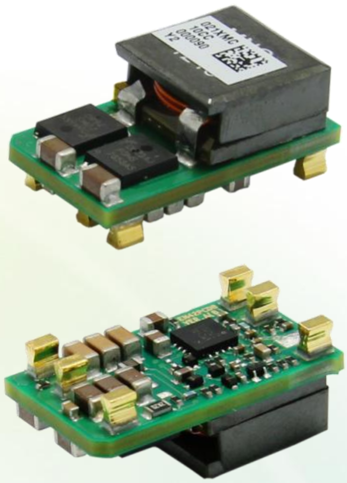
NAK12S20-C
DC-DC Converter Technical Manual V1.1

POL DC-DC Converter	**9 - 14 V Input**	**0.7 - 5.3 V Output**	**20 A Current**	**Positive Logic**

Description

The NAK12S20-C is a non-isolated DC-DC converter with an input voltage range of 9 V to 14 V and the maximum output current of 20 A. Its output voltage can be adjusted within a range of 0.7 V to 5.3 V.



NAK12S20-C

Operational Features

- Input voltage: 9 - 14 V
- Output current: 0 - 20 A
- Output voltage: 0.7 - 5.3 V
- Efficiency: 93.5% (5.0 V, 20 A)

Mechanical Features

- SMT pin
- Dimensions: 24 mm x 13.5 mm (0.94 in. x 0.53 in.)
- Height: <11mm (0.43 in.)
- Weight: about 7.5 g

Control Features

- Remote on/off
- Output voltage trim
- Monotonic start-up into pre-biased outputs

Protection Features

- Input undervoltage protection
- Output overcurrent protection (hiccup mode)
- Output short circuit protection (hiccup mode)
- Output overvoltage protection (self-recovery)
- Overtemperature protection (self-recovery)

Safety Features

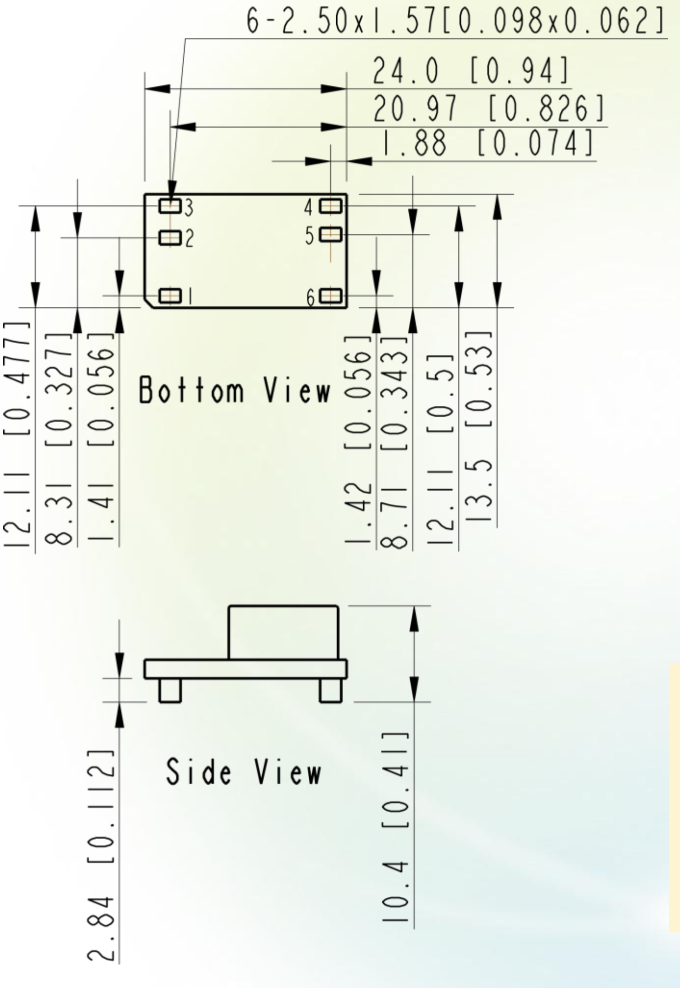
- Meet UL94V-0 flammability requirements
- RoHS6 complaint

Designation Explanation

NAK	12	S	20	-C
1	2	3	4	5

1 — Non-isolated, analog, package type
2 — Input voltage: 12 V
3 — Single output
4 — Output current: 20 A
5 — Extension code

Mechanical Diagram



Pin Description

Pin No.	Function
1	V_{in}
2	GND
3	V_{out}
4	Trim
5	SGND
6	On/Off

NOTE

1. All dimensions in mm [in.]
   Tolerances: x.x ± 0.5 mm [x.xx ± 0.02 in.]
   x.xx ± 0.25 mm [x.xxx ± 0.010 in.]
2. Tolerances for the lengths, widths, and heights of all pins are x.xx ± 0.05 mm [x.xxx ±0.002in.].

Electrical Specifications

Conditions: T_A = -40 - 85°C, V_{in} = 9 - 14 V DC, V_{out} = 0.7 - 5.3 V DC, unless otherwise notes.

Parameter	Output	Min.	Typ.	Max.	Units	Notes & Conditions
Absolute maximum ratings						
Input voltage(Continuous)	All	-	-	16	V	-
Operating ambient temperature	All	-40	-	85	ºC	See the thermal derating curve
Storage temperature	All	-55	-	125	ºC	-
Operating humidity	All	10	-	95	% RH	Non-condensing
Input characteristics						
Operating input voltage	All	9	12	14	V	-
Maximum input current	All	-	-	18	A	V_{in}= 0 -14 V; I_{out}= 20 A
Input capacitance	All	220+20	-	-	μF	220 μF: polymer aluminum capacitor ; 20 μF: ceramic capacitor
No-load input current	1.2 V	-	25	-	mA	V_{in} = 12 V
Output characteristics						
Output voltage set point	0.9 V	0.882	0.9	0.918	V	V_{in} = 12 V; 50% load
Output voltage Trim range	All	0.7	-	5.3	V	V_{in} = 9 - 14 V
Output line regulation	All	-	-	±1	%	V_{in} = 9 - 14 V; I_{out} = 20 A
Output load regulation	All	-	-	±1	%	V_{in} = 12 V; I_{out} = 0 - 20 A
Regulated voltage precision	All	-	-	±2	%	The whole range of V_{in} , I_{out} and T_A
Temperature coefficient	All	-	-	±0.02	$\%V_{out}$ /°C	T_A = -40 °C to +85 °C (-40 °F to +185 °F)
External capacitance	All	470	470	3000	μF	Polymer aluminum capacitor
Output current	All	0	-	20	A	-
Output ripple and noise (peak to peak)	<3.3V ≥3.3V	- -	- -	100 150	mV mV	Oscilloscope bandwidth: 20 MHz
Output voltage overshoot	All	-	-	5	%	-
Output voltage rise time	All	2	5	8	ms	-
Switching frequency	All	-	300	-	kHz	-
Protection characteristics						
Input undervoltage protection Startup threshold Shutdown threshold Hysteresis	All	 7 6 0.7	 7.8 6.8 1.0	 8.5 7.5 1.3	 V V V	-

Electrical Specifications

Conditions: T_A =-40 - 85 °C, V_{in} = 9 - 14 V DC, V_{out} = 0.7 - 5.3 V DC, unless otherwise notes.

Parameter	Output	Min.	Typ.	Max.	Units	Notes & Conditions
Protection characteristics						
Output overcurrent protection	All	22	-	45	A	Hiccup mode
Output short circuit protection	All	-	-	-	-	Hiccup mode
Output overvoltage protection	All	110	-	120	%	Self-recovery
Overtemperature protection Threshold Hysteresis	All	115 0	- 5	135 10	°C °C	Self-recovery The values are obtained by measuring the temperature of the hottest power component on the top surface of the converter.
Dynamic characteristics						
Overshoot amplitude Recovery time	≤1.2 V	- -	- -	60 200	mV µs	Current change rate: 1 A/µs load : 25% - 50% - 25%; 50% - 75% - 50%
Overshoot amplitude Recovery time	>1.2 V	- -	- -	5 200	% µs	Current change rate: 1 A/µs load : 25% - 50% - 25%; 50% - 75% - 50%
Efficiency						
100% load	0.7 V	79.5	81.0		%	V_{in} =12 V; T_A = 25°C
	0.9 V	83.0	84.0	-		
	1.0 V	84.0	85.0	-		
	1.2 V	85.5	86.5	-		
	1.5 V	87.0	88.0	-		
	1.8 V	88.5	89.5	-		
	2.5 V	89.5	91.0	-		
	3.3 V	91.0	92.0	-		
	5.0 V	92.0	93.5	-		
	5.3 V	92.5	94.0	-		
Other characteristics						
Remote on/off voltage Low level High level	All All	-0.2 2.0	- -	0.5 5.0	V V	- Pulled high internally (Connecting to an external voltage is not allowed.)
Reliability characteristics						
Mean time between failures (MTBF)	All	-	1.5	-	Million hours	Telcordia SR332; V_{in} = 12 V; 80% load; Airflow = 1.5 m/s (300 FLM); T_A = 40°C (104°F);

Characteristic Curves

Conditions: T_A = 25°C or 77°F, unless otherwise specified.

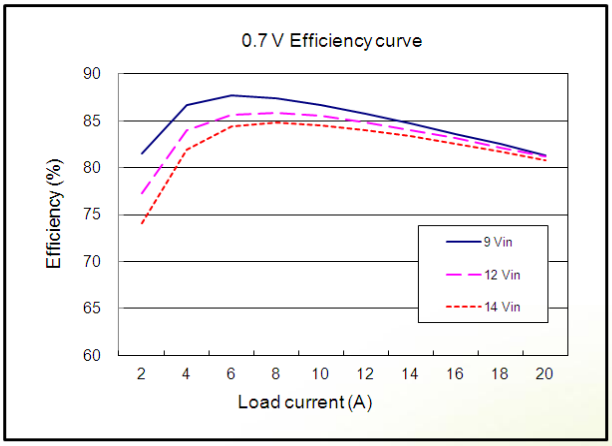


Figure 1: 0.7 V Efficiency

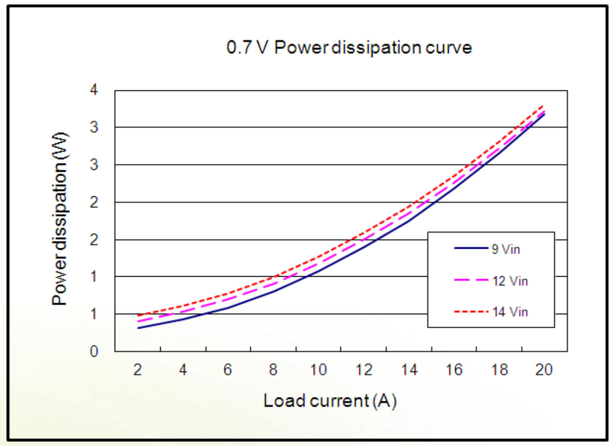


Figure 2: 0.7 V Power dissipation

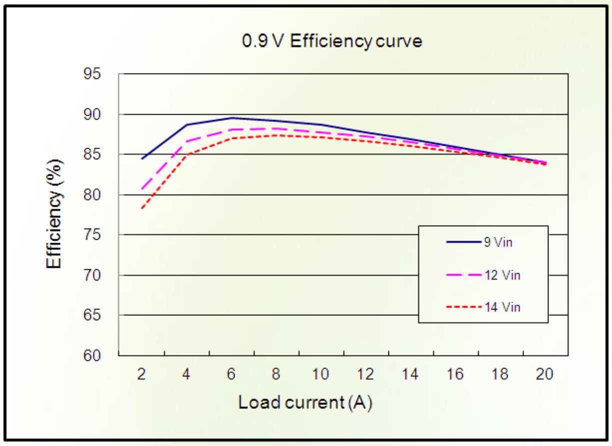


Figure 3: 0.9 V Efficiency

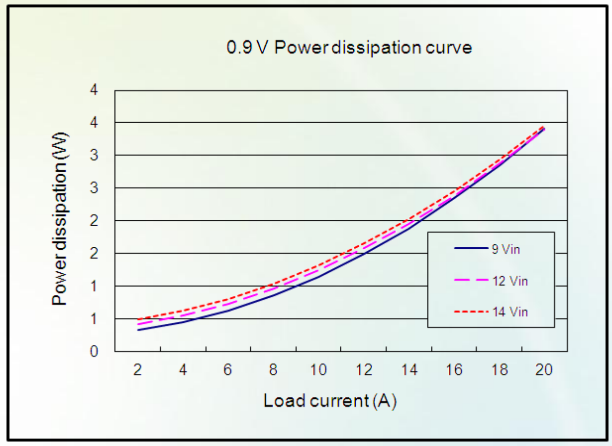


Figure 4: .0.9 V Power dissipation

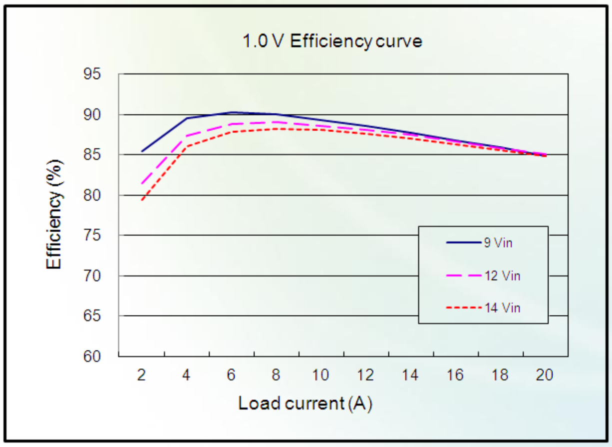


Figure 5: 1.0 V Efficiency

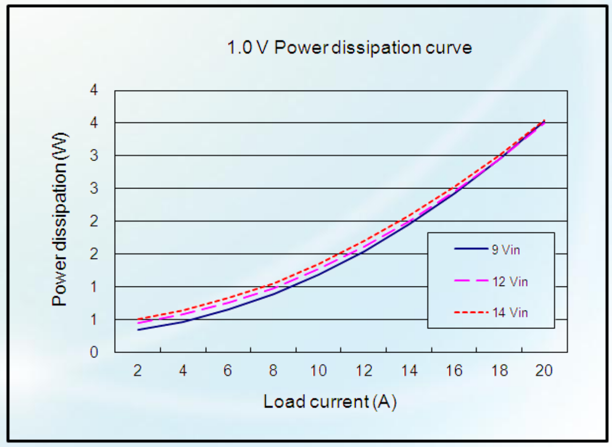


Figure 6: 1.0 V Power dissipation

Characteristic Curves

Conditions: T_A = 25°C or 77°F, unless otherwise specified.

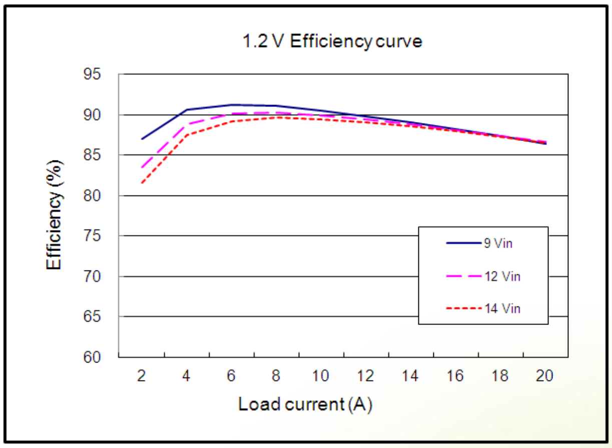


Figure 7: 1.2 V Efficiency

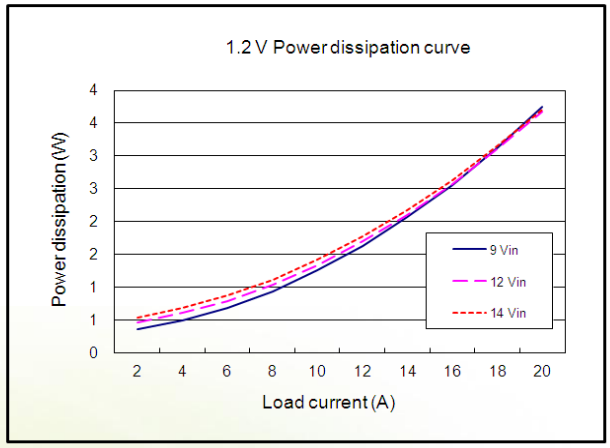


Figure 8: 1.2 V Power dissipation

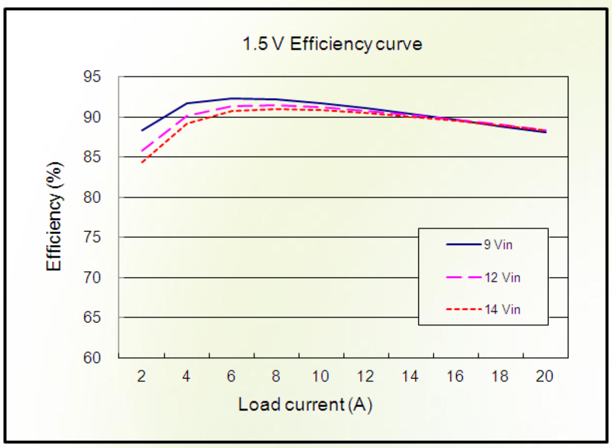


Figure 9: 1.5 V Efficiency

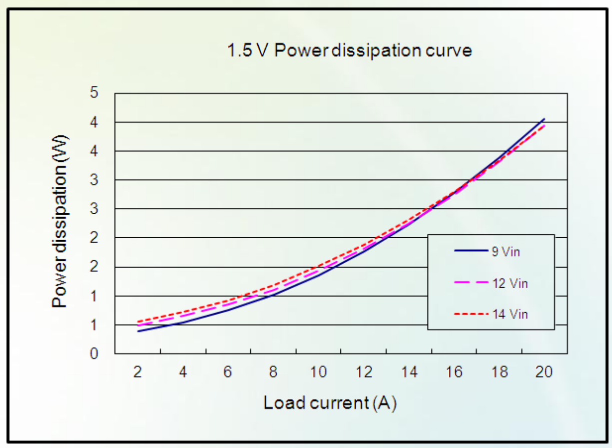


Figure 10: 1.5 V Power dissipation

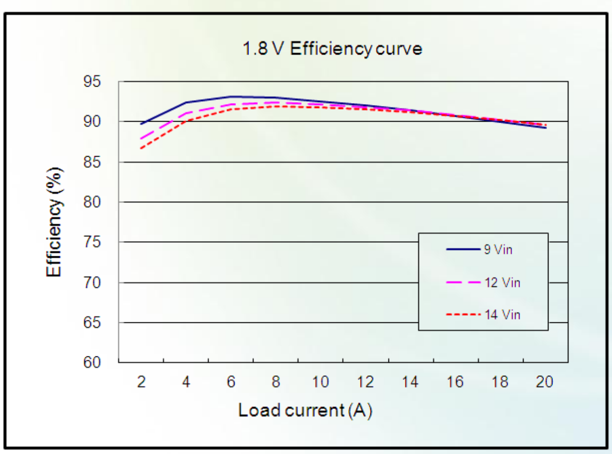


Figure 11: 1.8 V Efficiency

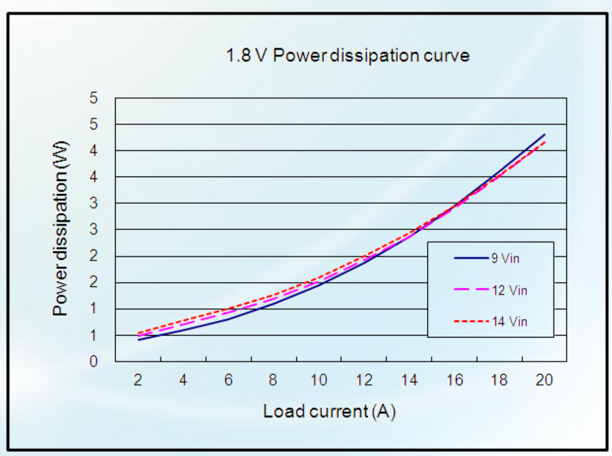


Figure 12: 1.8 V Power dissipation

Characteristic Curves

Conditions: T_A = 25°C or 77°F, unless otherwise specified.

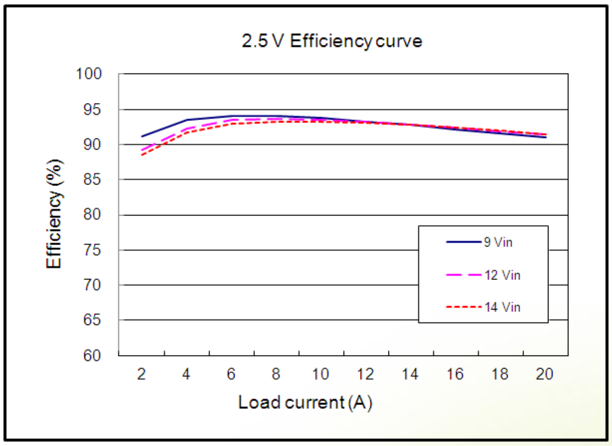


Figure 13: 2.5 V Efficiency

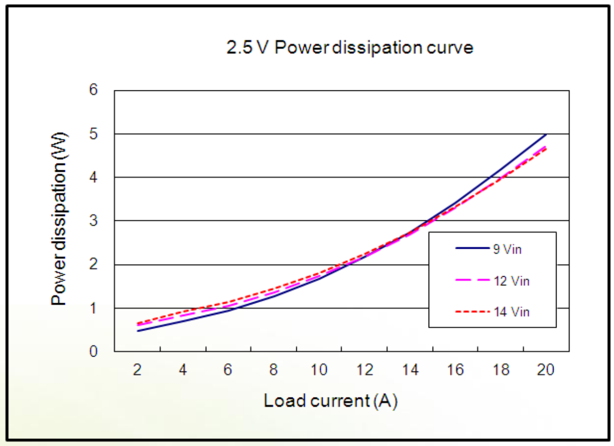


Figure 14: 2.5 V Power dissipation

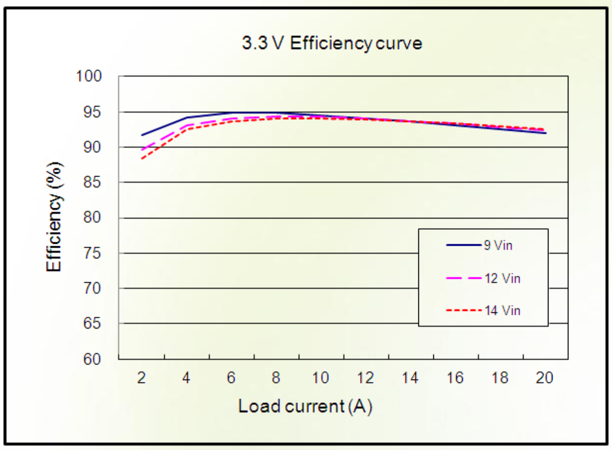


Figure 15: 3.3 V Efficiency

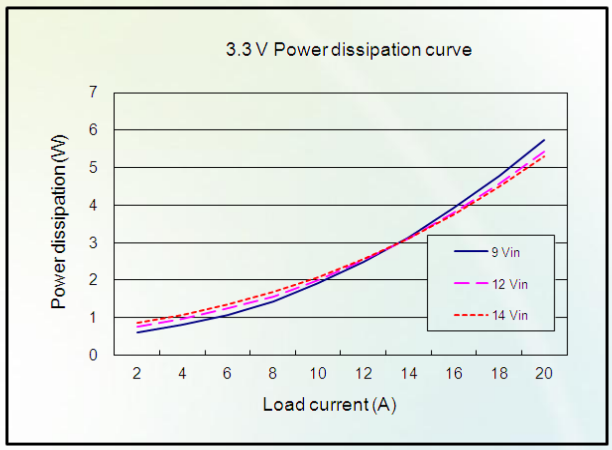


Figure 16: 3.3 V Power dissipation

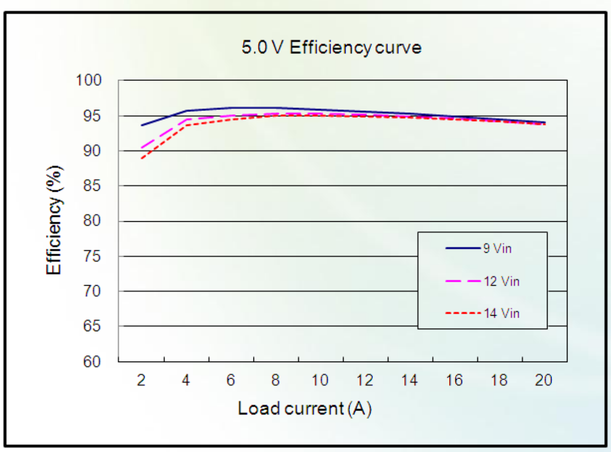


Figure 17: 5.0 V Efficiency

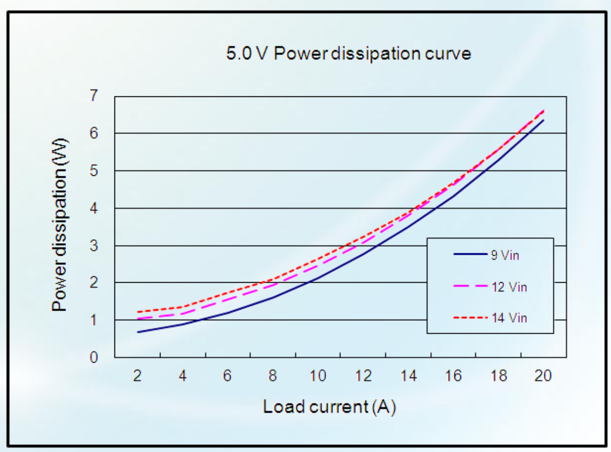


Figure 18: 5.0 V Power dissipation

Characteristic Curves

Conditions: T_A = 25°C or 77°F, unless otherwise specified.

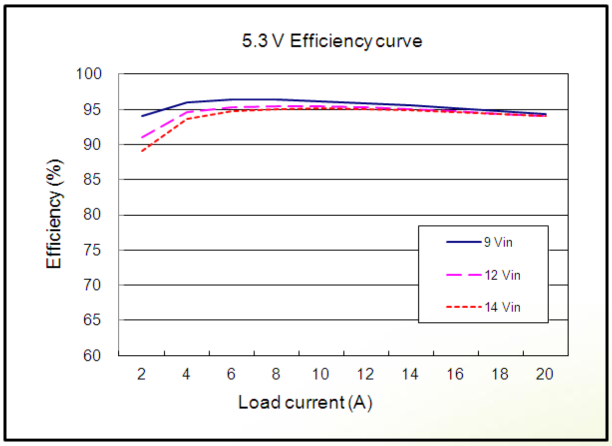


Figure 19: 5.3 V Efficiency

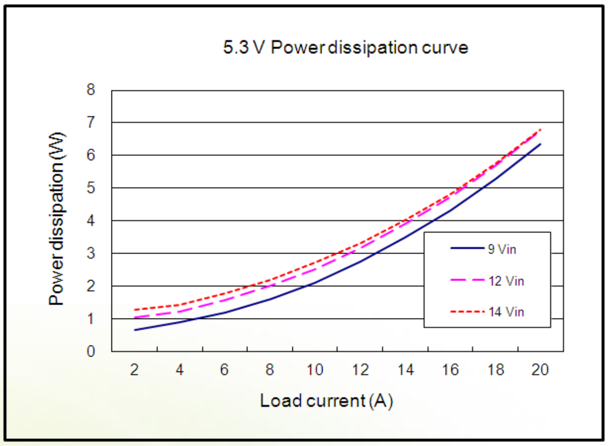


Figure 20: 5.3 V Power dissipation

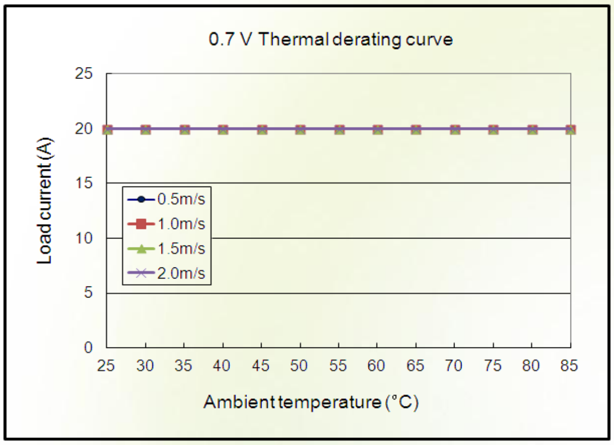


Figure 21: Thermal derating with airflow from pin1 to pin6 (V_{in} = 12 V; V_{out} = 0.7 V)

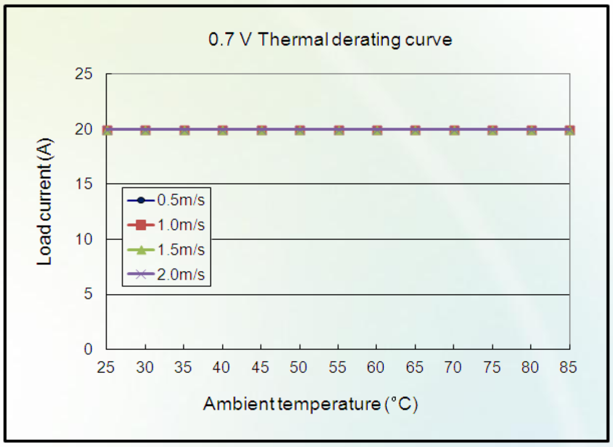


Figure 22: Thermal derating with airflow from pin3 to pin1 (V_{in} = 12 V; V_{out} = 0.7 V)

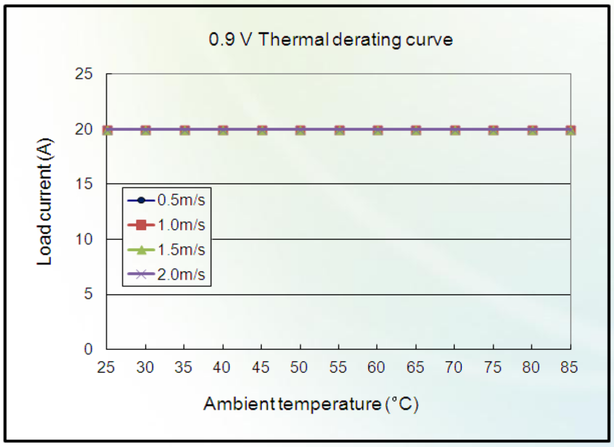


Figure 23: Thermal derating with airflow from pin1 to pin6 (V_{in} = 12 V; V_{out} = 0.9 V)

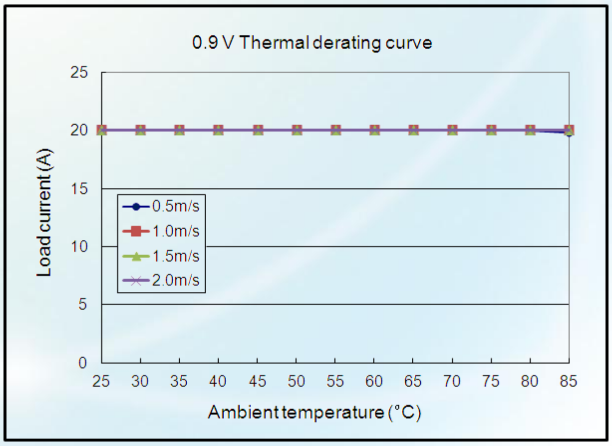


Figure 24: Thermal derating with airflow from pin3 to pin1 (V_{in} = 12 V; V_{out} = 0.9 V)

Characteristic Curves

Conditions: T_A = 25°C or 77°F, unless otherwise specified.

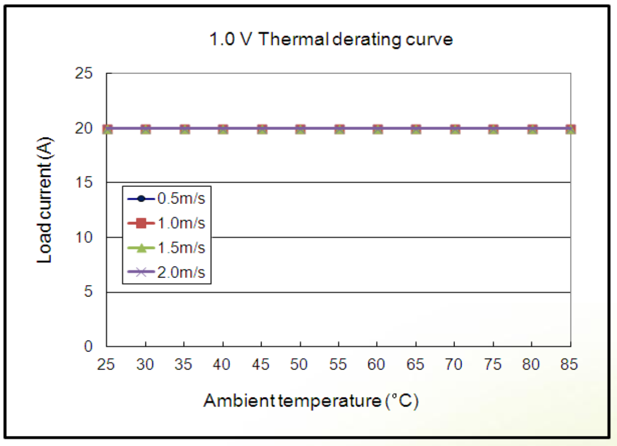


Figure 25: Thermal derating with airflow from pin1 to pin6 (V_{in} = 12 V; V_{out} = 1.0 V)

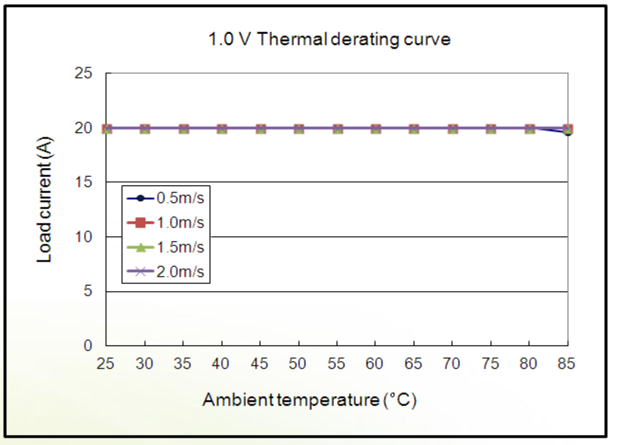


Figure 26: Thermal derating with airflow from pin3 to pin1 (V_{in} = 12 V; V_{out} = 1.0 V)

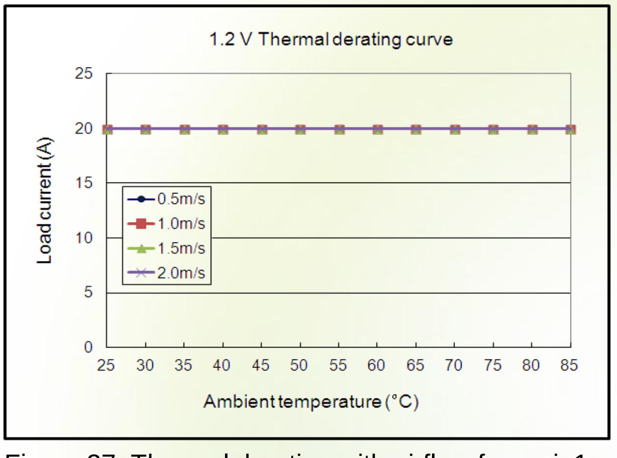


Figure 27: Thermal derating with airflow from pin1 to pin6 (V_{in} = 12 V; V_{out} = 1.2 V)

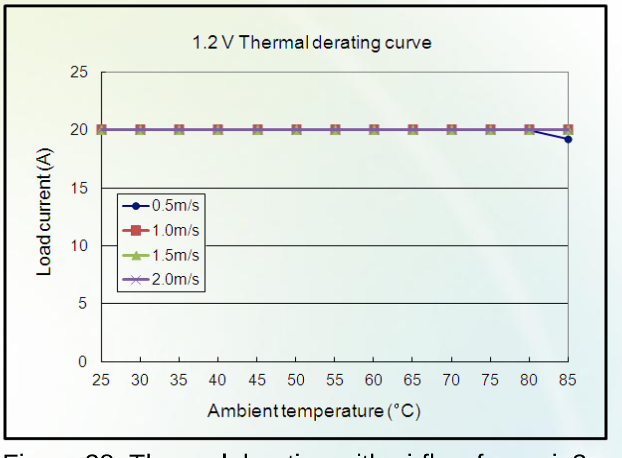


Figure 28: Thermal derating with airflow from pin3 to pin1 (V_{in} = 12 V; V_{out} = 1.2 V)

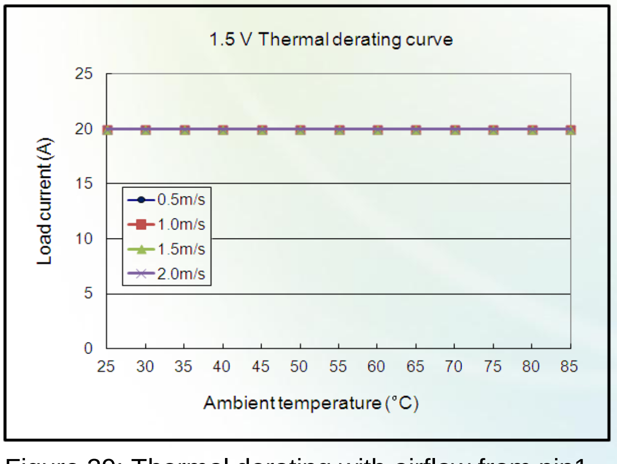


Figure 29: Thermal derating with airflow from pin1 to pin6 (V_{in} = 12 V; V_{out} = 1.5 V)

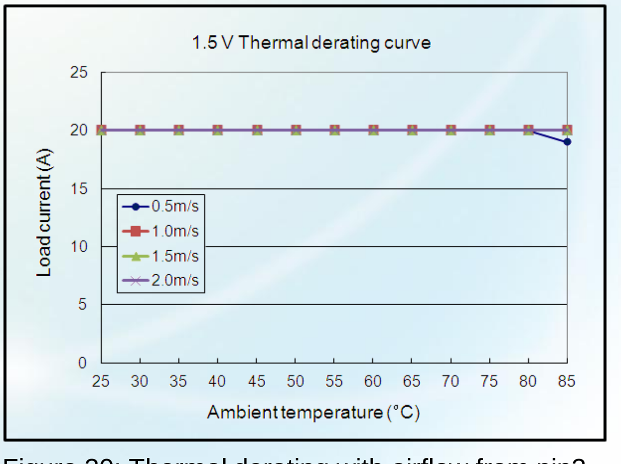


Figure 30: Thermal derating with airflow from pin3 to pin1 (V_{in} = 12 V; V_{out} = 1.5 V)

Characteristic Curves

Conditions: T_A = 25°C or 77°F, unless otherwise specified.

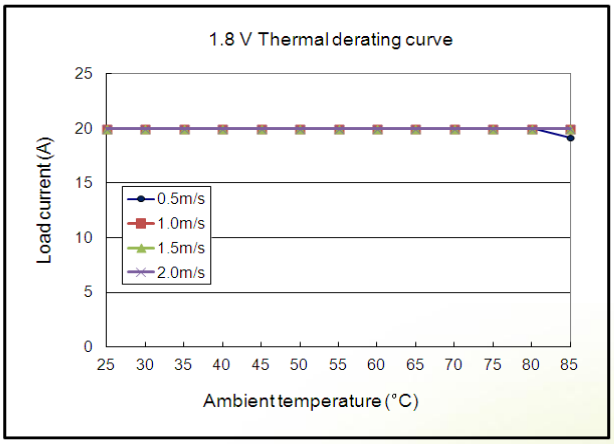


Figure 31: Thermal derating with airflow from pin1 to pin6 (V_{in} = 12 V; V_{out} = 1.8 V)

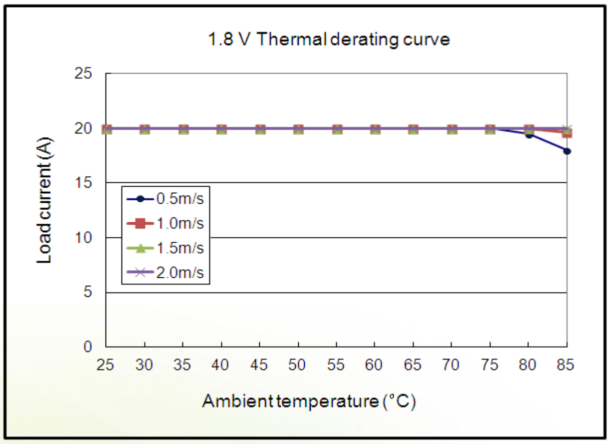


Figure 32: Thermal derating with airflow from pin3 to pin1 (V_{in} = 12 V; V_{out} = 1.8 V)

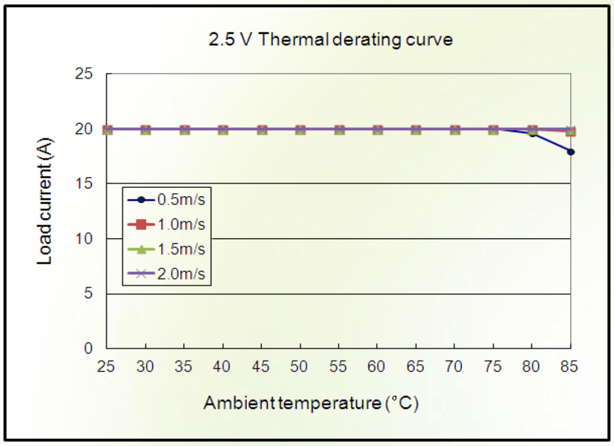


Figure 33: Thermal derating with airflow from pin1 to pin6 (V_{in} = 12 V; V_{out} = 2.5 V)

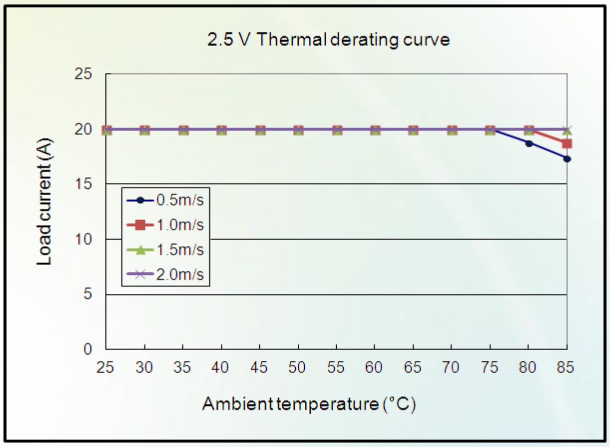


Figure 34: Thermal derating with airflow from pin3 to pin1 (V_{in} = 12 V; V_{out} = 2.5 V)

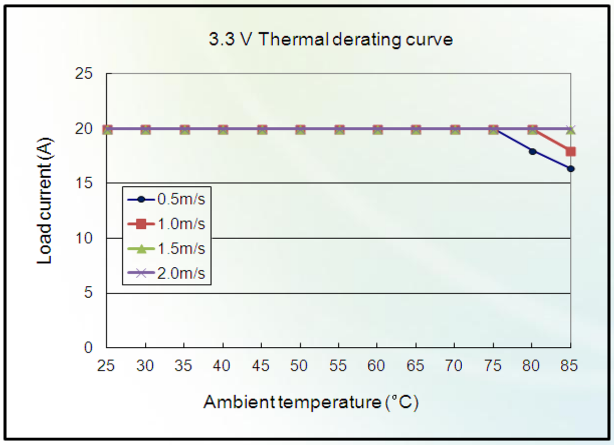


Figure 35: Thermal derating with airflow from pin1 to pin6 (V_{in} = 12 V; V_{out} = 3.3 V)

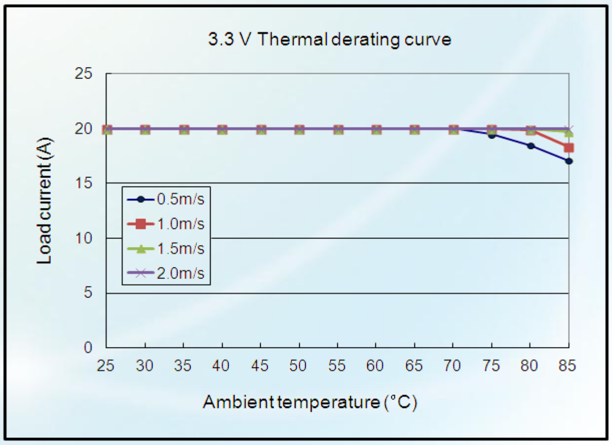


Figure 36: Thermal derating with airflow from pin3 to pin1 (V_{in} = 12 V; V_{out} = 3.3 V)

Characteristic Curves

Conditions: T_A = 25°C or 77°F, unless otherwise specified.

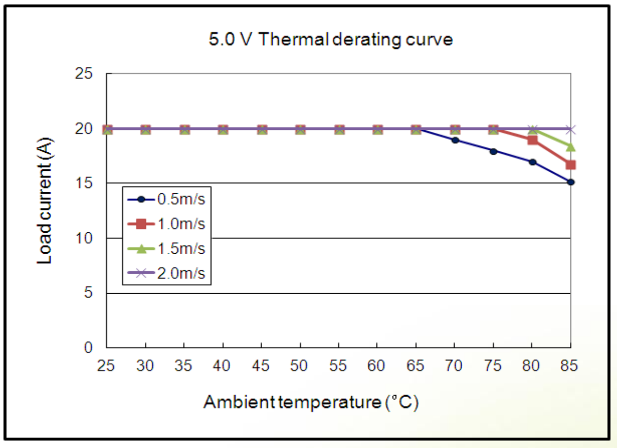


Figure 37: Thermal derating with airflow from pin1 to pin6 (V_{in} = 12 V; V_{out} = 5.0 V)

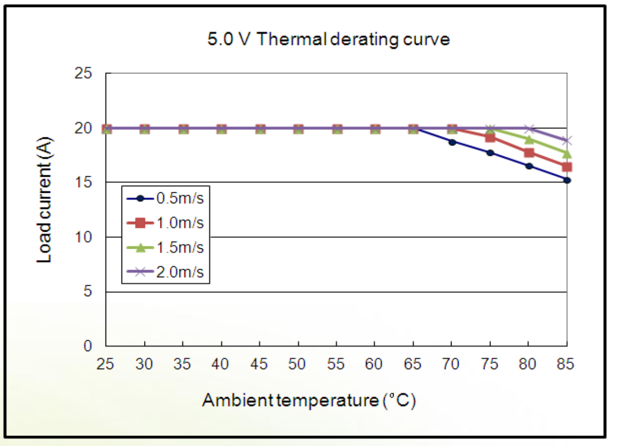


Figure 38: Thermal derating with airflow from pin3 to pin1 (V_{in} = 12 V; V_{out} = 5.0 V)

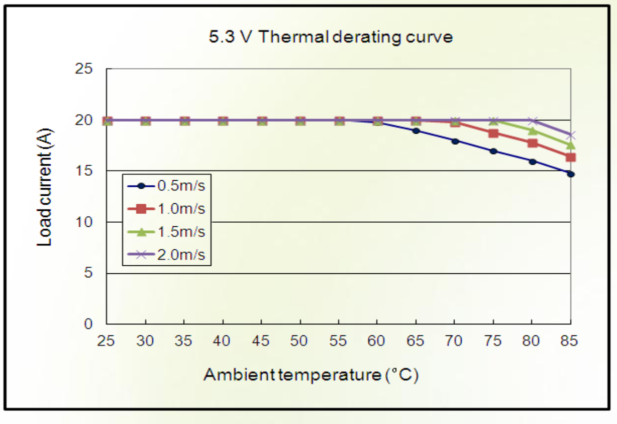


Figure 39: Thermal derating with airflow from pin1 to pin6 (V_{in} = 12 V; V_{out} = 5.3 V)

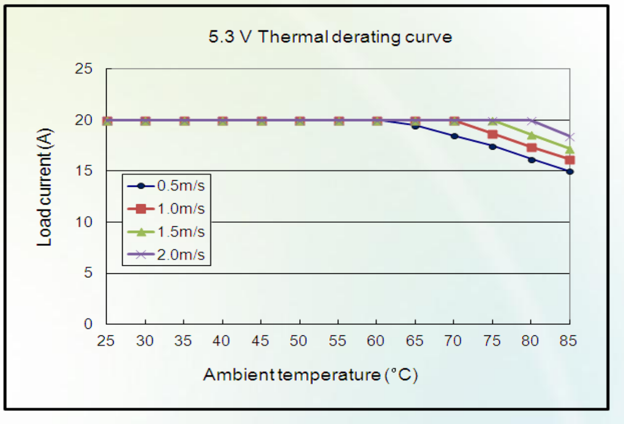


Figure 40: Thermal derating with airflow from pin3 to pin1 (V_{in} = 12 V; V_{out} = 5.3 V)

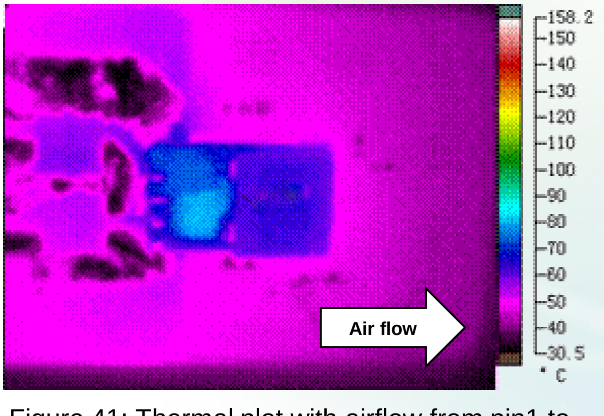


Figure 41: Thermal plot with airflow from pin1 to pin6 (T_A = 25°C(77°F); Airflow = 1 m/s (200 FLM); V_{in} = 12 V; V_{out} = 0.7 V; I_{out} = 20 A)

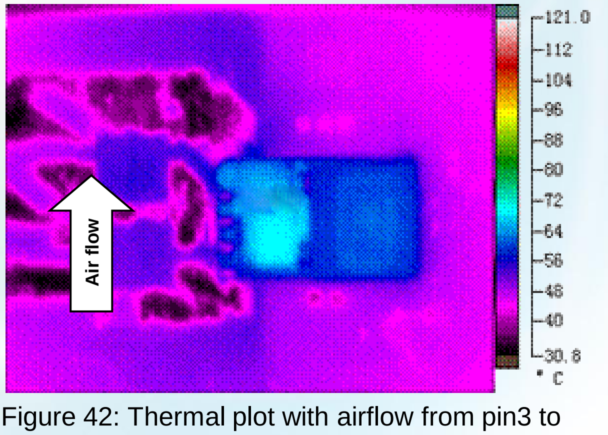


Figure 42: Thermal plot with airflow from pin3 to pin1 (T_A = 25°C(77°F); Airflow = 1 m/s (200 FLM); V_{in} = 12 V; V_{out} = 0.7 V; I_{out} = 20 A)

Characteristic Curves

Conditions: T_A = 25°C or 77°F, unless otherwise specified.

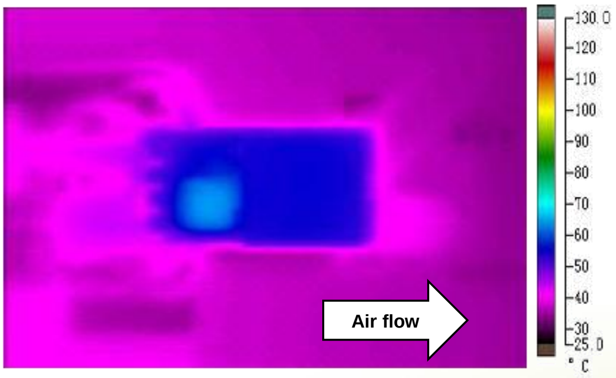


Figure 43: Thermal plot with airflow from pin1 to pin6 (T_A = 25°C(77°F); Airflow = 1 m/s (200 FLM); V_{in} = 12 V; V_{out} = 0.9 V; I_{out} = 20 A)

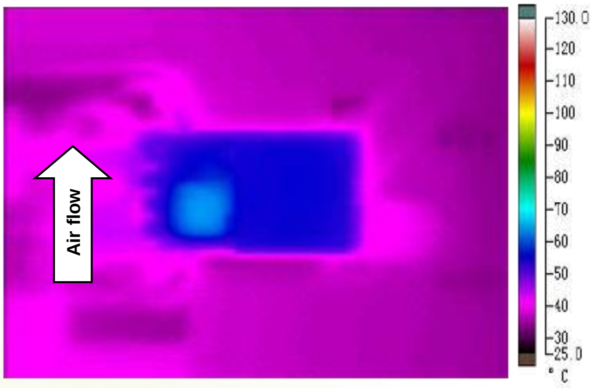


Figure 44: Thermal plot with airflow from pin3 to pin1 (T_A = 25°C(77°F); Airflow = 1 m/s (200 FLM); V_{in} = 12 V; V_{out} = 0.9 V; I_{out} = 20 A)

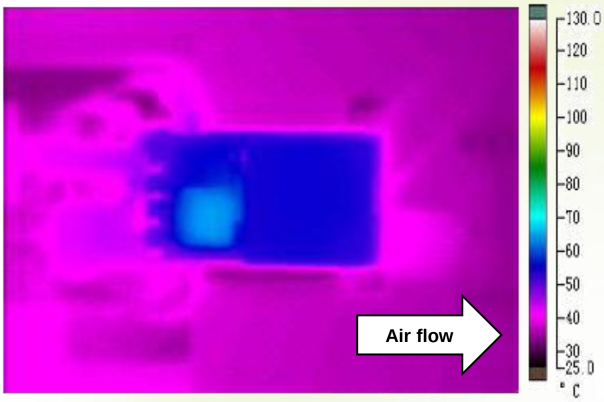


Figure 45: Thermal plot with airflow from pin1 to pin6 (T_A = 25°C(77°F); Airflow = 1 m/s (200 FLM); V_{in} = 12 V; V_{out} = 1.0 V; I_{out} = 20 A)

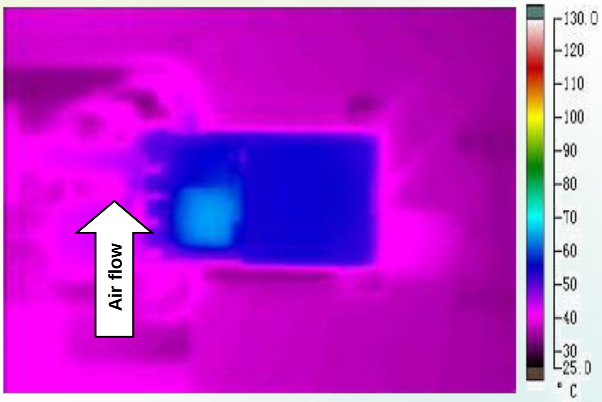


Figure 46: Thermal plot with airflow from pin3 to pin1 (T_A = 25°C(77°F); Airflow = 1 m/s (200 FLM); V_{in} = 12 V; V_{out} = 1.0 V; I_{out} = 20 A)

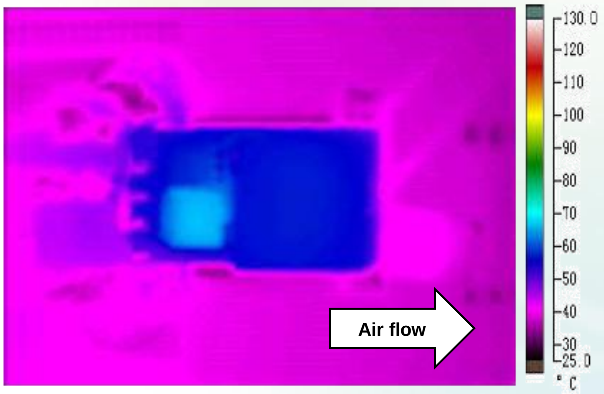


Figure 47: Thermal plot with airflow from pin1 to pin6 (T_A = 25°C(77°F); Airflow = 1 m/s (200 FLM); V_{in} = 12 V; V_{out} = 1.2V; I_{out} = 20 A)

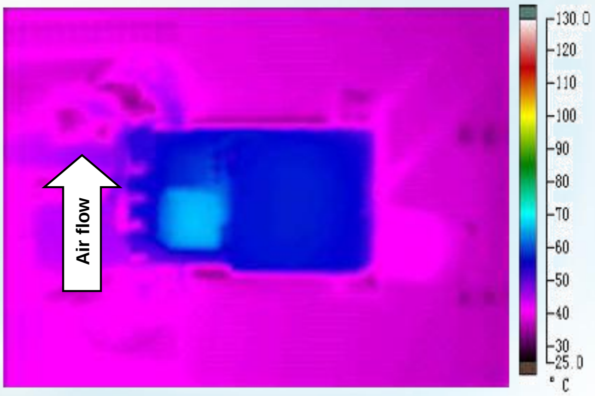


Figure 48: Thermal plot with airflow from pin3 to pin1 (T_A = 25°C(77°F); Airflow = 1 m/s (200 FLM); V_{in} = 12 V; V_{out} = 1.2 V; I_{out} = 20 A)

Characteristic Curves

Conditions: T_A = 25°C or 77°F, unless otherwise specified.

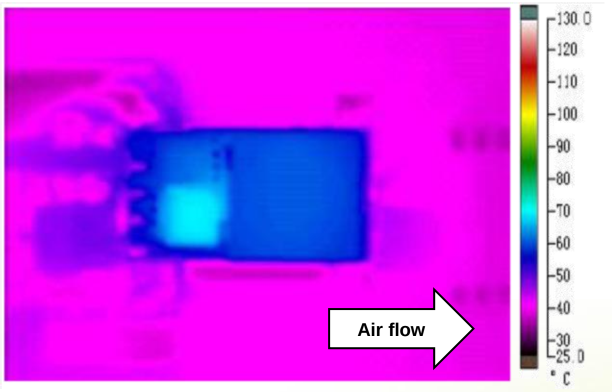


Figure 49: Thermal plot with airflow from pin1 to pin6 (T_A = 25°C(77°F); Airflow = 1 m/s (200 FLM); V_{in} = 12 V; V_{out} = 1.5V; I_{out} = 20 A)

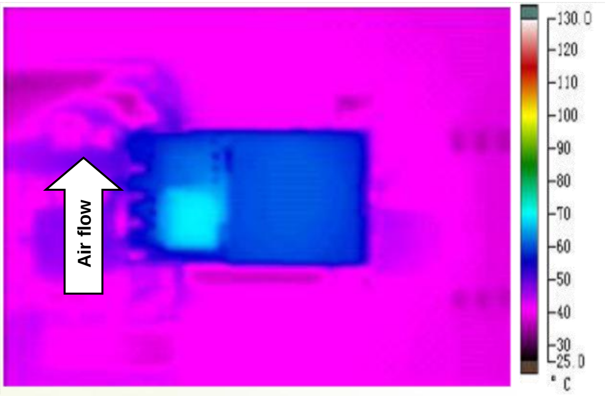


Figure 50: Thermal plot with airflow from pin3 to pin1 (T_A = 25°C(77°F); Airflow = 1 m/s (200 FLM); V_{in} = 12 V; V_{out} = 1.5 V; I_{out} = 20 A)

Figure 51: Thermal plot with airflow from pin1 to pin6 (T_A = 25°C(77°F); Airflow = 1 m/s (200 FLM); V_{in} = 12 V; V_{out} = 1.8 V; I_{out} = 20 A)

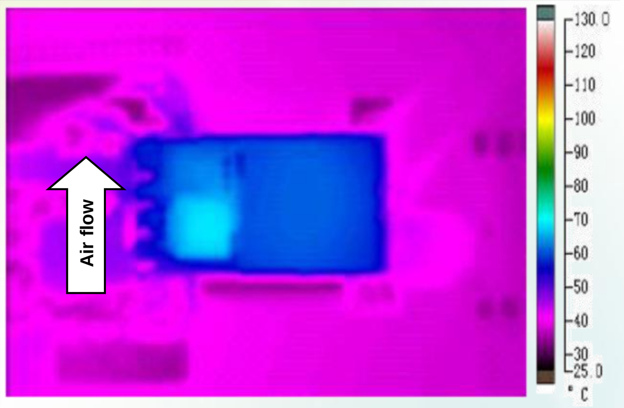


Figure 52: Thermal plot with airflow from pin3 to pin1 (T_A = 25°C(77°F); Airflow = 1 m/s (200 FLM); V_{in} = 12 V; V_{out} = 1.8V; I_{out} = 20 A)

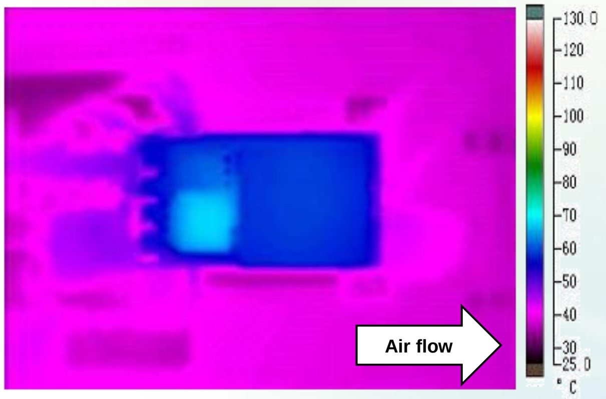


Figure 53: Thermal plot with airflow from pin1 to pin6 (T_A = 25°C(77°F); Airflow = 1 m/s (200 FLM); V_{in} = 12 V; V_{out} = 2.5 V; I_{out} = 20 A)

Figure 54: Thermal plot with airflow from pin3 to pin1 (T_A = 25°C(77°F); Airflow = 1 m/s (200 FLM); V_{in} = 12 V; V_{out} = 2.5 V; I_{out} = 20 A)

Characteristic Curves

Conditions: T_A = 25°C or 77°F, unless otherwise specified.

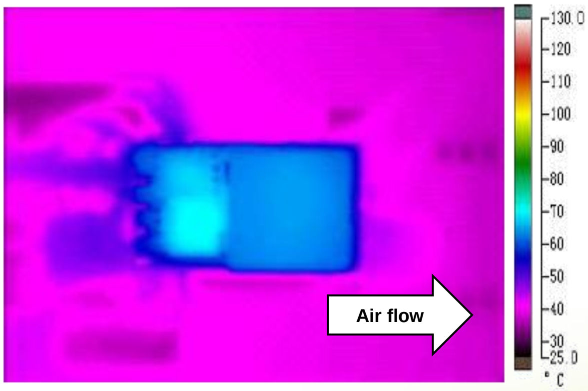


Figure 55: Thermal plot with airflow from pin1 to pin6 (T_A = 25°C(77°F); Airflow = 1 m/s (200 FLM); V_{in} = 12 V; V_{out} = 3.3 V; I_{out} = 20 A)

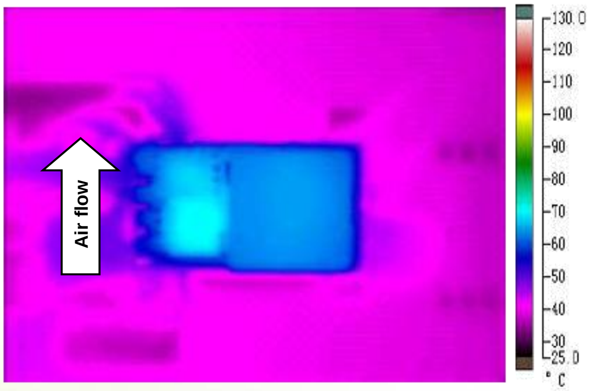


Figure 56: Thermal plot with airflow from pin3 to pin1 (T_A = 25°C(77°F); Airflow = 1 m/s (200 FLM); V_{in} = 12 V; V_{out} = 3.3V; I_{out} = 20 A)

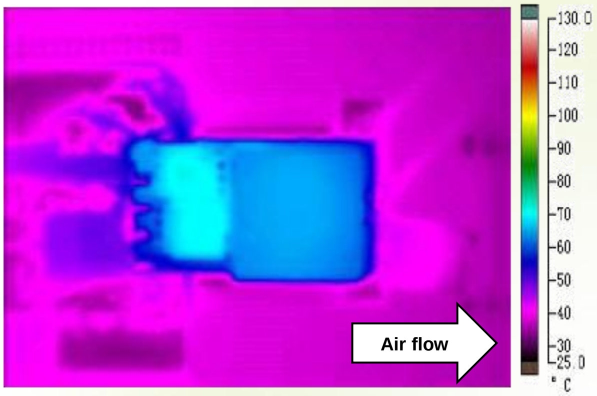


Figure 57: Thermal plot with airflow from pin1 to pin6 (T_A = 25°C(77°F); Airflow = 1 m/s (200 FLM); V_{in} = 12 V; V_{out} = 5.0 V; I_{out} = 20 A)

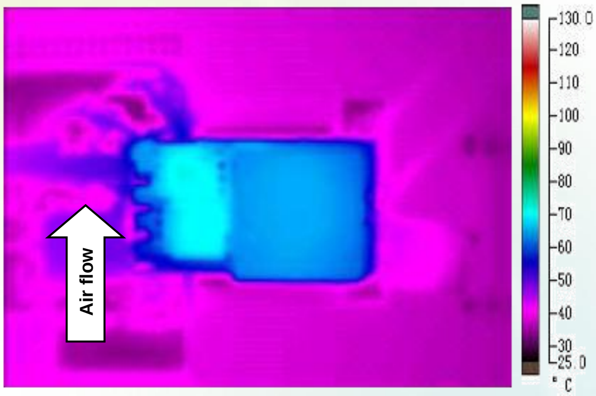


Figure 58: Thermal plot with airflow from pin3 to pin1 (T_A = 25°C(77°F); Airflow = 1 m/s (200 FLM); V_{in} = 12 V; V_{out} = 5.0 V; I_{out} = 20 A)

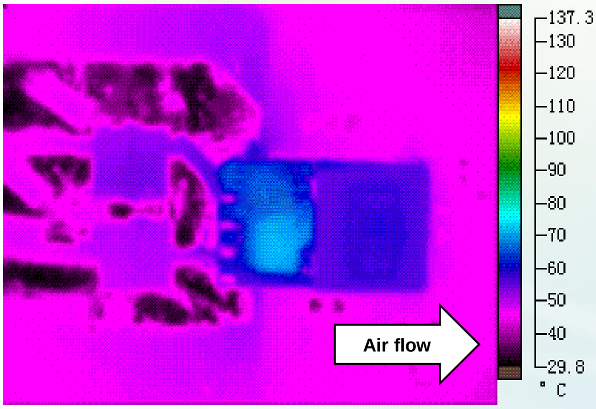


Figure 59: Thermal plot with airflow from pin1 to pin6 (T_A = 25°C(77°F); Airflow = 1 m/s (200 FLM); V_{in} = 12 V; V_{out} = 5.3 V; I_{out} = 20 A)

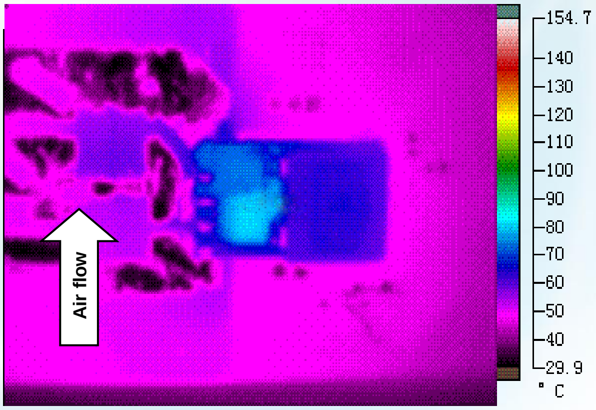


Figure 60: Thermal plot with airflow from pin3 to pin1 (T_A = 25°C(77°F); Airflow = 1 m/s (200 FLM); V_{in} = 12 V; V_{out} = 5.3 V; I_{out} = 20 A)

Typical Waveforms

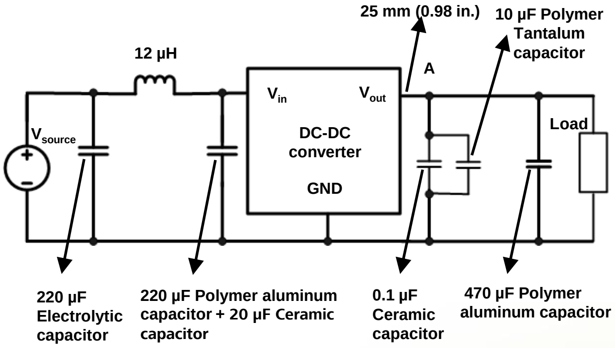


Figure 61: Test set-up diagram

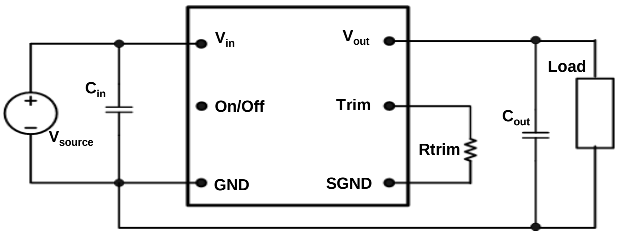


Figure 62: Application guidance6

NOTE

1. Measure the output voltage ripple at A respectively shown in Figure 61.
2. During the test of input reflected ripple current, the input terminal must be connected to a 12 μH inductor and a 220 μF electrolytic capacitor.
3. Point A, which is for testing the output voltage ripple, is 25 mm (0.98 in.) away from the V_{out} pin.
4. Test board: D x W = 200 mm x 110 mm, 1oz, 4 layers.

NOTE

Do not connect the GND and SGND pins outside the converter.

To ensure the stable operating of the converter, the proper capacitors must be add to the input and output terminals.

capacitor	Recommend capacitor
C_{in}	220 μF polymer aluminum capacitor and 20 μF ceramic capacitor
C_{out}	470 μF polymer aluminum capacitor

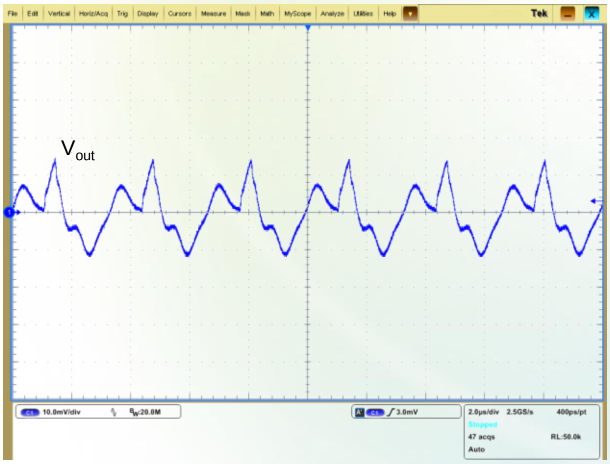


Figure 63: Output voltage ripple
(for point A in the test set-up diagram, V_{in} = 12 V, V_{out} = 1.2 V, I_{out} = 20 A)

Typical Waveforms

Conditions: T_A = 25°C (77°F), V_{in} = 5 V.

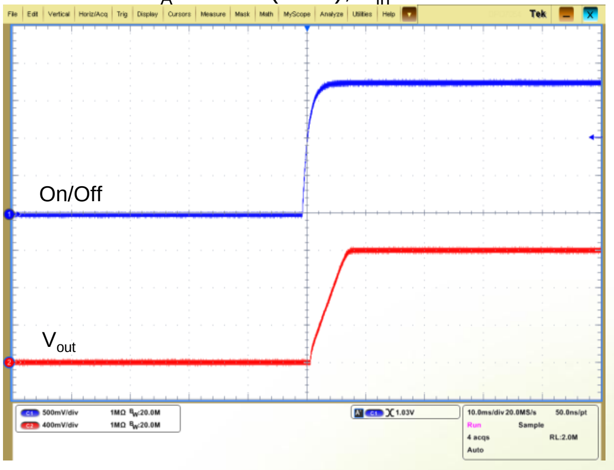


Figure 64: Startup from On/Off

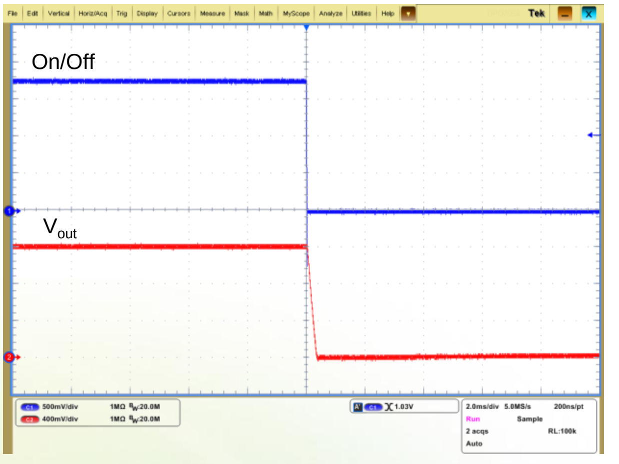


Figure 65: Shutdown from On/Off

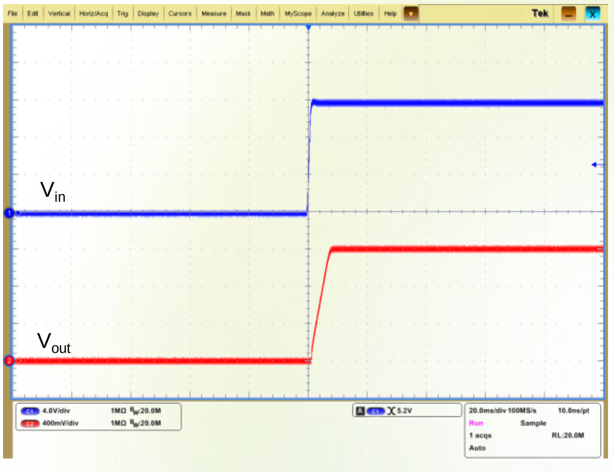


Figure 66: Startup by power on

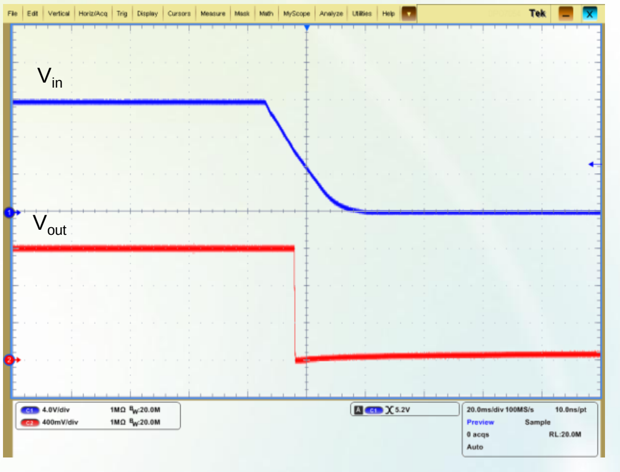


Figure 67: Shutdown by power off

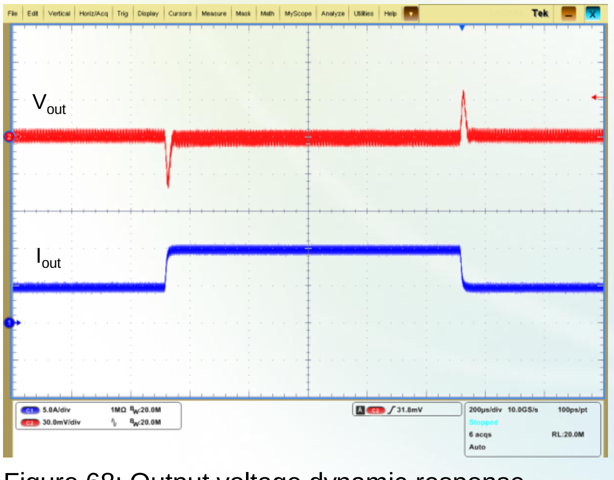


Figure 68: Output voltage dynamic response (Load : 25% - 50% - 25%, di/dt = 1 A/µs)

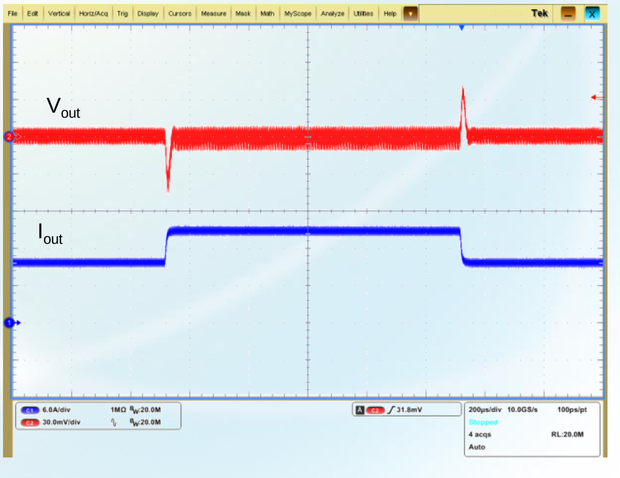


Figure 69: Output voltage dynamic response (Load : 50% - 75% - 50%, di/dt = 1 A/µs)

Remote On/Off

On/Off Pin Level	Status
Low level	Off
Left open	On

It is recommended to control the On/Off pin with an open collector transistor or similar device.

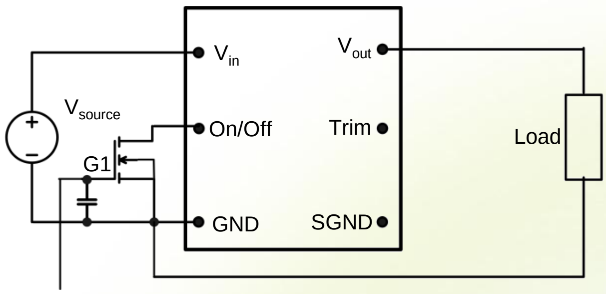


Figure 70: Circuit configuration for On/Off function

Output Voltage Trim

Output voltage can be adjusted by installing an external resistor between the Trim pin and the SGND pin.

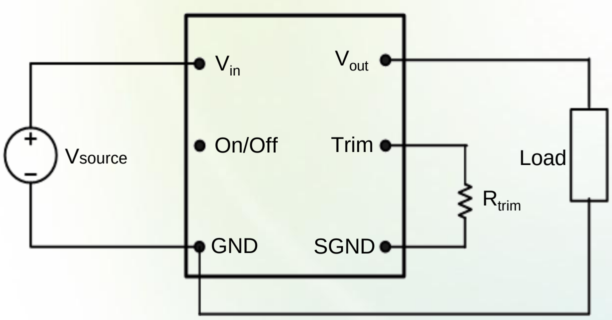


Figure 71: R_{trim} external connections

The relationship between R_{trim} and V_{out} :

$$R_{trim} = \left[\frac{12}{V_{out} - 0.6}\right] K\Omega$$

The output voltage varies depending on the Rtrim. Note that the trim resistor tolerance directly affects the output voltage accuracy. It is recommended to use ±1% trim resistor.

The following table describes the mapping between the V_{out} and R_{trim}.

Vout (V)	Rtrim(KΩ)
0.7	120
0.9	40
1.0	30
1.2	20
1.5	13.333
1.8	10
2.5	6.315
3.3	4.444
5.0	2.727
5.3	2.553

Input Undervoltage Protection

The converter will shut down after the input voltage drops below the undervoltage protection threshold for shutdown. The converter will start to work again after the input voltage reaches the input undervoltage protection threshold for startup. For the Hysteresis, see the Protection characteristics.

Output Overcurrent Protection

The converter equipped with current limiting circuitry can provide protection from an output overload or short circuit condition. If the output current exceeds the output overcurrent protection set point, the converter enters hiccup mode. When the fault condition is removed, the converter will automatically restart.

Output Overvoltage Protection

When the voltage directly across the output pins exceeds the output overvoltage protection threshold, the converter will stop working to protect the converter and the load. The converter will automatically resumes normal operation after the over voltage condition is removed.

Overtemperature Protection

A temperature sensor on the converter senses the average temperature of the module. It protects the converter from being damaged at high temperatures. When the temperature exceeds the Overtemperature protection threshold, the output will shut down. It will allow the converter to turn on again when the temperature of the sensed location falls by the value of Overtemperature Protection Hysteresis.

PCB Layout Considerations

To ensure the filtering effects, place the C_{in} and C_{out} symmetrically near the pins. The following figure shows the cable hole layouts at the input and output terminals.

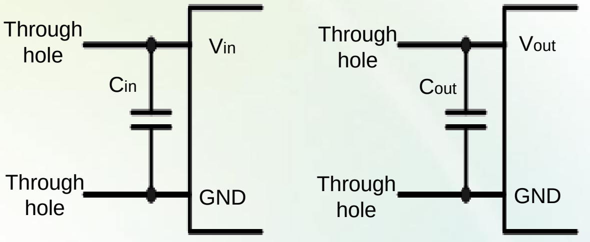


Figure 72: Recommend PCB layout

Qualification Testing

Parameter	Units	Condition
High Accelerated Life Test (HALT)	3	Lowest operating temperature: -60°C(-76°F); highest operating temperature: 120 °C (248 °F); vibration limit: 40 G
Power and Temperature Cycling Test	8	Rating input voltage; 50% load; ambient temperature between -40°C (-40°F) and +125°C (+257°F); temperature slope: 15°C(59°F) per minute
High Temperature Operating Bias	8	Operating temperature: 50±5°C; Input voltage: rated input voltage; Output: 50%~80%full load; Air flow : 0.5~5m/s; Time:1000 Hour
Temperature Humidity Bias	8	85 °C (185 °F); 85% RH; 1000 operating hours under lowest load power

Thermal Consideration

Thermal Test Point

Sufficient airflow should be provided to ensure reliable operating of the converter. Therefore, thermal components are mounted on the top surface of the converter to dissipate heat to the surrounding environment by conduction, convection and radiation. Proper airflow can be verified by measuring the temperature at the thermal test point.

Figure 73: Thermal test point

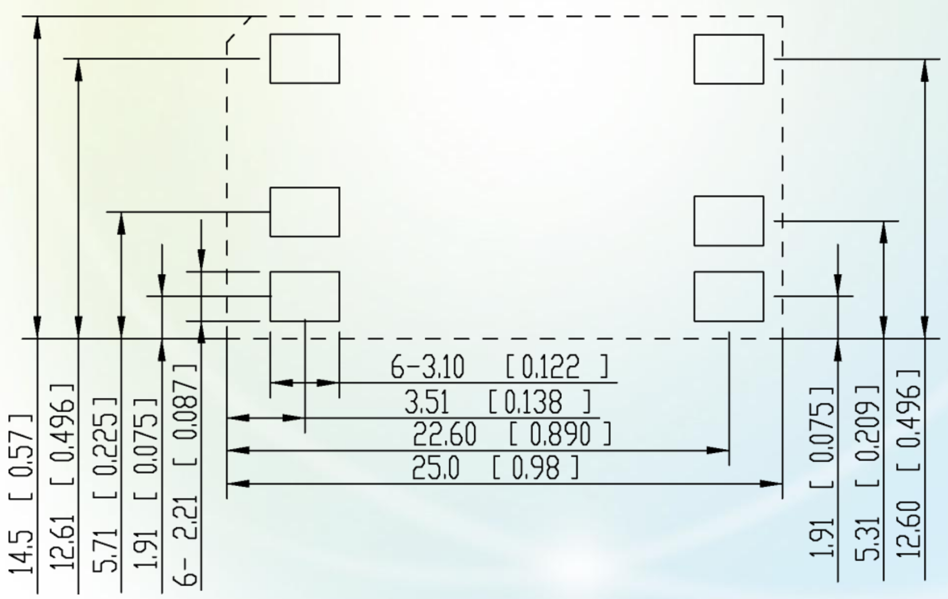
> **NOTE**
> The temperature at the thermal test point on the converter cannot exceed 125 °C (257 °F). Otherwise, the converter will be protected against overtemperature and will not operate properly.

Power Dissipation

The converter power dissipation is calculated based on efficiency. The following formula reflects the relationship between the consumed power (P_d), efficiency (η), and output power (P_o): Pd=Po(1-η)/η

Encapsulation Size Diagram

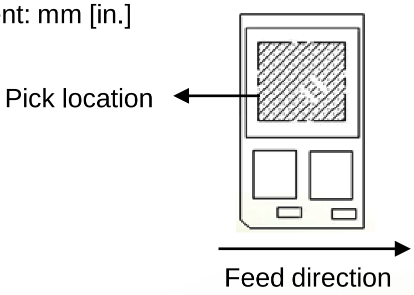
Unit of measurement: mm [in.]

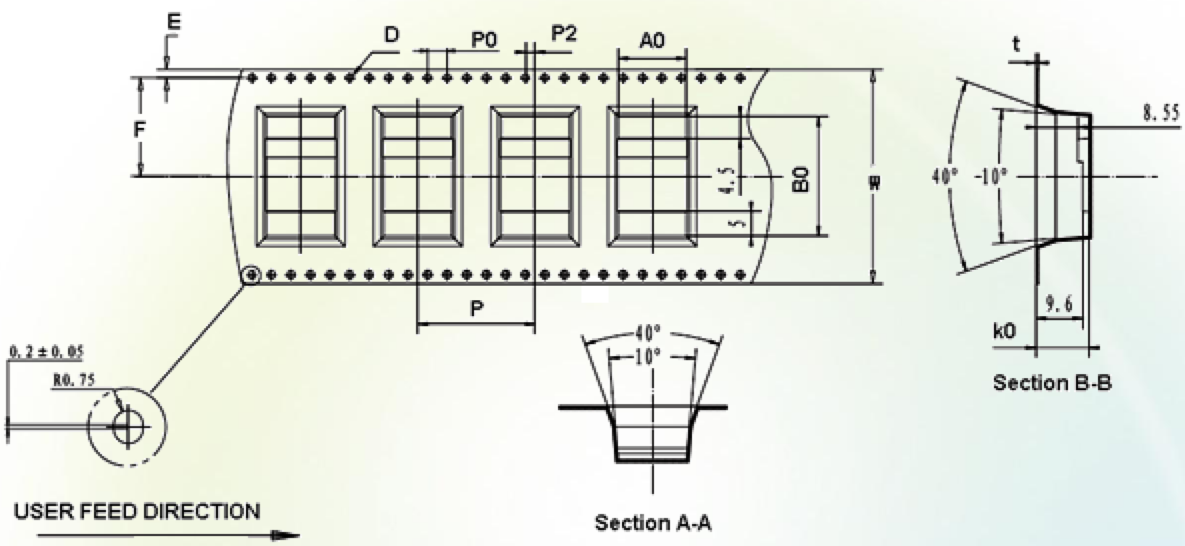


Package Information

The converters are supplied in tape & reel as standard. The following figure shows the tape dimensions.

Unit of measurement: mm [in.]





ITEM	W	A0	B0	K0	P	F	E	D	P0	P2	t	13"	
DIM	44.0	14	24.6	10.9	24	20.2	1.75	1.50	4.00	2.00	0.5	Length /Reel	Number of Components /Reel
TOLE	+0.30 -0.30	+0.10 -0.10	+0.10 -0.10	+0.10 -0.10	+0.10 -0.10	+0.10 -0.10	+0.10 -0.10	+0.10 -0.10	+0.10 -0.10	+0.10 -0.10	+0.05 -0.05	6.2M	220PCS

NOTE

1. The maximum accumulated tolerance for any 10 ratcheting holes is ±0.02 mm.
2. The thickness is measured at the edge of the carrier tape.
3. The maximum tolerance for parallelism of each 100 mm of the carrier tape is 1 mm.
4. The tolerance, if not specified, is ±0.1 mm.
5. A0 and B0 are measured at 0.3 mm above the mould cavity interior. K0 is the internal depth.
6. The chamfer on the exterior of the mould cavity, if not specified, ranges from 0.2 to 0.3.
7. The demould gradient, if not specified, is 3 degrees.
8. After wrapped with coiled tape, the converter is then packaged in a sealed bag together with desiccant.

Mechanical Consideration

Surface Mount Information

The converter uses an open frame structure and is designed for a fully automated assembly process.
The flat surface of the label on the large inductor can be the patch mounting surface. The converter weight can be borne by a standard surface mounting device (SMD). For most SMDs, the converter is heavy, and mounting on the capacitor surface will cause deviation. The solution is to optimize the model and size of the suction nozzle and increase the mounting speed and vacuum pressure.
The label meets all the requirements for surface mount processing, as well as safety standards, and is able to withstand reflow temperatures of up to 300°C. The label also carries product information such as product code and manufacturing date.

Recommended Furnace Temperature

The reflow profile should be optimized to avoid excessive heating of the converter. The converter can withstand the temperature of 260°C for 10 seconds. It is recommended that the peak temperature do not exceed 260°C.
It is recommended that the preheat time be long enough to minimize the difference in temperature between the converter and the host PCB.
The converter uses the lead-free technique. The following table lists the recommended values for reflow parameters.

Item	Specifications
Average ramp-up	≤ 2.5°C/s
Preheat time	90 - 120s
Infiltration time	60 - 120s
Reflow time (T_A ≥ 183°C)	60 - 90s
Peak temperature	230 - 260°C
Cooling rate	1°C/s ≤ slope ≤ 4°C/s

The furnace temperature can be adjusted based on the host board conditions.

Moisture Resistance Requirements

Store and transport the converter as required by the MSL rating 2 specified in the IPC/JEDEC J-STD-033A.
It is recommended that clean-free solder paste be used to assemble surface mount components. The surface of a soldered converter must be clean and dry. Otherwise the assembly, test, or even reliability of the converter will be negatively affected.

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