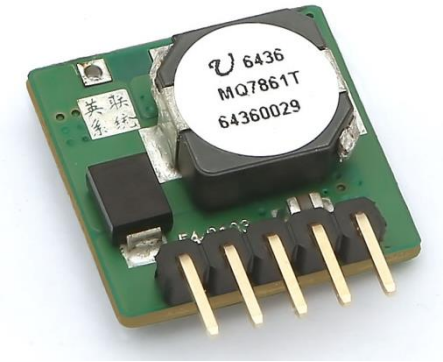
PowerBean™ MQ7861
Compact, 4.5~20V Wide input, 1.22~12V Output, 3A output, DC-DC Converter



Features

- Wide Operating Voltage: 4.5V ~ 20V
- Output Voltage: 1.22V ~ 12V
- Output Current Up to 3A
- Low output voltage ripple
- Overcurrent / shortcircuit protection
- Remote Control – Positive Logic
- Minimal space on PCB:
  - SIP PIN out
    - 17.8 mm x 17.8 mm x 7.0 mm or
    - 0.70 in x 0.70 in x 0.27 in
  - SMT PIN out
    - 17.8 mm x 17.8 mm x 8.6 mm or
    - 0.70 in x 0.70 in x 0.34 in
- No derating to +55℃, natural convection
- UL/IEC/EN60950 compliant
- RoHS Compliant

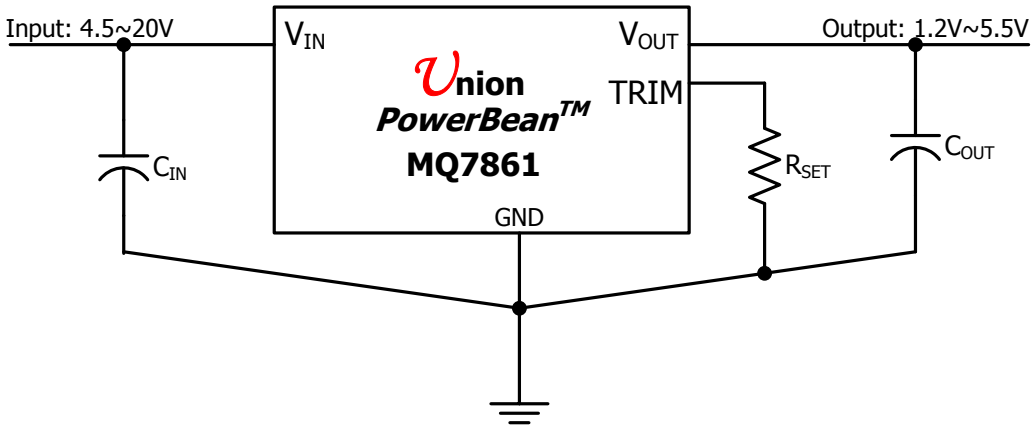
Applications

- Industry Control
- Audio Video Devices
- Data Acquisition Equipment

Description

The ***PowerBean™*** MQ7861 Power Modules are non-isolated dc-dc converters that operate over a wide input voltage range of 4.5Vdc to 20Vdc and provide a precisely (1%) regulated dc output. Such a module is suitable to applications like industrial automatic control, audio and video devices, and data acquisition systems. The modules have a maximum output current rating of 3A at a typical full-load efficiency 88%.

********** *Typical Application Circuit* **********

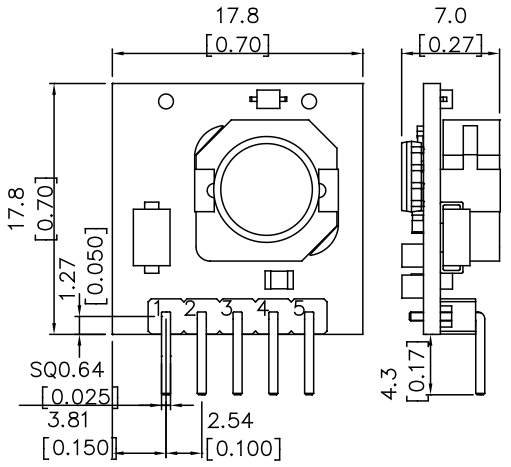


Performance Specifications (at TA=+25℃)

Model	Input V_{IN} Range (V)	Output				Efficiency (%)
		I_{OUT} (A)	Trim Range (V)	Regulation		
				Line (%)	Load (%)	
MQ7861T	4.5~20	3	1.22~12V	2	2	88
MQ7861S						

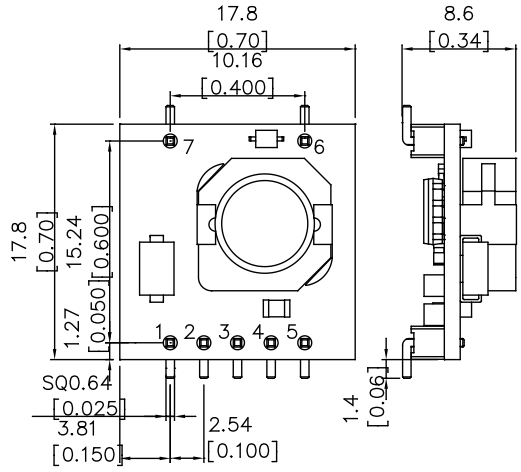
Mechanical Specifications

MQ7861T- Dimensions are in mm (inches)



PIN	DESCRIPTION
1	Enable
2	V_{in}
3	GND
4	V_{out}
5	T_{rim}

MQ7861S- Dimensions are in mm (inches)



PIN	DESCRIPTION
1	Enable
2	V_{in}
3	GND
4	V_{out}
5	T_{rim}
6	No Connect
7	No Connect

Ordering Information

MQ7861T

Union Microsystems Power module P/N

T: Through hole
S: Surface Mount

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Absolute Maximum Ratings

Note: These are stress ratings. Exposure of devices to any of these conditions may adversely affect long-term reliability. Proper operation under conditions other than those listed in the Performance Specifications Table is not implied.

Parameter	Symbol	Min	Max	Unit
Input Voltage	V_{IN}	-0.3	23	V
Storage Temperature	T_{STG}	-40	125	℃

MQ7861 Electrical Specifications: *(T_A=+25℃, input voltage 12V,unless otherwise noted)*

Parameter	Condition		Symbol	Min	Typ	Max	Unit
Input Voltage Range			V_{IN}	4.5		20	V
Output Current	$V_{O.SET}$ < 12V		Io			3	A
	$V_{O.SET}$ ≥ 12V					2	
Output Voltage Set point	100% load		ΔVo	-2		+2	%
Temperature Regulation	T_A= $T_{A.MIN}$ To $T_{A.MAX}$		-		0.4		%$V_{O.SET}$
Output Trim Range				1.22		12	V
Line Regulation					2		%
Load Regulation					2		%
Output Ripple and Noise Voltage	DC~20MHz	Vo.set ≤ 3.3V			20		mVpp
		Vo.set ≤ 5V			50		
		Vo.set ≤ 12V			100		
Transient Response					TBD		

General Specifications

Parameter	Condition	Symbol	Min	Typ	Max	Unit
Maximum Capacitive Load	100% resistive load + Aluminum capacitor			2200		μF
	100% resistive load +Sanyo POSCAP			330		
Over-current Protection			3.8		5.2	A
Output short-circuit current	All	Auto-Reset				
Under Voltage Lockout Trip Level	Rising V_{IN}			4.5		V
	Falling V_{IN}			4.2		
Logic High (Module ON) (1)		V_{IH}	2		5.5	V
Logic Low (Module OFF)		V_{IL}	-0.7		1	V
Start-up Time	100% resistive load, no external output capacitors, depend on input and output voltage		2		15	mS
Switching Frequency		Fo		380		kHz
Operating Temperature	Natural convection, no forced air flow		-40		85	℃
Vibration	3 Axes, 5 Min Each	10~55Hz，0.35mm，5g				
	3 Axes, 6 Times Each	Peak Deviation 300g，Settling Time 6mS				
MTBF	Telecordia SR 332, Nominal input, Maximum Load current, 55 Degree C	2,000,000				Hour

Note:
(1): Module will be on when left the Enable Pin open.

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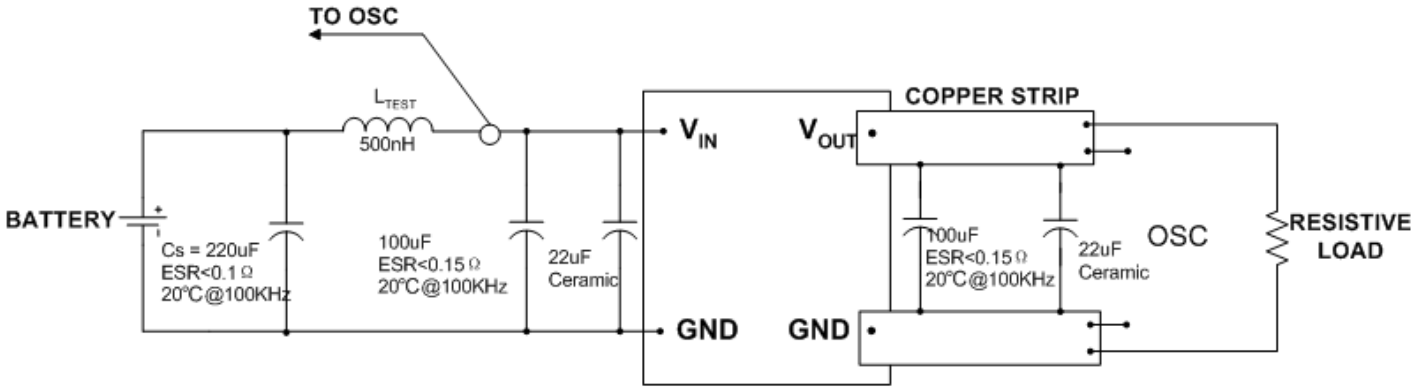
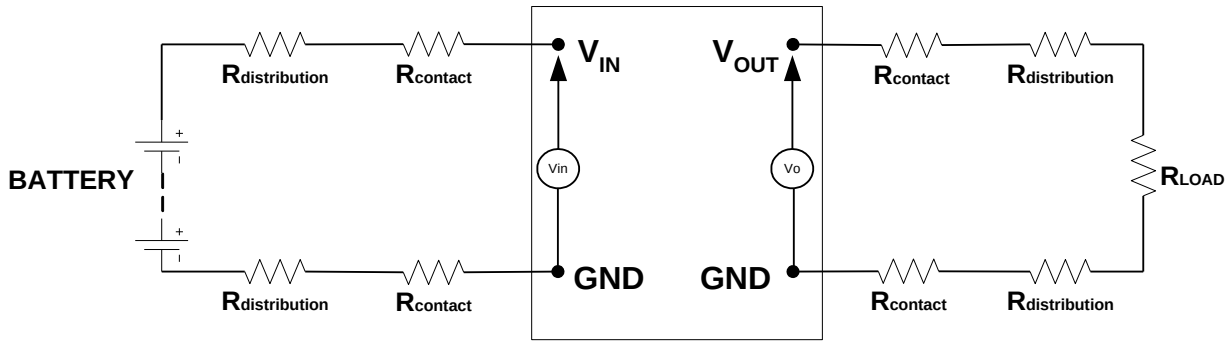
Test Configurations



Test setup for input noise, output noise and ripple

Note:

Output noise is measured with 0.1μ F ceramic capacitor connected at the output. OSC measurement should be made using a BNC socket. Position the load between 50mm and 75mm（2in. and 3in）from the tested module.



Test setup for efficiency

Note:

All voltage measurements must be taken at the module's terminals, as shown above. If sockets are needed, Kelvin connections are required at the module terminals to avoid measurement errors due to socket contact resistance.

Output Voltage Trimming

MQ7861's output voltage can be trimmed in certain ranges. See Figure 1 for the programming method. See Performance Specifications for allowable trim ranges in detail. Also customized products are offered.

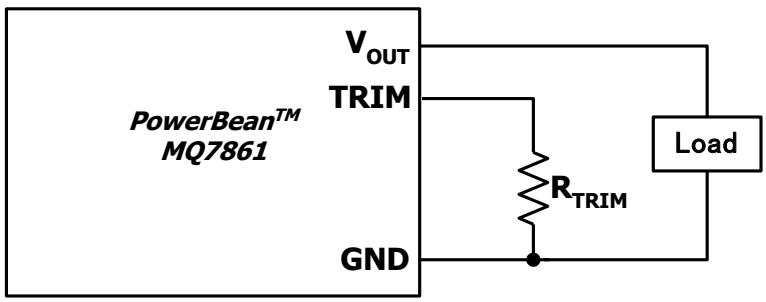


Fig1. Circuit configuration for programming output voltage using external resistor

Trim with external resistor (Fig1), the equation as below：

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$$Rtrim = \frac{3037.8}{V_o - 1.22} - 200$$

Resistor values are in Ω; V_O is desired output voltage.
For examples, to trim output to 3.3V, then

$$Rtrim = \frac{3037.8}{3.3 - 1.22} - 200$$

So, R_{TRIM} =1260Ω

Required Trim resistors for most common voltages, as Table 1.

Table 1, the required trim resistors R_{TRIM} for most common voltages

Output Voltage(V)	Resistor (kΩ)
1.22	Open
1.25	101.06
1.5	10.65
1.8	5.04
2.5	2.173
3.3	1.26
5.0	0.603
12.0	0.079

ON/OFF Control

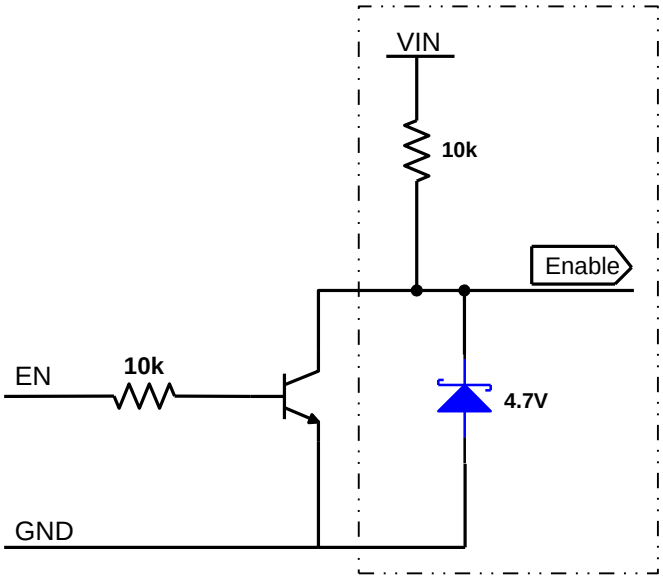
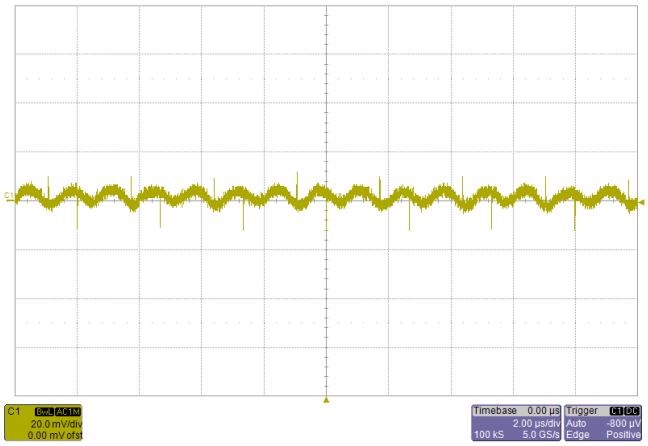


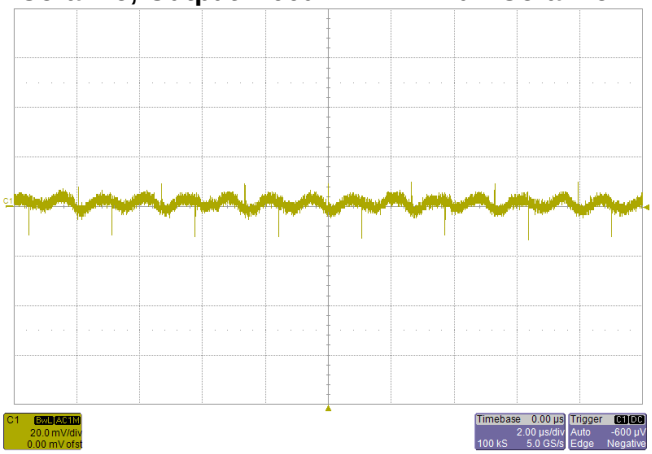
Fig2, Recommended external Remote ON/OFF Control Logic Circuit

The *MQ7861* power modules feature an On/Off pin for remote On/Off operation with positive logic. If not using the remote On/Off pin, leave the pin open (module will be On). The On/Off pin signal (Von/Off) is referenced to ground. To switch module on and off using remote On/Off, refer to Figure 2.

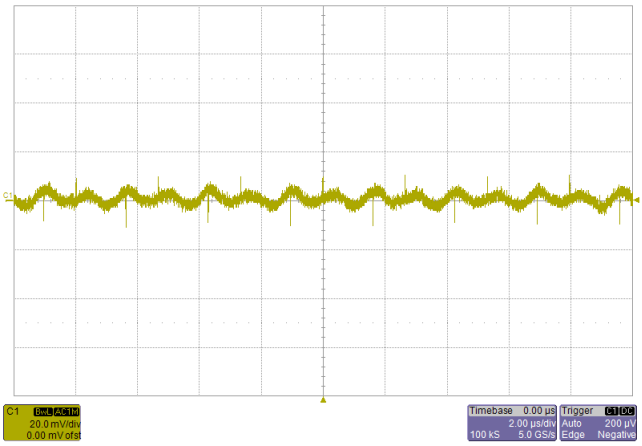
Typical Characteristics (Input=5V):
General Conditions: Input: 1000uF AL+100uF TAN+22uF Ceramic; Output: 100uF TAN +22uF Ceramic



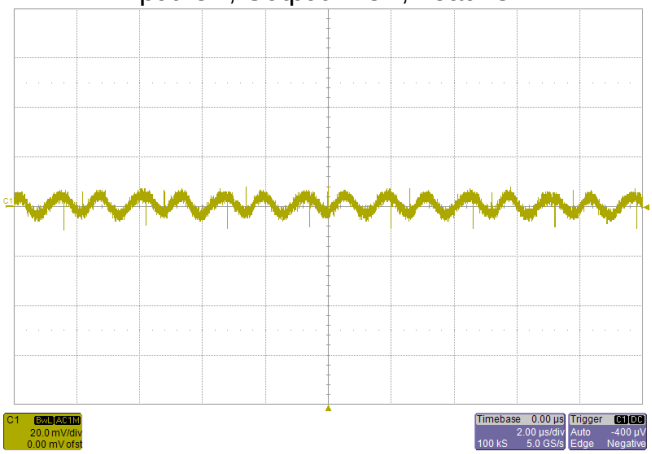
Ripple and Noise (0~20MHz)
Input: 5V, Output: 1.2V, Load: 3A



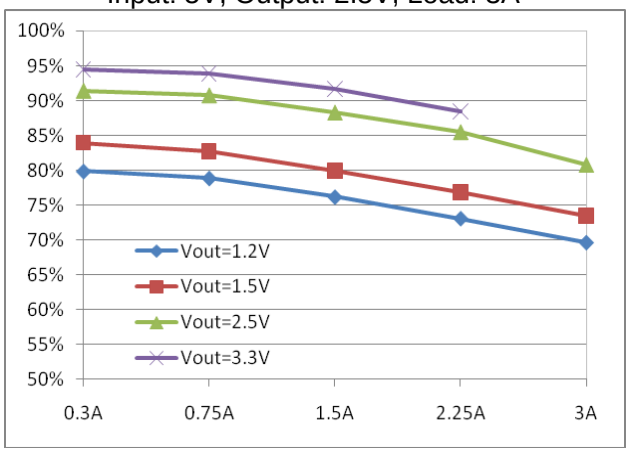
Ripple and Noise (0~20MHz)
Input: 5V, Output: 1.5V, Load: 3A



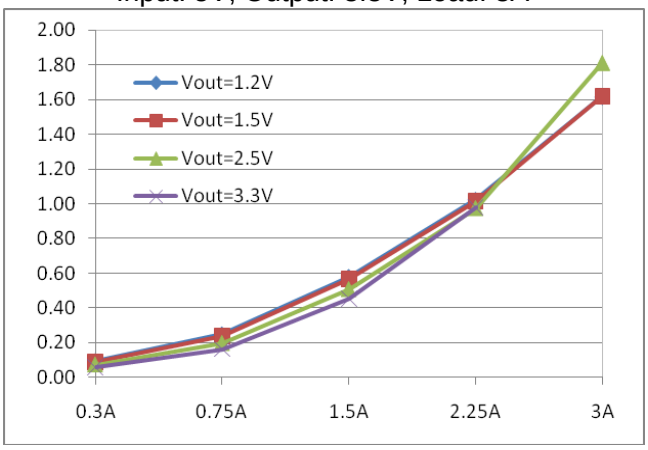
Ripple and Noise (0~20MHz)
Input: 5V, Output: 2.5V, Load: 3A



Ripple and Noise (0~20MHz)
Input: 5V, Output: 3.3V, Load: 3A



Input:5V, Efficiency



Input:5V, Power Dissipation

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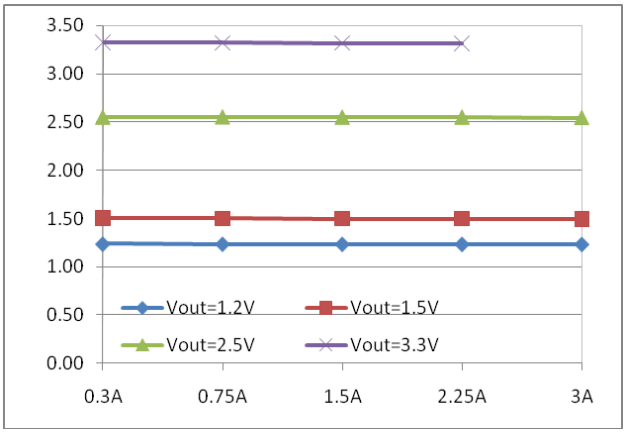
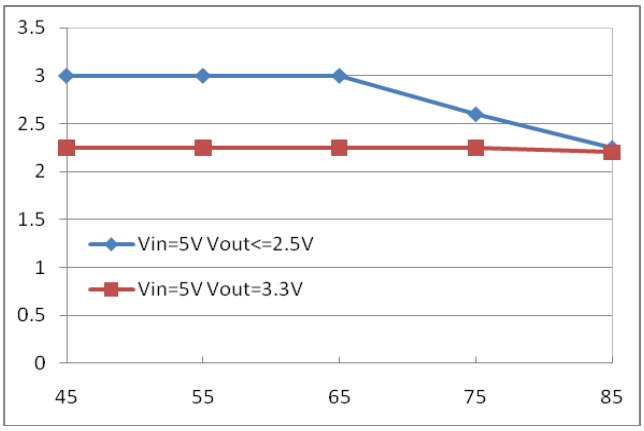


Input:5V, Regulation



Input:5V, Derating, Nature

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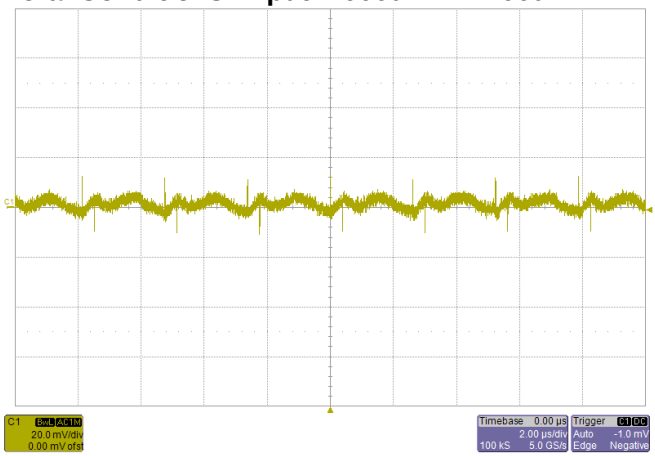
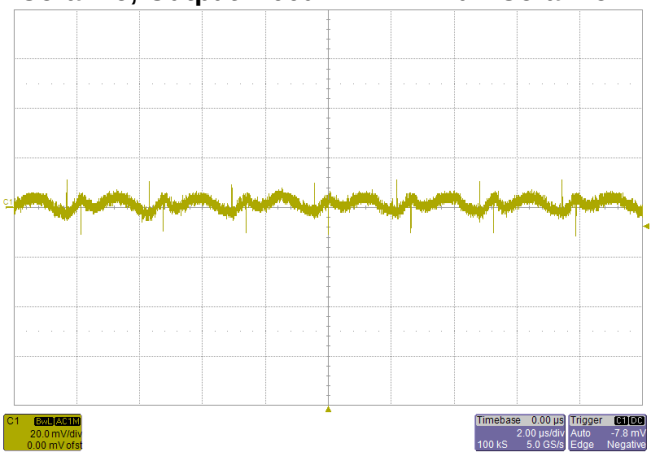
Typical Characteristics (Input=12V):

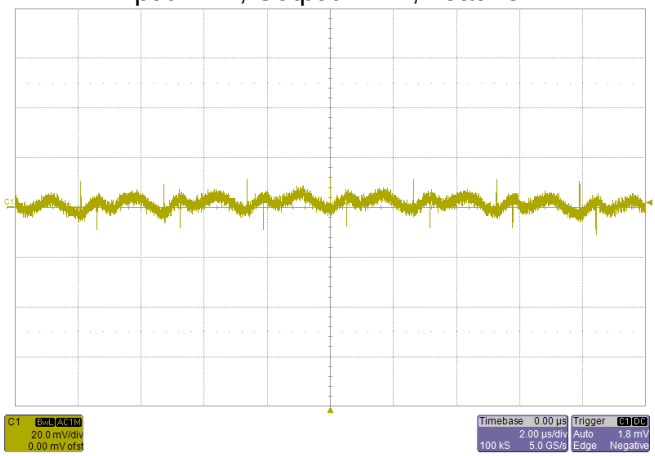
General Conditions: Input: 1000uF AL+100uF TAN+22uF Ceramic; Output: 100uF TAN +22uF Ceramic



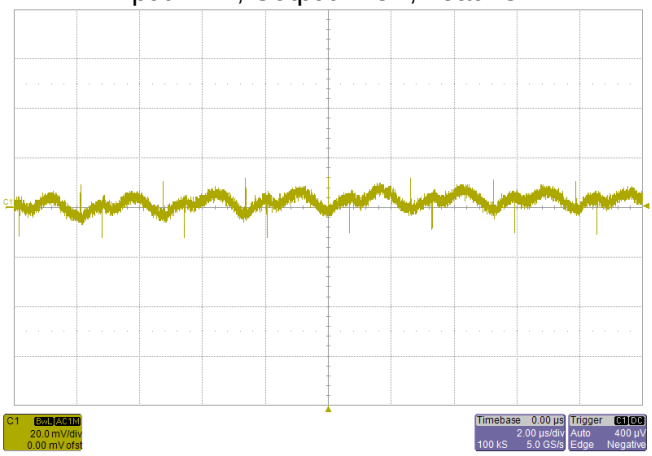
Ripple and Noise (0~20MHz)
Input: 12V, Output: 1.2V, Load: 3A



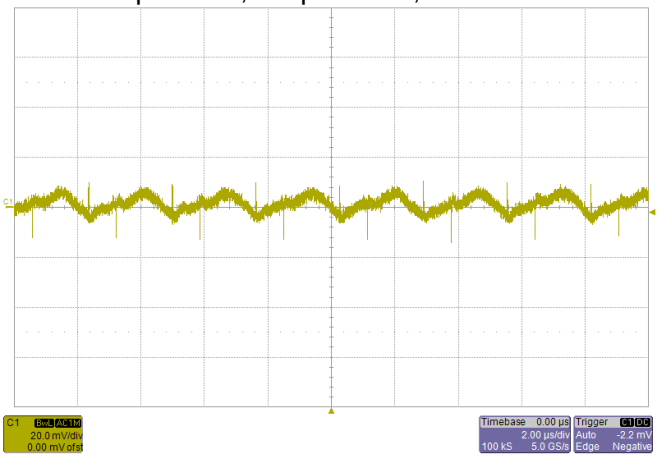
Ripple and Noise (0~20MHz)
Input: 12V, Output: 1.5V, Load: 3A



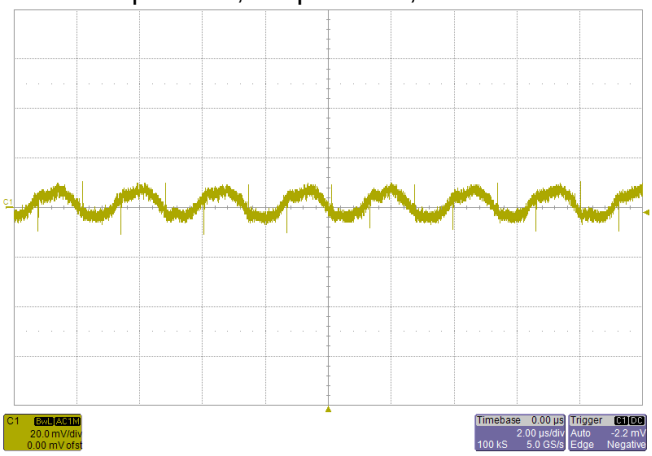
Ripple and Noise (0~20MHz)
Input: 12V, Output: 1.8V, Load: 3A



Ripple and Noise (0~20MHz)
Input: 12V, Output: 2.5V, Load: 3A



Ripple and Noise (0~20MHz)
Input: 12V, Output: 3.3V, Load: 3A



Ripple and Noise (0~20MHz)
Input: 12V, Output: 5V, Load: 3A

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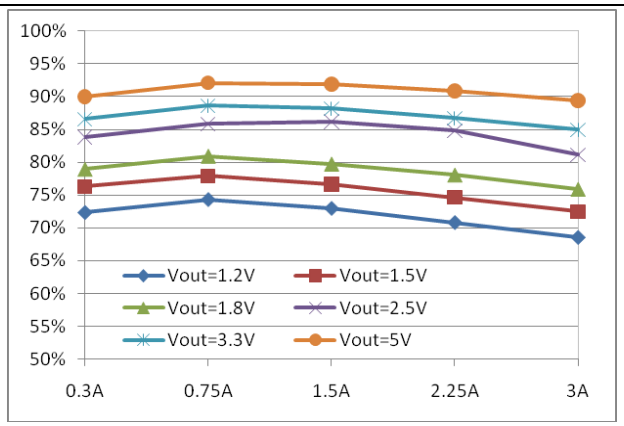
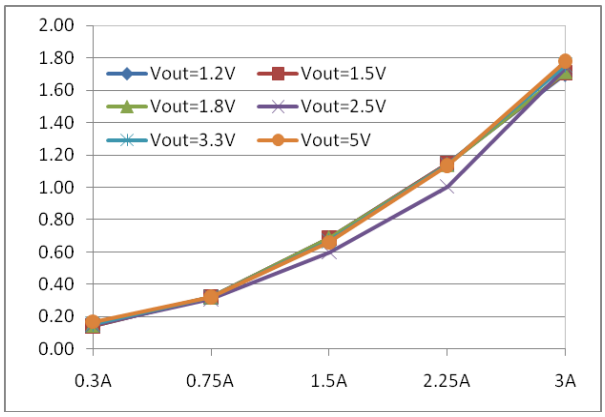
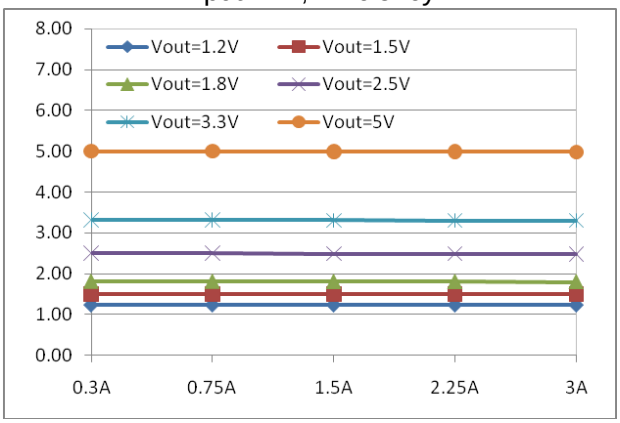


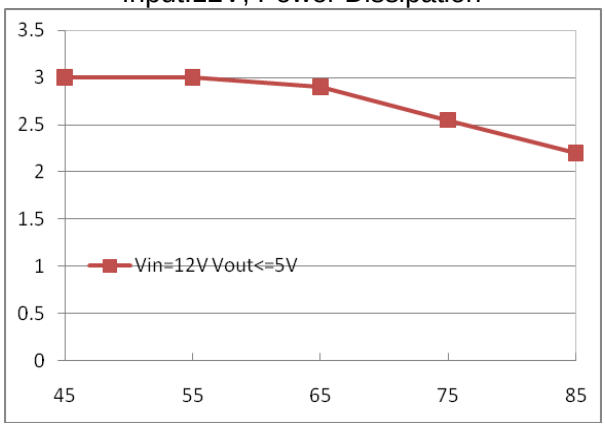
Input:12V, Efficiency



Input:12V, Power Dissipation

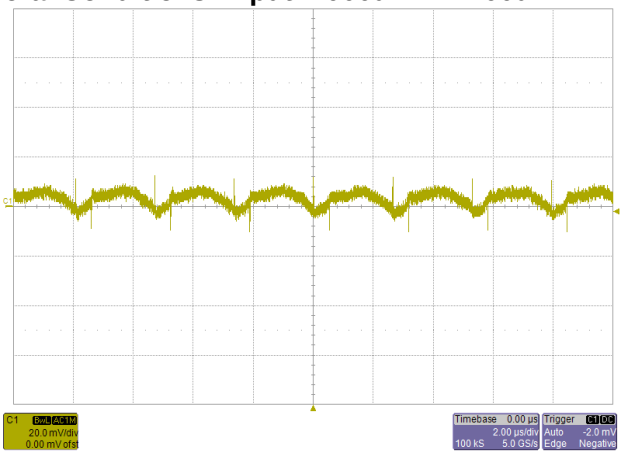


Input:12V, Regulation

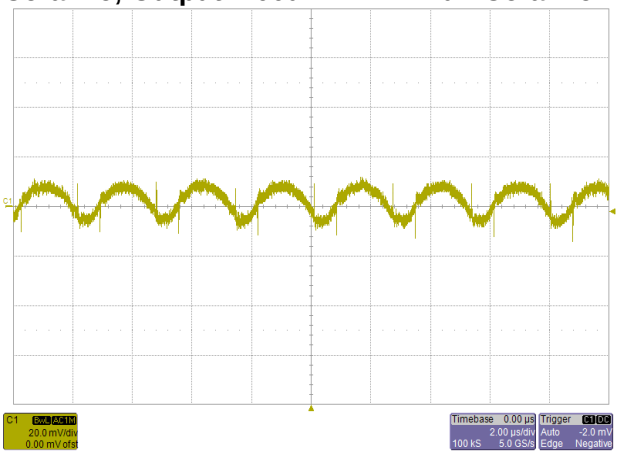


Input:12V, Derating,Nature

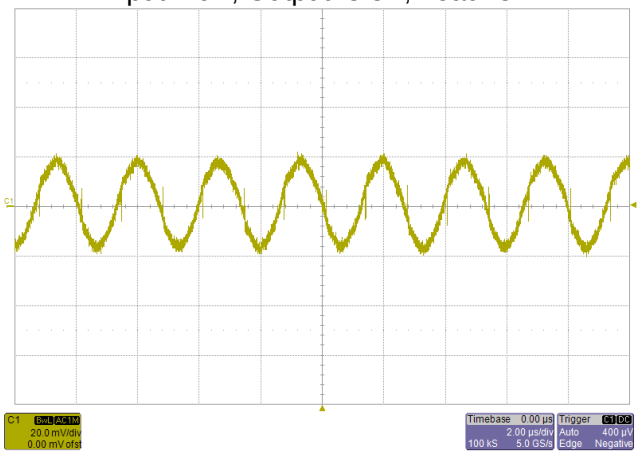
Typical Characteristics (Input=20V):
General Conditions: Input: 1000uF AL+100uF TAN+22uF Ceramic; Output: 100uF TAN +22uF Ceramic



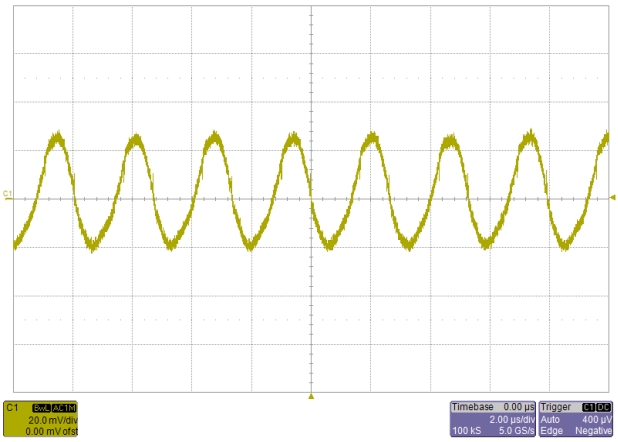
Ripple and Noise (0~20MHz)
Input: 20V, Output: 3.3V, Load: 3A



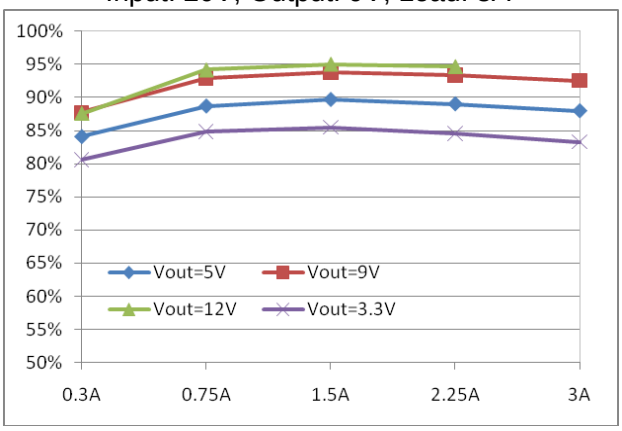
Ripple and Noise (0~20MHz)
Input: 20V, Output: 5V, Load: 3A



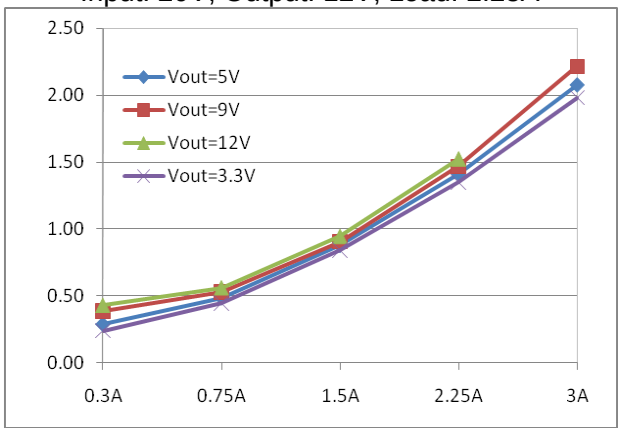
Ripple and Noise (0~20MHz)
Input: 20V, Output: 9V, Load: 3A



Ripple and Noise (0~20MHz)
Input: 20V, Output: 12V, Load: 2.25A



Input:20V, Efficiency



Input:20V, Power Dissipation

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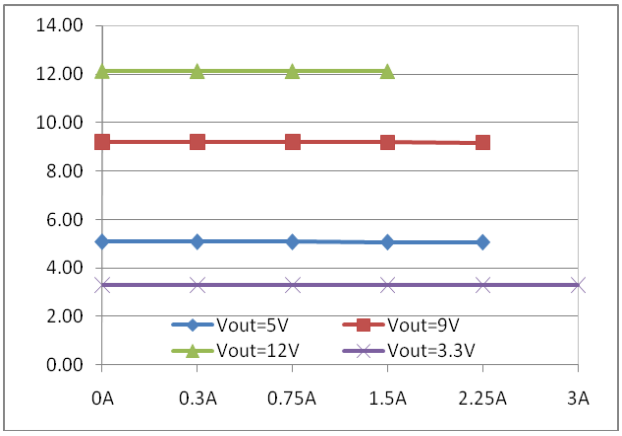
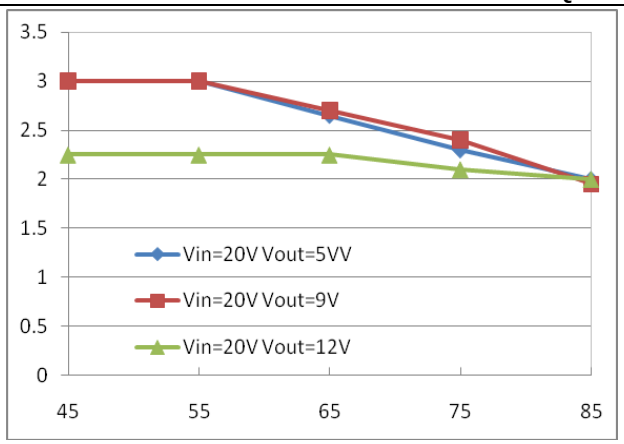


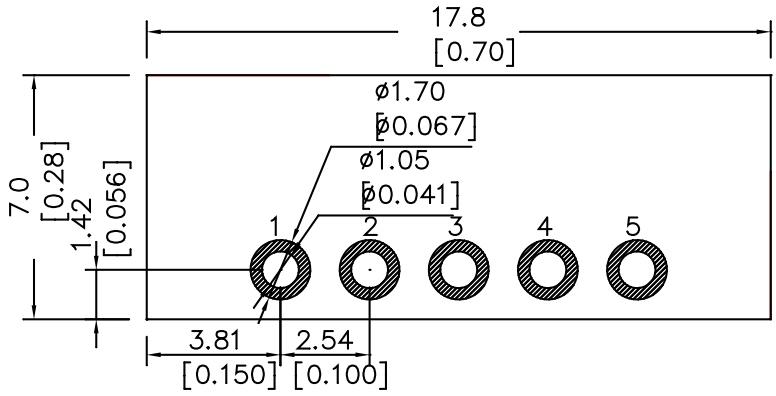
Input:20V, Regulation



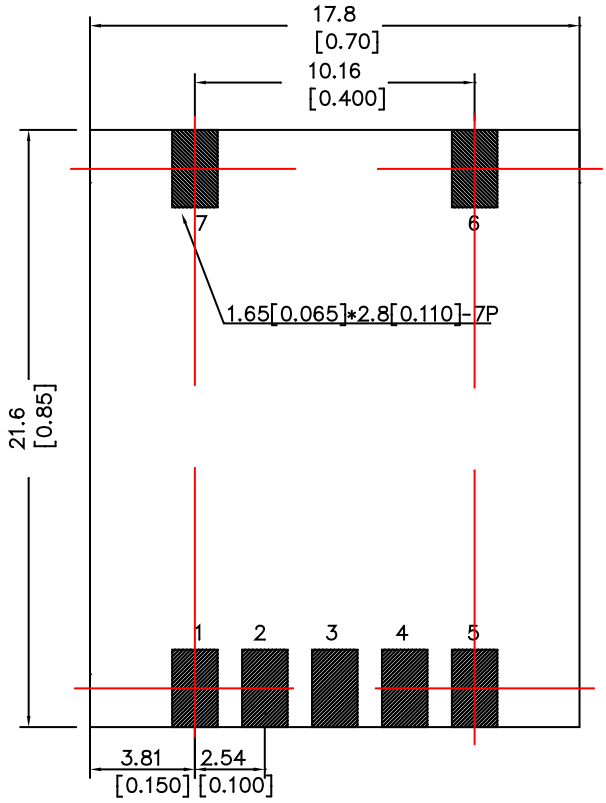
Input:20V, Derating, Nature

Recommended Hole Pattern

Dimensions are in inches (millimeters)



Component-side footprint for Through-Hole Pin Out



Component-side footprint for SMT Pin OUT

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