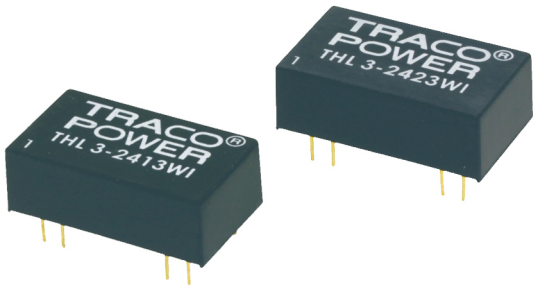
THL 3-WI Series Application Note

DC/DC Converter with 9 to 36Vdc or 18 to 75 Vdc Input Voltage
3.3 to 24Vdc Single Outputs and ±5 to ±15Vdc Dual Outputs, 3W



226037

Features

- Single output up to 600mA
- Dual output up to ±300mA
- 3 watts maximum output power
- 4:1 ultra wide input voltage range of 9-36Vdc and 18-75Vdc
- Efficiency up to 80%
- Complies with EN 55022 class A
- RoHS directive compliant
- Input to output isolation: 1500Vdc for 1 minute
- Internal SMD construction
- Output short circuit protection
- Remote on/off

Options

- Heat sinks available for extended operation

Applications

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

Complete THL 3WI datasheet can be downloaded at:
http://www.tracopower.com/products/thl3wi.pdf

General Description

Tracopower new launched THL 3WI series comprising 16 different models. The THL 3WI has wide input voltage ranges of 9 – 36Vdc and 18 – 75Vdc and is available in output voltages of 3.3Vdc, 5.0Vdc, 12Vdc, 15Vdc, 24Vdc, ±5Vdc, ±12Vdc and ±15Vdc.

Pin compatible with the TEL 2 series, the THL 3WI offers a power rating up to 3W and a typical full-load efficiency of 80%, continuous short circuit, remote on/off control, EN55022 Class A conducted noise compliance minimize design-in time, cost and eliminate the need for external filtering.

The THL 3WI series is an excellent selection for data communication equipment, mobile battery driven equipment, distributed power system, telecommunication equipment, mixed analog/digital subsystem, process/machine control equipment, computer peripheral equipment and industrial robot system.

Table of contents

Absolute Maximum Rating

Parameter	Model	Min	Max	Unit
Input Voltage				Vdc
Continuous	THL 3-24xxWI		36	
	THL 3-48xxWI		75	
Input Voltage				
Transient (for 100ms max.)	THL 3-24xxWI		50	
	THL 3-48xxWI		100	
Operating Ambient Temperature	All			°C
Without derating		-40	+65	
With derating		-40	+85	
Load Derating above +65°C	All		2.5	$^{\%}/_{K}$
Operating Case Temperature	All	-40	+105	°C
Storage Temperature	All	-40	+125	°C

Output Specification

Parameter	Model	Min	Nominal	Max	Unit
Output Voltage (V_{in} = $V_{in\ nom}$; Full Load; T_A = 25°C)	THL 3-xx10WI	3.234	3.3	3.366	Vdc
	THL 3-xx11WI	4.90	5.0	5.10	
	THL 3-xx12WI	11.76	12.0	12.24	
	THL 3-xx13WI	14.70	15.0	15.30	
	THL 3-xx15WI	23.52	24.0	24.48	
	THL 3-xx21WI	±4.90	±5.0	±5.10	
	THL 3-xx22WI	±11.76	±12.0	±12.24	
	THL 3-xx23WI	±14.70	±15.0	±15.30	
Output Regulation Line ($V_{in\ min}$ to $V_{in\ max}$ at Full Load)			±0.5	±1.0	%
Output Regulation Load (15% to 100% of Full Load)			±0.5	±1.2	%
Output Ripple & Noise Peak-to-Peak (5Hz to 20MHz bandwidth) (Measured with a 1µF/50V MLCC)	All		60	100	mV pk-pk
Temperature Coefficient	All	---	±0.01	±0.02	%/°C
Output Voltage Overshoot ($V_{in\ min}$ to $V_{in\ max}$; Full Load; T_A = 25°C)	All	---	---	5	%
Dynamic Load Response (V_{in} = $V_{in\ nom}$; T_A = 25°C) Load step change form 75% to 100% or 100 to 75% of Full Load	All				
Peak Deviation			±3	±5	%
Setting Time (V_{out} < 10% peak deviation)			300	600	µS

Output Specification (Continued)					
Parameter	**Model**	**Min**	**Nominal**	**Max**	**Unit**
Output Current	THL 3-xx10WI	90		600	mA
	THL 3-xx11WI	90		600	
	THL 3-xx12WI	38		250	
	THL 3-xx13WI	30		200	
	THL 3-xx15WI	19		125	
	THL 3-xx21WI	±45		±300	
	THL 3-xx22WI	±19		±125	
	THL 3-xx23WI	±15		±100	
Output Over Current Protection	All	110			%FL
Output Short Circuit Protection	All	Continuous			

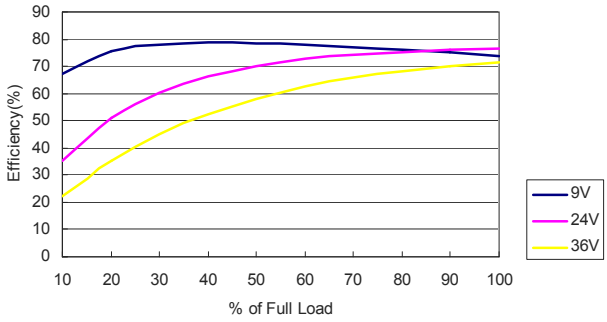
Input Specification					
Parameter	**Model**	**Min**	**Nominal**	**Max**	**Unit**
Operating Input Voltage	THL 3-24xxWI	9	24	36	Vdc
	THL 3-48xxWI	18	48	75	
Under Voltage Lockout Turn-on Threshold	THL 3-24xxWI	4.5	6	8.5	Vdc
	THL 3-48xxWI	8.5	12	17	
Under Voltage Lockout Turn-off Threshold	THL 3-24xxWI			8	Vdc
	THL 3-48xxWI			16	
Input reflected ripple current (5 to 20MHz, 12µH source impedance)	All			5	mA pk-pk
Input Current (Maximum value at V_{in} = $V_{in\ nom}$; Full Load)	THL 3-2410WI		110		mA
	THL 3-2411WI		160		
	THL 3-2412WI		156		
	THL 3-2413WI		156		
	THL 3-2415WI		156		
	THL 3-2421WI		162		
	THL 3-2422WI		156		
	THL 3-2423WI		156		
	THL 3-4810WI		55		
	THL 3-4811WI		80		
	THL 3-4812WI		78		
	THL 3-4813WI		78		
	THL 3-4815WI		78		
	THL 3-4821WI		81		
	THL 3-4822WI		78		
	THL 3-4823WI		78		

Input Specification					
Parameter	**Model**	**Min**	**Nominal**	**Max**	**Unit**
Input Standby current (Typical value at $V_{in} = V_{in\ nom}$; No Load)	THL 3-2410WI THL 3-2411WI THL 3-2412WI THL 3-2413WI THL 3-2415WI THL 3-2421WI THL 3-2422WI THL 3-2423WI			30	mA
	THL 3-4810WI THL 3-4811WI THL 3-4812WI THL 3-4813WI THL 3-4815WI THL 3-4821WI THL 3-4822WI THL 3-4823WI			20	
Remote ON/OFF Control (The Remote On/Off pin is referenced to $-V_{in}$) Positive logic On/Off pin High Voltage (Remote ON) On/Off pin Low Voltage (Remote OFF)	All	 2.5 -0.7		 5.5 0.8	 Vdc Vdc
Remote Off Stand by Input Current	All			5	mA
Input Current of Remote Control Pin	All			-400	µA

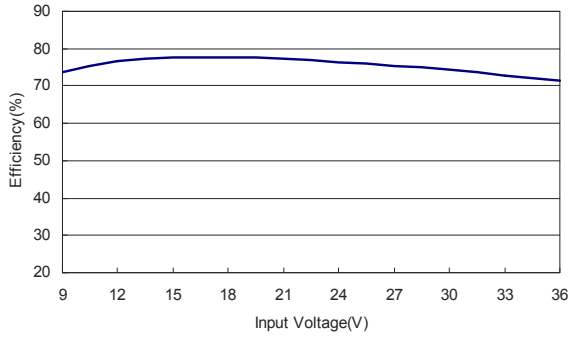
General Specification					
Parameter	**Model**	**Min**	**Nominal**	**Max**	**Unit**
Efficiency (V_{in} = $V_{in\ nom}$; Full Load; T_A = 25°C)	THL 3-2410WI		75		%
	THL 3-2411WI		78		
	THL 3-2412WI		80		
	THL 3-2413WI		80		
	THL 3-2415WI		80		
	THL 3-2421WI		77		
	THL 3-2422WI		80		
	THL 3-2423WI		80		
	THL 3-4810WI		75		
	THL 3-4811WI		78		
	THL 3-4812WI		80		
	THL 3-4813WI		80		
	THL 3-4815WI		80		
	THL 3-4821WI		77		
	THL 3-4822WI		80		
	THL 3-4823WI		80		
Isolation voltage Input to Output (for 60 seconds)		1500			Vdc
Isolation resistance	All	1000			MΩ
Isolation capacitance			350	500	pF
Switching Frequency			350		KHz
Weight			5.4		g
MTBF MIL-STD-217F, T_C = 25°C		300			K Hours

Characteristic Curves

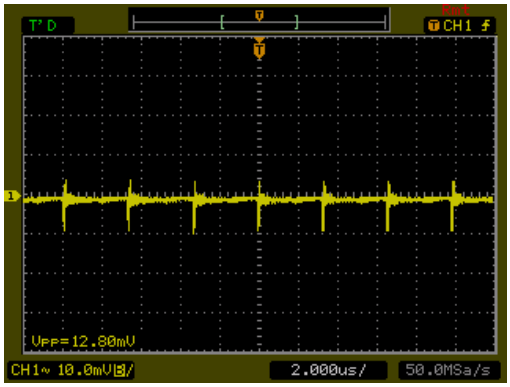
All test conditions are at 25°C. The figures are identical for THL 3-2410WI



Efficiency Versus Output Current

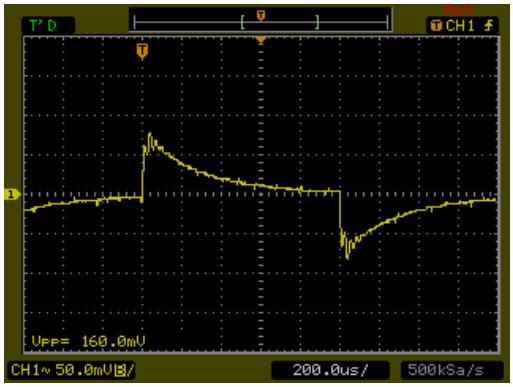


Efficiency Versus Input Voltage. Full Load

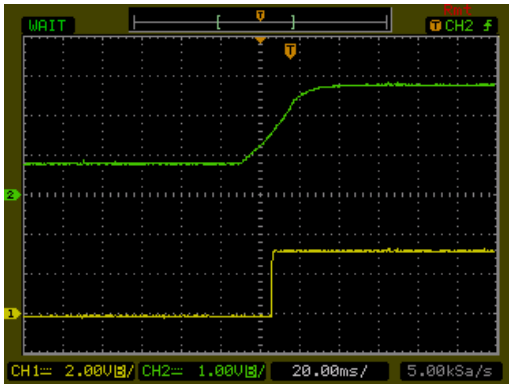


Typical Output Ripple and Noise.

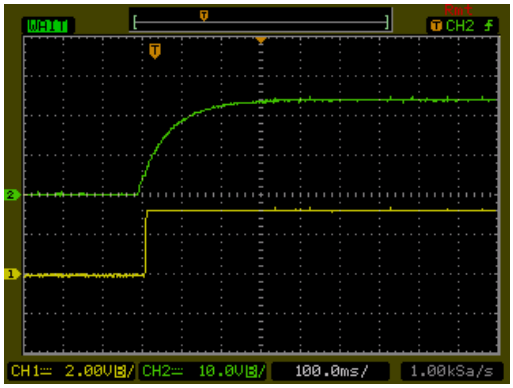
$V_{in} = V_{in\ nom}$; Full Load; T_A = 25°C



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



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

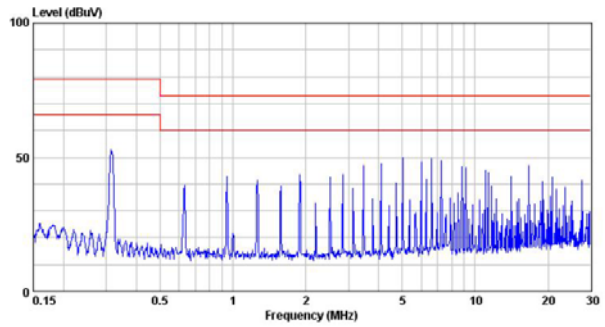


Typical Input Start-Up and Output Rise Characteristic

$V_{in} = V_{in\ nom}$; Full Load

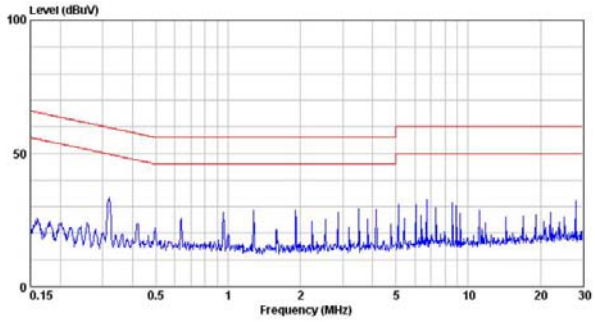
Characteristic Curves

All test conditions are at 25°C. The figures are identical for THL 3-2410WI



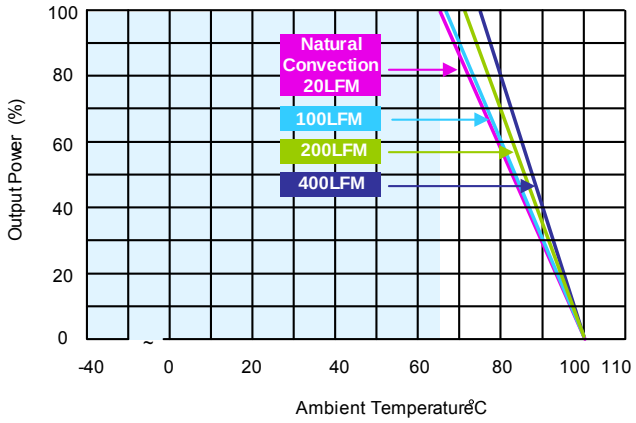
Conduction Emission of EN55022 Class A

$V_{in} = V_{in\ nom}$; Full Load



Conduction Emission of EN55022 Class B

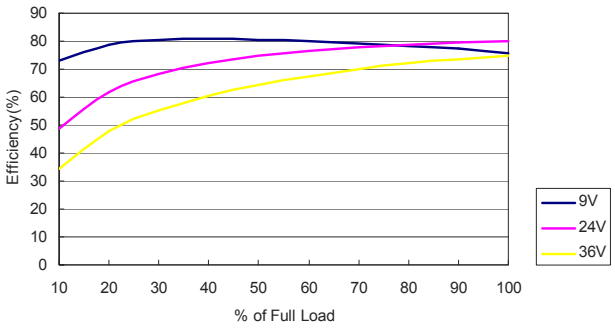
$V_{in} = V_{in\ nom}$; Full Load



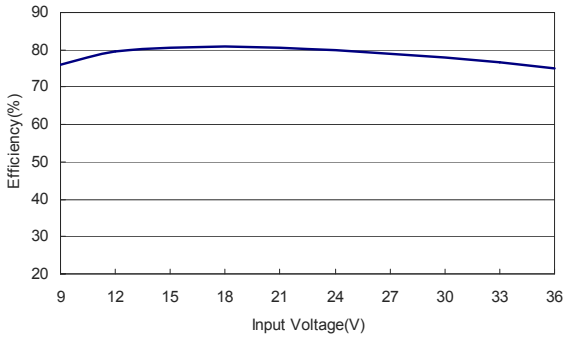
Derating Output Current Versus Ambient Temperature and Airflow; $V_{in} = V_{in\ nom}$

Characteristic Curves

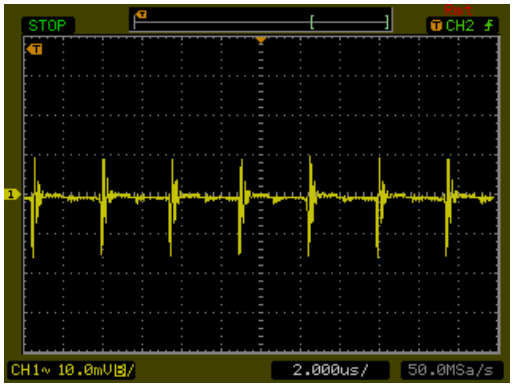
All test conditions are at 25°C. The figures are identical for THL 3-2411WI



Efficiency Versus Output Current

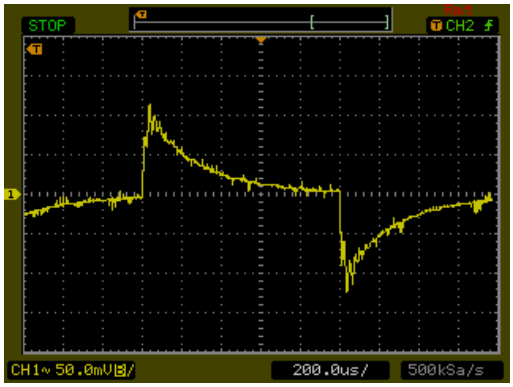


Efficiency Versus Input Voltage. Full Load

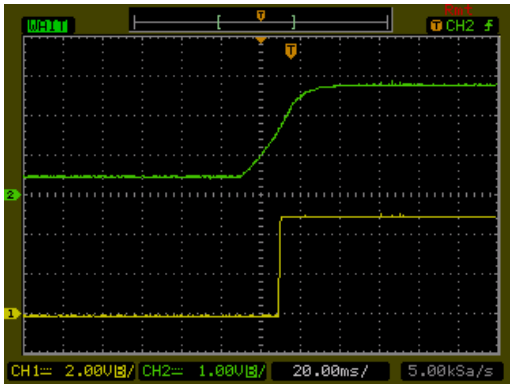


Typical Output Ripple and Noise.

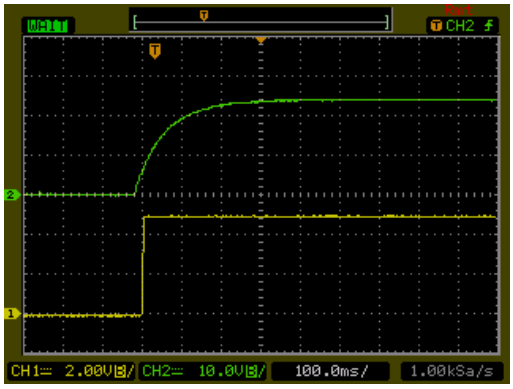
$V_{in} = V_{in\ nom}$; Full Load; $T_A = 25°C$



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



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

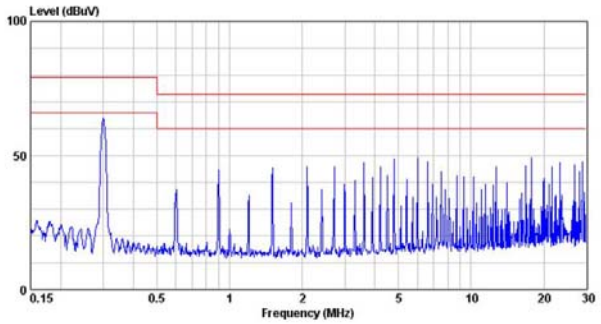


Typical Input Start-Up and Output Rise Characteristic

$V_{in} = V_{in\ nom}$; Full Load

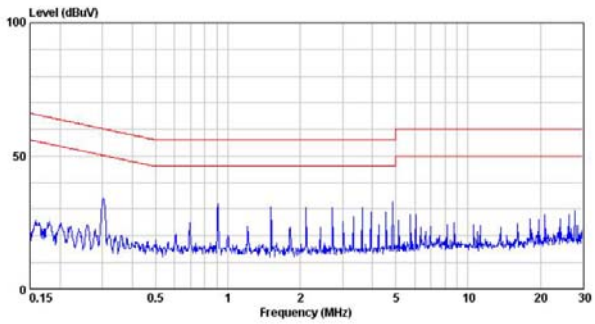
Characteristic Curves

All test conditions are at 25°C. The figures are identical for THL 3-2411WI (Continued)



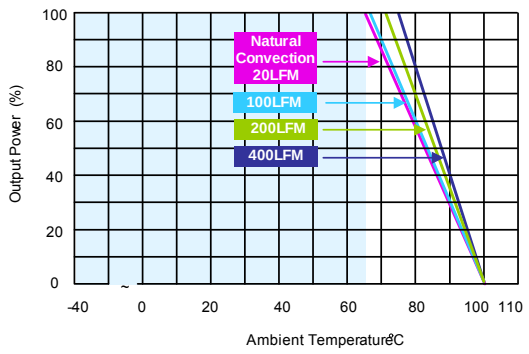
Conduction Emission of EN55022 Class A

$V_{in} = V_{in\ nom}$; Full Load



Conduction Emission of EN55022 Class B

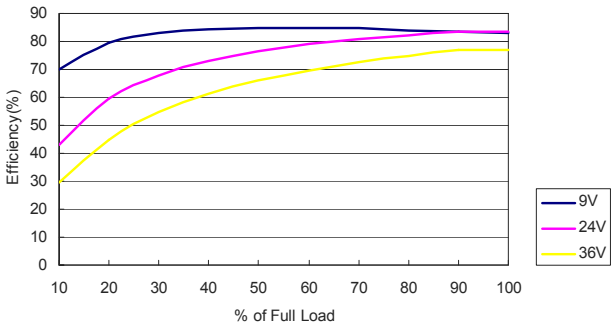
$V_{in} = V_{in\ nom}$; Full Load



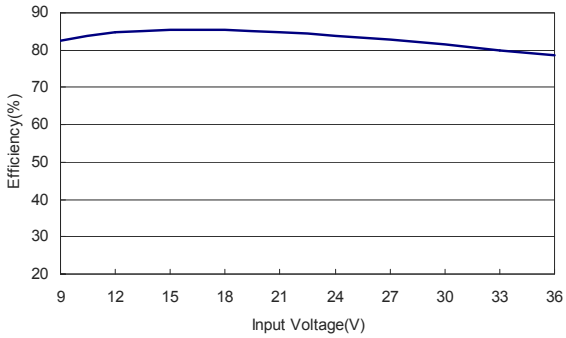
Derating Output Current Versus Ambient Temperature and Airflow; $V_{in} = V_{in\ nom}$

Characteristic Curves

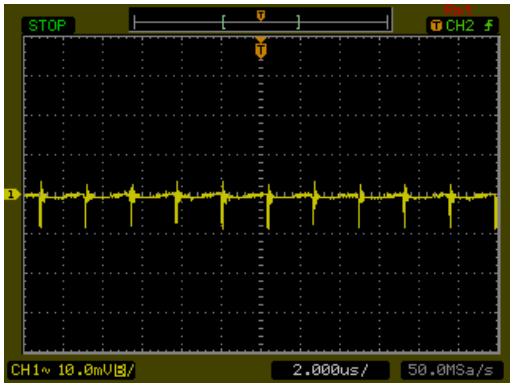
All test conditions are at 25°C. The figures are identical for THL 3-2412WI



Efficiency Versus Output Current

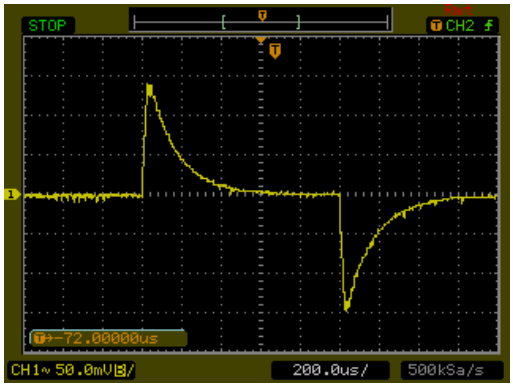


Efficiency Versus Input Voltage. Full Load

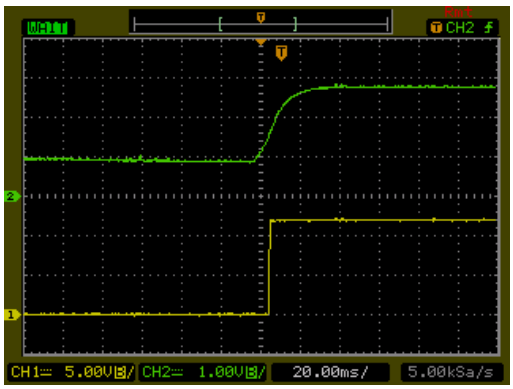


Typical Output Ripple and Noise.

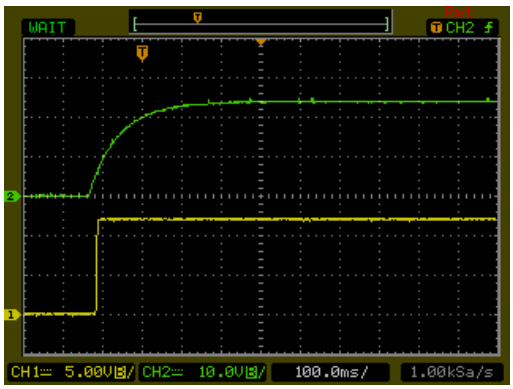
$V_{in} = V_{in\ nom}$; Full Load; T_A = 25°C



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



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

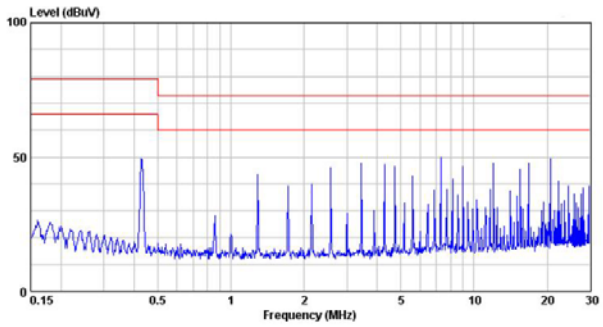


Typical Input Start-Up and Output Rise Characteristic

$V_{in} = V_{in\ nom}$; Full Load

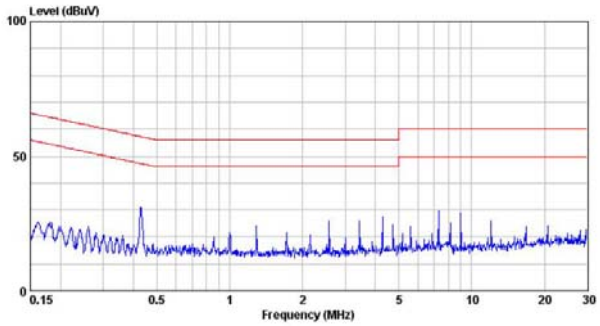
Characteristic Curves

All test conditions are at 25°C. The figures are identical for THL 3-2412WI (Continued)



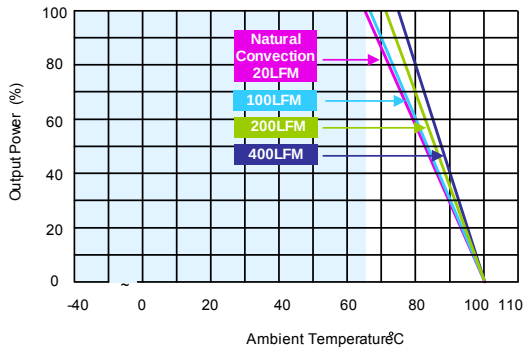
Conduction Emission of EN55022 Class A

$V_{in} = V_{in\ nom}$; Full Load



Conduction Emission of EN55022 Class B

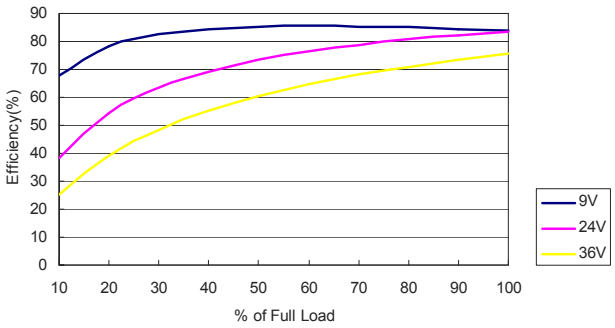
$V_{in} = V_{in\ nom}$; Full Load



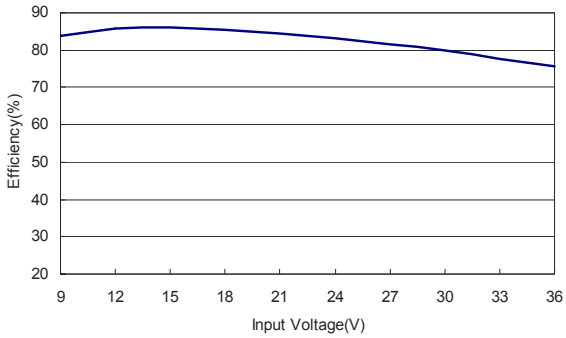
Derating Output Current Versus Ambient Temperature and Airflow; $V_{in} = V_{in\ nom}$

Characteristic Curves

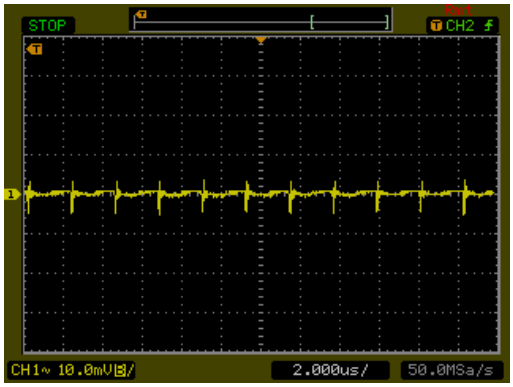
All test conditions are at 25°C. The figures are identical for THL 3-2413WI



Efficiency Versus Output Current

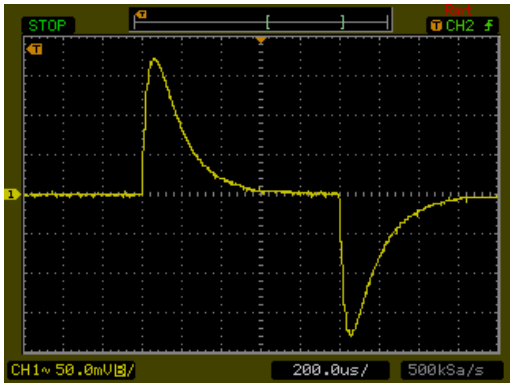


Efficiency Versus Input Voltage. Full Load

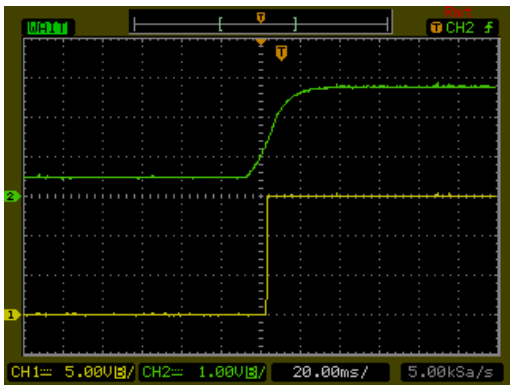


Typical Output Ripple and Noise.

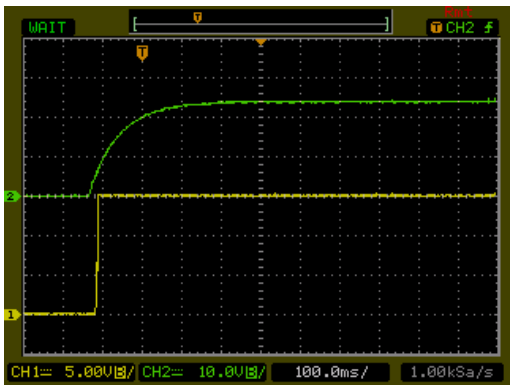
$V_{in} = V_{in\ nom}$; Full Load; $T_A = 25°C$



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



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

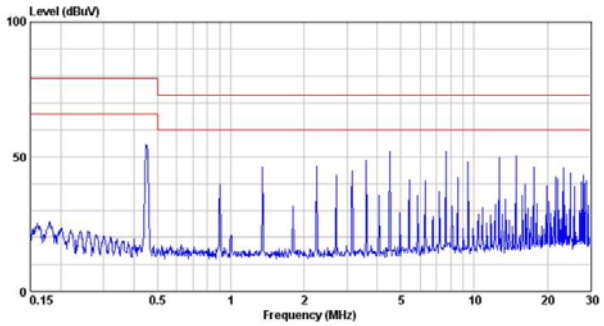


Typical Input Start-Up and Output Rise Characteristic

$V_{in} = V_{in\ nom}$; Full Load

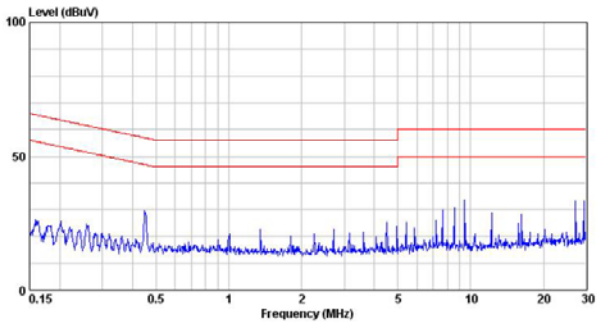
Characteristic Curves

All test conditions are at 25°C. The figures are identical for THL 3-2413WI (Continued)



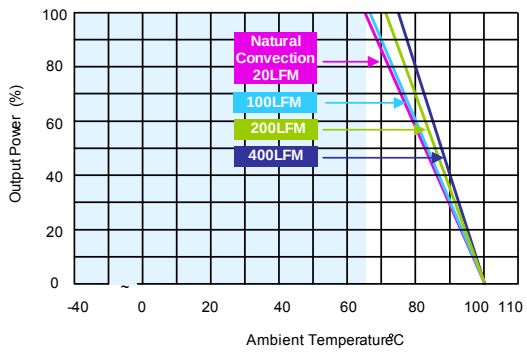
Conduction Emission of EN55022 Class A

$V_{in} = V_{in\ nom}$; Full Load



Conduction Emission of EN55022 Class B

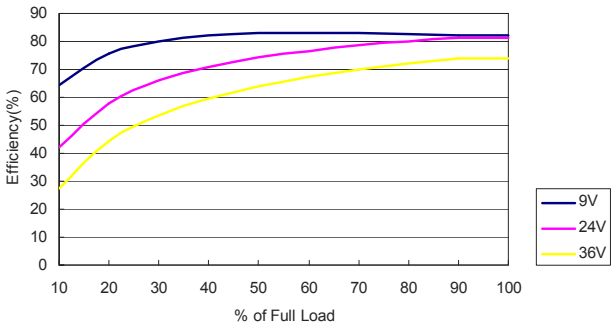
$V_{in} = V_{in\ nom}$; Full Load



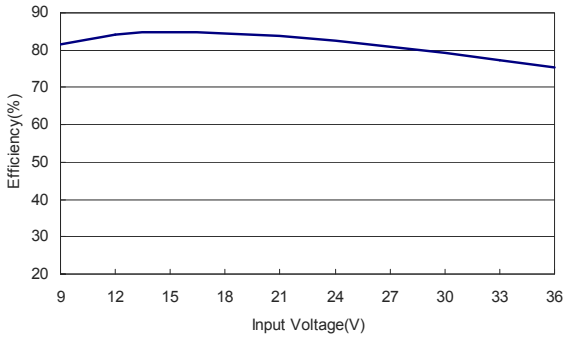
Derating Output Current Versus Ambient Temperature and Airflow; $V_{in} = V_{in\ nom}$

Characteristic Curves

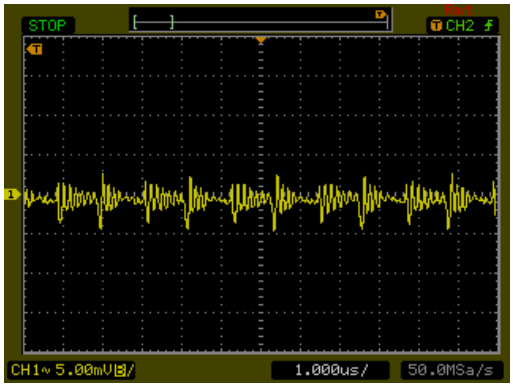
All test conditions are at 25°C. The figures are identical for THL 3-2415WI



Efficiency Versus Output Current

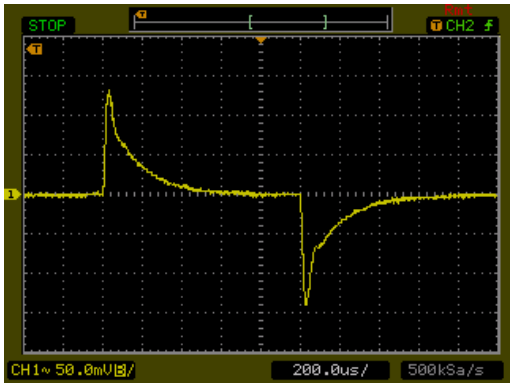


Efficiency Versus Input Voltage. Full Load

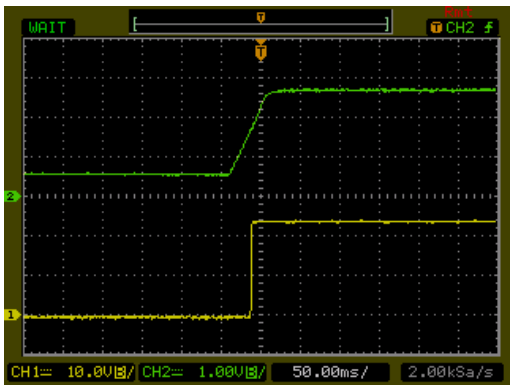


Typical Output Ripple and Noise.

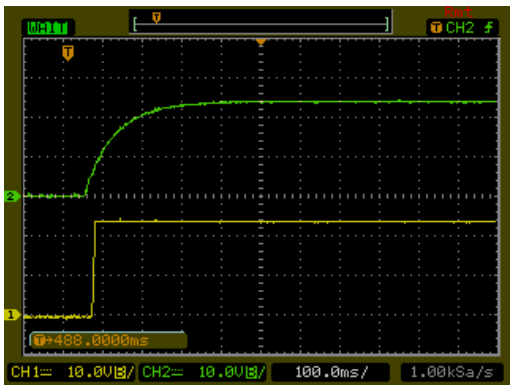
$V_{in} = V_{in\ nom}$; Full Load; T_A = 25°C



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



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

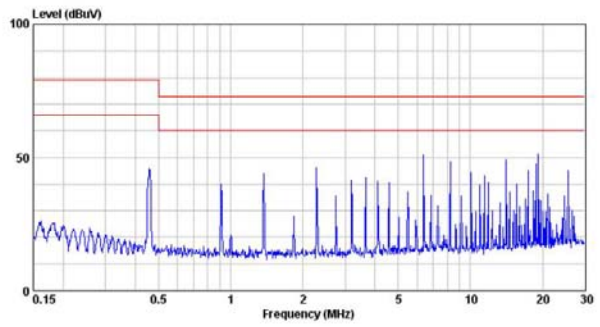


Typical Input Start-Up and Output Rise Characteristic

$V_{in} = V_{in\ nom}$; Full Load

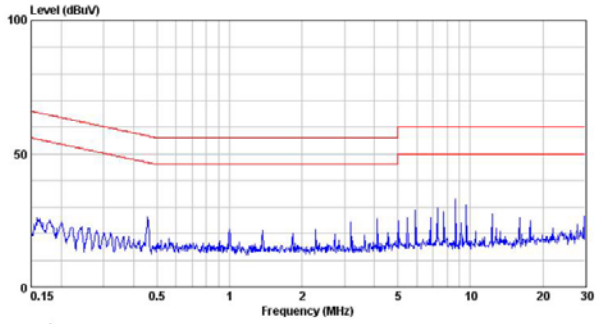
Characteristic Curves

All test conditions are at 25°C. The figures are identical for THL 3-2415WI (Continued)



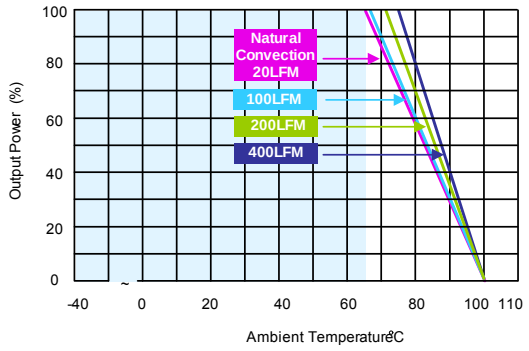
Conduction Emission of EN55022 Class A

$V_{in} = V_{in\ nom}$; Full Load



Conduction Emission of EN55022 Class B

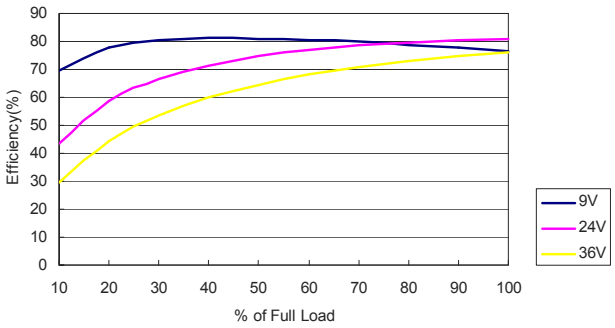
$V_{in} = V_{in\ nom}$; Full Load



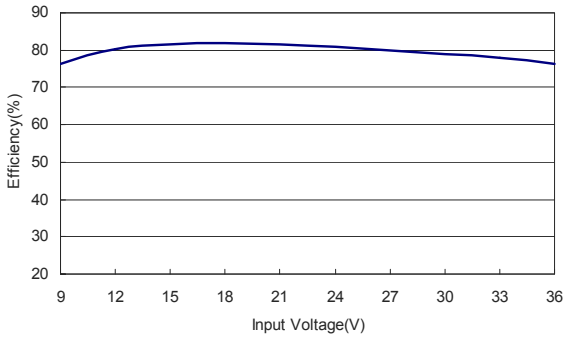
Derating Output Current Versus Ambient Temperature and Airflow; $V_{in} = V_{in\ nom}$

Characteristic Curves

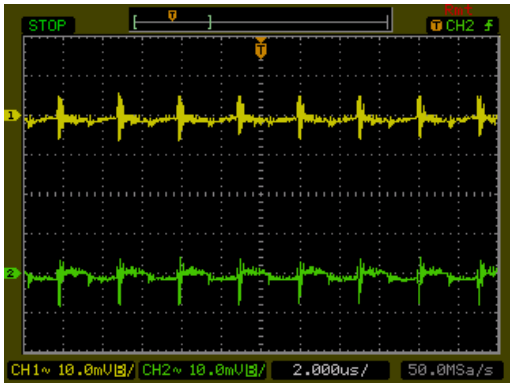
All test conditions are at 25°C. The figures are identical for THL 3-2421WI



Efficiency Versus Output Current

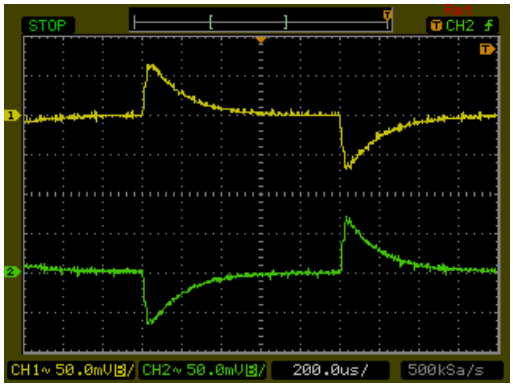


Efficiency Versus Input Voltage. Full Load

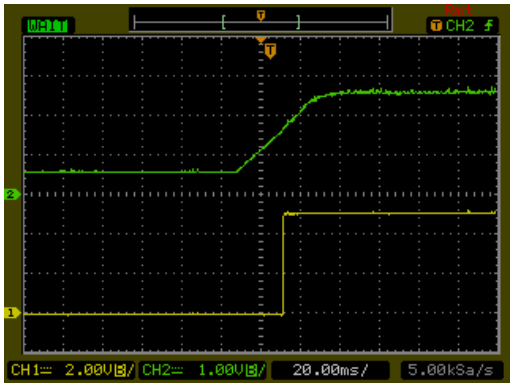


Typical Output Ripple and Noise.

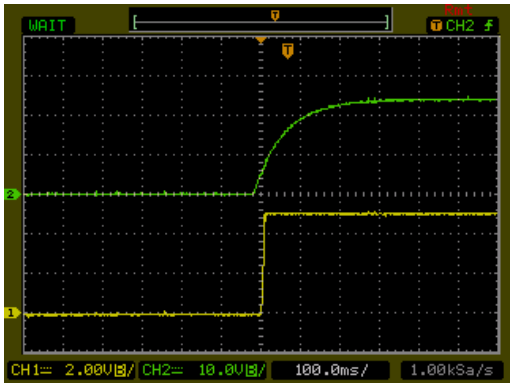
$V_{in} = V_{in\ nom}$; Full Load; T_A = 25°C



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



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

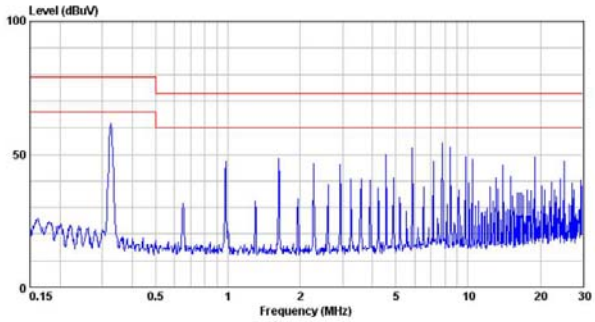


Typical Input Start-Up and Output Rise Characteristic

$V_{in} = V_{in\ nom}$; Full Load

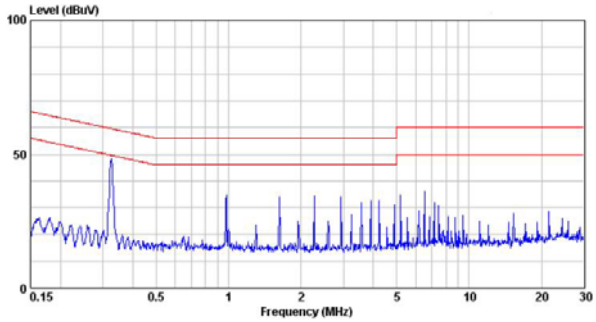
Characteristic Curves

All test conditions are at 25°C. The figures are identical for THL 3-2421WI (Continued)



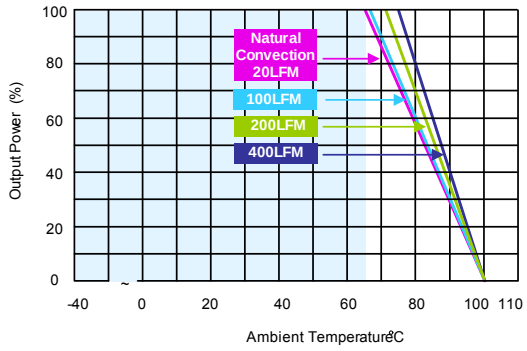
Conduction Emission of EN55022 Class A

$V_{in} = V_{in\ nom}$; Full Load



Conduction Emission of EN55022 Class B

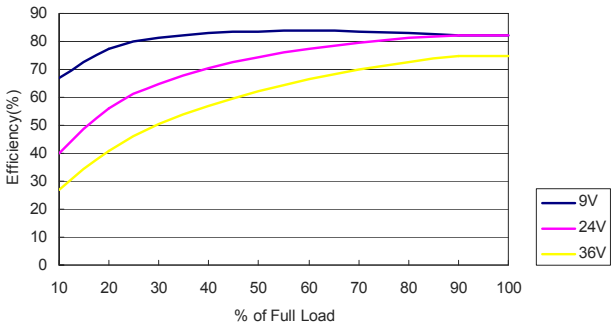
$V_{in} = V_{in\ nom}$; Full Load



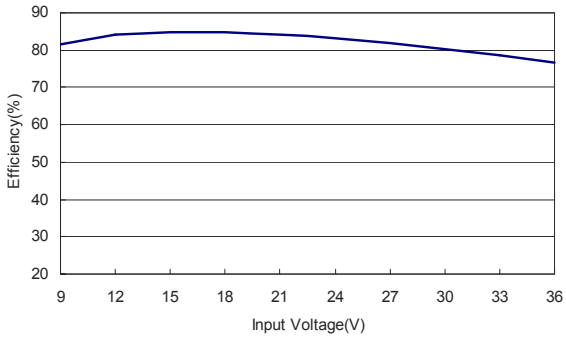
Derating Output Current Versus Ambient Temperature and Airflow; $V_{in} = V_{in\ nom}$

Characteristic Curves

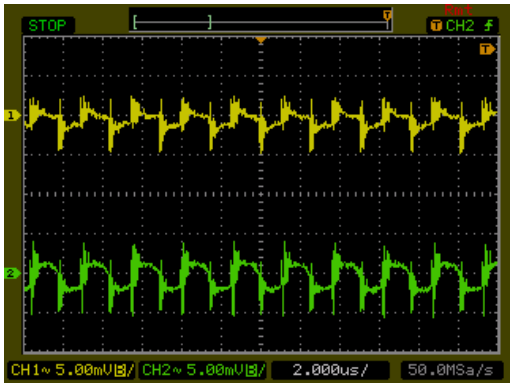
All test conditions are at 25°C. The figures are identical for THL 3-2422WI



Efficiency Versus Output Current

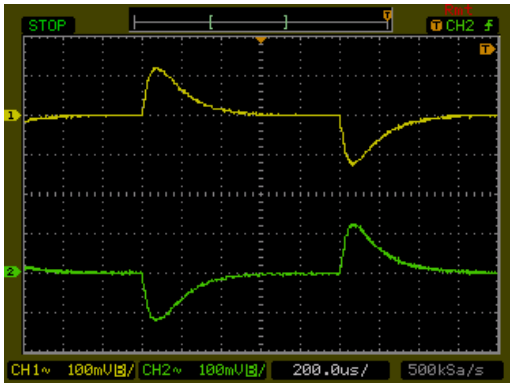


Efficiency Versus Input Voltage. Full Load

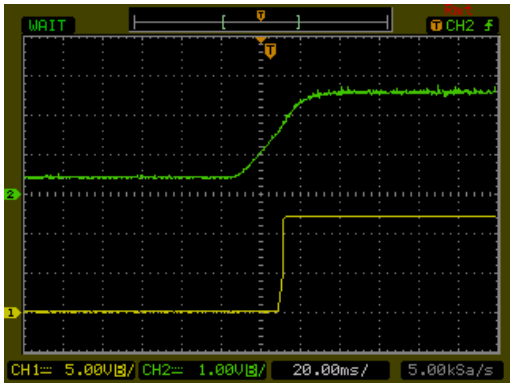


Typical Output Ripple and Noise.

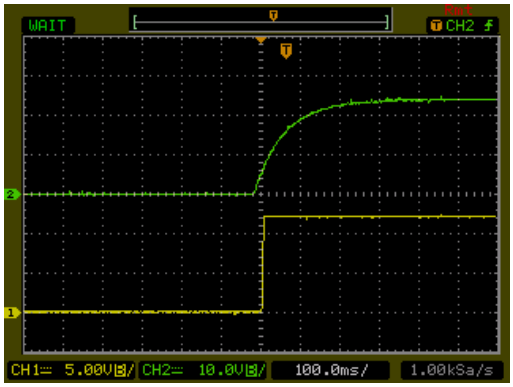
$V_{in} = V_{in\ nom}$; Full Load; $T_A = 25°C$



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



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

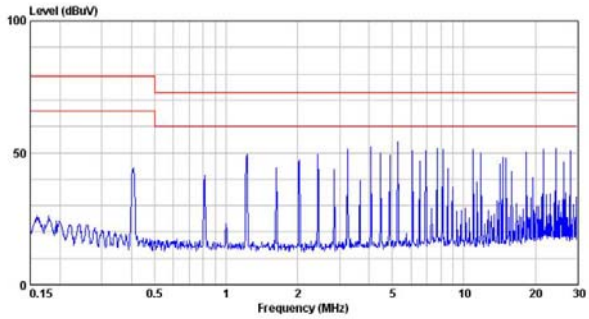


Typical Input Start-Up and Output Rise Characteristic

$V_{in} = V_{in\ nom}$; Full Load

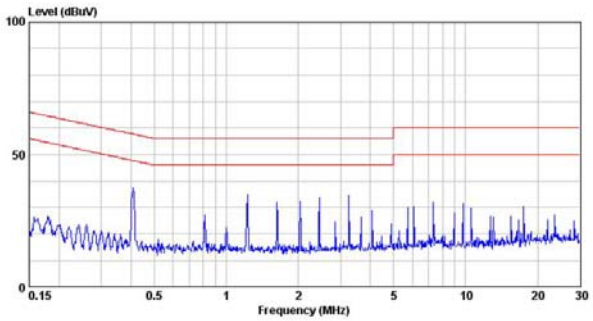
Characteristic Curves

All test conditions are at 25°C. The figures are identical for THL 3-2422WI (Continued)



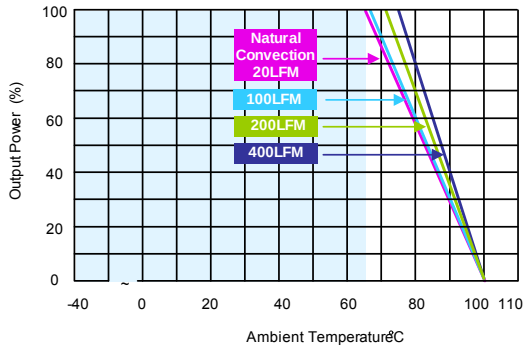
Conduction Emission of EN55022 Class A

$V_{in} = V_{in\ nom}$; Full Load



Conduction Emission of EN55022 Class B

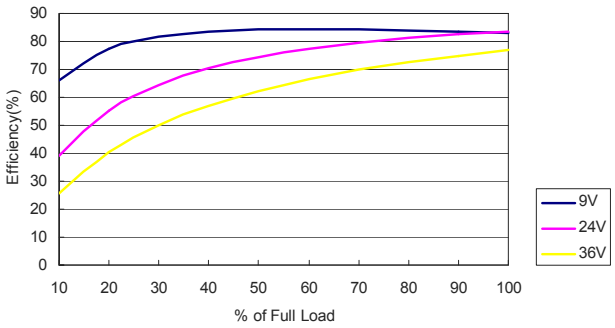
$V_{in} = V_{in\ nom}$; Full Load



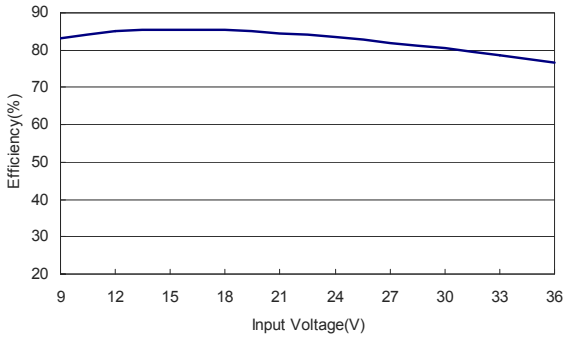
Derating Output Current Versus Ambient Temperature and Airflow; $V_{in} = V_{in\ nom}$

Characteristic Curves

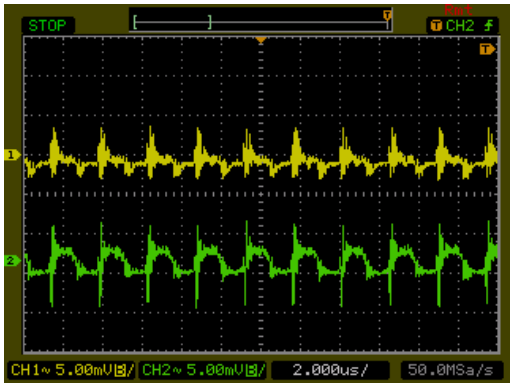
All test conditions are at 25°C. The figures are identical for THL 3-2423WI



Efficiency Versus Output Current

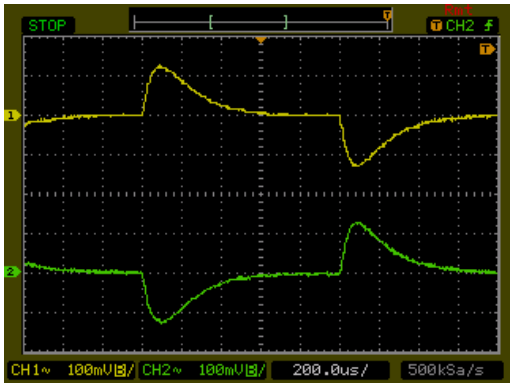


Efficiency Versus Input Voltage. Full Load

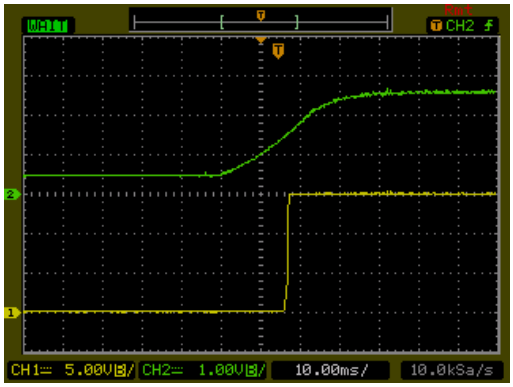


Typical Output Ripple and Noise.

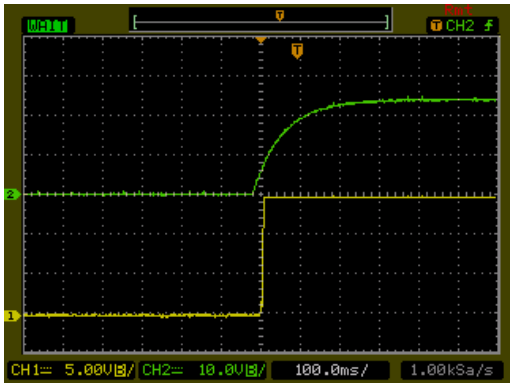
$V_{in} = V_{in\ nom}$; Full Load; $T_A = 25°C$



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



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

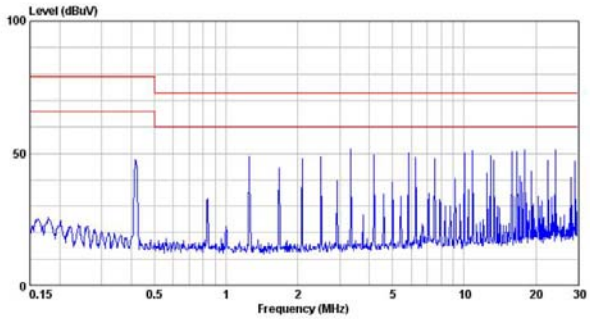


Typical Input Start-Up and Output Rise Characteristic

$V_{in} = V_{in\ nom}$; Full Load

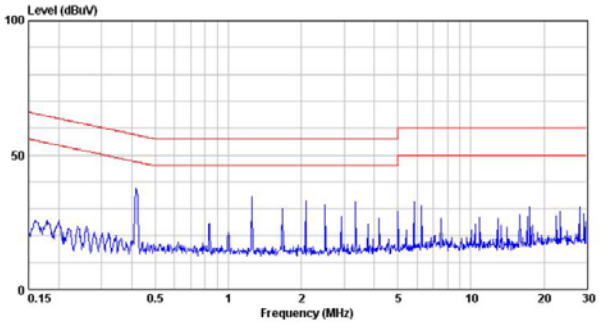
Characteristic Curves

All test conditions are at 25°C. The figures are identical for THL 3-2423WI (Continued)



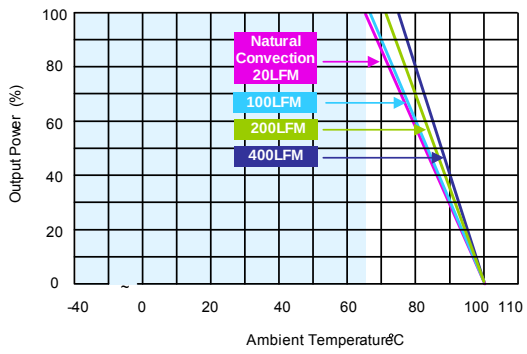
Conduction Emission of EN55022 Class A

$V_{in} = V_{in\ nom}$; Full Load



Conduction Emission of EN55022 Class B

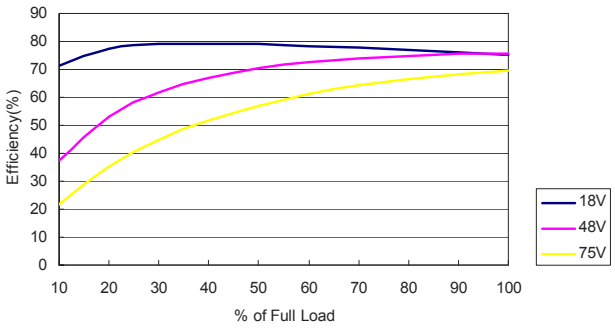
$V_{in} = V_{in\ nom}$; Full Load



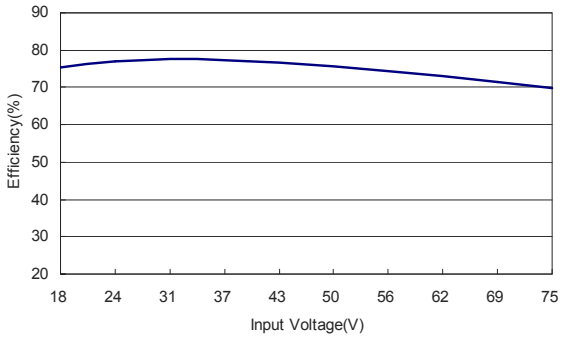
Derating Output Current Versus Ambient Temperature and Airflow; $V_{in} = V_{in\ nom}$

Characteristic Curves

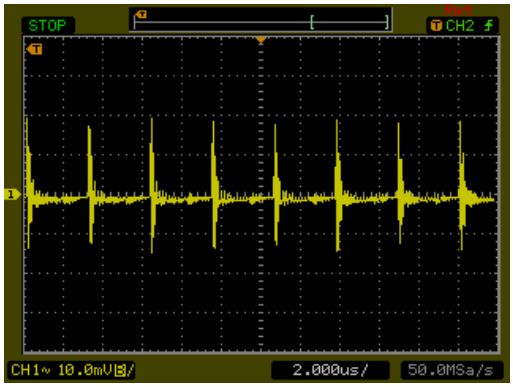
All test conditions are at 25°C. The figures are identical for THL 3-4810WI



Efficiency Versus Output Current

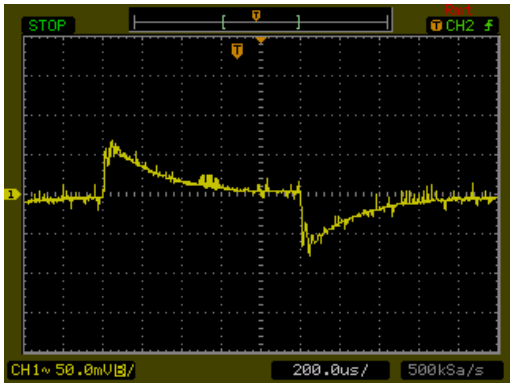


Efficiency Versus Input Voltage. Full Load

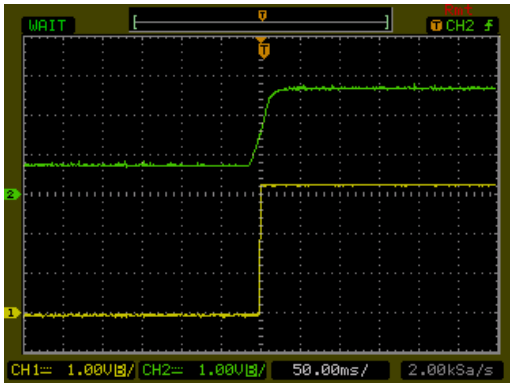


Typical Output Ripple and Noise.

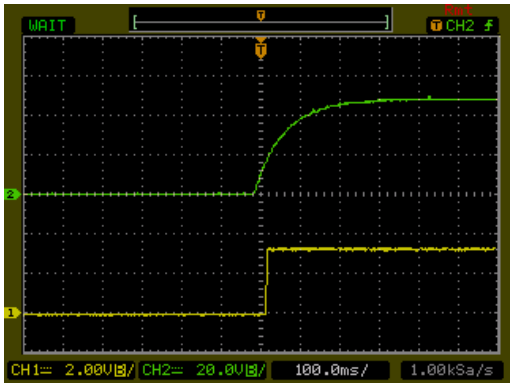
$V_{in} = V_{in\ nom}$; Full Load; T_A = 25°C



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



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

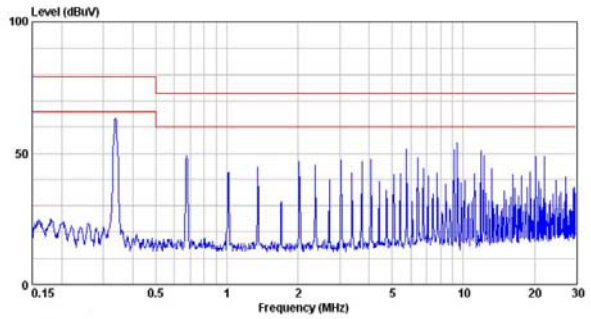


Typical Input Start-Up and Output Rise Characteristic

$V_{in} = V_{in\ nom}$; Full Load

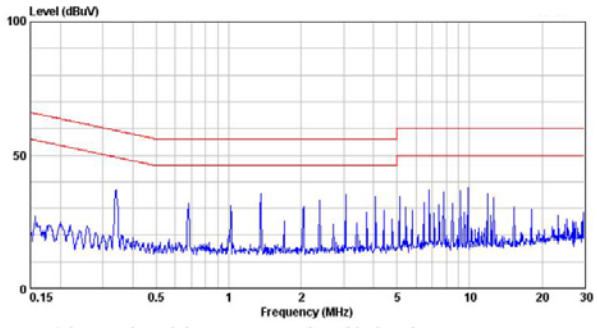
Characteristic Curves

All test conditions are at 25°C. The figures are identical for THL 3-4810WI (Continued)



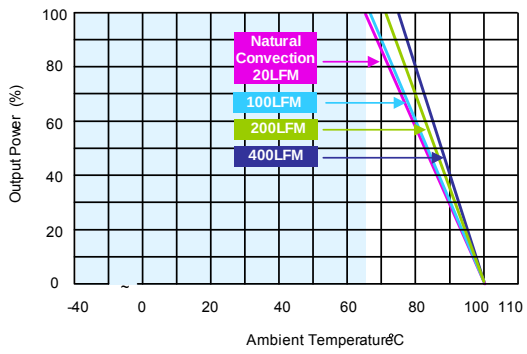
Conduction Emission of EN55022 Class A

$V_{in} = V_{in\ nom}$; Full Load



Conduction Emission of EN55022 Class B

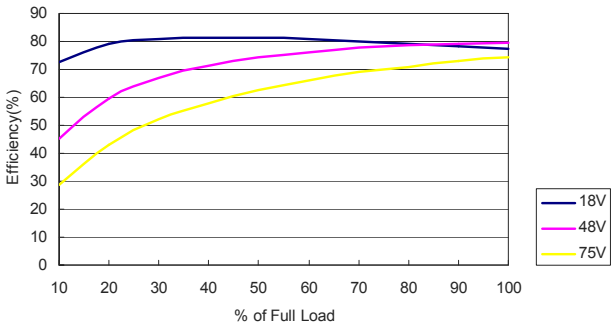
$V_{in} = V_{in\ nom}$; Full Load



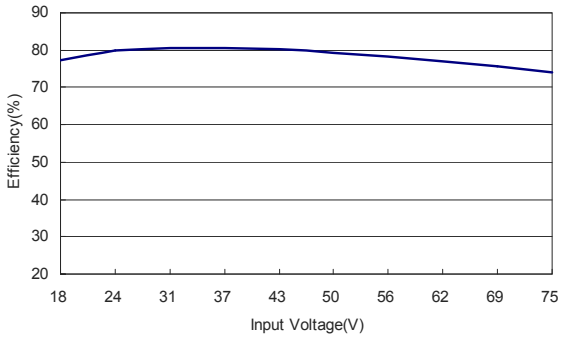
Derating Output Current Versus Ambient Temperature and Airflow; $V_{in} = V_{in\ nom}$

Characteristic Curves

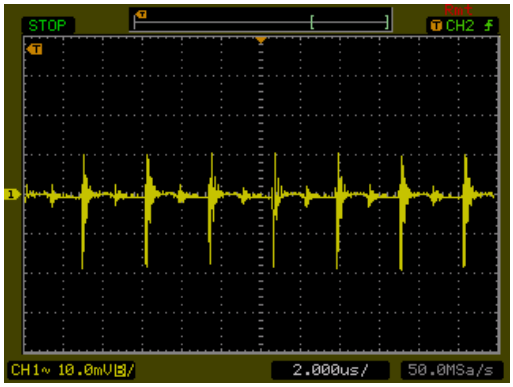
All test conditions are at 25°C. The figures are identical for THL 3-4811WI



Efficiency Versus Output Current

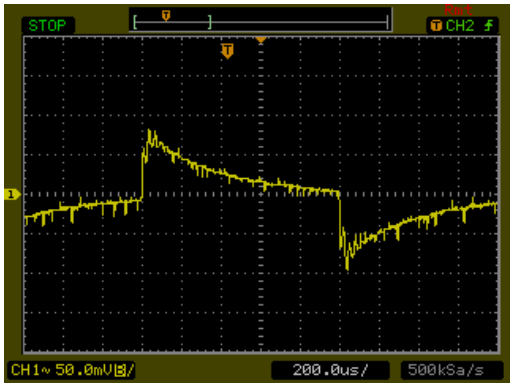


Efficiency Versus Input Voltage. Full Load

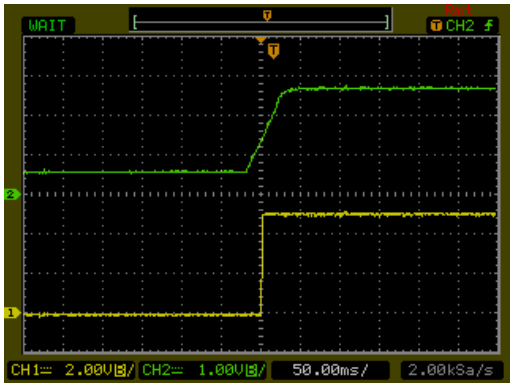


Typical Output Ripple and Noise.

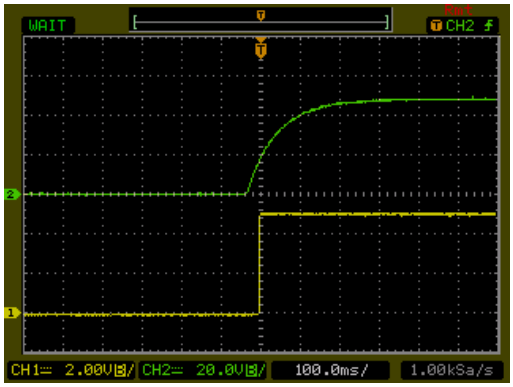
$V_{in} = V_{in\ nom}$; Full Load; T_A = 25°C



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



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

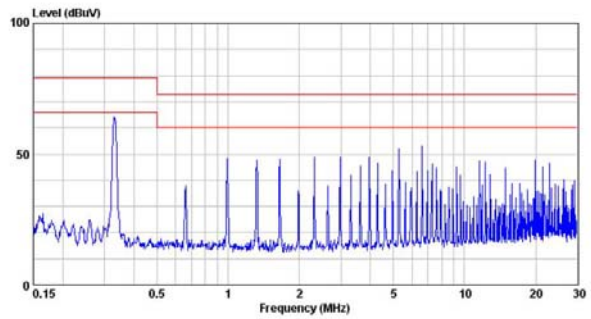


Typical Input Start-Up and Output Rise Characteristic

$V_{in} = V_{in\ nom}$; Full Load

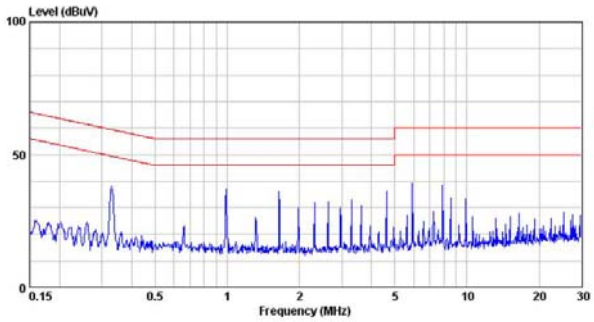
Characteristic Curves

All test conditions are at 25°C. The figures are identical for THL 3-4811WI (Continued)



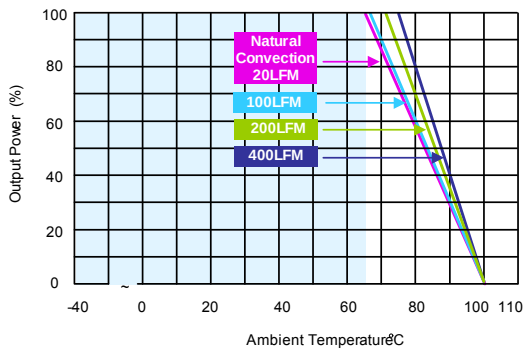
Conduction Emission of EN55022 Class A

$V_{in} = V_{in\ nom}$; Full Load



Conduction Emission of EN55022 Class B

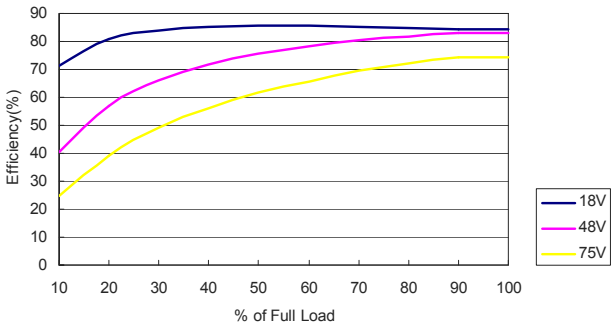
$V_{in} = V_{in\ nom}$; Full Load



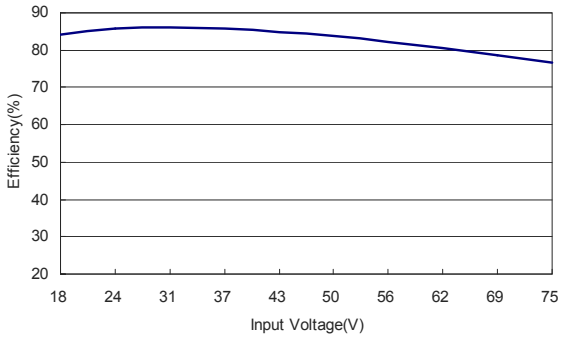
Derating Output Current Versus Ambient Temperature and Airflow; $V_{in} = V_{in\ nom}$

Characteristic Curves

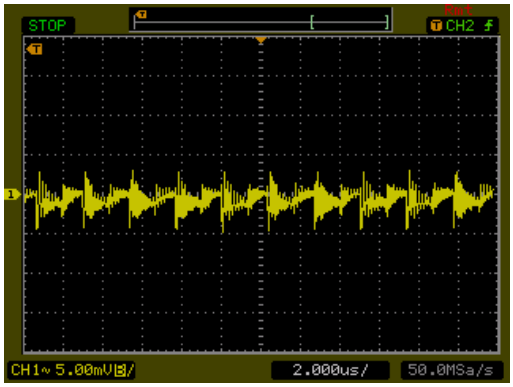
All test conditions are at 25°C. The figures are identical for THL 3-4812WI



Efficiency Versus Output Current

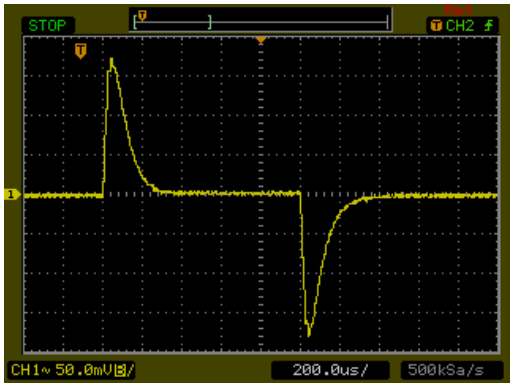


Efficiency Versus Input Voltage. Full Load

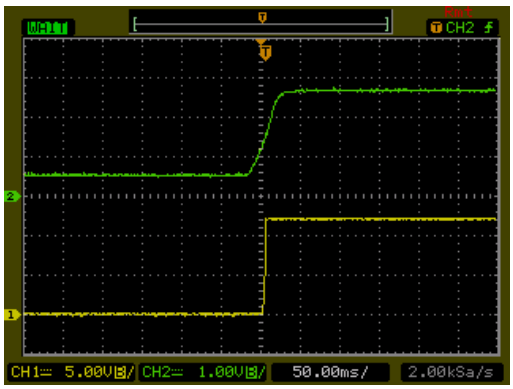


Typical Output Ripple and Noise.

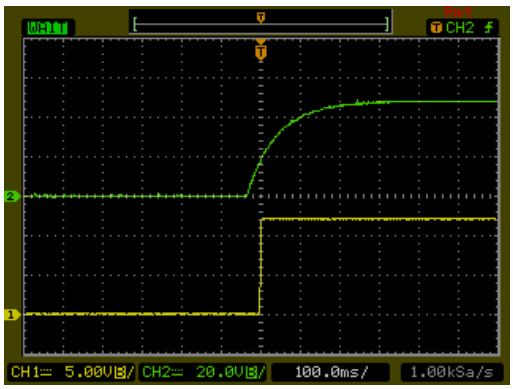
$V_{in} = V_{in\ nom}$; Full Load; T_A = 25°C



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



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

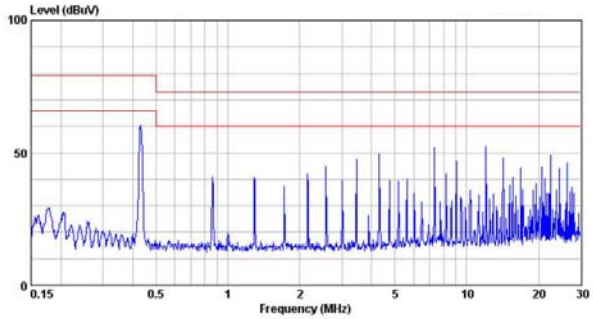


Typical Input Start-Up and Output Rise Characteristic

$V_{in} = V_{in\ nom}$; Full Load

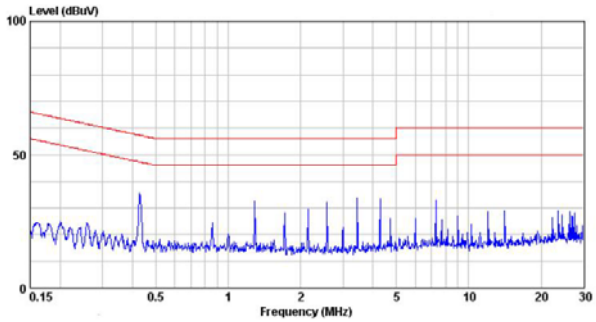
Characteristic Curves

All test conditions are at 25°C. The figures are identical for THL 3-4812WI (Continued)



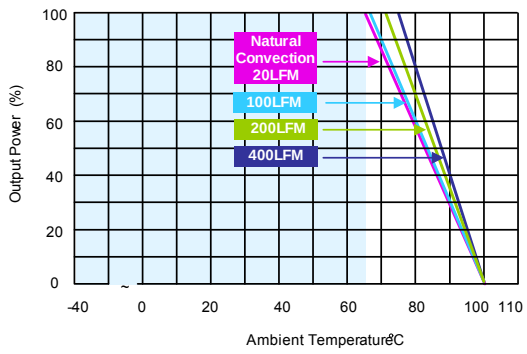
Conduction Emission of EN55022 Class A

$V_{in} = V_{in\ nom}$; Full Load



Conduction Emission of EN55022 Class B

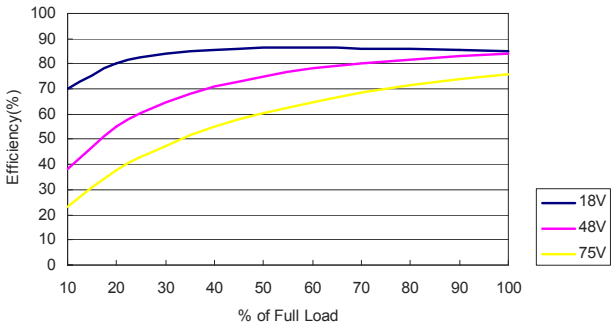
$V_{in} = V_{in\ nom}$; Full Load



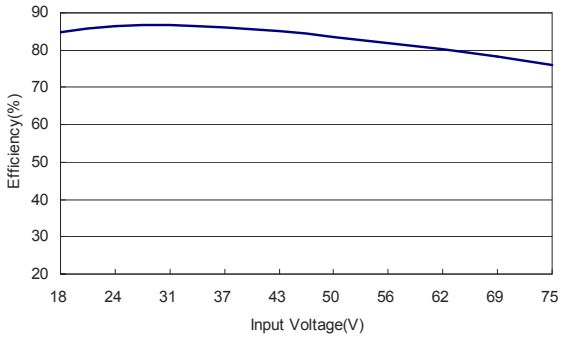
Derating Output Current Versus Ambient Temperature and Airflow; $V_{in} = V_{in\ nom}$

Characteristic Curves

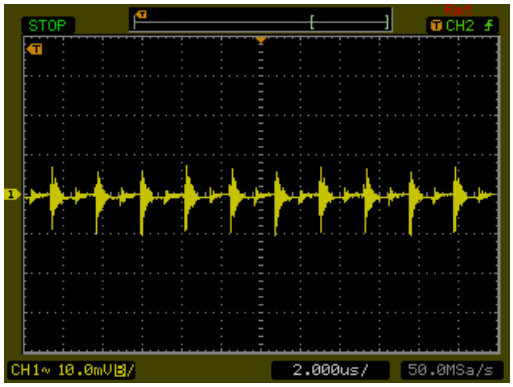
All test conditions are at 25°C. The figures are identical for THL 3-4813WI



Efficiency Versus Output Current

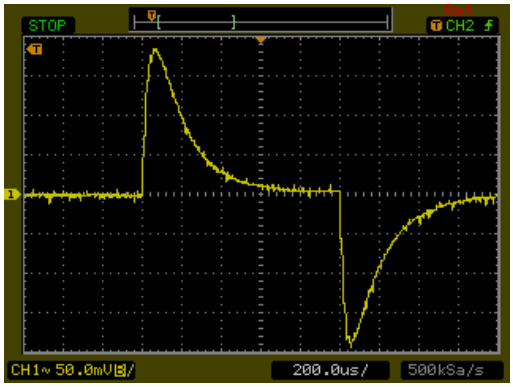


Efficiency Versus Input Voltage. Full Load

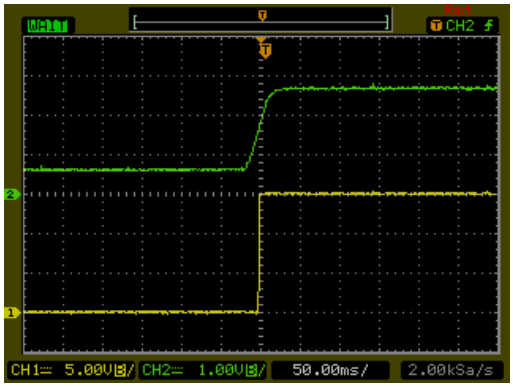


Typical Output Ripple and Noise.

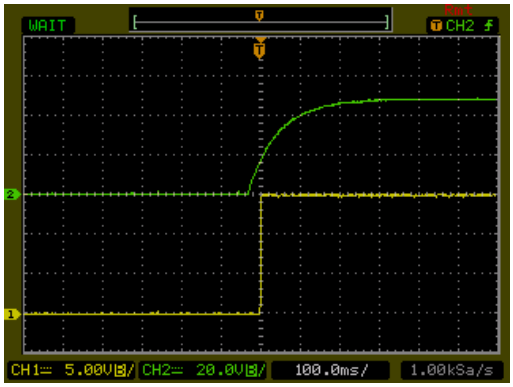
$V_{in} = V_{in\ nom}$; Full Load; T_A = 25°C



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



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

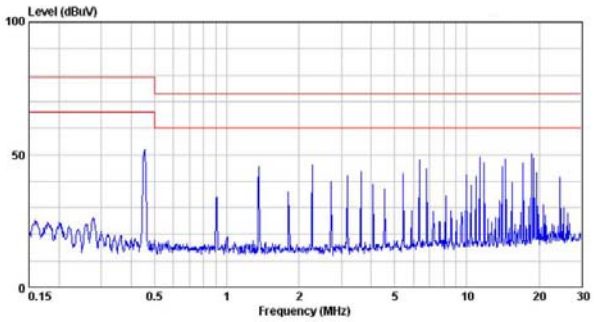


Typical Input Start-Up and Output Rise Characteristic

$V_{in} = V_{in\ nom}$; Full Load

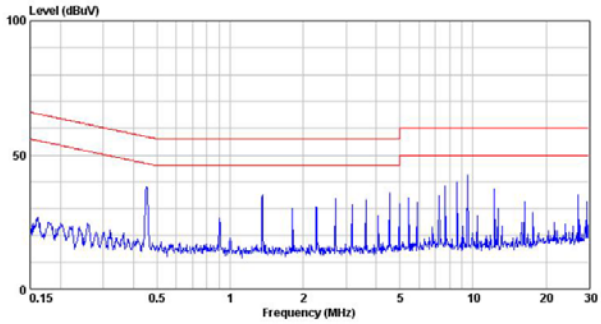
Characteristic Curves

All test conditions are at 25°C. The figures are identical for THL 3-4813WI (Continued)



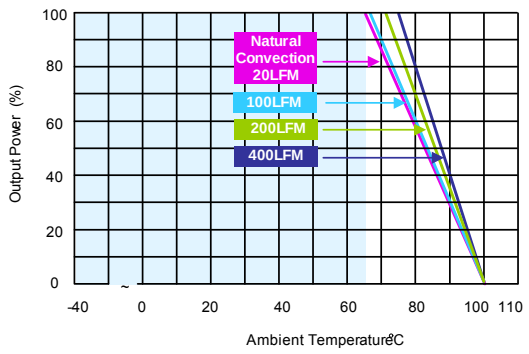
Conduction Emission of EN55022 Class A

$V_{in} = V_{in\ nom}$; Full Load



Conduction Emission of EN55022 Class B

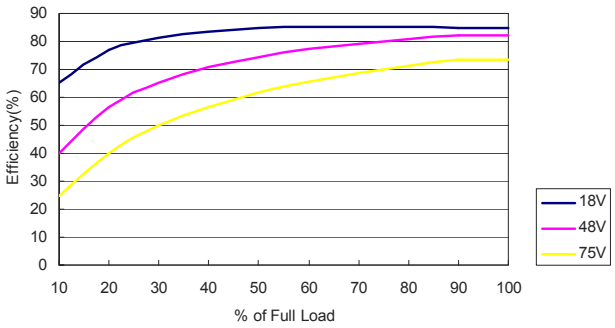
$V_{in} = V_{in\ nom}$; Full Load



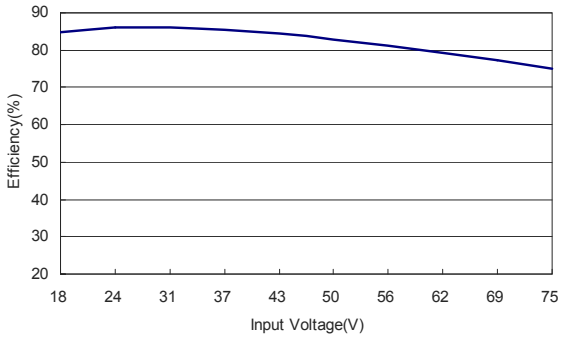
Derating Output Current Versus Ambient Temperature and Airflow; $V_{in} = V_{in\ nom}$

Characteristic Curves

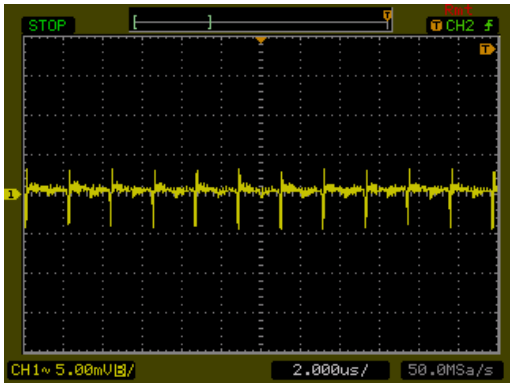
All test conditions are at 25°C. The figures are identical for THL 3-4815WI



Efficiency Versus Output Current

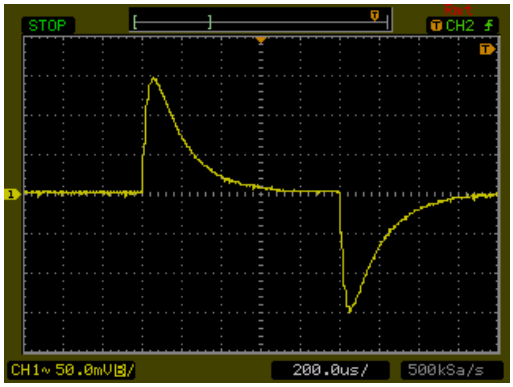


Efficiency Versus Input Voltage. Full Load

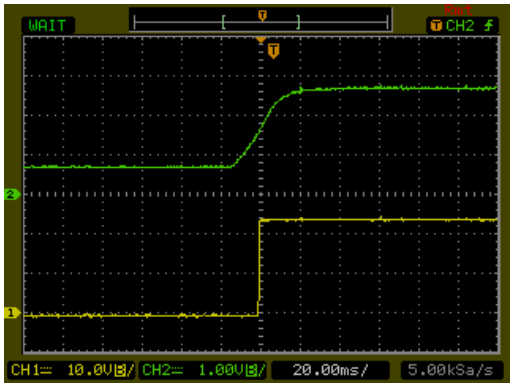


Typical Output Ripple and Noise.

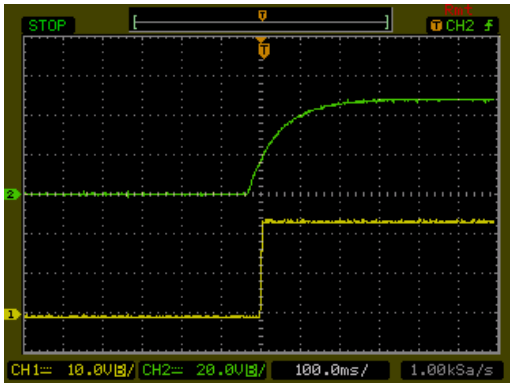
$V_{in} = V_{in\ nom}$; Full Load; T_A = 25°C



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



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

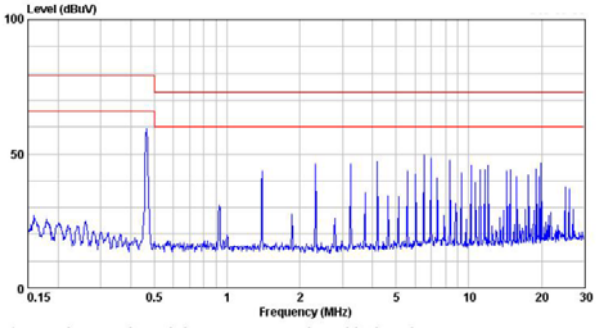


Typical Input Start-Up and Output Rise Characteristic

$V_{in} = V_{in\ nom}$; Full Load

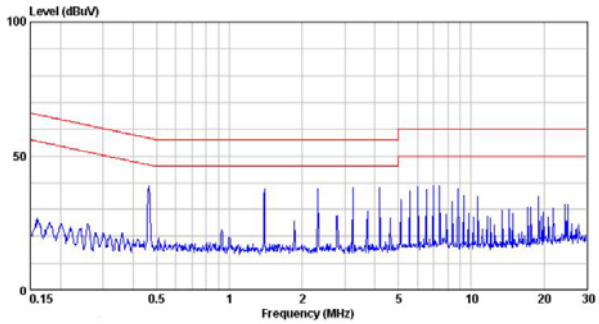
Characteristic Curves

All test conditions are at 25°C. The figures are identical for THL 3-4815WI (Continued)



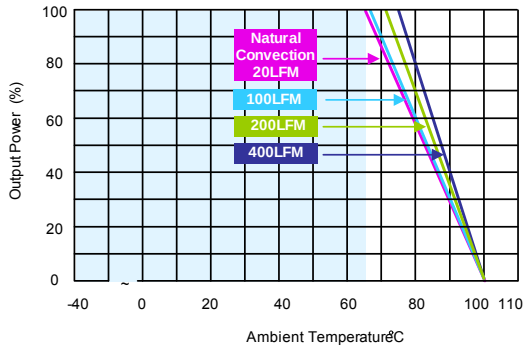
Conduction Emission of EN55022 Class A

$V_{in} = V_{in\ nom}$; Full Load



Conduction Emission of EN55022 Class B

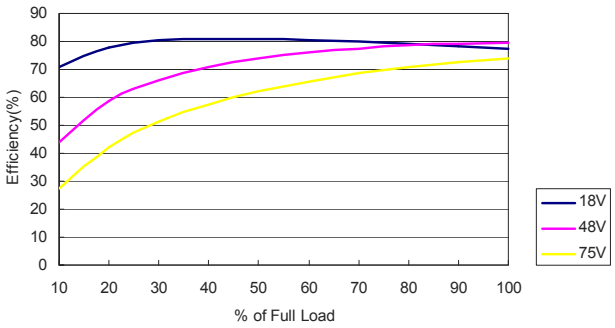
$V_{in} = V_{in\ nom}$; Full Load



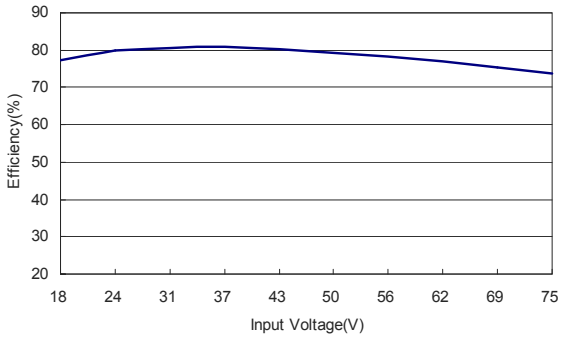
Derating Output Current Versus Ambient Temperature and Airflow; $V_{in} = V_{in\ nom}$

Characteristic Curves

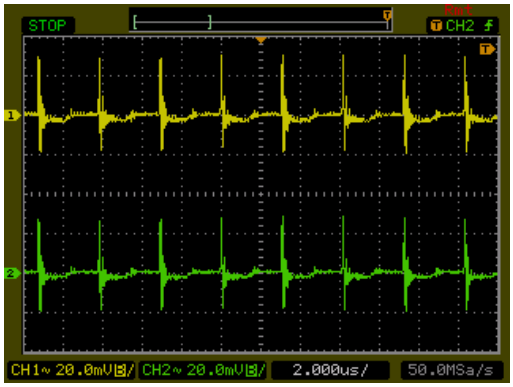
All test conditions are at 25°C. The figures are identical for THL 3-4821WI



Efficiency Versus Output Current

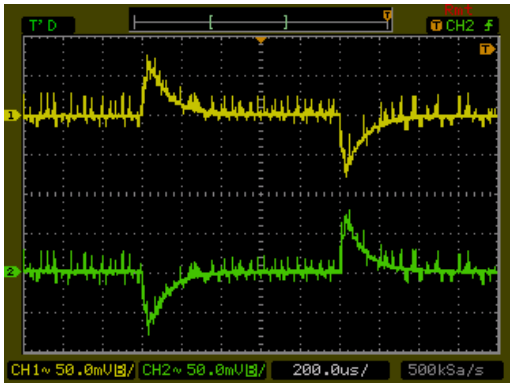


Efficiency Versus Input Voltage. Full Load

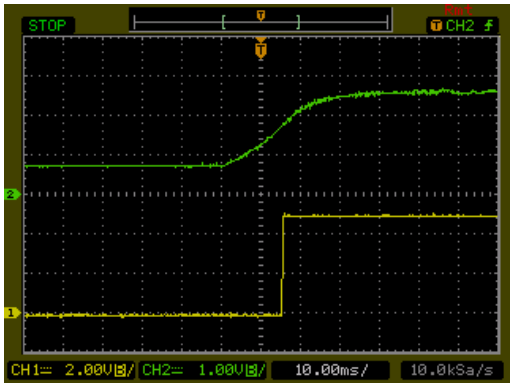


Typical Output Ripple and Noise.

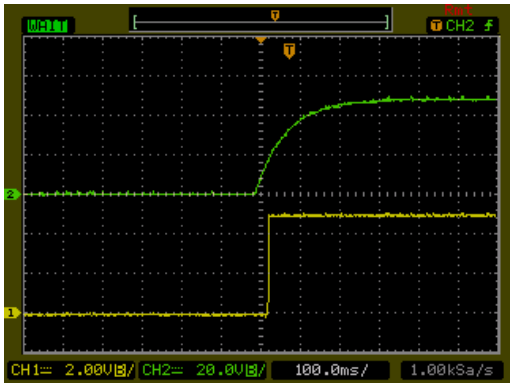
$V_{in} = V_{in\ nom}$; Full Load; T_A = 25°C



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



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

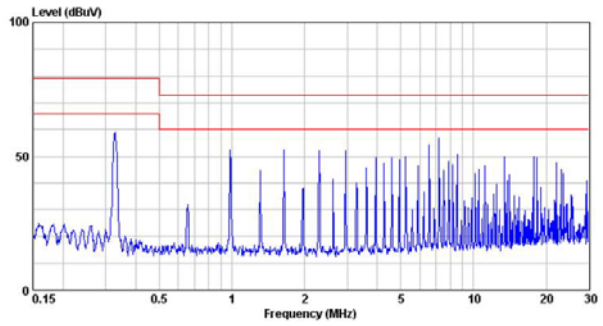


Typical Input Start-Up and Output Rise Characteristic

$V_{in} = V_{in\ nom}$; Full Load

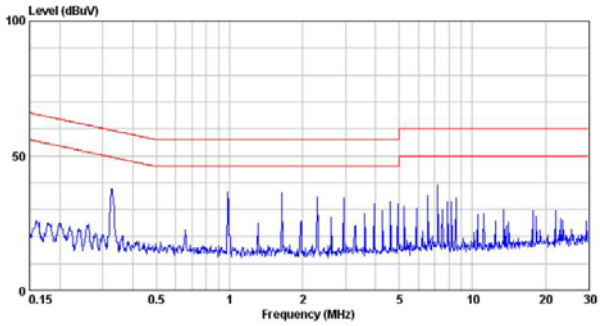
Characteristic Curves

All test conditions are at 25°C. The figures are identical for THL 3-4821WI (Continued)



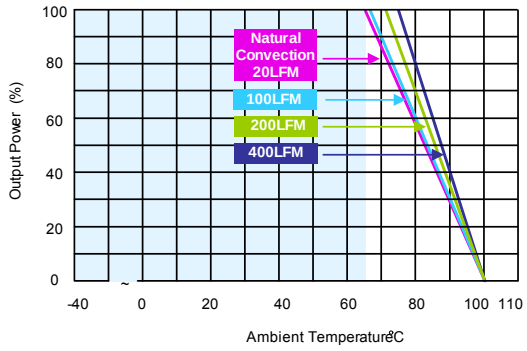
Conduction Emission of EN55022 Class A

$V_{in} = V_{in\ nom}$; Full Load



Conduction Emission of EN55022 Class B

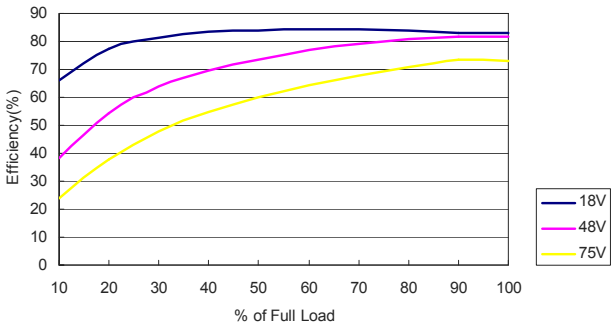
$V_{in} = V_{in\ nom}$; Full Load



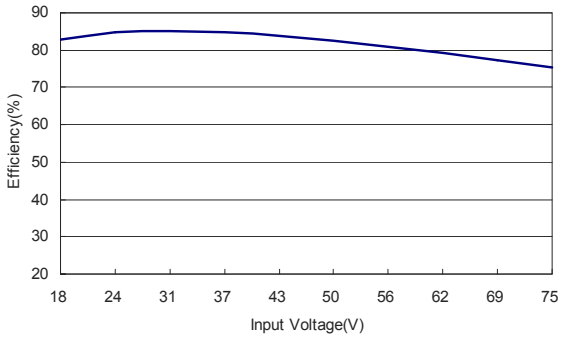
Derating Output Current Versus Ambient Temperature and Airflow; $V_{in} = V_{in\ nom}$

Characteristic Curves

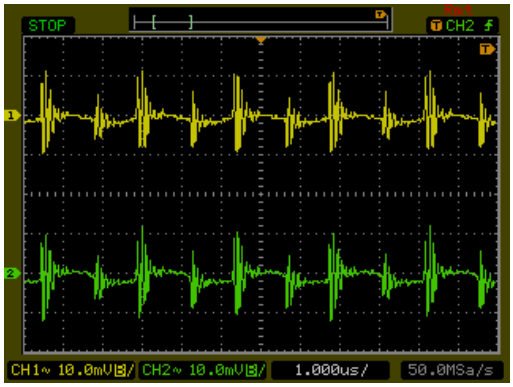
All test conditions are at 25°C. The figures are identical for THL 3-4822WI



Efficiency Versus Output Current

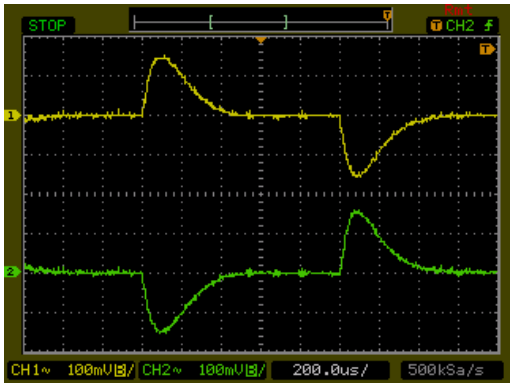


Efficiency Versus Input Voltage. Full Load

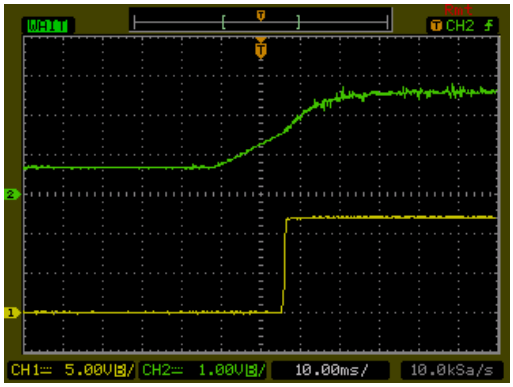


Typical Output Ripple and Noise.

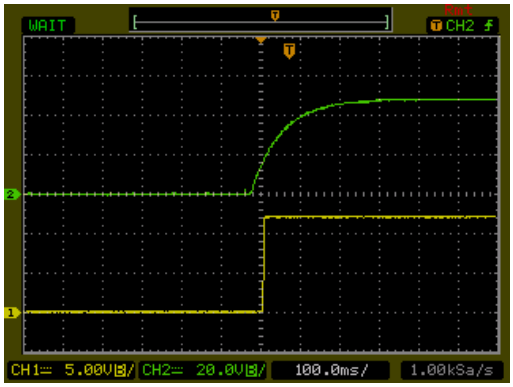
$V_{in} = V_{in\ nom}$; Full Load; T_A = 25°C



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



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

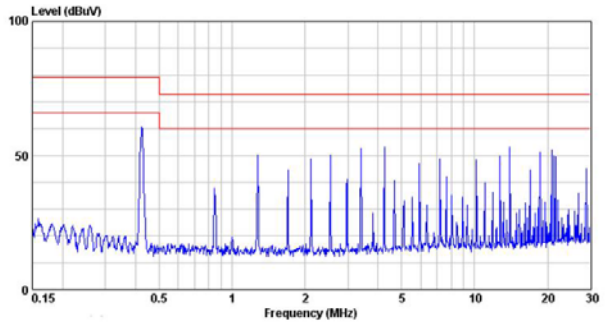


Typical Input Start-Up and Output Rise Characteristic

$V_{in} = V_{in\ nom}$; Full Load

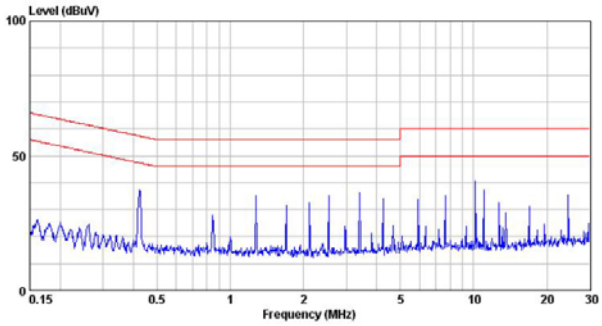
Characteristic Curves

All test conditions are at 25°C. The figures are identical for THL 3-4822WI (Continued)



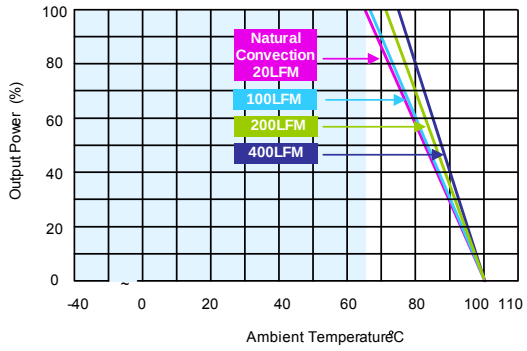
Conduction Emission of EN55022 Class A

$V_{in} = V_{in\ nom}$; Full Load



Conduction Emission of EN55022 Class B

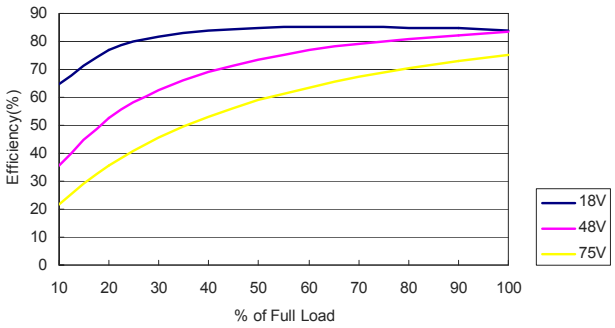
$V_{in} = V_{in\ nom}$; Full Load



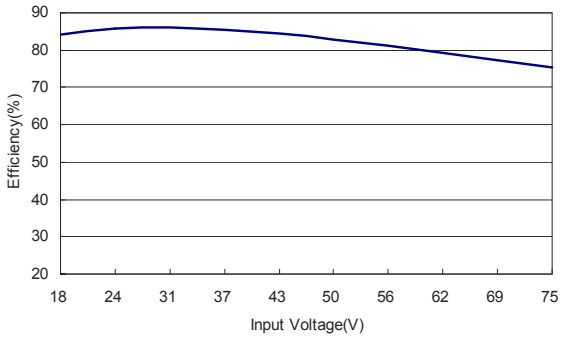
Derating Output Current Versus Ambient Temperature and Airflow; $V_{in} = V_{in\ nom}$

Characteristic Curves

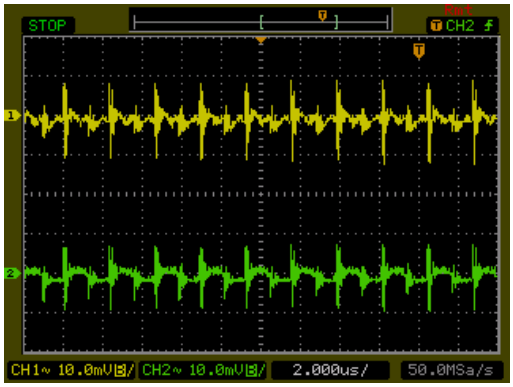
All test conditions are at 25°C. The figures are identical for THL 3-4823WI



Efficiency Versus Output Current

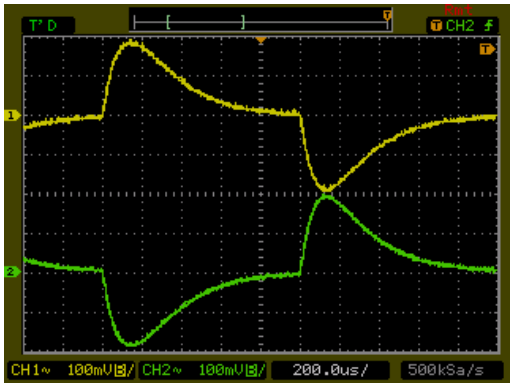


Efficiency Versus Input Voltage. Full Load

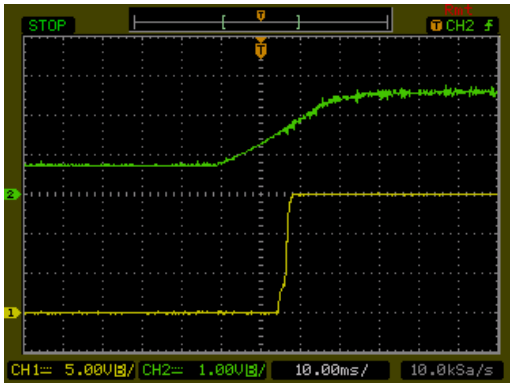


Typical Output Ripple and Noise.

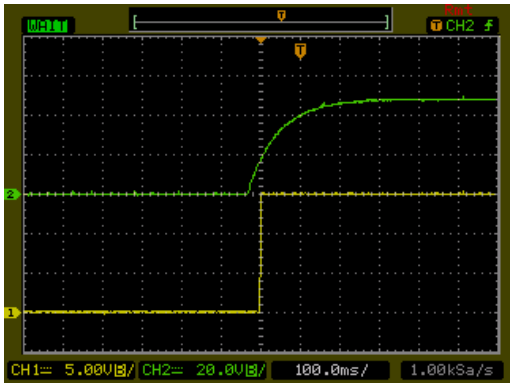
$V_{in} = V_{in\ nom}$; Full Load; T_A = 25°C



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



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

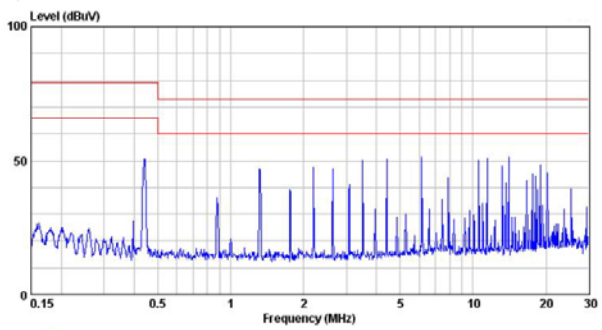


Typical Input Start-Up and Output Rise Characteristic

$V_{in} = V_{in\ nom}$; Full Load

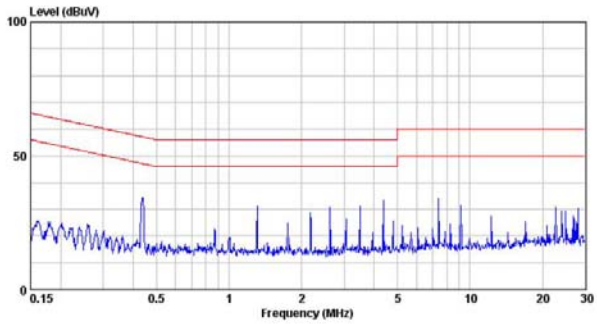
Characteristic Curves

All test conditions are at 25°C. The figures are identical for THL 3-4823WI (Continued)



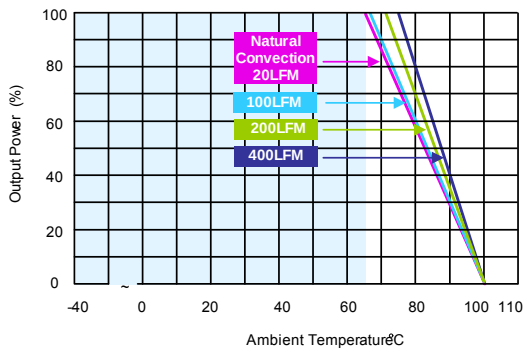
Conduction Emission of EN55022 Class A

$V_{in} = V_{in\ nom}$; Full Load



Conduction Emission of EN55022 Class B

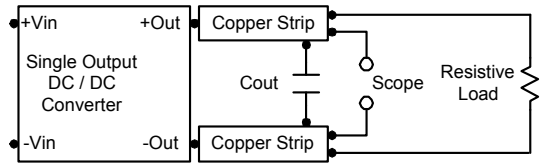
$V_{in} = V_{in\ nom}$; Full Load

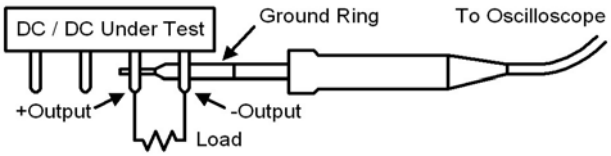


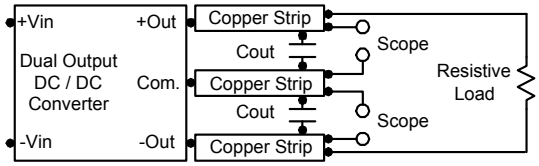
Derating Output Current Versus Ambient Temperature and Airflow; $V_{in} = V_{in\ nom}$

Testing Configurations

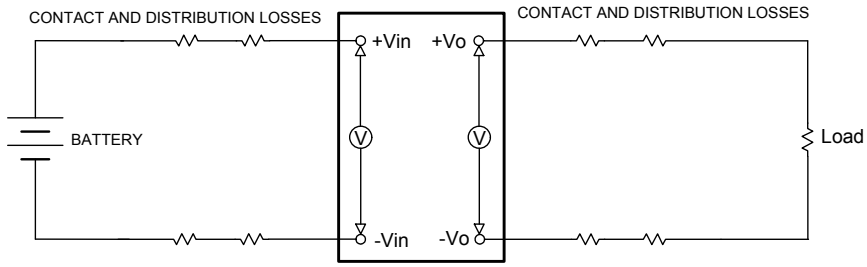
Peak-to-peak output ripple & noise measurement test up





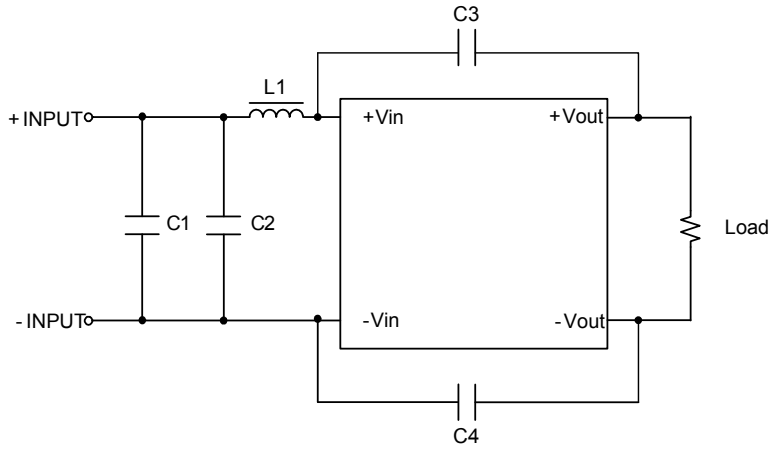


Output voltage and efficiency measurement test up

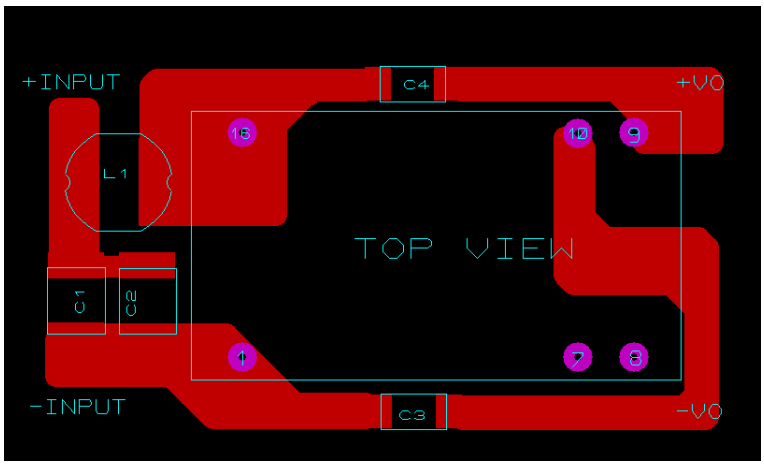


$$Efficiency = \left(\frac{V_{out} \times I_{out}}{V_{in} \times I_{in}} \right) \times 100\% = [\%]$$

EMC considerations



Suggested Schematic to comply with EN55022 Conducted Noise Class B



Recommended PCB Layout with Input Filter

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

For THL 3-24xxWI

Component	Value	Voltage	Reference
C1&C2	10µF	50V	1812/Y5V
C3&C4	470pF	2KV	1808/X7R
L1	27µH		SCD0403T/0.71A

For THL 3-48xxWI

Component	Value	Voltage	Reference
C1&C2	1µF	100V	1812/X7R
C3&C4	2200pF	2KV	1808/X7R
L1	88µH		SCD0403T/1.42A

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.

Short Circuitry Protection

Continuous and auto-recovery mode.

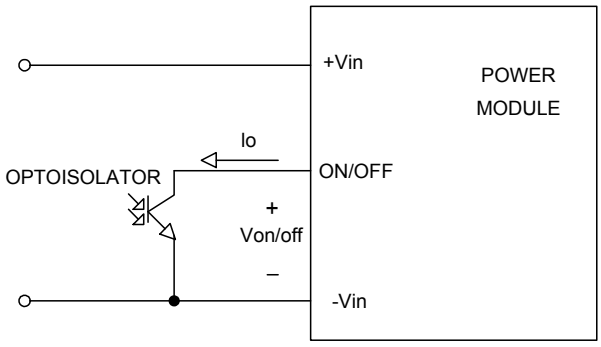
During short circuit, converter still shut down, The average current during this condition will be very low and the device will be safe in this condition.

Remote ON/OFF Control

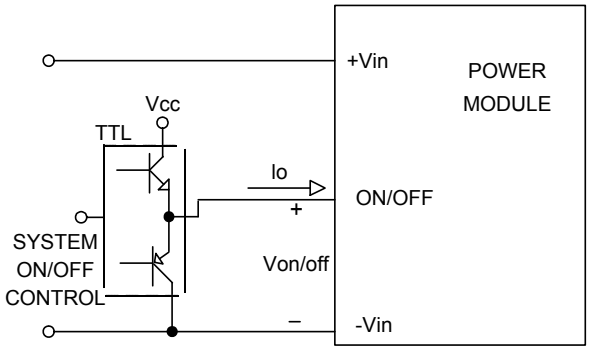
The positive logic remote ON/OFF control circuit is included.
Turns the module ON during logic High on the ON/Off pin and turns OFF during logic Low. The ON/OFF input signal (Von/off) that referenced to GND. If not using the remote on/off feature, please open circuit between on/off pin and -Vin pin to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

The negative logic remote ON/OFF control circuit is included.
Turns the module ON during logic Low on the On/Off pin and turns OFF during logic High. The On/Off pin is an open collector/drain logic input signal (Von/off) that referenced to GND. If not using the remote on/off feature. Please short circuit between on/off pin and –Vin pin to turn the module on.

Remote ON/OFF implementation

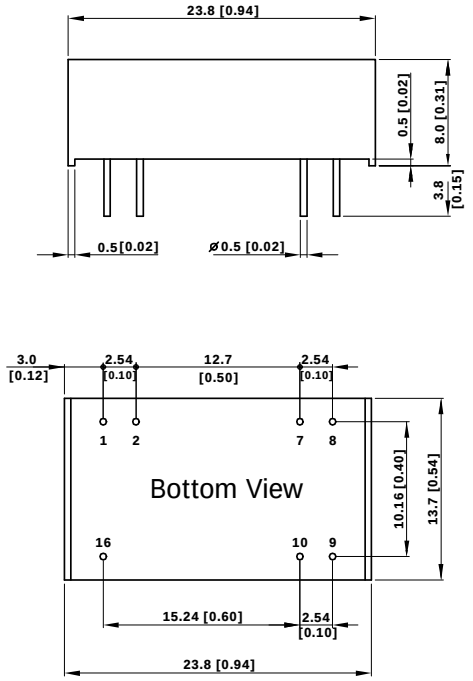


Isolated-Closure Remote ON/OFF



Level Control Using TTL Output

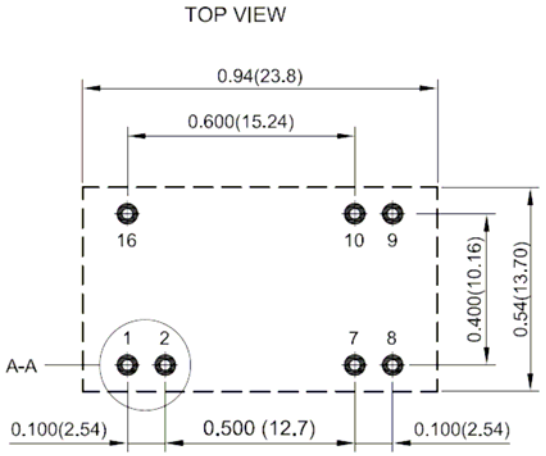
Mechanical Dimensions

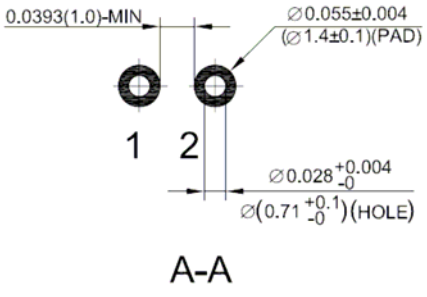


Pin Connections		
Pin	Single	Dual
1	-Vin	-Vin
2	Remote On/Off	Remote On/Off
7	NC	NC
8	NC	Common
9	+Vout	+Vout
10	-Vout	-Vout
16	+Vin	+Vin

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 pitch tolerance: ±0.25 (±0.01")
3. Pin dimension tolerance: ±0.1 (±0.004")

Recommended Pad Layout for Single & Dual Output Converter

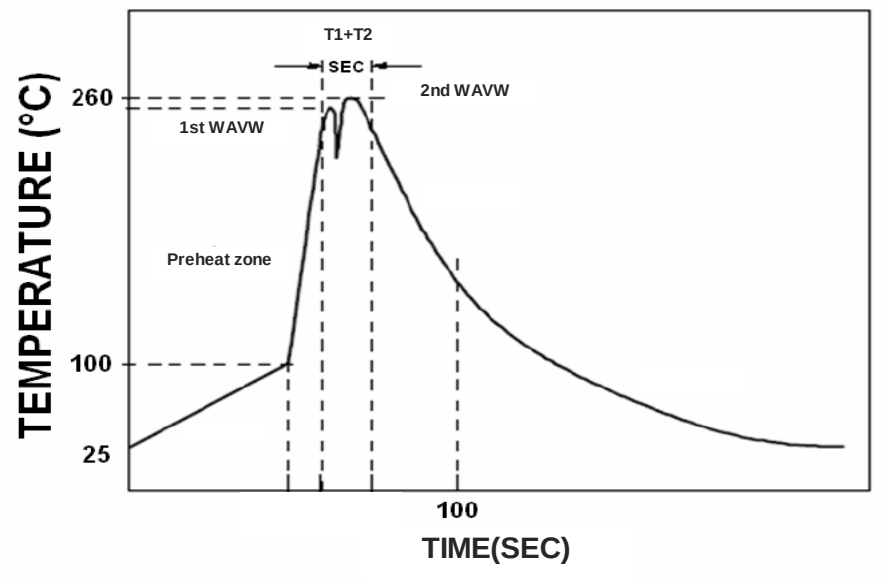




1.All Dimensions in Inches(mm)
Tolerance: x.xx ±0.02"(x.x ±0.5mm)
x.xxx±0.01"(x.xx ±0.25mm)
2.Pin Pitch Tolerance: ±0.01"(±0.25mm)
3.Pin Dimension Tolerance: ±0.004"(±0.1mm)

Soldering and Reflow Considerations

Lead free wave solder profile for THL 3WI Series



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

Reference Solder: Sn-Ag-Cu: Sn-Cu: Sn-Ag

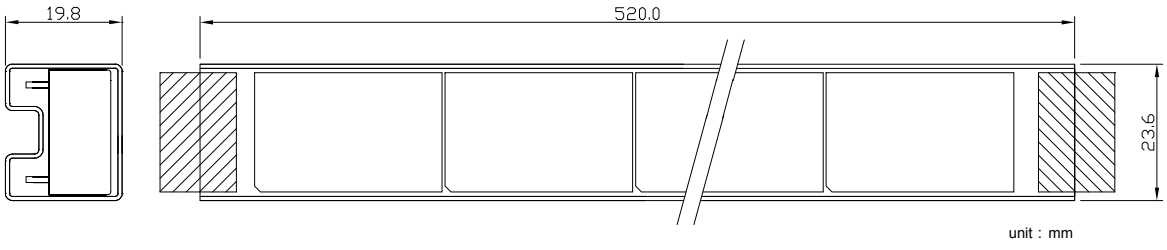
Hand Welding: Soldering iron: Power 60W

Welding Time: 2 ~ 4 sec

Temperature: 380°C ~ 400℃

Packaging Information

TUBE



10 PCS per TUBE

Part Number Structure

Model Number	Input Range (VDC)	Output Voltage (VDC)	Max. Output Current (mA)	Input Current at Full Load(1) (mA)	Efficiency(2) (%)
THL 3-2410WI	9-36	3.3	600	110	75
THL 3-2411WI	9-36	5	600	160	78
THL 3-2412WI	9-36	12	250	156	80
THL 3-2413WI	9-36	15	200	156	80
THL 3-2412WI	9-36	24	125	156	80
THL 3-2421WI	9-36	±5	±300	162	77
THL 3-2422WI	9-36	±12	±125	156	80
THL 3-2423WI	9-36	±15	±100	156	80
THL 3-4810WI	18-75	3.3	600	55	75
THL 3-4811WI	18-75	5	600	80	78
THL 3-4812WI	18-75	12	250	78	80
THL 3-4813WI	18-75	15	200	78	80
THL 3-4812WI	18-75	24	125	78	80
THL 3-4821WI	18-75	±5	±300	81	77
THL 3-4822WI	18-75	±12	±125	78	80
THL 3-4823	18-75	±15	±100	78	80

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 normal-blow fuse in 24Vin with maximum rating of 1500mA and in 48Vin with maximum rating of 800mA. 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 THL 3WI series of DC/DC converters has been calculated using MIL-HDBK 217F NOTICE2, Operating Temperature 25°C, Ground Benign.

THL 3-2410WI → MTBF = 934,667 Hours

THL 3-2411WI → MTBF = 932,923 Hours

THL 3-2412WI → MTBF = 943,752 Hours

THL 3-2413WI → MTBF = 953,834 Hours

THL 3-2415WI → MTBF = 960,799 Hours

THL 3-2421WI → MTBF = 931,446 Hours

THL 3-2422WI → MTBF = 947,329 Hours

THL 3-2423WI → MTBF = 947,329 Hours

THL 3-4810WI → MTBF = 934,667 Hours

THL 3-4811WI → MTBF = 937,295 Hours

THL 3-4812WI → MTBF = 943,752 Hours

THL 3-4813WI → MTBF = 951,203 Hours

THL 3-4815WI → MTBF = 958,405 Hours

THL 3-4821WI → MTBF = 936,768 Hours

THL 3-4822WI → MTBF = 949,127 Hours

THL 3-4823WI → MTBF = 945,180 Hours