DELPHI SERIES

FEATURES

- Fully integrated 10A point-of-load DC/DC converter for low component count solutions
- Small footprint and low profile: 15mm x 15mm x 3.5mm (SMD)
- Input voltage range from 4.5V~ 5.5V and 7V ~ 13.2V.
- 10A DC output current
- Output adjustable 0.6V to 2.5V
- Monotonic startup into normal and pre-biased loads
- Fast transient response
- Enable function
- Internal 5V bias supply
- Mositure Sensitivity Level (MSL) 3
- Pb-free and RoHS compliant package
- Lead free reflow process compatible

Integrated, Non-Isolated, Point of Load, DC/DC Power Modules: 4.5~5.5Vin and 7~13.2Vin, 0.6-2.5V/ 10Aout

The MCM12S10Q, 4.5~5.5V and 7V~13.2V input, single output, fully integrated non-isolated point of load DC/DC converters are the latest offering from a world leader in power systems technology and manufacturing — Delta Electronics, Inc. This product family provides up to 10A of output current or 25W of output power in a compact, very low profile, miniature, IC-like, very easy to use, molded package. It is highly integrated and requires very few external components to provide the point-of-load function. Copper pads on the back of the module in close contact with the internal heat dissipation components provide excellent thermal performance. These converters hence possess outstanding electrical and thermal performance, as well as extremely high reliability under highly stressful operating conditions. Operating over both the input voltage ranges 4.5V to 5.5V and 7V to 13.2V, the MCM12S10Q A supports an output voltage range from 0.6V to 2.5V, set by a single resistor. The MCM12S10Q is packaged in a thermally enhanced, compact (15mm x 15mm), and low profile (3.5mm) over-molded Package suitable for automated assembly by standard surface mount equipment. The MCM12S10Q is Pb-free and RoHS compliant.

APPLICATIONS

- UMPC
- Server
- Industrial PC and Equipment
- Point of Load Regulation
- General Purpose Step Down DC/DC

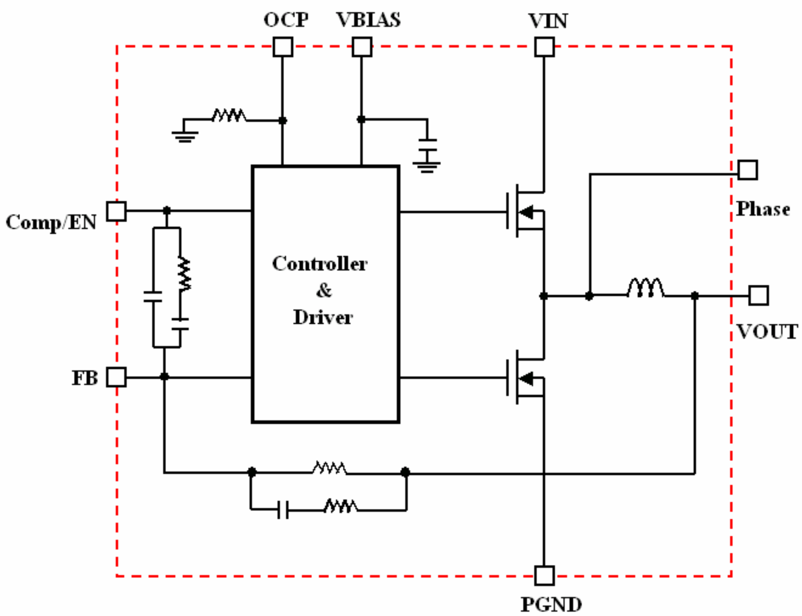
PRELIMINARY DATASHEET
DS_MCM12S10Q_07022008

Delta Electronics, Inc.

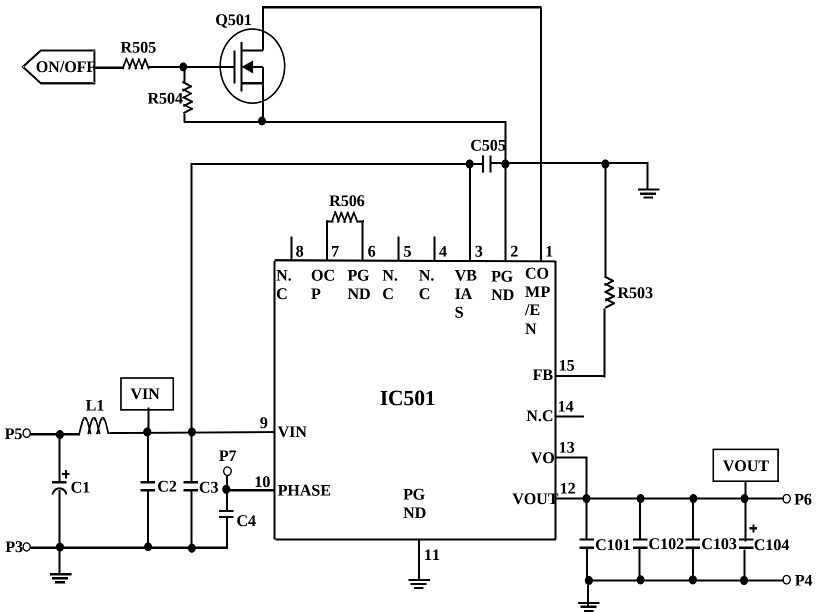
MODEL LIST

Model Name	Input Voltage	Output Voltage	Output Current	With Power Good	Efficiency 12Vin, 2.5Vo, full load
MCM12S10Q A	4.5 ~ 5.5V and 7 ~ 13.2Vdc	0.6V ~ 2.5Vdc	10A	No	88.5%
MCM12S10Q B	4.5 ~ 5.5V and 7 ~ 13.2Vdc	0.8V ~ 2.5Vdc	10A	Yes	88.5%

SIMPLIFIED BLOCK DIAGRAM



REFERENCE CIRCUITRY FOR GENERAL APPLICATION



C1 = 470µF/35V, L1=0.2µH to simulate source

C2, C3= 2 x 10µF/25V

= 2 x 22µF/16V (for VIN=5V)

C4= 1000pF/25V

R503: trim resistor

R504, R505, Q501= for on/off control

R506= open for 20A OCP default setting

C505= 1µF/25V

C101~103= 3 x 22µF/25V

C104 = 330µF/6.3V (ESR = 10mΩ)

TECHNICAL SPECIFICATIONS

T_A = 25°C, airflow rate = 300 LFM, V_{in} = 4.5~ 5.5Vdc or 7~ 13.2Vdc, nominal Vout unless otherwise noted.

PARAMETER	NOTES and CONDITIONS	MCM12S10Q A			
		Min.	Typ.	Max.	Units
ABSOLUTE MAXIMUM RATINGS					
Input Voltage (Continuous)		-0.3		15	Vdc
Operating Temperature	Refer to Figure 45 for the measuring point	-40		105	°C
Storage Temperature		-40		125	°C
INPUT CHARACTERISTICS					
Operating Input Voltage	Range 1	4.5	5.0	5.5	V
	Range 2	7.0	9, 12	13.2	V
Input Under-Voltage Lockout					
Turn-On Voltage Threshold	Io=Io,min	3.9	4.1	4.3	V
Hysteresis		0.3	0.35	0.4	V
Maximum Input Current	Vin=12V, Io=Io,max, Vo=2.5V		2.4		A
	Vin=9V, Io=Io,max, Vo=2.5V		3.6		A
	Vin=5V, Io=Io,max, Vo=2.5V		5.65		A
	Vin=12V, Io=Io,max, Vo=1.2V		1.27		A
	Vin=9V, Io=Io,max, Vo=1.2V		1.65		A
	Vin=5V, Io=Io,max, Vo=1.2V		3.0		
No-Load Input Current	Vin=Vin,min to Vin,max, Io=Io,min	40	80		mA
Off Converter Input Current	Vin=Vin,min to Vin,max, Converter is off		10		mA
OUTPUT CHARACTERISTICS					
Output Voltage Set Point	Vin=12V, Io=Io,min		2.0		% Vo,set
Output Voltage Adjustable Range		0.6		2.5	V
Output Voltage Regulation					
Over Line	Vin= 4.5V~5.5V and 7V to 13.2V		0.2		% Vo,set
Over Load	Io=Io,min to Io,max, Vin= 4.5V~5.5V and 7V to 13.2V		0.2		% Vo,set
Over Temperature	Ta= -40℃ to 85℃		1		% Vo,set
Total Output Voltage Range	Over sample load, line and temperature	TBD	1.5	TBD	% Vo,set
Output Voltage Ripple and Noise	Vin=12V, 5Hz to 20MHz bandwidth				
Peak-to-Peak	Vo=2.5V, Io=min to max		65		mV
Peak-to-Peak	Vo=1.0V, Io=min to max		40		mV
Output Current Range		0		10	A
Output Voltage Over-shoot at Start-up	Vout=2.5V			5	% Vo,set
Output DC Current-Limit Inception	Vout =90%Vo, set		200		% Io
DYNAMIC CHARACTERISTICS					
Dynamic Load Response	2.5A/μs, Vin=12V				
Positive Step Change in Output Current	25% Io, max to 75% Io, max		120		mVpk
Negative Step Change in Output Current	75% Io, max to 25% Io, max		120		mVpk
Settling Time	To be within 1% of Vo nominal		40		μs
Turn-On Transient	Io=Io.max				
Start-Up Time, From On/Off Control	Von/off, Vo=10% of Vo,set		15		ms
Start-Up Time, From Input	Vin=Vin,min, Vo=10% of Vo,set		15		ms
Output Voltage Rise Time	Time for Vo to rise from 10% to 90% of Vo,set		5	TBD	ms
Output Capacitive Load	Full load; ESR ≧**10mΩ**			3000	μF
Output Capacitive Load, minimum	330uF/6.3V (ESR = 10m Ohms)*1 and 22uF/25V*3	See left			μF
EFFICIENCY					
Vo=2.5V	Vin=12V, Io=Io,max		88		%
Vo=1.8V	Vin=12V, Io=Io,max		85.5		%
Vo=1.5V	Vin=12V, Io=Io,max		83.8		%
Vo=1.2V	Vin=12V, Io=Io,max		81		%
FEATURE CHARACTERISTICS					
Switching Frequency		270	300	330	kHz
ON/OFF Control,					
Logic Low Voltage	Module Off, Von/off			0.4	V
Power Good			TBD		
GENERAL SPECIFICATIONS					
MTBF	Io=80%Io, max, Ta=25℃		TBD		M hours
Weight			6.5		grams

ELECTRICAL CHARACTERISTICS CURVES (12V IN)

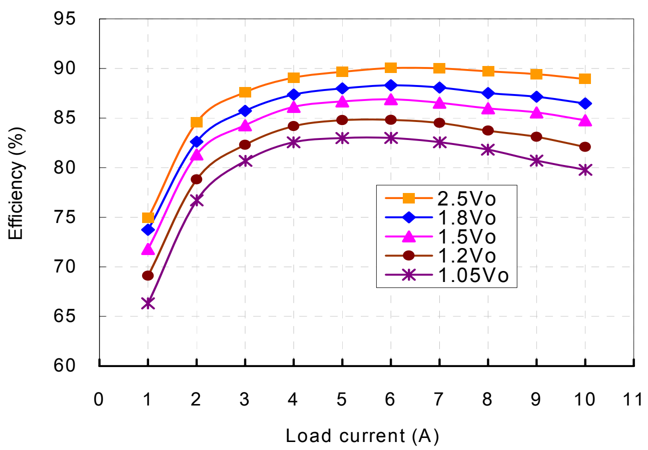


Figure 1: *Converter Efficiency vs. output current at 12Vin*

All tests in this section are tested with

Cin = 1x 470µF/35V, 2x 10µF/25V

Cout = 1x 330µF/6.3V (ESR = 10mΩ), 3x 22µF/25V

12Vin dynamic

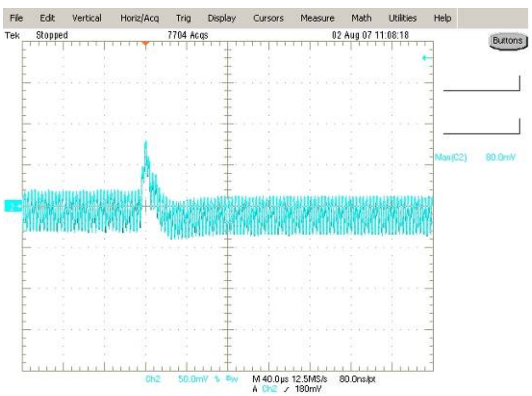


Figure 2: *Typical transient response to step load change at 2.5A/µS from 75% to 25% of Io, max at 12Vin, 2.5V out (50mV/div, 40uS/div)*

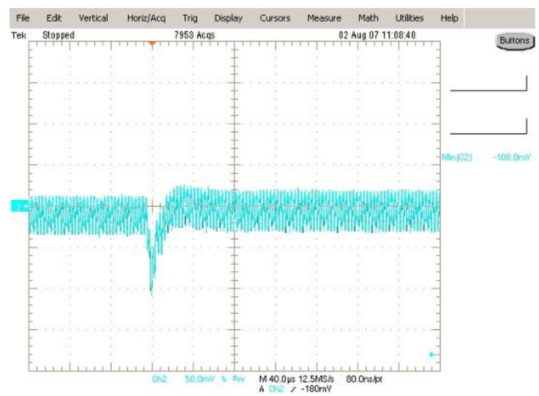


Figure 3: *Typical transient response to step load change at 2.5A/µS from 25% to 75% of Io, max at 12Vin, 2.5V out (50mV/div, 40uS/div)*

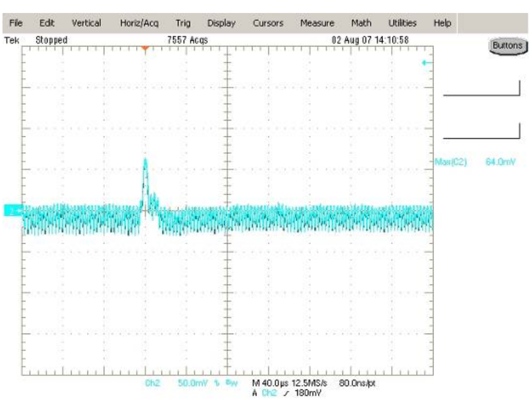


Figure 4: *Typical transient response to step load change at 2.5A/µS from 75% to 25% of Io, max at 12Vin, 1.2V out (50mV/div, 40uS/div)*

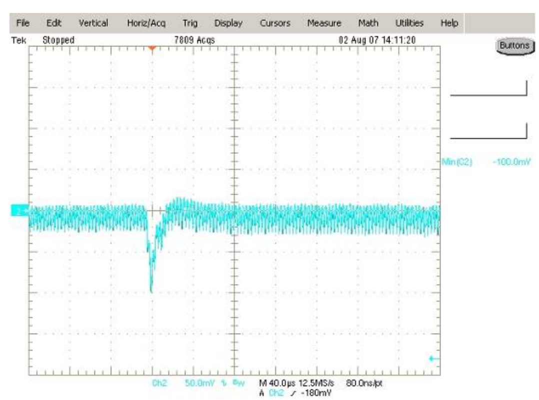


Figure 5: *Typical transient response to step load change at 2.5A/µS from 25% to 75% of Io, max at 12Vin, 1.2V out (50mV/div, 40uS/div)*

ELECTRICAL CHARACTERISTICS CURVES

12Vin output ripple and noise

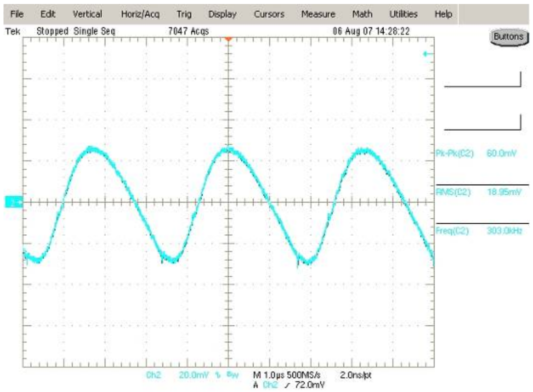


Figure 6: *Ripple & Noise: 12Vin 2.5V/10A out, 20mV/div, pk-pk : 60mV, rms : 18.95mV*

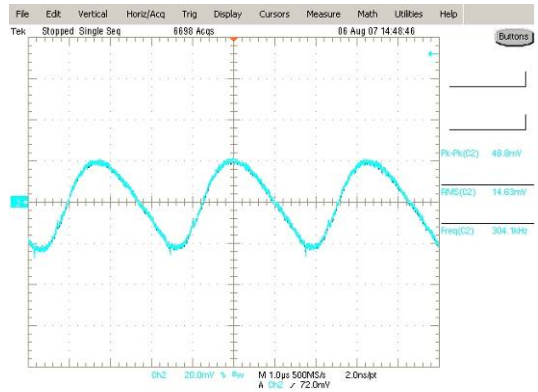


Figure 7: *Ripple & Noise: 12Vin 1.8V/10A out, 20mV/div, pk-pk : 48.8mV, rms : 14.63mV*

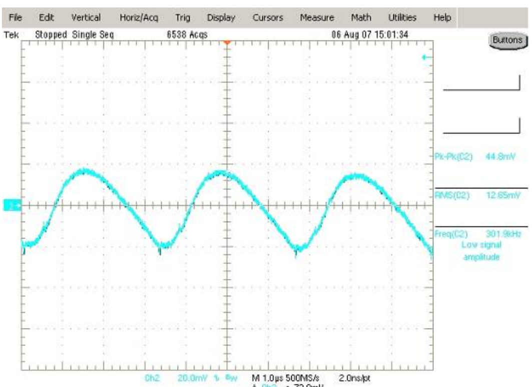


Figure 8: *Ripple & Noise: 12Vin 1.5V/10A out, 20mV/div, pk-pk : 44.8mV, rms : 12.65mV*

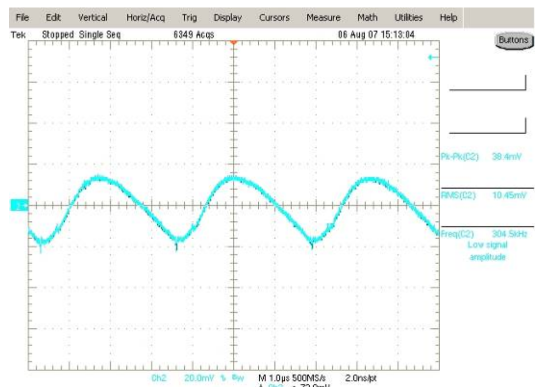


Figure 9: *Ripple & Noise: 12Vin 1.2V/10A out, 20mV/div, pk-pk : 38.4mV, rms : 10.45mV*

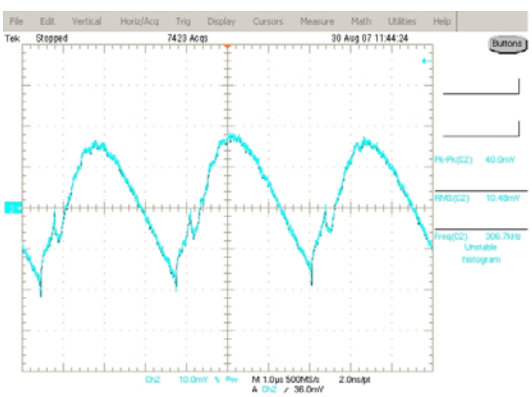
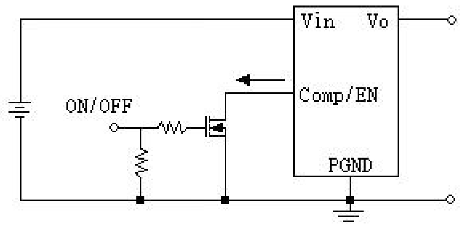


Figure 10: *Ripple & Noise: 12Vin 1.05V/10A out, 10mV/div, pk-pk : 40mV, rms : 10.48mV*

ELECTRICAL CHARACTERISTICS CURVES

12Vin Turn-on (Remote ON/OFF Control)



Remote On/Off implementation

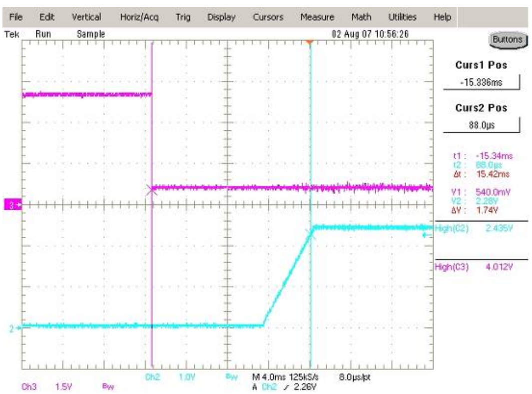


***Figure 11:** Turn-on delay time at 12vin, 2.5V/10A out*
Top: on/off, 1V/div; Bottom: Vout, 1V/ div. (4mS/div)

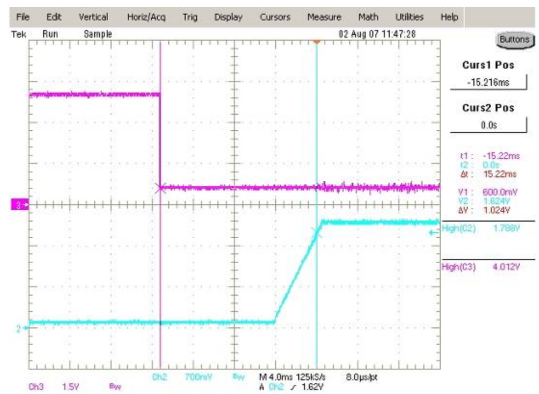


***Figure 12:** Turn-on delay time at 12vin, 1.8V/10A out*
Top: on/off, 0.7V/div; Bottom: Vout, 0.7V/ div. (4mS/div)

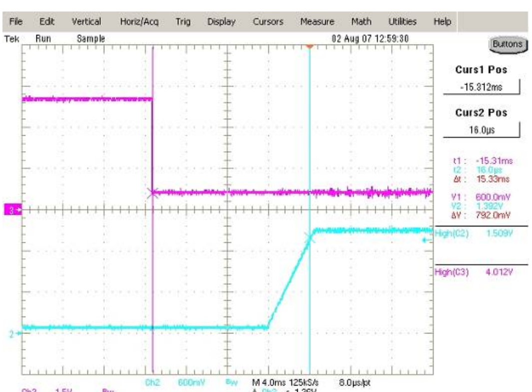


***Figure 13:** Turn on delay time at 12vin, 1.5V/10A out*
Top: on/off, 0.6V/div; Bottom: Vout, 0.6V/ div. (4mS/div)

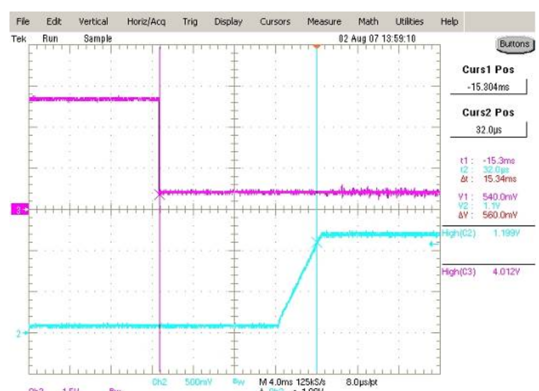
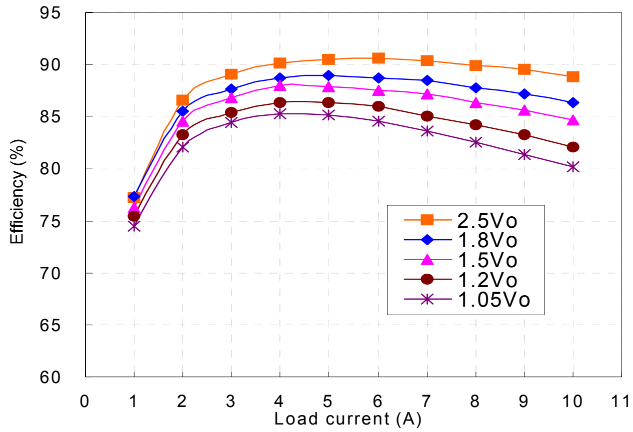


***Figure 14:** Turn on delay time at 12vin, 1.2V/10A out*
Top: on/off, 0.5V/div; Bottom: Vout, 0.5V/ div. (4mS/div)

ELECTRICAL CHARACTERISTICS CURVES (9V IN)



All tests in this section are tested with

Cin = 1x 470µF/35V, 2x 10µF/25V

L1=0.2µH to simulate source

Cout = 1x 330µF/6.3V (ESR = 10mΩ), 3x 22µF/25V

Figure 15: *Converter Efficiency vs. output current at 9Vin*

9Vin Dynamic

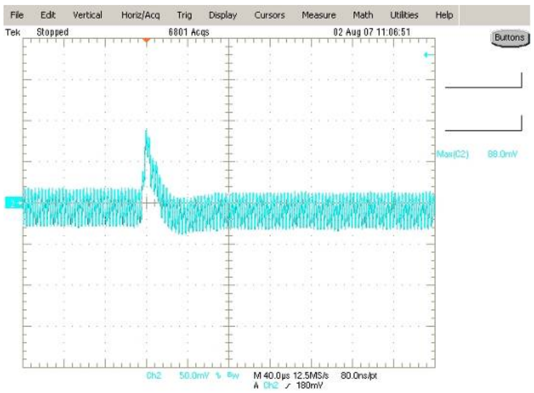


Figure 16: *Typical transient response to step load change at 2.5A/µS from 75% to 25% of Io, max at 9Vin, 2.5V out (50mV/div, 40uS/div)*

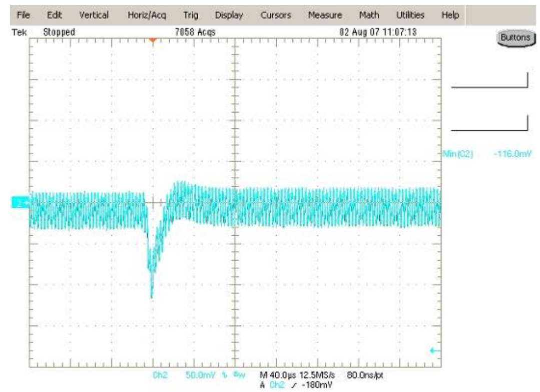


Figure 17: *Typical transient response to step load change at 2.5A/µS from 25% to 75% of Io, max at 9Vin, 2.5V out (50mV/div, 40uS/div)*

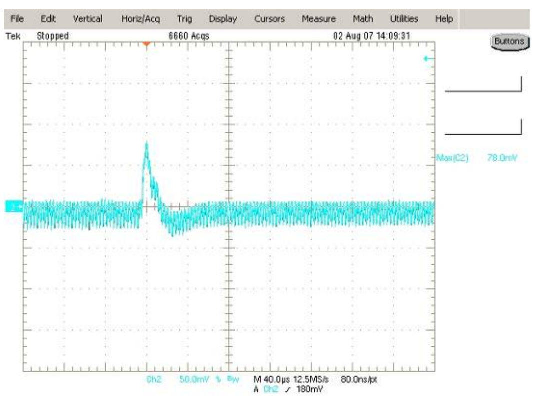


Figure 18: *Typical transient response to step load change at 2.5A/µS from 75% to 25% of Io, max at 9Vin, 1.2V out (50mV/div, 40uS/div)*

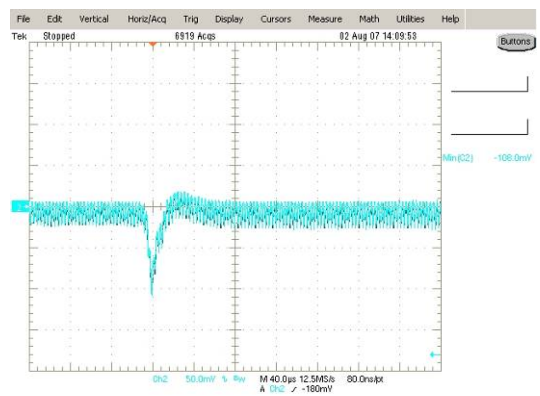


Figure 19: *Typical transient response to step load change at 2.5A/µS from 25% to 75% of Io, max at 9Vin, 1.2V out (50mV/div, 40uS/div)*

ELECTRICAL CHARACTERISTICS CURVES

9Vin output ripple and noise

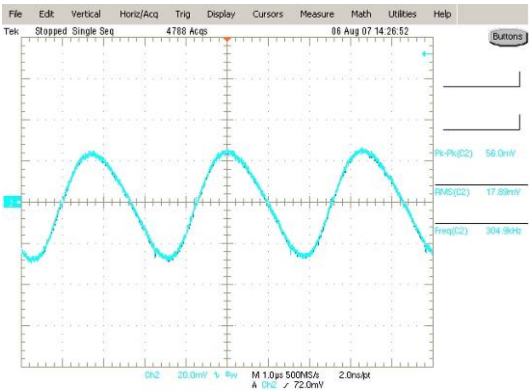


Figure 20: *Ripple & Noise: 9Vin 2.5V/10A out, 20mV/div, pk-pk : 56mV, rms : 17.89mV*

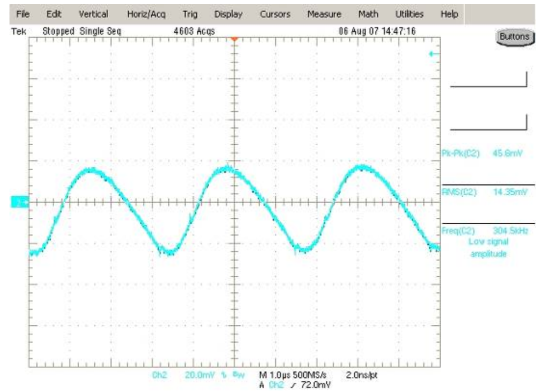


Figure 21: *Ripple & Noise: 9Vin 1.8V/10A out, 20mV/div, pk-pk : 45.6mV, rms : 14.35mV*

Figure 22: *Ripple & Noise: 9Vin 1.5V/10A out, 20mV/div, pk-pk : 41.6mV, rms : 12.3mV*

Figure 23: *Ripple & Noise: 9Vin 1.2V/10A out, 20mV/div, pk-pk : 35.2mV, rms : 10.3mV*

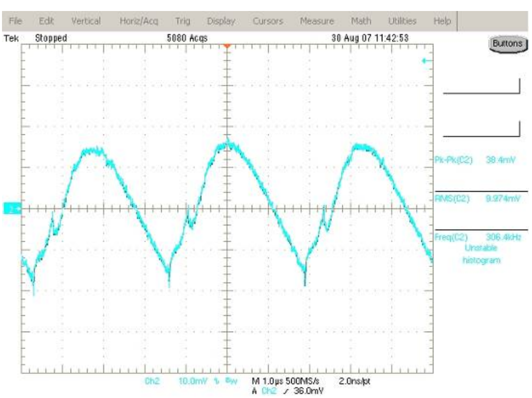


Figure 24: *Ripple & Noise: 9Vin 1.05V/10A out, 10mV/div, pk-pk : 38.4mV, rms : 9.974mV*

ELECTRICAL CHARACTERISTICS CURVES

9Vin Turn-on (Remote ON/OFF Control)

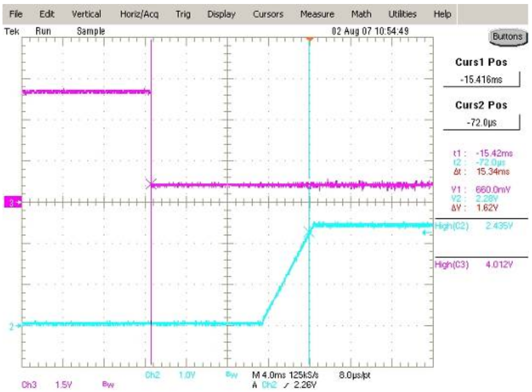


Figure 25: *Turn on delay time at 9vin, 2.5V/10A out*
Top: on/off, 1V/div; Bottom: Vout, 1V/div; (4mS/div)

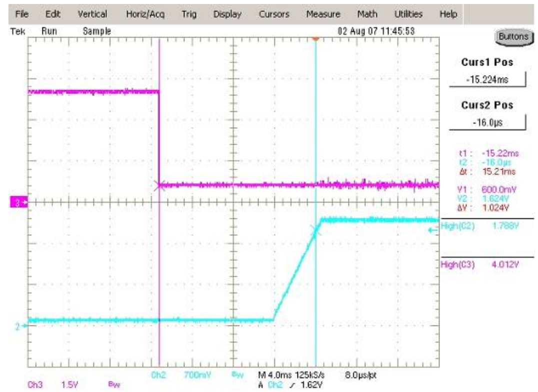


Figure 26: *Turn on delay time at 9vin, 1.8V/10A out*
Top: on/off, 1V/div; Bottom: Vout, 0.7V/div; (4mS/div)

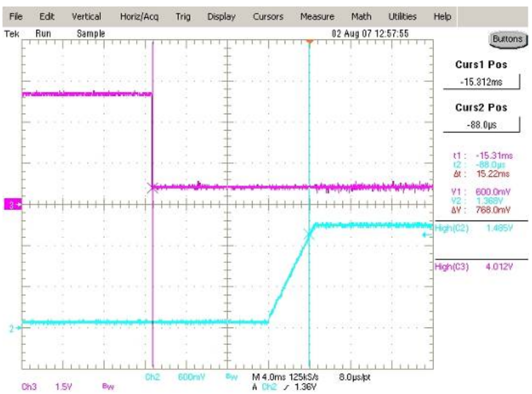


Figure 27: *Turn on delay time at 9vin, 1.5V/10A out*
Top: on/off, 1V/div; Bottom: Vout, 0.6V/div; (4mS/div)

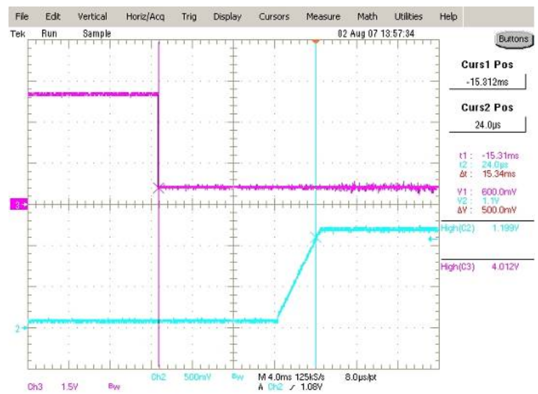


Figure 28: *Turn on delay time at 9vin, 1.2V/10A out*
Top: on/off, 1V/div; Bottom: Vout, 0.5V/div; (4mS/div)

ELECTRICAL CHARACTERISTICS CURVES (5V IN)

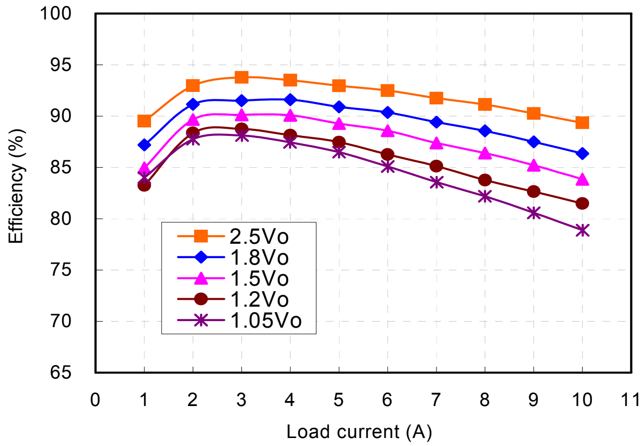


Figure 29: *Converter Efficiency vs. output current at 5Vin*

All tests in this section are tested with

Cin = 1x 470µF/35V, 2x 22µF/16V

L1=0.2µH to simulate source

Cout = 1x 330µF/6.3V (ESR = 10mΩ), 3x 22µF/25V

5Vin Dynamic

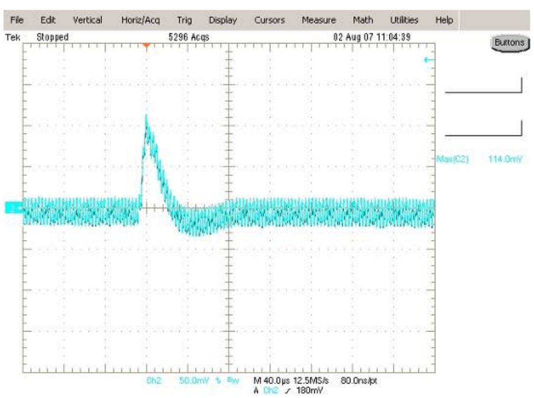


***Figure 30:** Typical transient response to step load change at 2.5A/µS from 75% to 25% of Io, max at 5Vin, 2.5V out (50mV/div, 40uS/div)*

***Figure 31:** Typical transient response to step load change at 2.5A/µS from 25% to 75% of Io, max at 5Vin, 2.5V out (50mV/div, 40uS/div)*

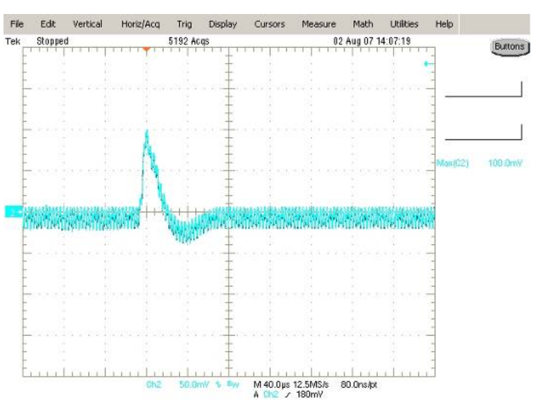


***Figure 32:** Typical transient response to step load change at 2.5A/µS from 75% to 25% of Io, max at 5Vin, 1.2V out (50mV/div, 40uS/div)*

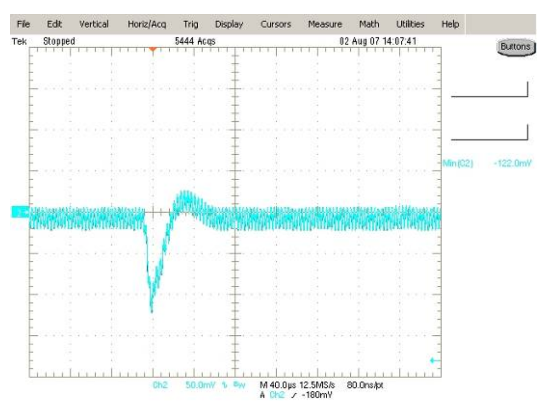


***Figure 33:** Typical transient response to step load change at 2.5A/µS from 25% to 75% of Io, max at 5in, 1.2V out (50mV/div, 40uS/div)*

ELECTRICAL CHARACTERISTICS CURVES

5Vin output ripple and noise

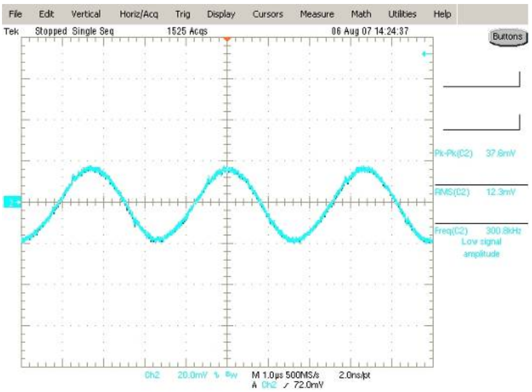


Figure 34: *Ripple & Noise: 5Vin 2.5V/10A out, 20mV/div, pk-pk : 37.6mV, rms : 12.3mV*

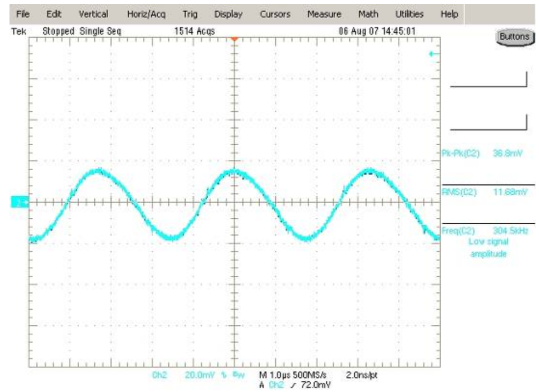


Figure 35: *Ripple & Noise: 5Vin 1.8V/10A out, 20mV/div, pk-pk : 36.8mV, rms : 11.68mV*

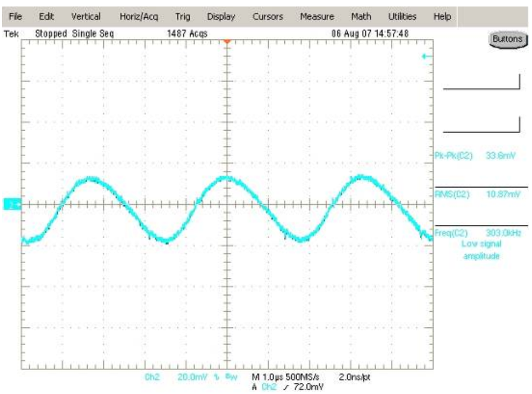


Figure 36: *Ripple & Noise: 5Vin 1.5V/10A out, 20mV/div, pk-pk : 33.6mV, rms : 11.87mV*

Figure 37: *Ripple & Noise: 5Vin 1.2V/10A out, 20mV/div, pk-pk : 30.4mV, rms : 11.512mV*

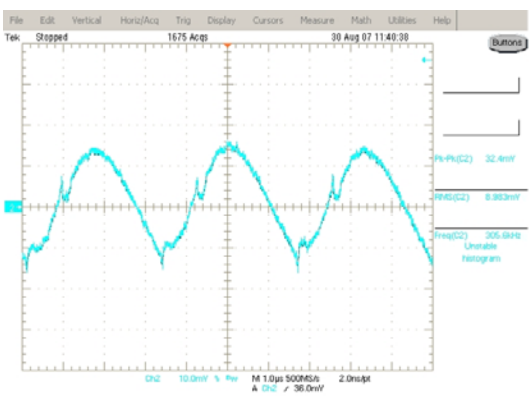


Figure 38: *Ripple & Noise: 5Vin 1.05V/10A out, 10mV/div, pk-pk : 32.4mV, rms : 8.98mV*

ELECTRICAL CHARACTERISTICS CURVES

5Vin Turn-on (Remote ON/OFF Control)

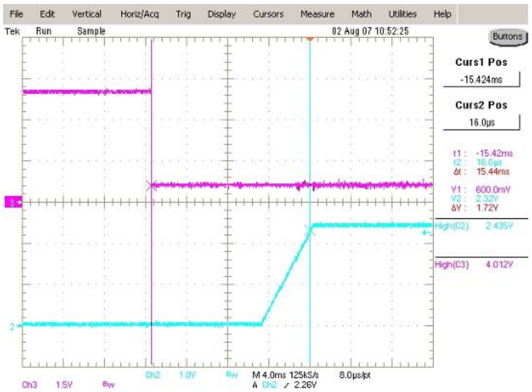


Figure 39: *Turn on delay time at 5vin, 2.5V/10A out*
Top: on/off, 1V/div; Bottom: Vout, 1V/div; (4mS/div)

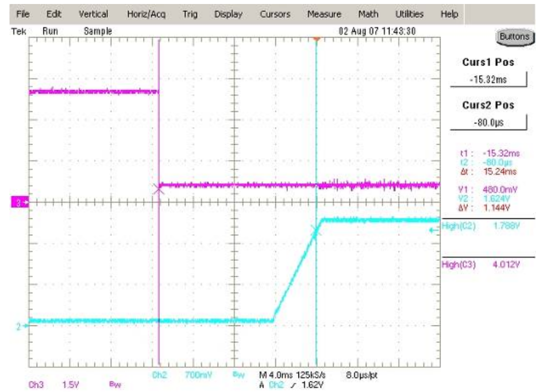


Figure 40: *Turn on delay time at 5vin, 1.8V/10A out*
Top: on/off, 1V/div; Bottom: Vout, 0.7V/ div ; (4mS/div)

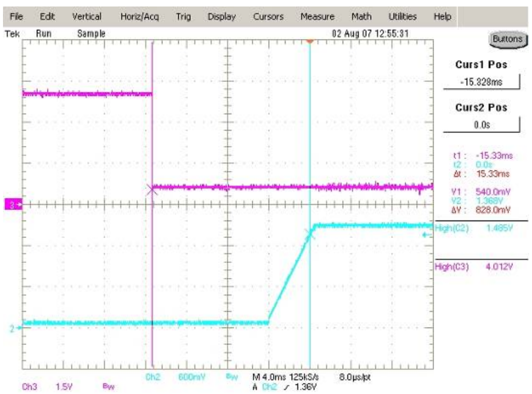


Figure 41: *Turn on delay time at 5vin, 1.5V/10A out*
Top: on/off, 1V/div; Bottom: Vout, 0.6V/div; (4mS/div)

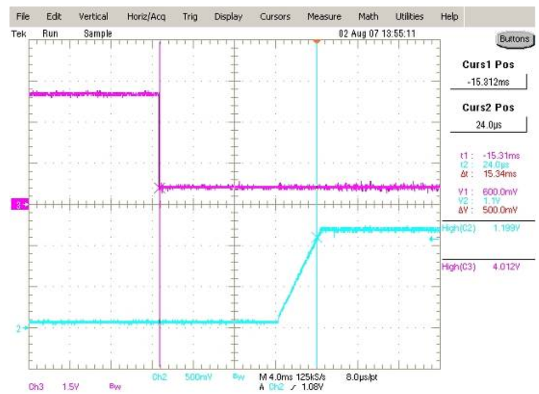


Figure 42: *Turn on delay time at 5vin, 1.2V/10A out*
Top: on/off, 1V/div; Bottom: Vout, 0.5V/div; (4mS/div)

DESIGN CONSIDERATIONS

The power module should be connected to a low ac-impedance input source. Highly inductive source impedances can affect the stability of the module. An input capacitance must be placed close to the modules input pins to filter ripple current and ensure module stability in the presence of inductive traces that supply the input voltage to the module.

FEATURES DESCRIPTIONS

Remote On/Off

The MCM12S10Q A series power modules have a Comp/EN pin for remote On/Off control.

When the Comp/EN pin is pulled below the falling threshold voltage (0.4V nominal), the MCM12S10Q A will be off. The external pull down device (open collector or open drain) will initially need to sink 5mA (max.) of pin output current. Once the MCM12S10Q A is disabled, only a 20uA current source will continue to draw current.

If the On/Off function is not used, leave the pin open and the module will be on.

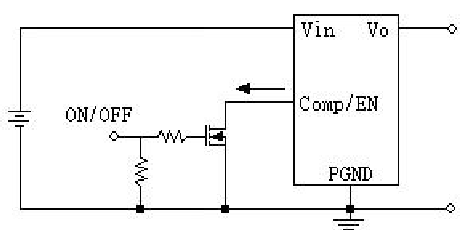


Figure 43: *Remote On/Off implementation*

Soft-Start

The soft-start ramps the reference on the non-inverting terminal of the error amplifier internally from 0V to 0.6V in a nominal 6.8ms. The output voltage will thus follow the ramp, from zero to the final value. In the same 6.8ms, the soft-start is completed and the output should be in regulation at the voltage setpoint. This method provides a rapid and controlled output voltage rise; there is no large inrush current charging the output capacitors. The entire start-up sequence from power-on reset typically takes up to 17ms; up to 10.2ms for the delay and OCP sample and 6.8ms for the soft-start ramp.

Vbias Connection

Please connect Vbias pin to VIN pin and add a 1 uF cap between Vbias pin and PGND pin.

Over current and Short-Circuit Protection

When an OCP or SCP fault is detected, the MCM12S10Q A over current and short circuit protection circuit will shut down the high side MOSFET and turn the low side MOSFET on, then circulating in hiccup mode. The module will remain in the hiccup mode until the EN pin is pulled below 0.4V (typ) or if the voltage at the VIN pin has fallen below the power-on reset threshold.

There is an OCP pin used to set the over current protection (OCP) and short-circuit protection (SCP) set point. MCM12S10Q A initial OCP set point is 20A (typ) when this pin is left open. Connect a 40.2KΩ resistor between the OCP pin and the PGND pin will lower the OCP set point to 16A (typ). If you would like to adjust the over-current set point to other values, please contact us.

Input Capacitor

Please use a mix of input bypass capacitors to control the voltage overshoot, small ceramic capacitors for high frequency de-coupling and bulk capacitors to supply the current needed each time module turns on.

The important parameters for the bulk input capacitor are the voltage rating and the RMS current rating. For reliable operation, select the bulk capacitor with voltage and current ratings above the maximum input voltage and highest RMS current required by the circuit.

These capacitors must be capable of handling the surge-current at power-up. The MCM12S10Q A provides the soft-start function that controls and limits the current surge.

Output Voltage Programming

The output voltage of the MCM12S10Q A can be programmed to any voltage between 0.6Vdc and 2.5Vdc by connecting one resistor (Please see reference circuitry on page 2, R503) between the FB and PGND pins of the module. Without this external resistor, the output voltage of the module is 0.6 Vdc.

To calculate the value of the resistor Rtrim for a particular output voltage Vo, please use the following equation:

$$R_{Trim} = 0.6 \times \frac{9.76K}{V_O - 0.6}$$

Rtrim is the external resistor in Ω
Vo is the desired output voltage

Table 1 shows the standard values of 1% R_{trim} resistor for typical output voltages：

Table 1.

R_{trim} (kΩ)	Open	14.7	9.76	6.49	4.87	3.09
Vout (V)	0.6	1.0	1.2	1.5	1.8	2.5

For example, to program the output voltage of the MCM12S10Q A module to 1.8Vdc, Rtrim is calculated as follows:

$$R_{Trim} = 0.6 \times \frac{9.76K}{1.8 - 0.6}$$

Rtrim = 4.88 kΩ

The amount of power delivered by the module is the voltage at the output terminals multiplied by the output current. When using the trim feature, the output voltage of the module will be increased. At the same output current level, it would increase the output power of the module. Care should be taken to ensure that the maximum output power of the module must not exceed the maximum rated power (Vo.set x Io.max ≤ P max).

Output Capacitors

An output capacitor is required to filter the output and supply the load transient current. The filtering requirements are a function of the switching frequency and the ripple current. The load transient requirements are a function of the slew rate (di/dt) and the magnitude of the transient load current. These requirements are generally met with a mix of capacitors and careful layout.

The bulk filter capacitor values are generally determined by the ESR (effective series resistance) and voltage rating requirements rather than by the actual capacitance requirements. High frequency decoupling capacitors should be placed as physically close to the power pins of the load as possible.

The bulk capacitor's ESR will determine the output ripple voltage and the initial voltage drop after a high slew-rate transient. An aluminum electrolytic capacitor's ESR value is related to the case size with lower ESR available in larger case sizes. In most cases, multiple electrolytic capacitors of small case size perform better than a single large case capacitor.

Additional output filtering may be required by the system, if further reduction of output ripple or dynamic transient spike is required.

FEATURES DESCRIPTIONS (CON.)

PIN FUNCTIONS

COMP/EN, Pin 1

The COMP/EN pin is a multiplexed pin. When the Comp/EN pin is pulled below the falling threshold voltage (0.4V normal), the MCM12S10Q A will be off. The external pull down device (open collector or open drain) will initially need to overcome maximum of 5mA of Pin output current. Once the MCM12S10Q A is disabled, only a 20uA current source will continue to draw current.

PGND, Pin 2, 6, 11

Power Ground, these 3 pins are the return path for input and output current.

VBIAS Pin 3

The VBIAS pin provides the bias voltage for the MCM12S10Q A. It is normally connected to the VIN pin (Pin 9).

NC, Pin 4, 5, 8, 14

These four pins have no function. Please do not connect any trace to these 4 pins.

OCP, Pin 7

The OCP pin is used to set the over current protection (OCP) and short-circuit protection (SCP) set point. MCM12S10Q A initial OCP set point is 20A (typ) when this pin is left open. Connect a resistor between the OCP pin and the PGND pin will change the OCP set point.

VIN, Pin 9

This pin should be tied directly to the input rail. It provides power to the MCM12S10Q A.

PHASE, Pin 10

This pin connects to the source of the high side MOSFET and the drain of the low side MOSFET inside the module. This pin is used as heatsink.

Vout, Pin 12

Power Output Pin, it should be connected to the positive rail of the load. Apply output load between this pin and PGND pin. Suggest placing high frequency output decoupling capacitance as near as possible directly between this pin and PGND pin. Please refer this datasheet output capacitance item

Vo, Pin 13

Power Output Pin, same as Vout pin above.

FB, Pin 15

This pin is used to adjust the output voltage. Please add a resistor between the FB pin and PGND pin to set the output voltage.

THERMAL CONSIDERATIONS

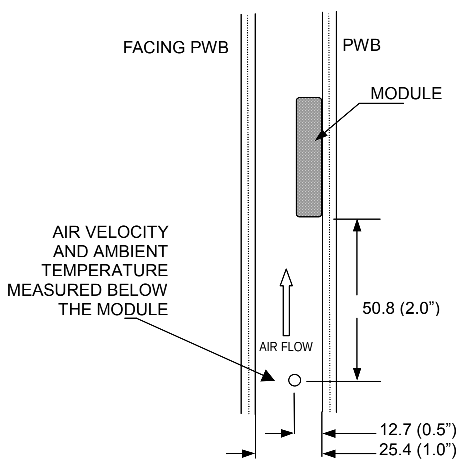
Thermal management is an important part of the system design. To ensure proper, reliable operation, sufficient cooling of the power module is needed over the entire temperature range of the module. Convection cooling is usually the dominant mode of heat transfer.

Hence, the choice of equipment to characterize the thermal performance of the power module is a wind tunnel.

Thermal Testing Setup

Delta's DC/DC power modules are characterized in heated vertical wind tunnels that simulate the thermal environments encountered in most electronics equipment. This type of equipment commonly uses vertically mounted circuit cards in cabinet racks in which the power modules are mounted.

The following figure shows the wind tunnel characterization setup. The power module is mounted on a test PWB and is vertically positioned within the wind tunnel. The height of this fan duct is constantly kept at 25.4mm (1'').



Note: Wind Tunnel Test Setup Figure Dimensions are in millimeters and (Inches)

Figure 44: *Wind tunnel test setup*

Heat can be removed by increasing airflow over the module. To enhance system reliability, the power module should always be operated below the maximum operating temperature. If the temperature exceeds the maximum module temperature, reliability of the unit may be affected.

Thermal performance shown as below is based on the test board with minimum copper traces area (worst condition). The test board is 1oz / 4 layers.

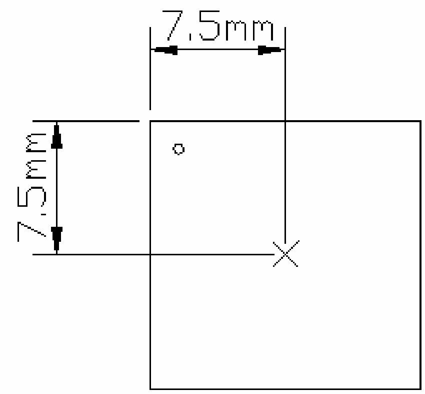


Figure 45: *Temperature measurement location*

The max. allowed temperature of hot spot is defined at 105℃

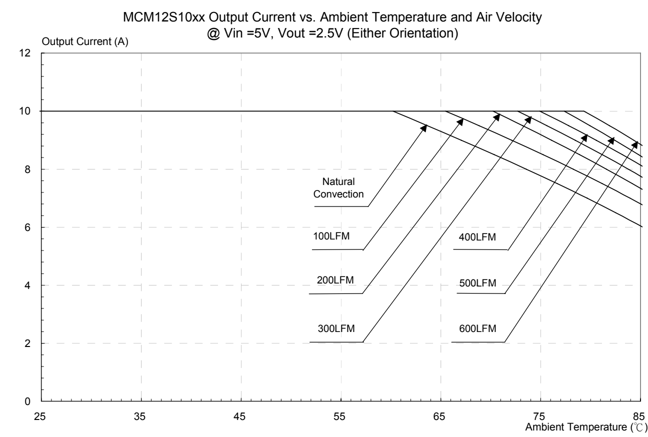


Figure 46: *Output current vs. ambient temperature and air velocity @ Vin=5V, Vo=2.5V(Either Orientation)*

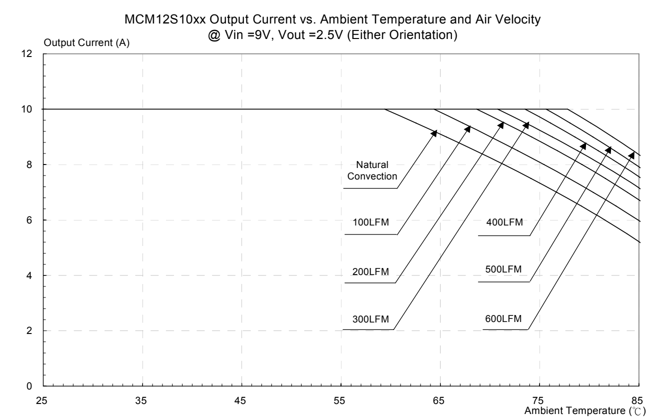


Figure 47: *Output current vs. ambient temperature and air velocity @ Vin=9V, Vo=2.5V(Either Orientation)*

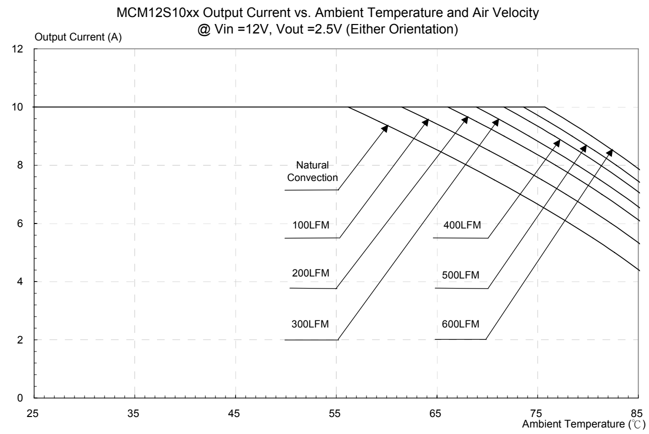


Figure 48: *Output current vs. ambient temperature and air velocity @ Vin=12V, Vo=2.5V(Either Orientation)*

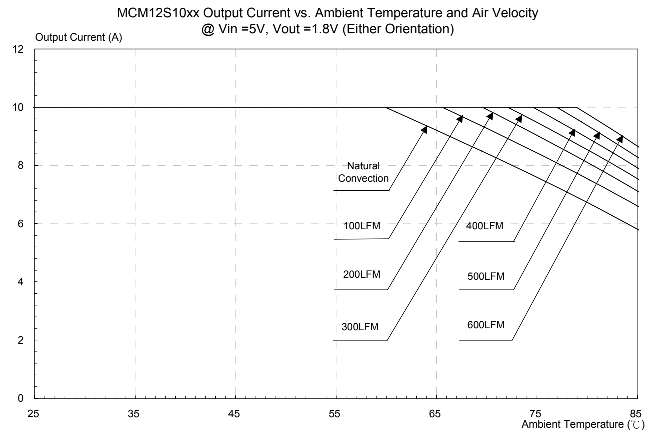


Figure 49: *Output current vs. ambient temperature and air velocity @ Vin=5V, Vo=1.8V(Either Orientation)*

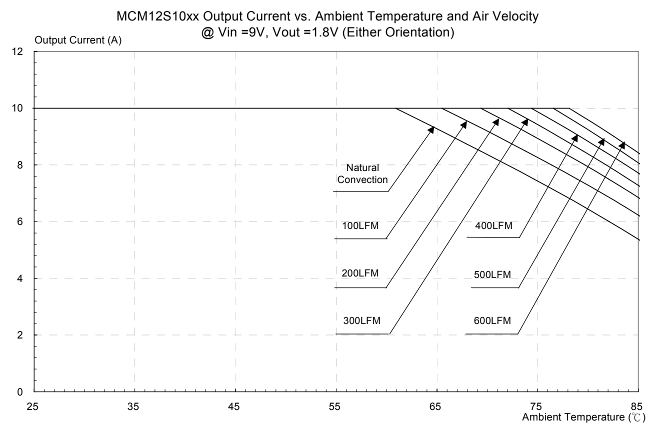


Figure 50: *Output current vs. ambient temperature and air velocity @ Vin=9V, Vo=1.8V(Either Orientation)*

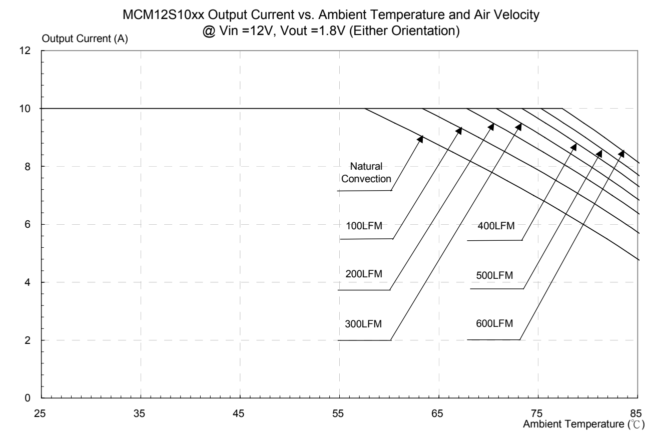
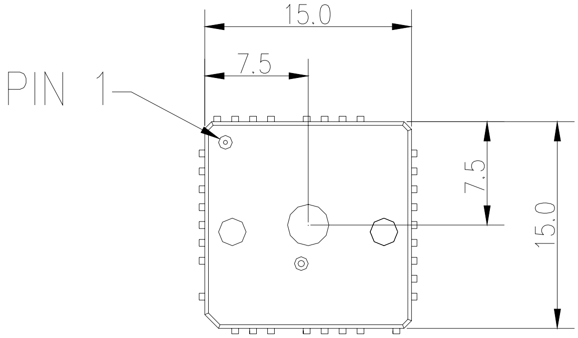


Figure 51: *Output current vs. ambient temperature and air velocity @ Vin=12V, Vo=1.8V(Either Orientation)*

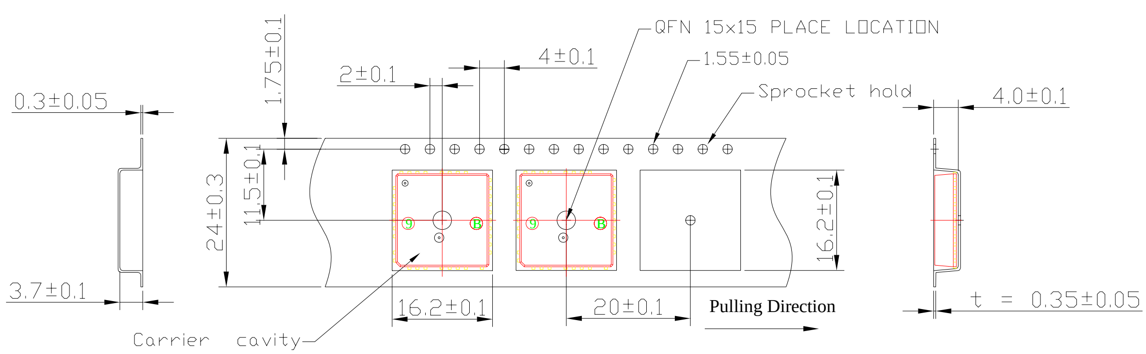
PICK AND PLACE LOCATION

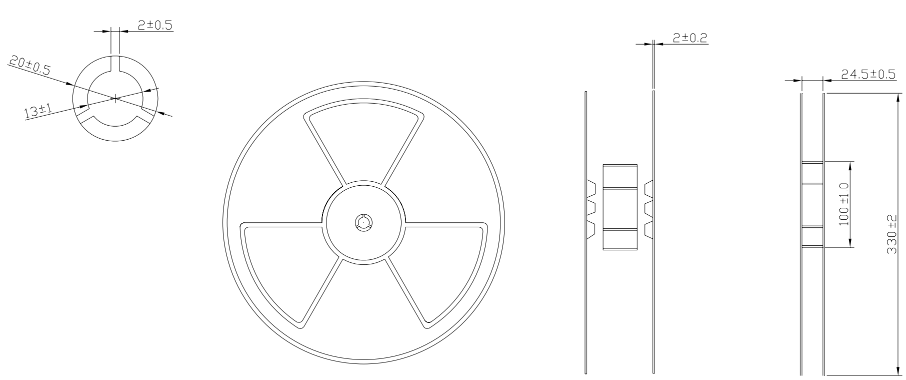


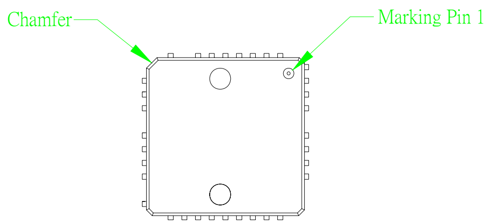
[Dimensions are in millimeters (mm)]

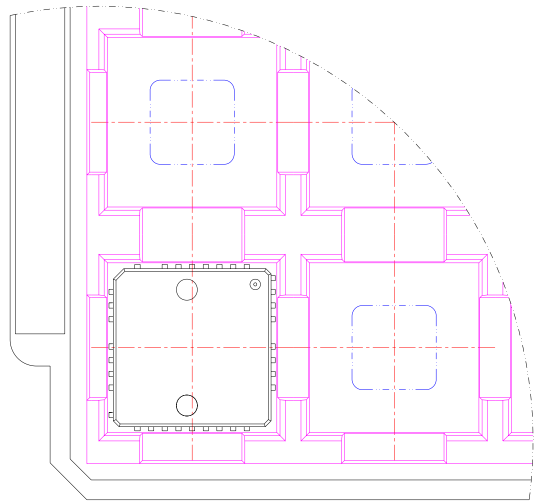
PACKAGE: TAPE & REEL
500 PIECES PER REEL

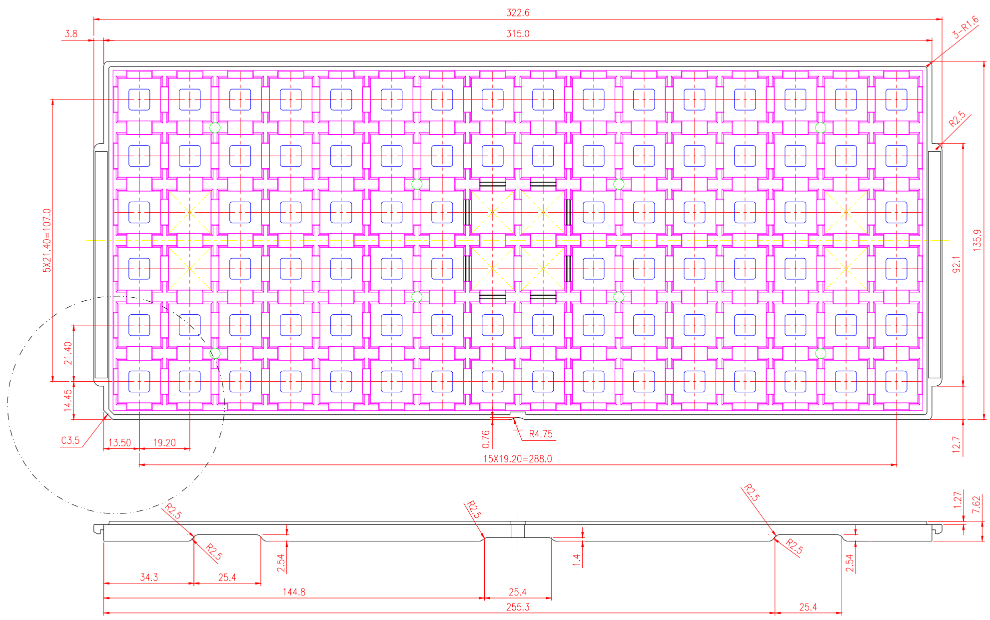
[Dimensions are in millimeters (mm)]





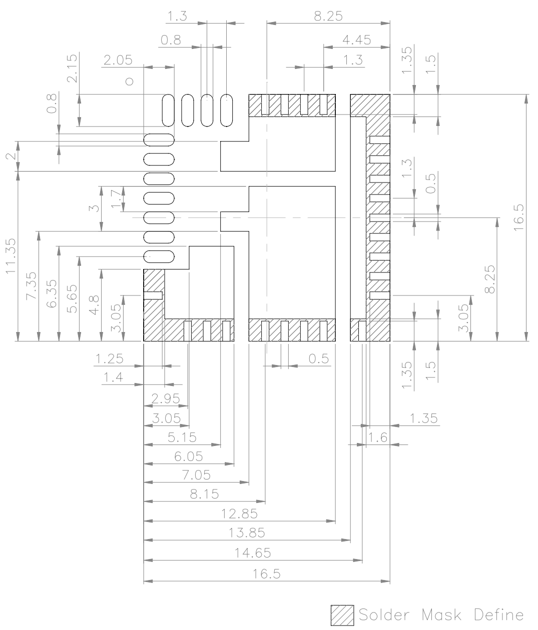

Chamfer
Marking Pin 1

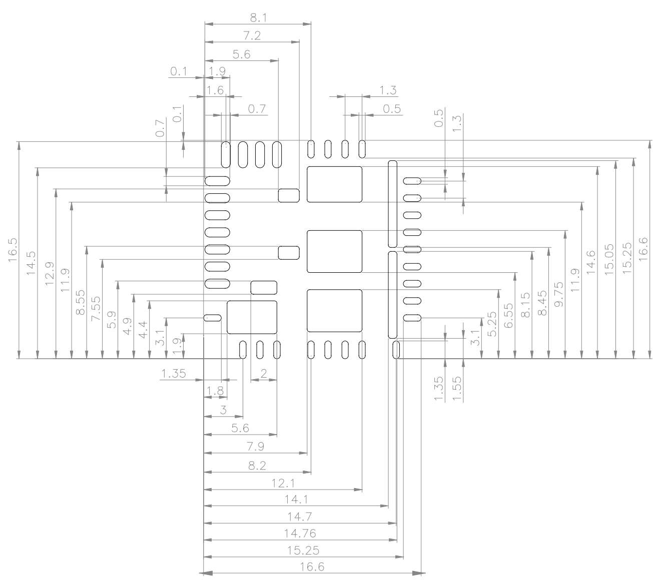



322.6
315.0
3.8
3-R1.6
R2.5
5X21.40=107.0
135.9
92.1
21.40
14.45
C3.5
13.50
19.20
0.76
R4.75
15X19.20=288.0
12.7
1.27
7.62
R2.5
34.3
25.4
2.54
144.8
1.4
255.3

RECOMMENDED PWB PAD LAYOUT

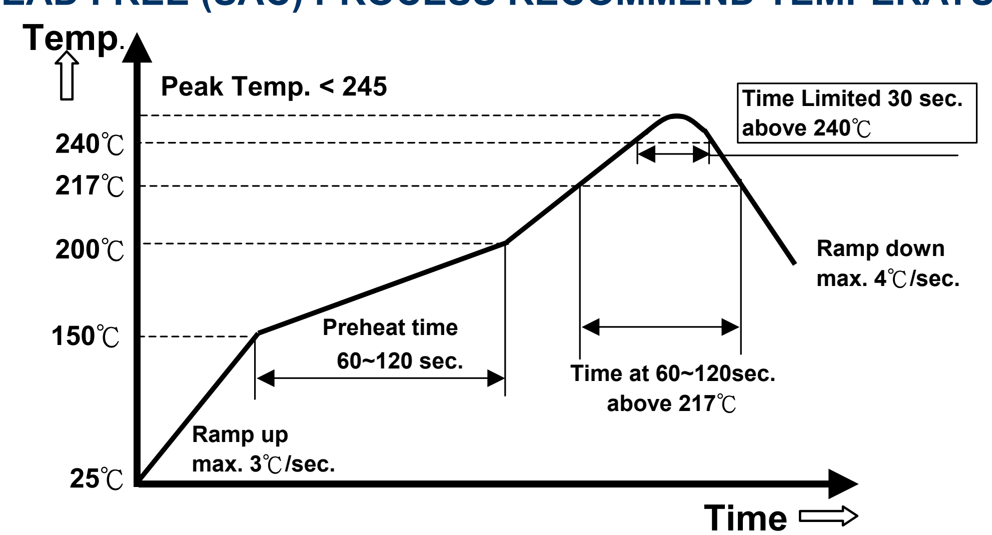
Recommend footprint： **Recommend stencil：**





[Dimensions are in millimeters (mm)]

LEAD FREE (SAC) PROCESS RECOMMEND TEMPERATURE PROFILE



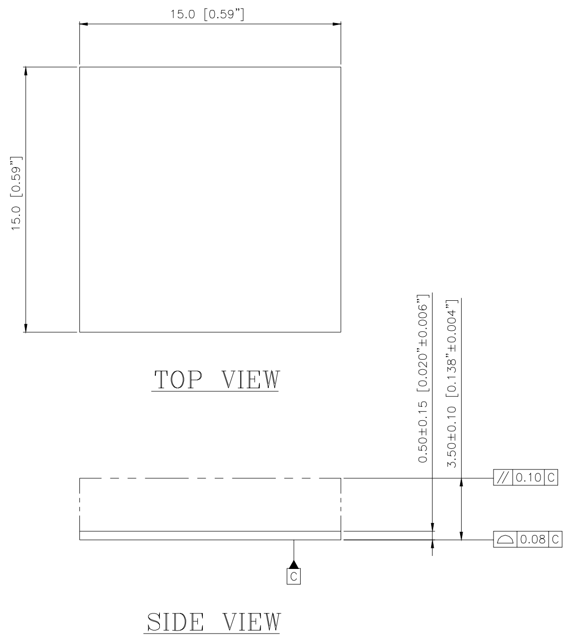
Note: 1. All temperatures refer to assembly application board, measured on the land of assembly application board.

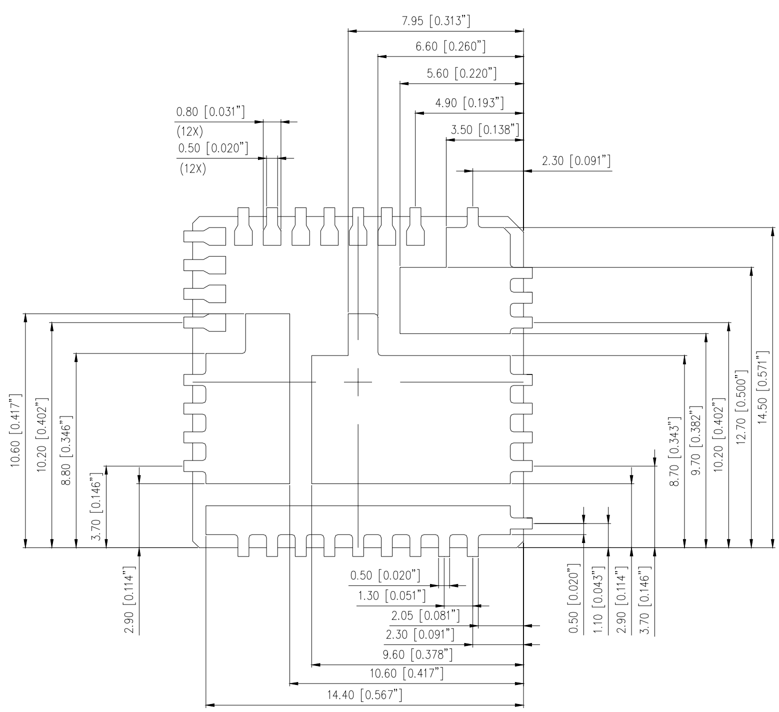
2. Peak temperature measured on topside surface of device is no higher than 245C

3. Temperature profile comply with IPC J-STD-020D

MECHANICAL DRAWING

NOTES:
DIMENSIONS ARE IN MILLIMETERS AND (INCHES)
TOLERANCES: X.Xmm±0.5mm(X.XX in.±0.02 in.)
X.XXmm±0.25mm(X.XXX in.±0.010 in.)



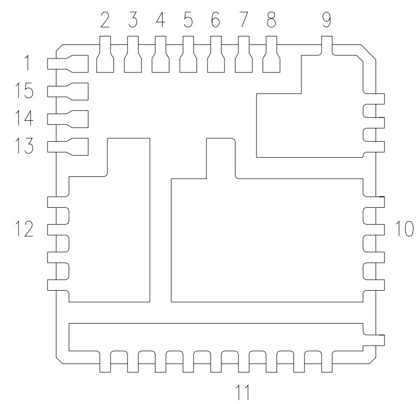


BOTTOM VIEW

MECHANICAL DRAWING

Pin	Symbol	Description
1	Comp/EN	Module enable
2	PGND	Power Ground
3	VBIAS	Bias Supply
4	N.C	
5	N.C	
6	PGND	Power Ground
7	OCP	OCP Set Point
8	N.C	
9	VIN	Power Input
10	PHASE	Phase Node
11	PGND	Power Ground
12	Vo	Output Voltage
13	Vo	Output Voltage
14	N.C	
15	FB	Feedback Input

BOTTOM VIEW



MCM12S10Q

(15mm × 15mm × 3.5mm)

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WARRANTY

Delta offers a two (2) year limited warranty. Complete warranty information is listed on our web site or is available upon request from Delta.

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