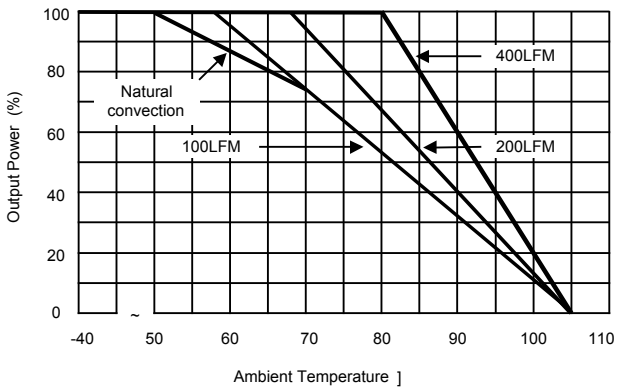
All test conditions are at 25°C The figures are identical for TEN 25-4812WI(Continued)



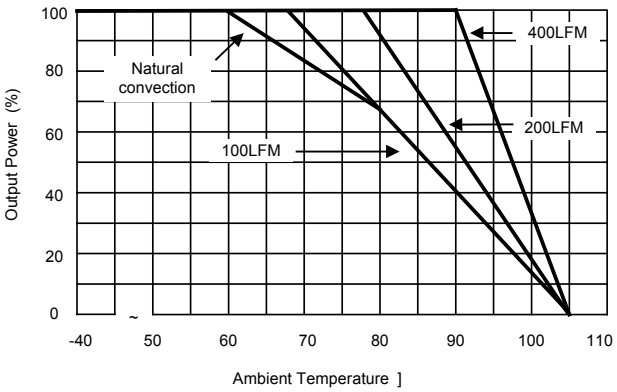
Conduction Emission of EN55022 Class A
V_{in} =$V_{in\ nom}$; Full Load



Conduction Emission of EN55022 Class B
V_{in} =$V_{in\ nom}$; Full Load



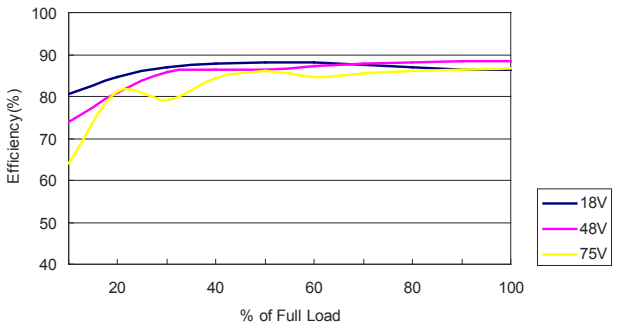
Derating Output Current Versus Ambient Temperature and Airflow
V_{in} =$V_{in\ nom}$ (without heatsink)



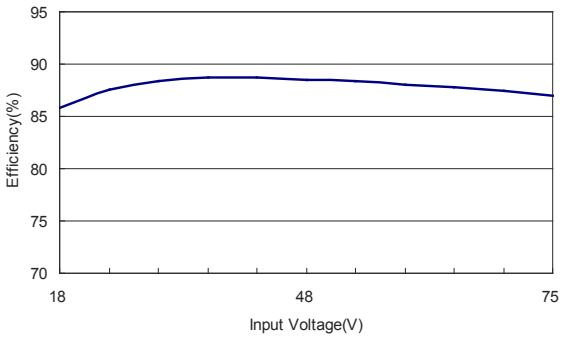
Derating Output Current Versus Ambient Temperature and Airflow
V_{in} =$V_{in\ nom}$ (with heatsink)

Characteristic Curves

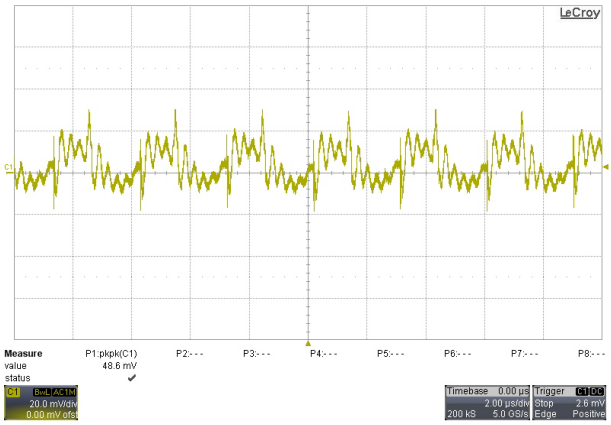
All test conditions are at 25°C The figures are identical for TEN 25-4813WI



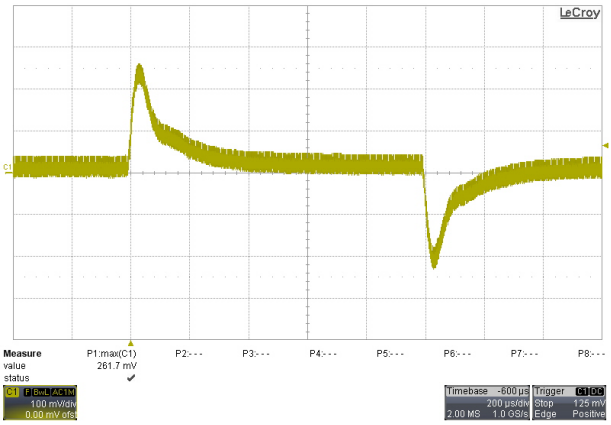
Efficiency Versus Output Current



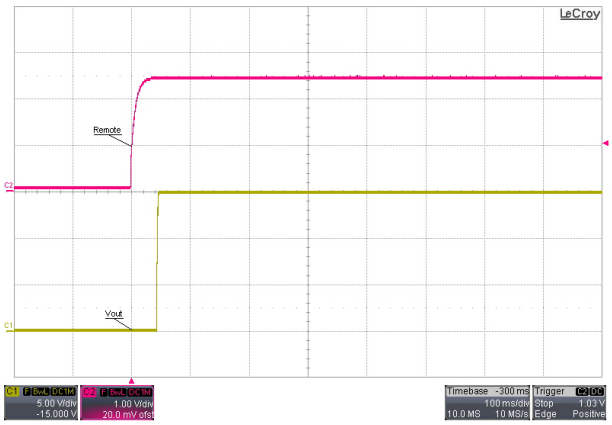
Efficiency Versus Input Voltage
Full Load



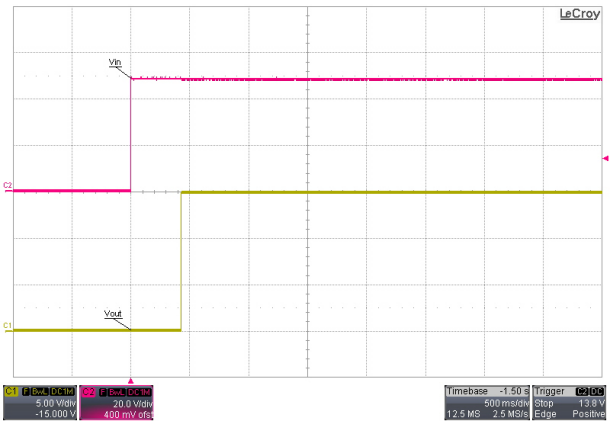
Typical Output Ripple and Noise.
V_{in} =$V_{in\ nom}$; Full Load; T_A



Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; V_{in} =$V_{in\ nom}$



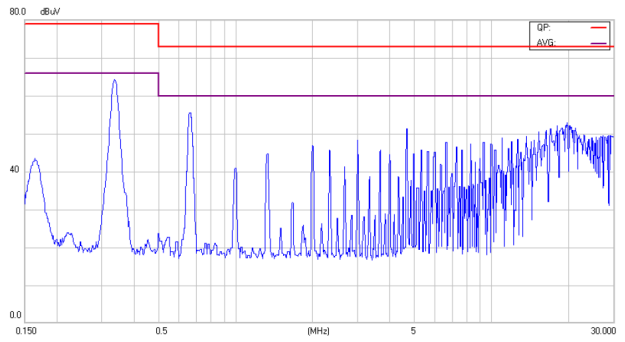
ON/OFF Voltage Start-Up and Output Rise Characteristic
V_{in} =$V_{in\ nom}$; Full Load



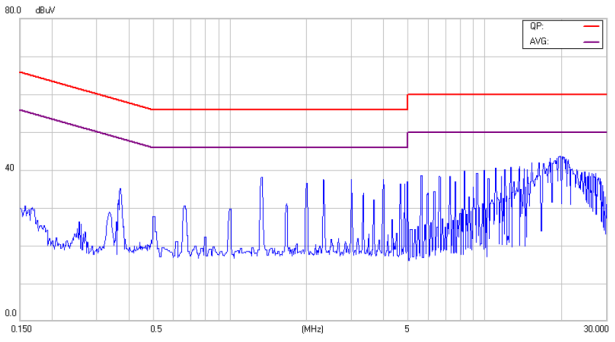
Typical Input Start-Up and Output Rise Characteristic
V_{in} =$V_{in\ nom}$; Full Load

Characteristic Curves

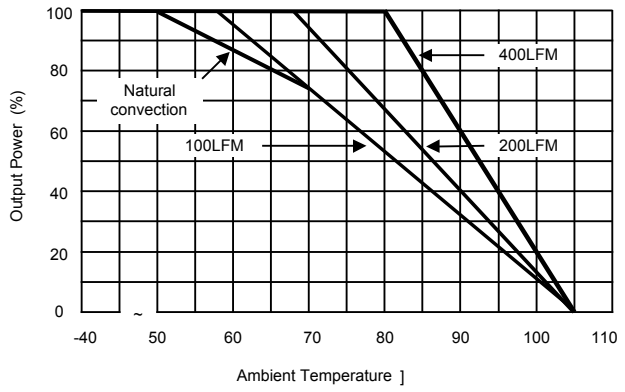
All test conditions are at 25°C The figures are identical for TEN 25-4813WI(Continued)



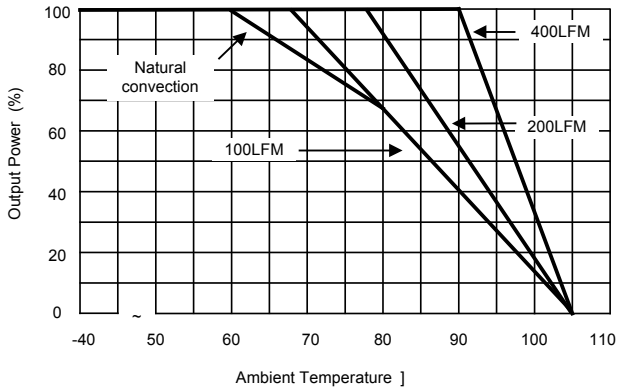
Conduction Emission of EN55022 Class A
V_{in} =$V_{in\ nom}$; Full Load



Conduction Emission of EN55022 Class B
V_{in} =$V_{in\ nom}$; Full Load



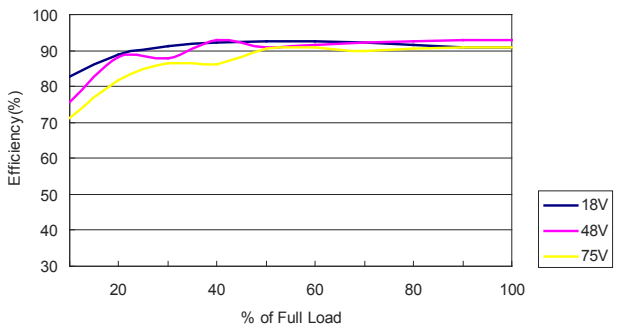
Derating Output Current Versus Ambient Temperature and Airflow
V_{in} =$V_{in\ nom}$ (without heatsink)



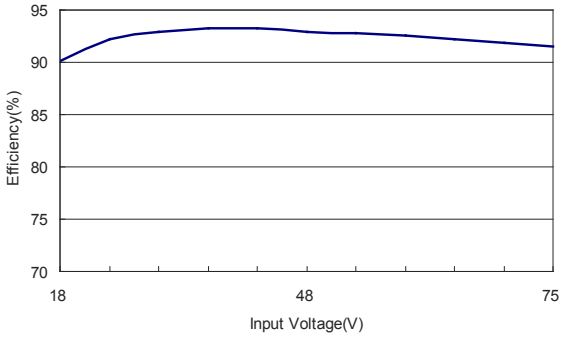
Derating Output Current Versus Ambient Temperature and Airflow
V_{in} =$V_{in\ nom}$ (with heatsink)

Characteristic Curves

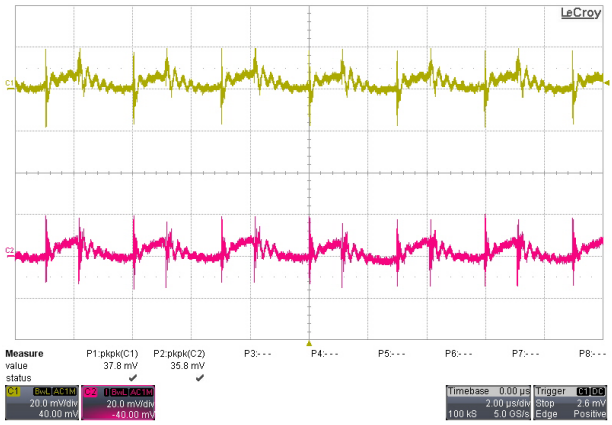
All test conditions are at 25°C The figures are identical for TEN 25-4822WI



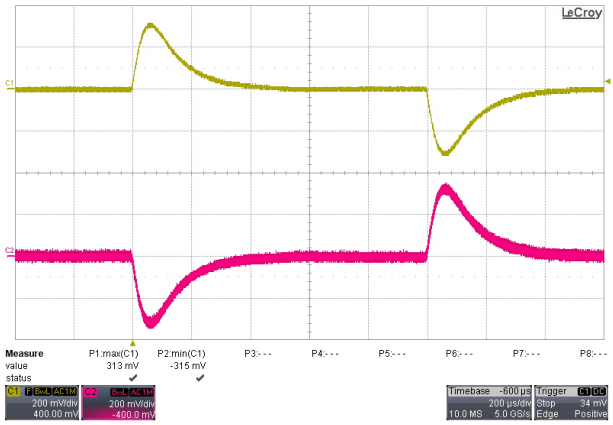
Efficiency Versus Output Current



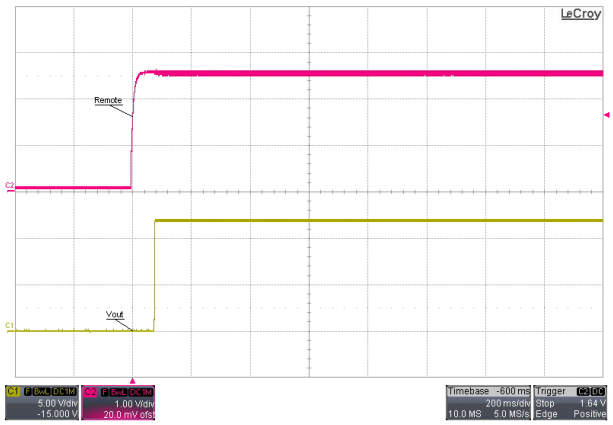
Efficiency Versus Input Voltage
Full Load



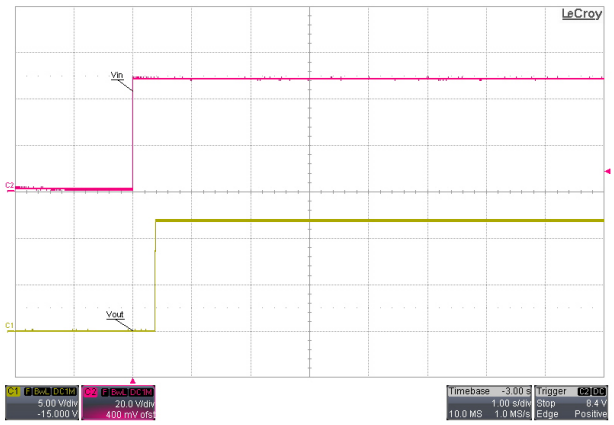
Typical Output Ripple and Noise.
V_{in} =$V_{in\ nom}$; Full Load; T_A



Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; V_{in} =$V_{in\ nom}$



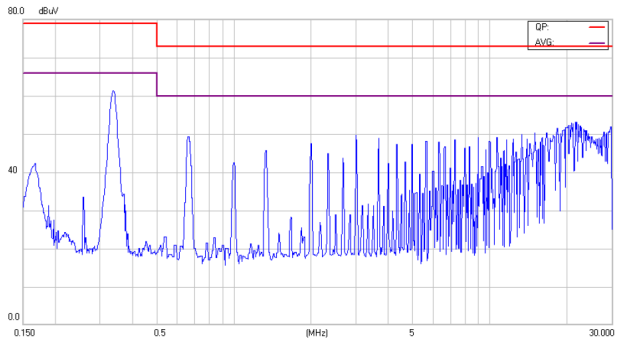
ON/OFF Voltage Start-Up and Output Rise Characteristic
V_{in} =$V_{in\ nom}$; Full Load



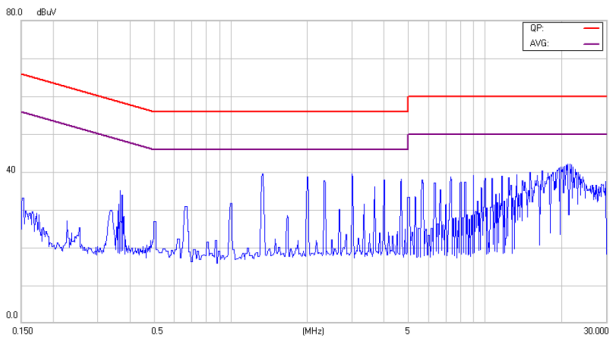
Typical Input Start-Up and Output Rise Characteristic
V_{in} =$V_{in\ nom}$; Full Load

Characteristic Curves

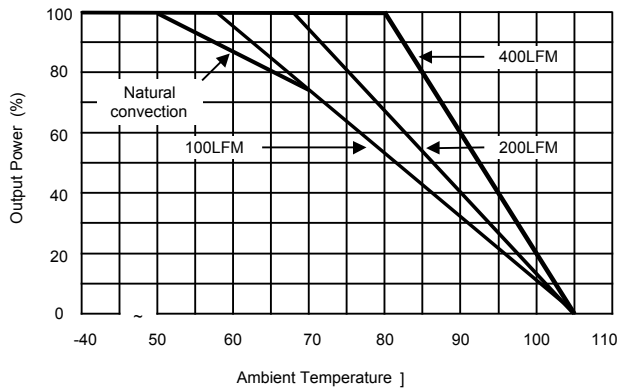
All test conditions are at 25°C The figures are identical for TEN 25-4822WI(Continued)



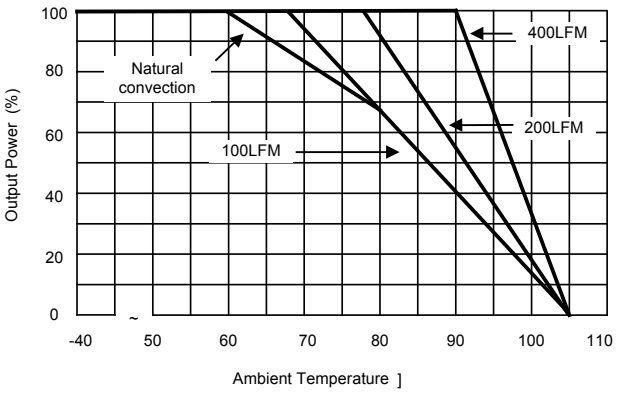
Conduction Emission of EN55022 Class A
V_{in} =$V_{in\ nom}$; Full Load



Conduction Emission of EN55022 Class B
V_{in} =$V_{in\ nom}$; Full Load



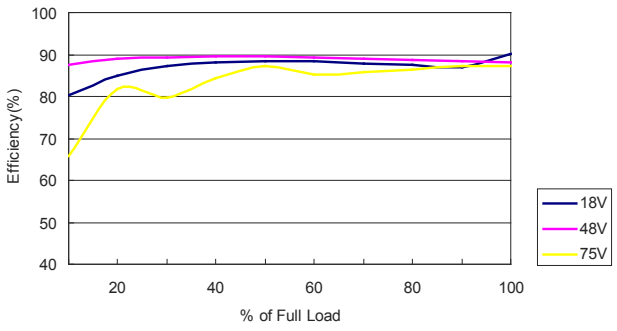
Derating Output Current Versus Ambient Temperature and Airflow
V_{in} =$V_{in\ nom}$ (without heatsink)



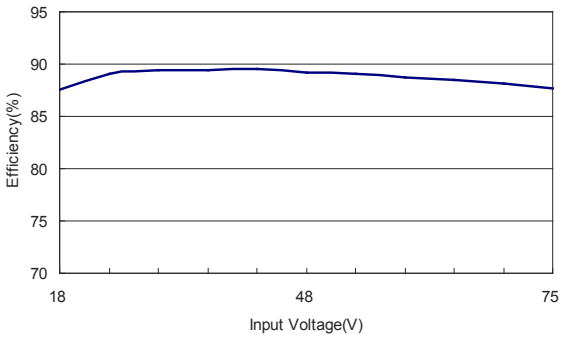
Derating Output Current Versus Ambient Temperature and Airflow
V_{in} =$V_{in\ nom}$ (with heatsink)

Characteristic Curves

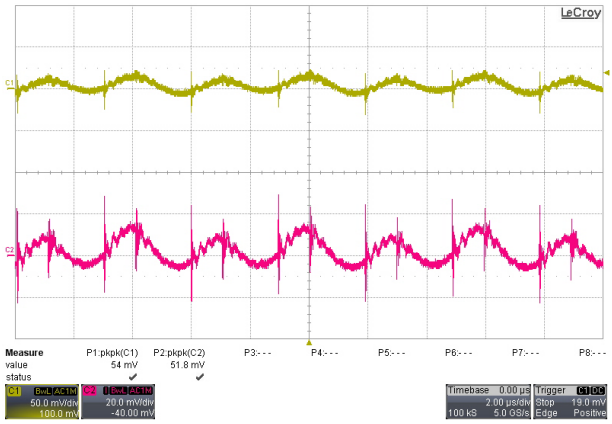
All test conditions are at 25°C The figures are identical for TEN 25-4823WI



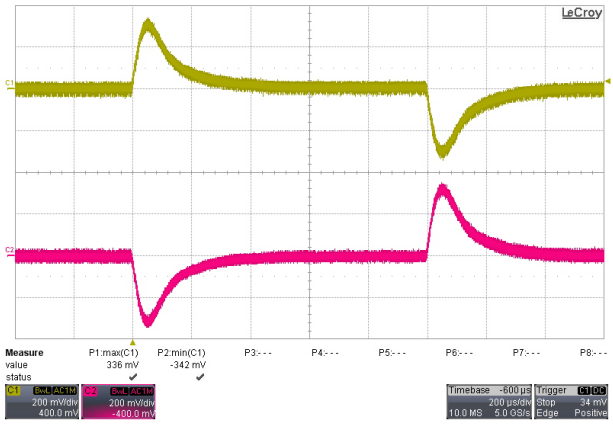
Efficiency Versus Output Current



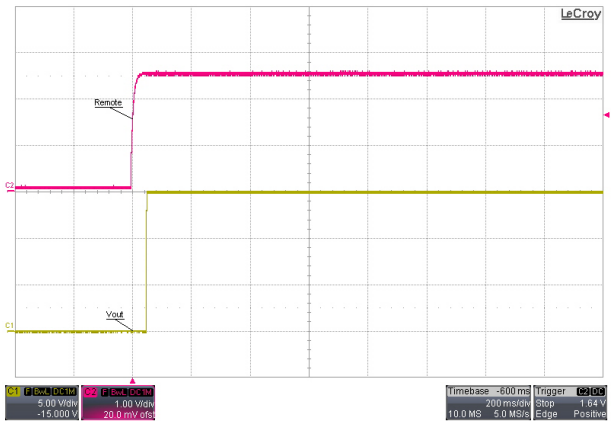
Efficiency Versus Input Voltage
Full Load



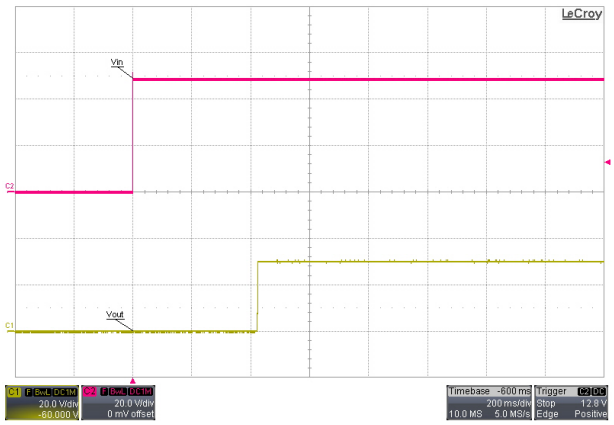
Typical Output Ripple and Noise.
V_{in} =$V_{in\ nom}$; Full Load; T_A



Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; V_{in} =$V_{in\ nom}$



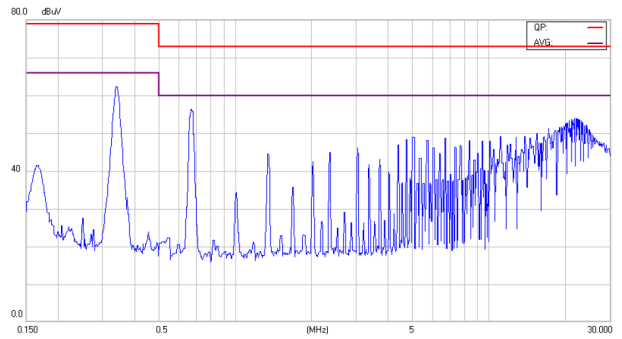
ON/OFF Voltage Start-Up and Output Rise Characteristic
V_{in} =$V_{in\ nom}$; Full Load



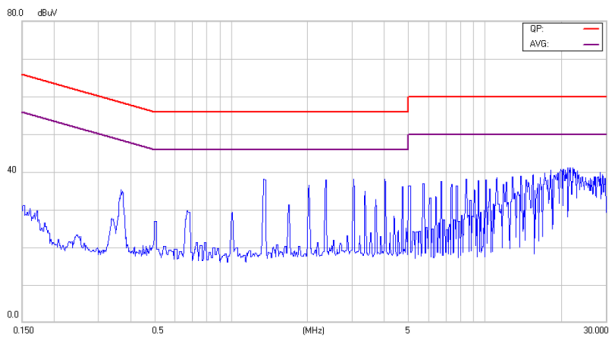
Typical Input Start-Up and Output Rise Characteristic
V_{in} =$V_{in\ nom}$; Full Load

Characteristic Curves

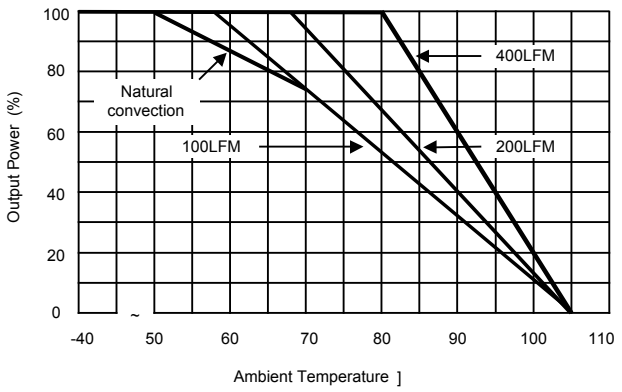
All test conditions are at 25°C The figures are identical for TEN 25-4823WI(Continued)



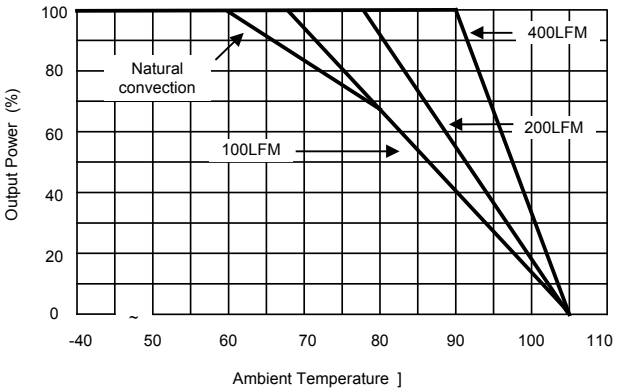
Conduction Emission of EN55022 Class A
V_{in} =$V_{in\ nom}$; Full Load



Conduction Emission of EN55022 Class B
V_{in} =$V_{in\ nom}$; Full Load



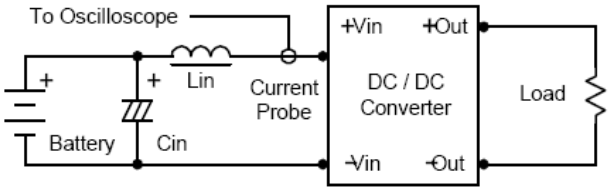
Derating Output Current Versus Ambient Temperature and Airflow
V_{in} =$V_{in\ nom}$ (without heatsink)



Derating Output Current Versus Ambient Temperature and Airflow
V_{in} =$V_{in\ nom}$ (with heatsink)

Testing Configurations

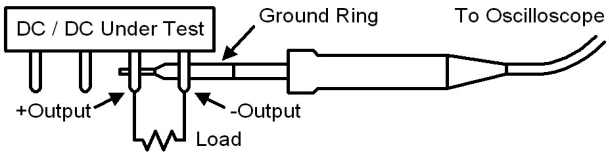
Input reflected-ripple current measurement test up



Component	Value	Reference
L	4.7µH	-----
C	220µF (ESR<1.0Ω at 100KHz)	Aluminum Electrolytic Capacitor

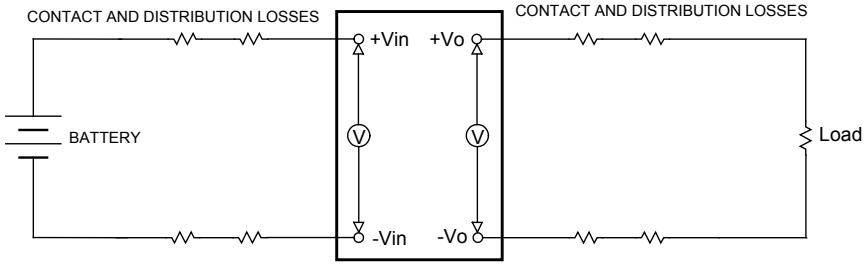
Peak-to-peak output ripple & noise measurement test up

This noise pickup is eliminated as shown in Figure by using a scope probe with an external ground band or ring and pressing this band directly against the output common terminal of the power converter while the tip contacts the voltage output terminal. This makes the shortest possible connection across the output terminals.

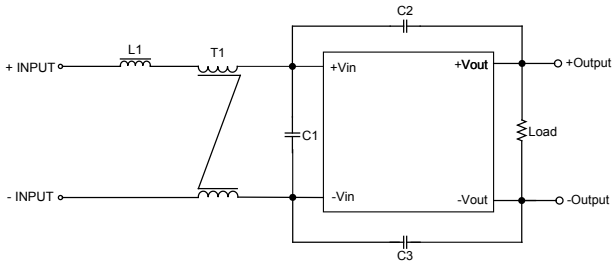


Output voltage and efficiency measurement test up

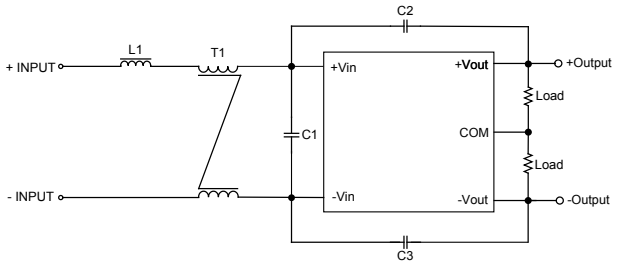
$$Efficiency = \left(\frac{V_{out} \times I_{out}}{V_{in} \times I_{in}} \right) \times 100\% = [\%]$$



EMC considerations

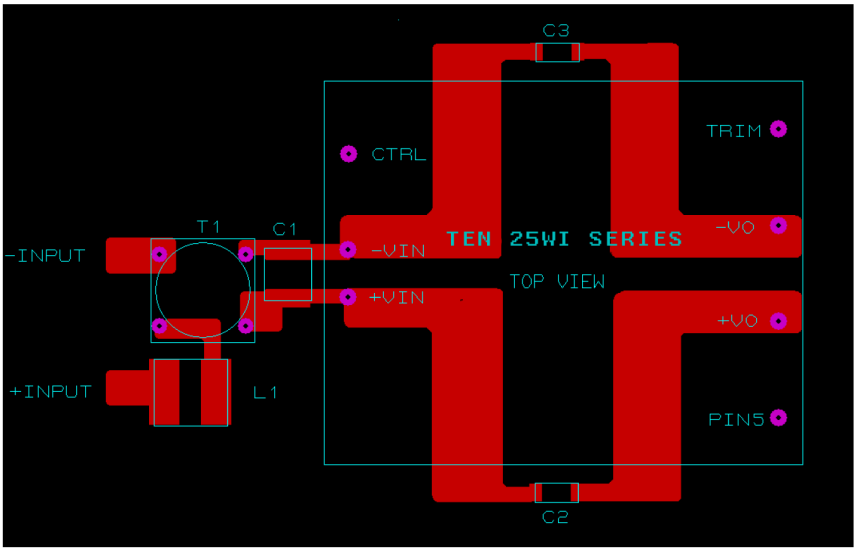


Single Output

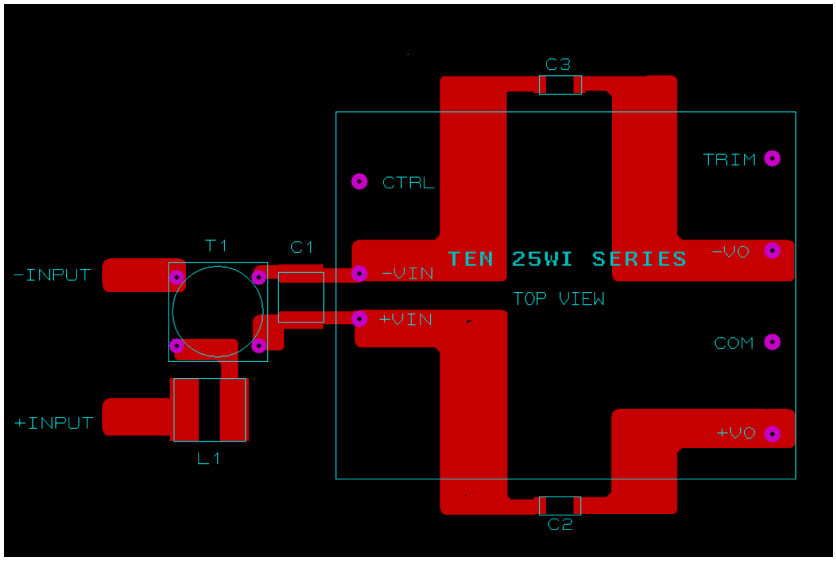


Dual Output

Recommended circuit to comply EN55022 Class B Limits (TEN 25-24xxWI)

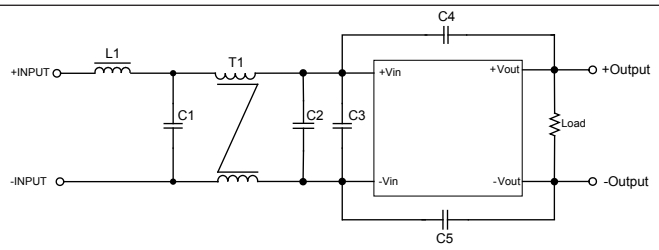


Single Output

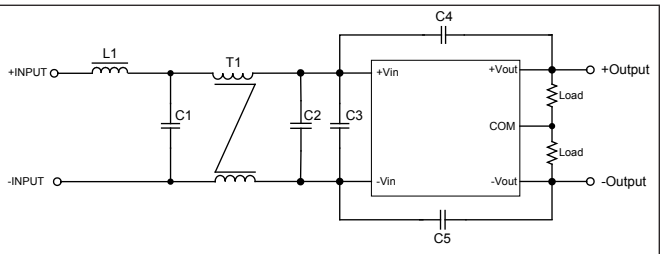


Dual Output

Recommended PCB Layout with Input Filter (TEN 25-24xxWI)

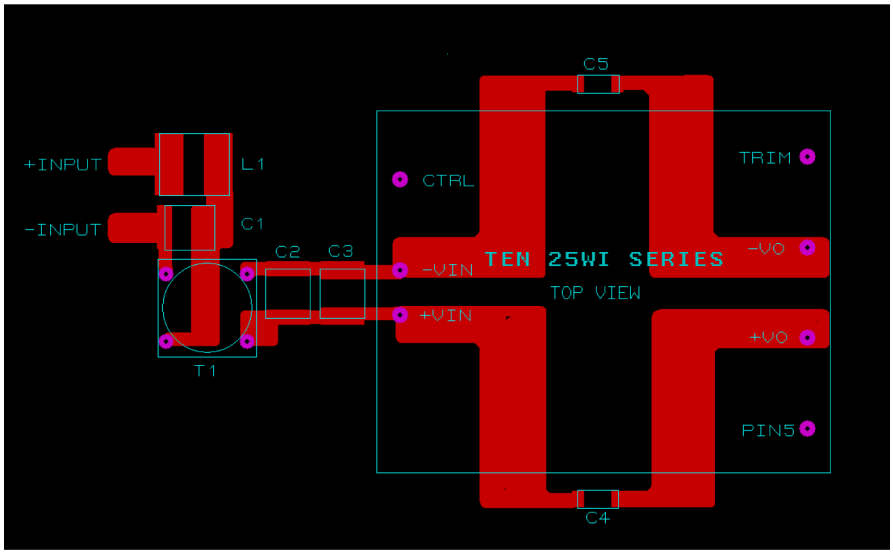


Single Output

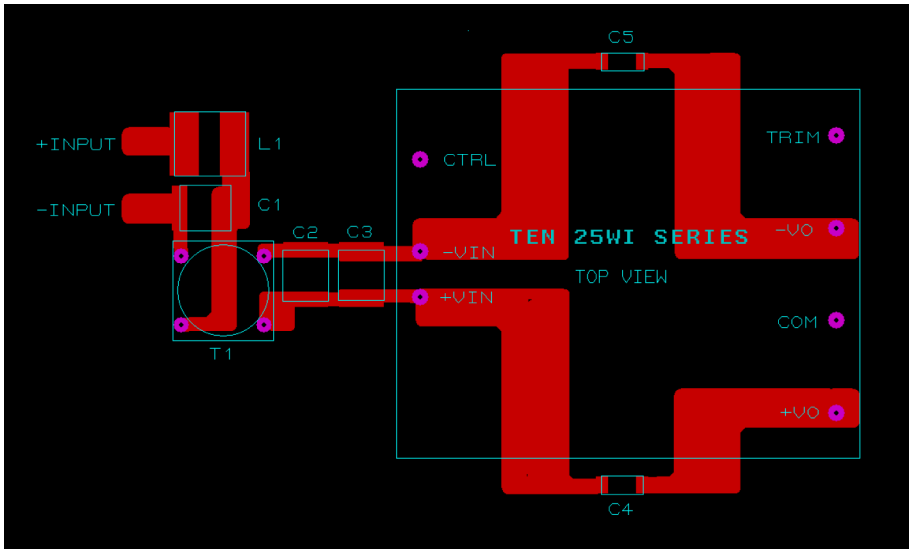


Dual Output

Recommended circuit to comply EN55022 Class B Limits (TEN 25-48xxWI)



Single Output



Dual Output

Recommended PCB Layout with Input Filter (TEN 25-48xxWI)

To: comply with EN55022 CLASS B following components are needed:

Model	Component	Value
TEN 25-24xxWI	C1	3.3µF/50V 1210 X7R
	C2,C3	470pF/2KV 1808 X7R
	L1	2.2µH SCD0705T/3.7A
	T1	460µH Common choke, core:T10X2.5X5 H5B2/HPN155 <-> 0.44X16T
TEN 25-48xxWI	C1	4.7µF/100V 2220 X7R
	C2,C3	10µF/100V 2220 X7S
	C4	470pF/2KV 1808 X7R
	C5	1000pF/2KV 1808 X7R
	L1	4.7µH SCD0705T/3.5A
	T1	1.07mH Common choke, core:T10X2.5X5 H5B2/HPN155 <-> 0.34X20T

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 < 1.0Ω at 100 KHz) capacitor of a 33µF for the 24V input devices and a 10µF for the 48V devices.

Output Over Current Protection

To provide protection in a fault (output overload) condition, the unit is equipped with internal current limiting circuitry and can endure current limiting for an unlimited duration. At the point of current-limit inception, the unit shifts from voltage control to current control. The unit operates normally once the output current is brought back into its specified range.

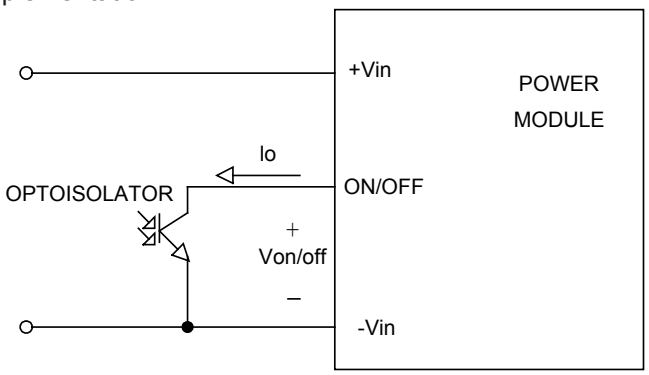
Output Over Voltage Protection

The output overvoltage clamp consists of control circuitry, which is independent of the primary regulation loop, that monitors the voltage on the output terminals. The control loop of the clamp has a higher voltage set point than the primary loop. This provides a redundant voltage control that reduces the risk of output overvoltage.
The OVP level can be found in the output data

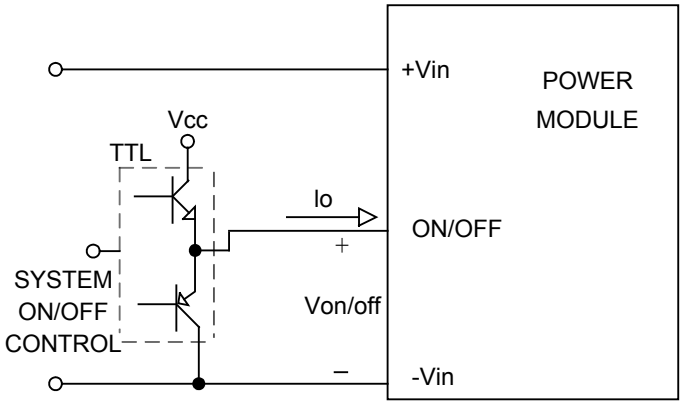
Remote ON/OFF Control

With no suffix, 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.

Remote ON/OFF implementation



Isolated-Closure Remote ON/OFF

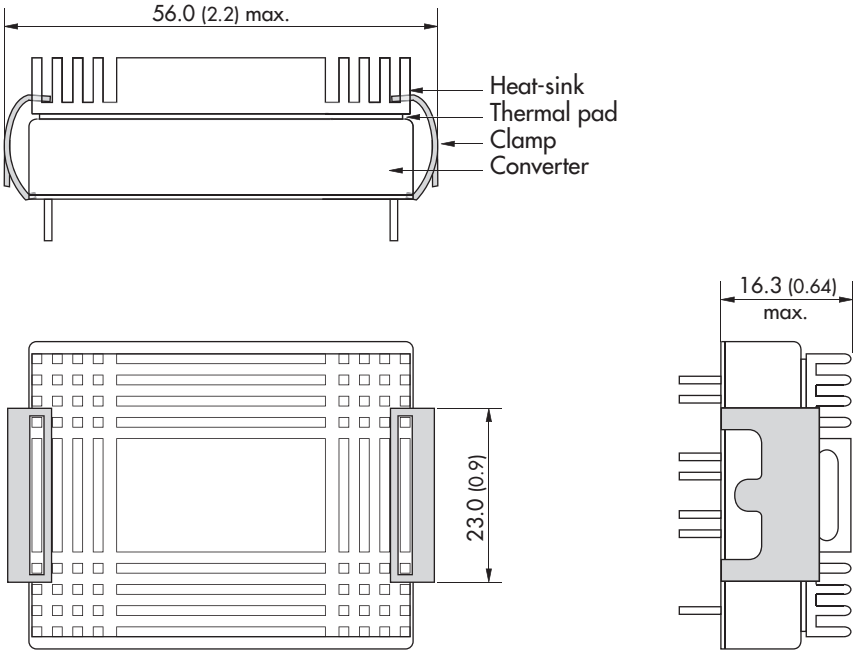


Level Control Using TTL Output

Heat Sink Consideration

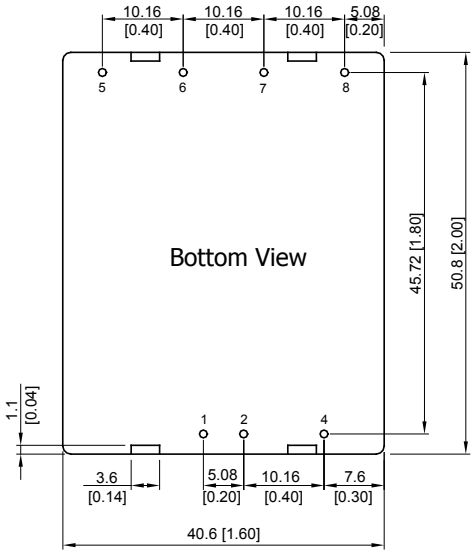
Equip heat-sink for lower temperature and higher reliability of the module.

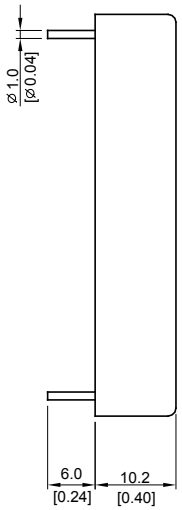
Suffix-HS5



All dimensions in mm (inches)

Mechanical Dimensions



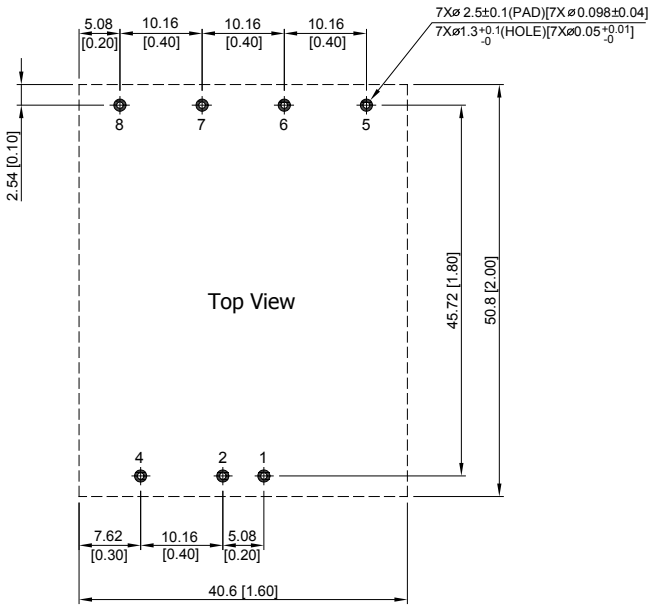


Pin Connections		
Pin	Single Output	Dual Output
1	+Vin	+Vin
2	-Vin	-Vin
4	Remote On/Off	
5	No Pin	+Vout
6	+Vout	Common
7	-Vout	-Vout
8	Trim	

1. All dimensions in mm (inches)
Tolerance: X.X±0.25 (X.XX±0.01")
X.XX±0.13 (X.XXX±0.005")
2. Pin diameter <->1.0 ±0.05 (0.04±0.002)

Weight:48g

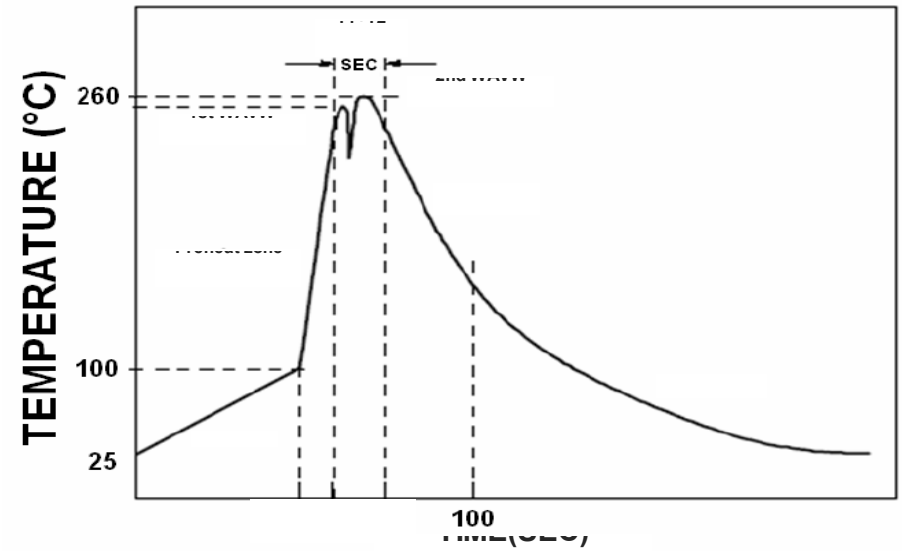
Recommended Pad Layout for Single & Dual Output Converter



Packaging Information

Soldering and Reflow Considerations

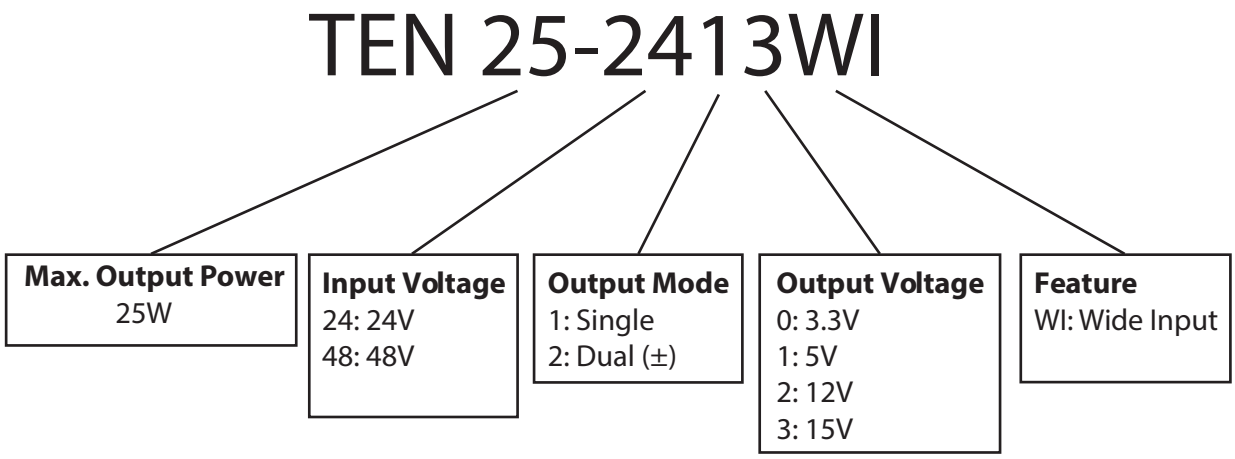
Lead free wave solder profile for TEN 25WI Series



Zone	Reference Parameter
Preheat	Rise temp. speed：3℃/sec max.
zone	Preheat temp.：100~130℃
Actual	Peak temp.：250~260℃
heating	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℃

Part Number Structure



Model Number	Input Range (VDC)	Output Voltage (VDC)	Max. Output Current (mA)	Input Current at Full Load[1] (mA)	Efficiency[2] (%)
TEN 25-2410WI	10-40	3.3	5500	922	82
TEN 25-2411WI	10-40	5	5000	1225	85
TEN 25-2412WI	10-40	12	2500	1404	89
TEN 25-2413WI	10-40	15	2000	1404	89
TEN 25-2422WI	10-40	±12	±1250	1404	89
TEN 25-2423WI	10-40	±15	±1000	1404	89
TEN 25-4810WI	18-75	3.3	5500	461	82
TEN 25-4811WI	18-75	5	5000	613	85
TEN 25-4812WI	18-75	12	2500	702	89
TEN 25-4813WI	18-75	15	2000	702	89
TEN 25-4822WI	18-75	±12	±1250	702	89
TEN 25-4823WI	18-75	±15	±1000	702	89

Note 1. Maximum value at nominal input voltage and full load of standard type.

Note 2. Typical value at nominal input voltage and full load.

Safety and Installation Instruction

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 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 in 24Vin, 48Vin with maximum rating of 5000mA, 3000mA. 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.

MTBF and Reliability

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

Model	MTBF	Unit
TEN 25-2410WI	550,812	Hours
TEN 25-2411WI	518,995	
TEN 25-2412WI	513,663	
TEN 25-2413WI	555,278	
TEN 25-2422WI	592,031	
TEN 25-2423WI	578,235	
TEN 25-4810WI	522,111	
TEN 25-4811WI	505,791	
TEN 25-4812WI	537,606	
TEN 25-4813WI	562,430	
TEN 25-4822WI	577,367	
TEN 25-4823WI	581,328	