SMT05E SERIES

0.75 Vin to 3.63 Vin Single output

- 5 A current rating
- Output voltage range: 0.75 Vdc to 3.63 Vdc
- Applications for 5 V or 3.3 V input POL converters
- High power density (191 W/in^3)
- High efficiency - typically 94% for 5 Vin and 3.3 V out
- SMT POL converter that saves board space
- Industry standard footprint
- Remote ON/OFF
- Available RoHS compliant

THE SMT05E series are non-isolated SMT dc-dc converters packaged in an industry standard footprint giving designers a cost effective solution for conversion from either a 5 V or 3.3 V input to output voltages of 3.63 Vdc and 0.75 Vdc. The SMT05E offers a wide output range, which allows maximum design flexibility and a pathway for future upgrades. Local voltage conversion by the SMT05E series from existing 5 V or 3.3 V system voltages eliminates the need for redesign of existing power architectures when voltage requirements change. The SMT05E is designed for applications that include distributed power, workstations, optical network and wireless applications. Implemented using state of the art surface mount technology and automated manufacturing techniques, the SMT05E offers compact size and efficiencies of up to 94%.

[2 YEAR WARRANTY]

ARTESYN TECHNOLOGIES

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Stresses in excess of the maximum ratings can cause permanent damage to the device. Operation of the device is not implied at these or any other conditions in excess of those given in the specification. Exposure to absolute maximum ratings can adversely affect device reliability.

Absolute Maximum Ratings

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Input voltage - continuous	$V_{in\ (cont)}$	-0.3		5.5	V dc	$V_{in}(+) - V_{in}(-)$
Input voltage - peak/surge	V_{surge}	-0.3		6	V dc	2s max, non-repetitive
Operating temperature	T_{op}	-40		85	°C	Measured at thermal reference points, see Note 5 for thermal derating
Storage temperature	$T_{storage}$	-40		125	°C	
Output power (W3V3)	$P_{out\ (max)}$	0		18.15	W	

All specifications are typical at nominal input Vin = 5V, full load under any resistive load combination at 25 ˚C unless otherwise stated.

Input Characteristics

Input voltage - operating	$V_{in\ (oper)}$	3	5	5.5	V dc	See Note 6
Input current - no load	I_{in}		70	150	mA dc	V_{in} (min) - V_{in} (max), enabled
Input current - quiescent	$I_{in\ (off)}$		2		mA dc	Converter disabled
Inrush current (i^2t)	I_{inrush}			0.04	A^2s	Complies with ETS300 132 Part 4.7, with recommended LISN
Input ripple current			40		mA rms	
Input fuse*				6	A	Slowblow/antisurge HRC recommended

*See Application Note 146 for manufacturer and part number

Turn On/Off

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Input voltage - turn on	$V_{in\ (on)}$	2	2.70	3	V dc	Will regulate @ V_{in} >3V if $V_{out} \leq$ 2.5 V
Turn on delay - enabled, then power applied	T_{delay} (power)		20		msec	With the enable signal asserted, this is the time from when the input voltage reaches the minimum specified operating voltage until the output voltage is within the total regulation band
Turn on delay - power applied, then enabled	T_{delay} (enable)		20		msec	$V_{in} = V_{in}$ (nom), then enabled. This is the time taken until the output voltage is within the total error band
Rise time	T_{rise}		15		msec	From 10% to 90%; full resistive load, no external capacitance

Signal Electrical Interface

Characteristic - Signal Name	Symbol	Min	Typ	Max	Units	Notes and Conditions
At remote/control ON/OFF pin						**See Notes 2 and 3**
High level input current	I_{ih}			500	µA	Current flowing into control pin when pin is pulled high (max at V_{ih} = 5.5 V
Acceptable high level leakage current	I_{ih} (leakage)			-10	µA	Acceptable leakage current from signal pin into the open collector driver (neg = from converter)
Low level input voltage	V_{il}	0		0.4	V	Converter guaranteed ON when control pin is less than V_{il} (max)
High level input voltage	V_{ih}	2.5			V	Converter guaranteed OFF when control pin is greater than V_{ih} (max)

Reliability and Service Life

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Mean time between failure	MTBF	551,000			Hours	MIL-HDBK-217F, $V_{in} = V_{in\ (nom)}$; $I_{out} = I_{out\ (max)}$; ambient 25 °C; ground benign environment
Mean time between failure	MTBF	9,009,000			Hours	Telcordia SR-332

Other Specifications

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Switching frequency	F_{sw}		300		kHz	Fixed frequency
Weight			2.8		g	
Coplanarity				100	µm	Measured from seating plane

EMC Electromagnetic Compatibility

Phenomenon	Port	Standard	Test level	Criteria	Notes and conditions
Immunity:					
Conducted immunity		EN61000-4-6			
Radiated immunity		EN61000-4-3			
ESD	Enclosure	EN61000-4-2	6 kV contact 8 kV air	NP	As per ETS 300 386-1 table 5

Safety Agency Approvals

Standard	Category
IEC60950	EN60950
UL/cUL CAN/CSA 22.2 No. 60950-00 : UL60950	File No. E174104
TÜV Product Service	Certificate No. B 03 10 38572 037
CB Certificate No	DE3-51686M1

Material Ratings

Characteristic - Signal Name	Notes and Conditions
Flammability rating	UL94V-0

Model Numbers

Model Number	Input Voltage	Output Voltage	Output Current (Max.)	Typical Efficiency	Max. Load Regulation
SMT05E-05S1V5J	3.0-5.5 Vdc	1.5 V	5 A	87.5%	±1.0%
SMT05E-05W3V3J*	3.0-5.5 Vdc	0.75-3.63 V	5 A	94.0%	±1.0%

Note: Efficiency at 5 Vin, 3V3 Vout

RoHS Compliance Ordering Information

RoHS 2002/95/EC

The 'J' at the end of the part number indicates that the part is Pb-free (RoHS 6/6 compliant). TSE RoHS 5/6 (non Pb-free) compliant versions may be available on special request, please contact your local sales representative for details.

S1V5 Model

Input Characteristics

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Input current - operating	I_{in}		1.7	1.9	A dc	$V_{in} = V_{in}$ (nom); $I_{out} = I_{out}$ (max.); $V_o = V_o$ (nom)
Reflected ripple current	I_{in} (ripple)		15		mA rms	$I_{out} = I_{out}$ (max.), measured without external filter
Input capacitance - internal filter	C_{input}		9.3		µF	Internal to converter
Input capacitance - external bypass	C_{bypass}	100			µF	Recommended customer added capacitance

S1V5 Model

Electrical Characteristics – O/P

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Nominal set-point voltage	Vo (nom)	1.46	1.50	1.53	V dc	$V_{in} = V_{in}$ (nom); $I_{out} = I_{out}$ (nom)
Total regulation band	V_o	1.44		1.56	V dc	For all line, static load and temperature until end of life
Line regulation				1	%	$I_{out} = I_{out}$ (nom); V_{in} (min) to V_{in} (max)
Load regulation				1	%	$V_{in} = V_{in}$ (nom); I_{out} (min) to I_{out} (max)
Output current continuous	I_{out}	0		5	A DC	
Output current - short circuit	I_{sc}		10	20	A rms	Continuous, unit auto recovers from short, V_o < 100mV
Output voltage - noise	V_{p-p} V_{rms}		60 10	75 20	mV pk-pk mV rms	Measurement bandwidth: 20 MHz. See Application Note 146 for measurement set-up details

S1V5 Model

Electrical Characteristics - O/P

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Load transient response - peak deviation	$V_{dynamic}$		60		mV	Peak deviation for 50% to 75% step load, di/dt = 100 mA/µsec. Measurement taken with no external capacitors
Load transient response - recovery	$T_{recovery}$		50		µsec	Settling time to within 1% of output set point voltage for 50% to 75% step load. Measurement taken with no external capacitors
External load capacitance	C_{ext}			10,000	µF	

S1V5 Model

Protection and Control Features

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Allowable output voltage trim range		90		110	%	Trim up (% of V_o nom). V_o = 1.5 V. Note that the maximum output power is still 8.25 W. Derate the maximum output current accordingly.

S1V5 Model

Efficiency

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Efficiency	η	85.5	87.5		%	I_{out} = 100% I_{out} (max), V_{in} = V_{in} (5V)
Efficiency	η	88.4	90.4		%	I_{out} = 50% I_{out} (max), V_{in} = V_{in} (5V)

W3V3 Model

Input Characteristics

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Input current - operating	I_{in}		3.5	3.9	A dc	$V_{in} = V_{in}$ (nom); $I_{out} = I_{out}$ (max.); $V_o = V_o$ (nom)
Reflected ripple current	I_{in} (ripple)		40		mA rms	$I_{out} = I_{out}$ (max.), measured without external filter
Input capacitance - internal filter	C_{input}		9.4		µF	Internal to converter
Input capacitance - external bypass	C_{bypass}	100			µF	Recommended customer added capacitance

W3V3 Model

Electrical Characteristics – O/P

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Nominal set-point voltage	Vo (nom)	3.24	3.30	3.36	V dc	$V_{in} = V_{in}$ (nom); $I_{out} = I_{out}$ (max)
Total regulation band	V_o	3.19		3.41	V dc	For all line, static load and temperature until end of life
Line regulation				1	%	$I_{out} = I_{out}$ (nom); V_{in} (min) to V_{in} (max)
Load regulation				1	%	$V_{in} = V_{in}$ (nom); I_{out} (min) to I_{out} (max)
Output current continuous	I_{out}	0		5	A dc	
Output current - short circuit	I_{sc}		10	20	A rms	Continuous, unit auto recovers from short, V_o < 100mV
Output voltage - noise	V_{p-p} V_{rms}			75 25	mV pk-pk mV rms	Measurement bandwidth: 20 MHz. See Application Note 146 for measurement set-up details

W3V3 Model

Electrical Characteristics - O/P

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Load transient response - peak deviation	$V_{dynamic}$		30		mV	Peak deviation for 50% to 75% step load, di/dt = 100 mA/µsec.
Load transient response - recovery	$T_{recovery}$		50		µsec	Settling time to within 1% of output set point voltage for 50% to 75% step load.
External load capacitance	C_{ext}	0		10,000	µF	

W3V3 Model

Protection and Control Features

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Allowable output voltage				384	%	Trim up (% of V_o nom) = 0.75 V See Application Note 146 for details of trim equations and trim curves

W3V3 Model

Efficiency

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Efficiency	η	92	94		%	I_{out} = 100% I_{out} (max), V_{in} = 5 V
Efficiency	η	93	95		%	I_{out} = 50% I_{out} (max), V_{in} = 5 V

S1V5 Model

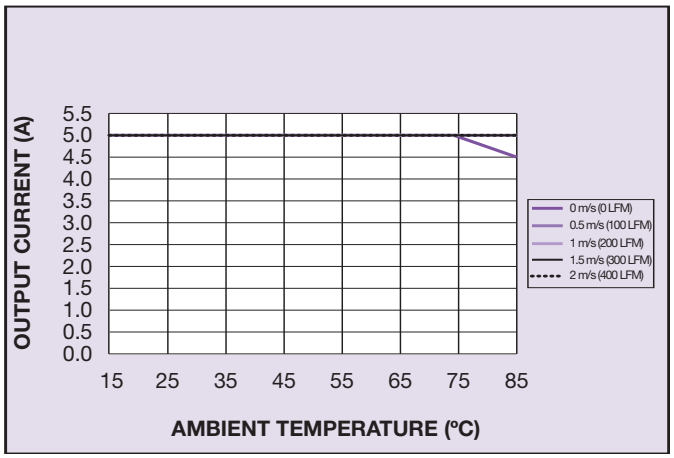


Figure 1: Derating Curve (Vo = 3.3 V)

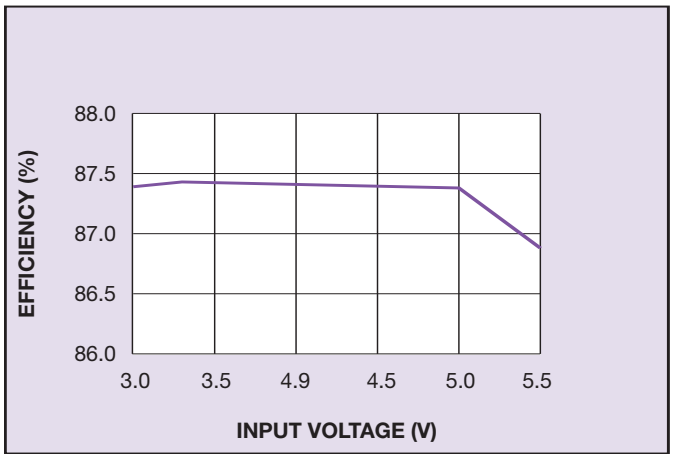


Figure 2: Efficiency vs Line (Vo = 3.3 V)

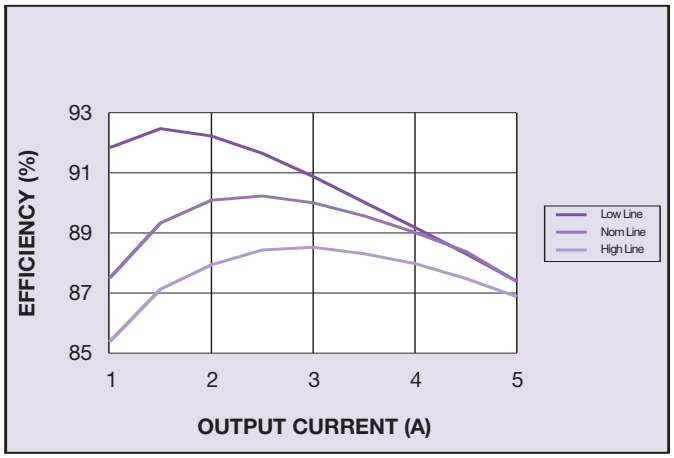


Figure 3: Efficiency vs Load (Vo = 3.3 V)

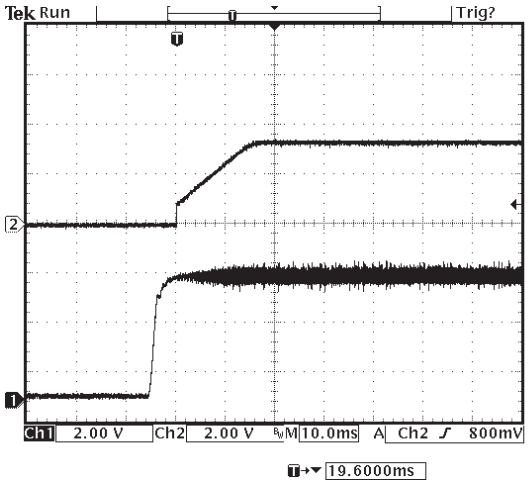


Figure 4: Typical Power-up Characteristic (Channel 1: Vin, Channel 2: Vo)

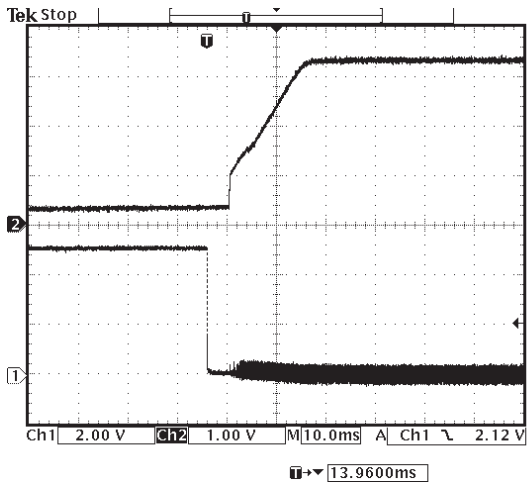


Figure 5: Control On/Off Characteristic (Channel 1 Remote ON/OFF: , Channel 2: Vo)

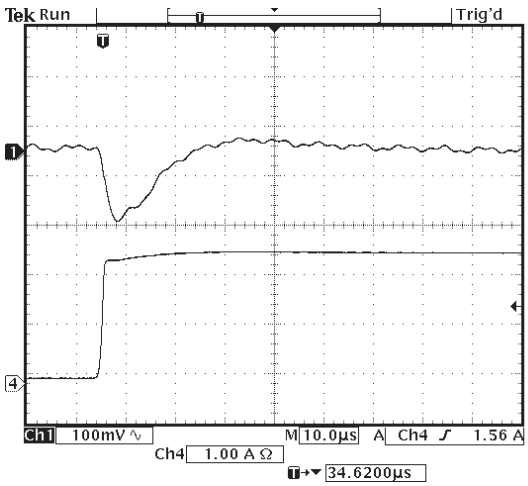


Figure 6: Typical Transient Response 50% - 100% Step Load Change (Channel 1: Vo, Channel 4: Io)

S1V5 Model

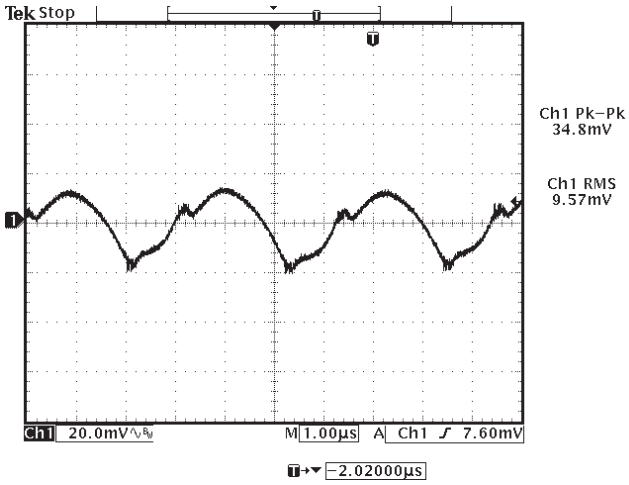


Figure 7: Typical Ripple and Noise (Channel 1: Vo)

W3V3 Model

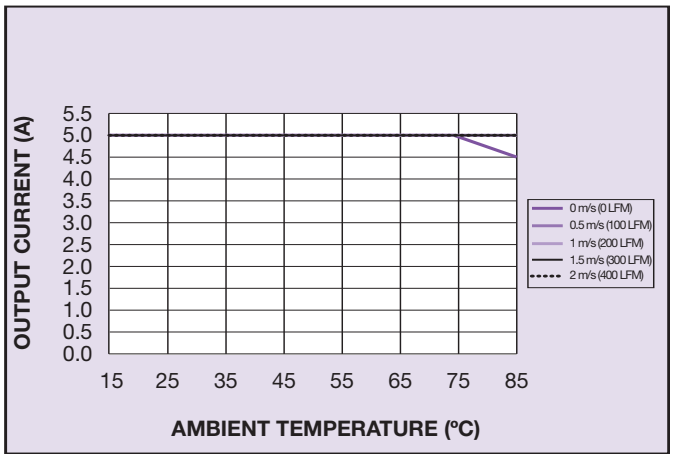


Figure 8: Derating Curve (Vo = 3.3 V)

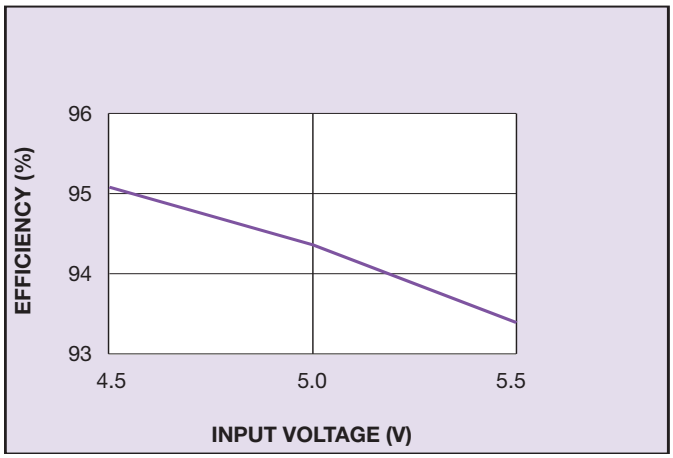


Figure 9: Efficiency vs Line (Vo = 3.3 V)

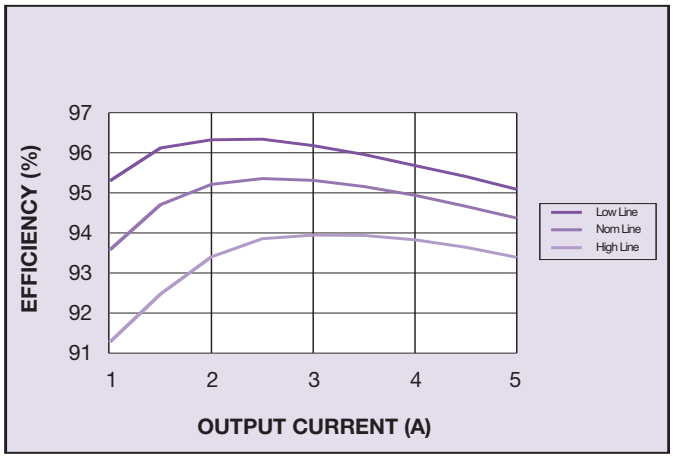


Figure 10: Efficiency vs Load (Vo = 3.3 V)

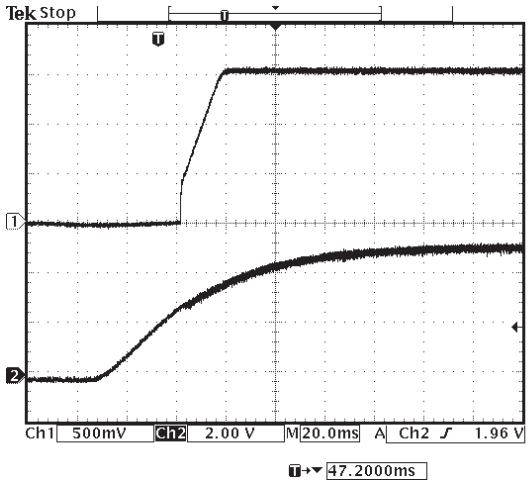


Figure 11: Typical Power-up Characteristic (Channel 1: Vo, Channel 2: Vin)

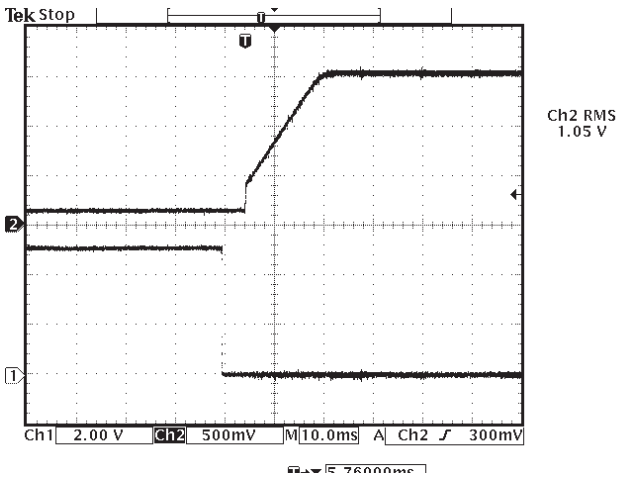


Figure 12: Control On/Off Characteristic (Channel 1 Remote ON/OFF: , Channel 2: Vo)

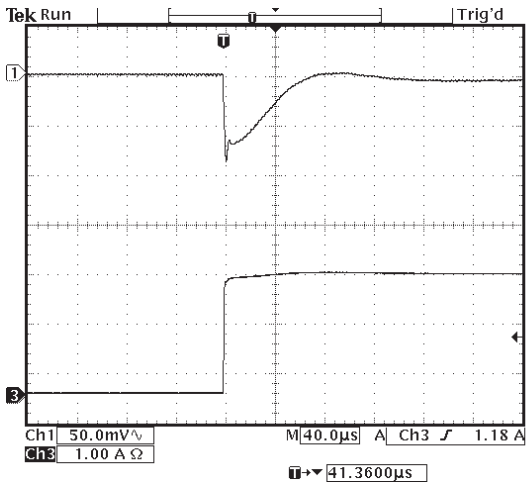


Figure 13: Typical Transient Response 50% - 100% Step Load Change (Channel 1: Vo, Channel 3: Io)

W3V3 Model

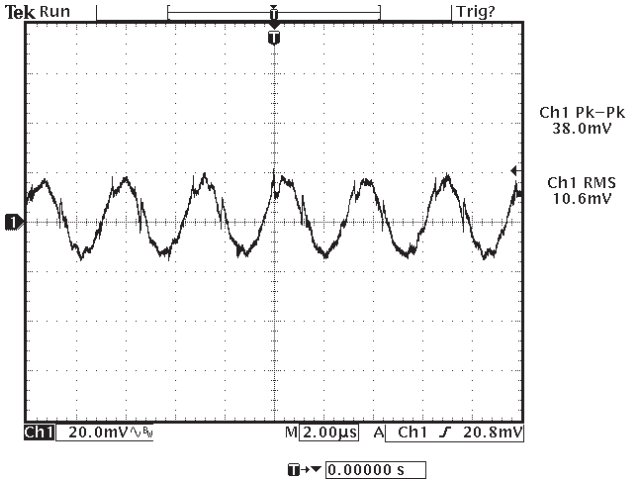
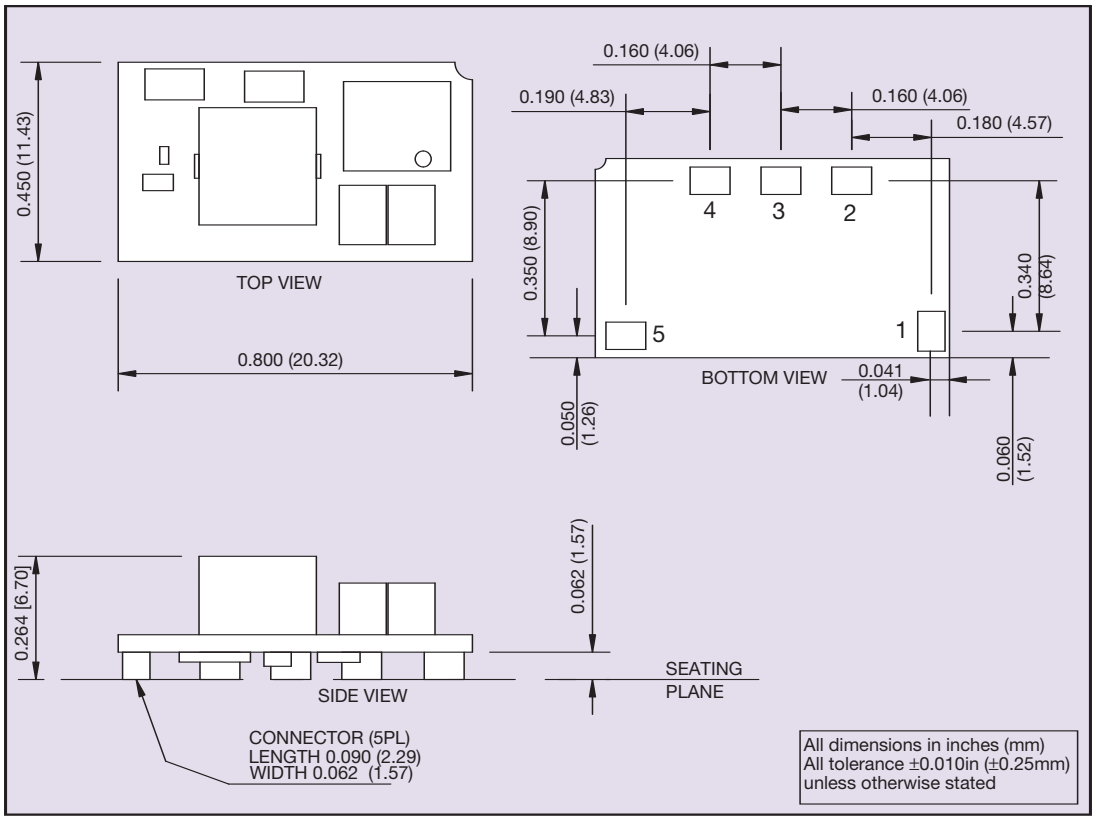


Figure 14: Typical Ripple and Noise (Channel 1: Vo)



Pin Connections

Pin No.	*Function*
1	Remote ON/OFF
2	Vout
3	Trim
4	GND
5	+Vin

Figure 15: Mechanical Drawing Pinout Table

Note 1

Thermal reference is defined as the highest temperature measured at any one of the specified thermal reference points. See Figure 16: Thermal reference points.

Note 2

The Remote ON/OFF pin is referenced to ground.

Note 3

The SMT05E features a 'Negative Logic' Remote ON/OFF operation. If not using the Remote ON/OFF pin, leave the pin open (the converter will be on). The Remote ON/OFF pin is referenced to ground.

The following conditions apply for the SMT05E:

Configuration	Converter Operation
Remote pin open circuit	Unit is ON
Remote pin pulled low	Unit is ON
Remote pin pulled high [Von/off >2.5 V]	Unit is OFF

A 'Positive Logic' Remote ON/OFF version is also possible with this converter. To order please use part number SMT05E-05W3V3-R or SMT05E-05W3V3-RTJ.

Note 4

Thermal reference set up: Unit mounted on an edge card test board 203 mm x 190 mm. Test board mounted vertically. For test details and recommended set-up see Application Note 146.

Note 5

Max 75 °C for full load in still air.

Note 6

For SMT05E-05W3V3 minimum operating voltage is 4.5 V, for V_o = 3.3 V

CAUTION: Hazardous internal voltages and high temperatures. Ensure that unit is accessible only to trained personnel. The user must provide the recommended fusing in order to comply with safety approvals.

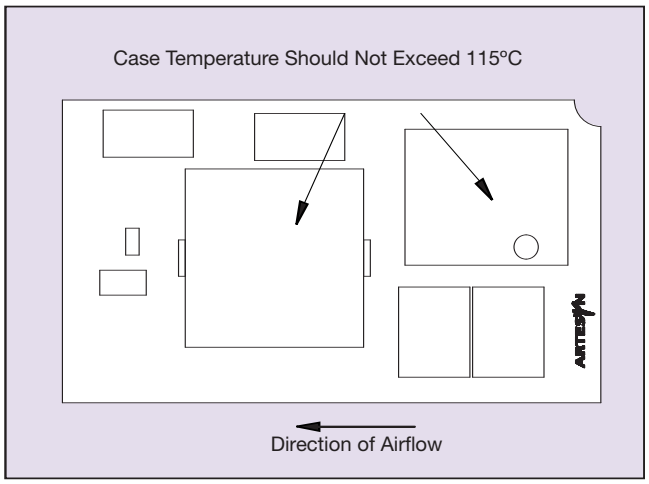


Figure 16: Thermal Reference Points

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