POWER
MANAGEMENT

Marvell Solutions

DSP Switcher™ 88MG875z-x/ 88MG876-x Series

5A Rated Output Current, Non-Isolated, Step-Down Switching Regulator Module with AnyVoltage™ Technology

Advance Specifications, Patent Pending

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Document Status	
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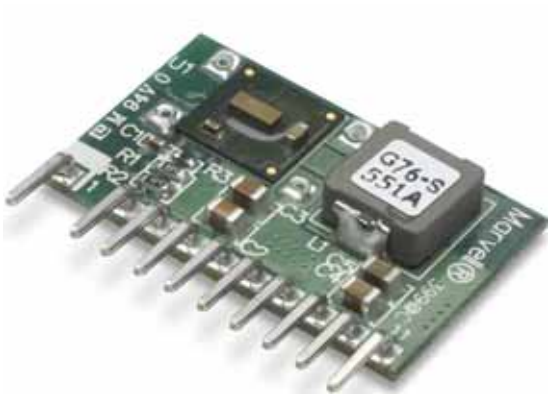
5A Rated Output Current, Non-Isolated, Step-Down Switching Regulator Module with AnyVoltage™ Technology

SIP Package



DIP Package

SMT Package (TBD)

FEATURES/BENEFITS

- True lead-free "plug-n-play" solution
- No external components required - except a single voltage programming resistor
- Tiny SIP, DIP, and SMT packages available
- Input voltage range: 3V to 5.5V
- Programmable output voltage: 0.72V to 3.63V
- 1 MHz switching frequency
- 2% output voltage tolerance
- 95% efficiency
- 2.5V and 3.3V LDO Secondary voltage versions
- Ultra-fast transient response
- Any Voltage™ Technology provides 72 output selections and shortens design cycles
- Output voltage margining capability for easy system testing and qualification
- High reliability - lowest component count
- Works with any external capacitive load (low ESR, high ESR)
- Built-in undervoltage lockout, thermal protection, and current limit
- Control IC and passive kit components are available for high volume user

OVERVIEW

The 88MG875z-x/88MG876-x Series[1] is a high-performance, non-isolated, DC-DC converter module for point-of-load (POL) applications. It functions as a synchronous step-down (buck) switching regulator in a small form factor. The module includes a proprietary Marvell® integrated regulator device. The switching frequency for the regulator is 1 MHz, and no external components are required (except one voltage programming resistor, see Section 2.1 "Output Voltage - Any Voltage™ Technology" on page 13).

Ultra-high conversion efficiency (typically 95%) allows for the use of the 88MG875z-x/88MG876-x Series without any heatsink. Additionally, the 88MG875z-x/88MG876-x Series includes an innovative single resistor method[2] to program the output voltage. This voltage is defined by the user with an external resistor.

The 88MG875z-x/88MG876-x Series operates from an input voltage range of 3V to 5.5V, making the device well suited for portable applications. The output voltage range is 0.72V to 3.63V, supporting future devices down to 65 nm geometries.

Other key features include an internal current limit, an undervoltage lockout, a thermal shutdown, and an ambient temperature range of -40°C to 85°C.

1. The 88MG875z-x/88MG876-x series includes 88MG75z-S, 88MG875z-D, 88MG875z-T, 88MG876-S, 88MG876-D, and 88MG876-T.
2. Patent Pending

APPLICATIONS

- Point-of-load power supplies
- Networking/Datacom systems
- Portable computing
- Servers
- DSP power supplies
- LAN/WAN

DEVICE FEATURE DIFFERENCES

The table below summarizes the feature differences between 88MG875z, and 88MG876

Features	88MG875z	88MG876
Rated Output Current	5A	5A
Packages	• 12-Pin SIP • 9-Pin DIP • 9-Pin SMT	• 11-Pin SIP • 8-Pin DIP • 8-Pin SMT
LDO	LDO Voltage Option	No LDO

Table 1: Product Selector Table

Part Name	Description	LDO Output Voltage	Output Current	Package
88MG875B-S	SIP Module: 5A Rated Output Current with LDO	3.3V	5A	12-Pin SIP
88MG875B-D	DIP Module: 5A Rated Output Current with LDO	3.3V	5A	9-Pin DIP
88MG875B-T	SMT Module: 5A Rated Output Current with LDO	3.3V	5A	9-Pin SMT
88MG875E-S	SIP Module: 5A Rated Output Current with LDO	2.5V	5A	12-Pin SIP
88MG875E-D	DIP Module: 5A Rated Output Current with LDO	2.5V	5A	9-Pin DIP
88MG875E-T	SMT Module: 5A Rated Output Current with LDO	2.5V	5A	9-Pin SMT
88MG876-S	SIP Module: 5A Rated Output Current	--	5A	11-Pin SIP
88MG876-D	DIP Module: 5A Rated Output Current	--	5A	8-Pin DIP
88MG876-T	SMT Module: 5A Rated Output Current	--	5A	8-Pin SMT

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Section 1. Signal Description

1.1 Pin Diagram

Figure 1: 88MG875z-S Package - Component View

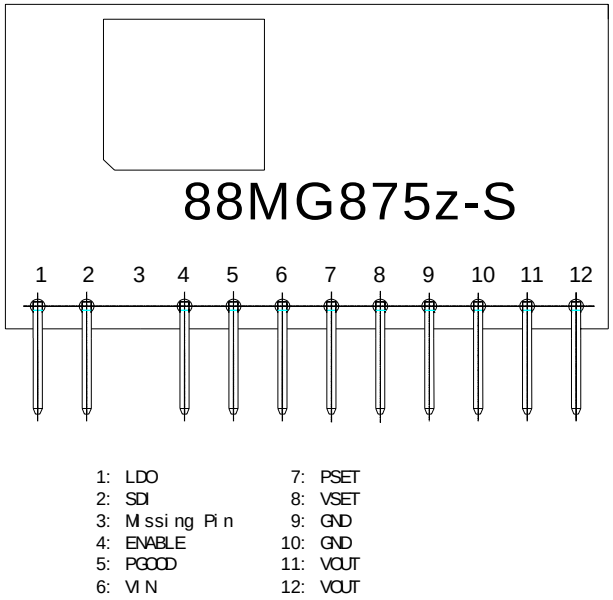


Figure 2: 88MG875z-D Package - Component View

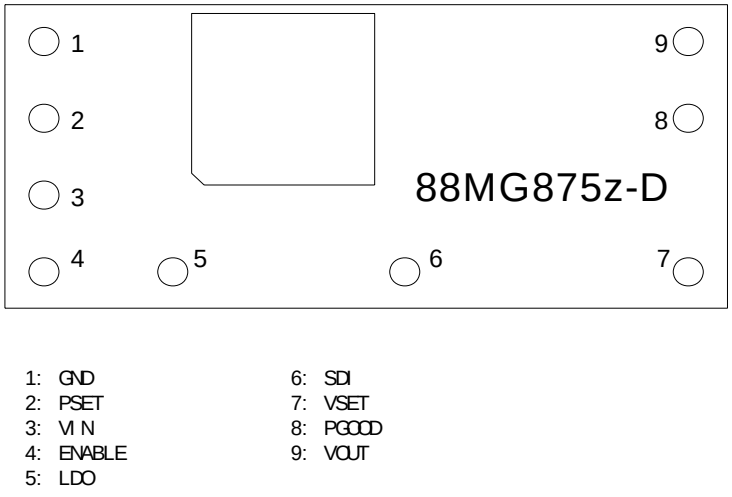
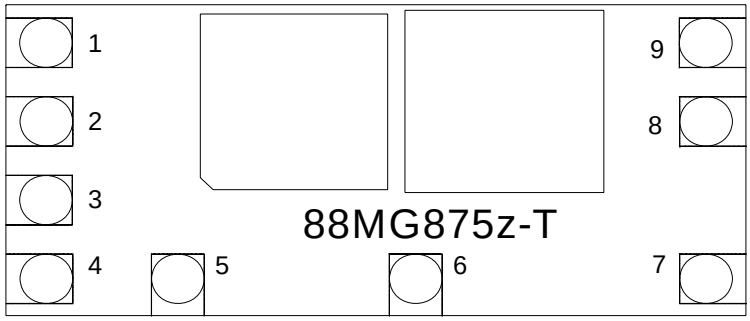


Figure 3: 88MG875z-T Packages - Component View



1: GND
2: PSET
3: VIN
4: ENABLE
5: LDO
6: SDI
7: VSET
8: PGOOD
9: VOUT

Figure 4: Connection Block Configuration Sample for 88MG875z -S

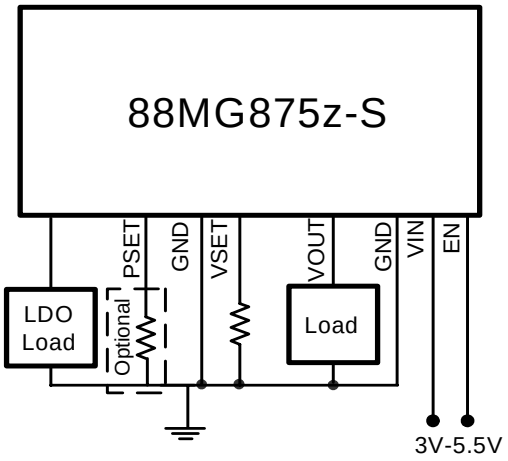


Figure 5: 88MG876-S Package - Component View

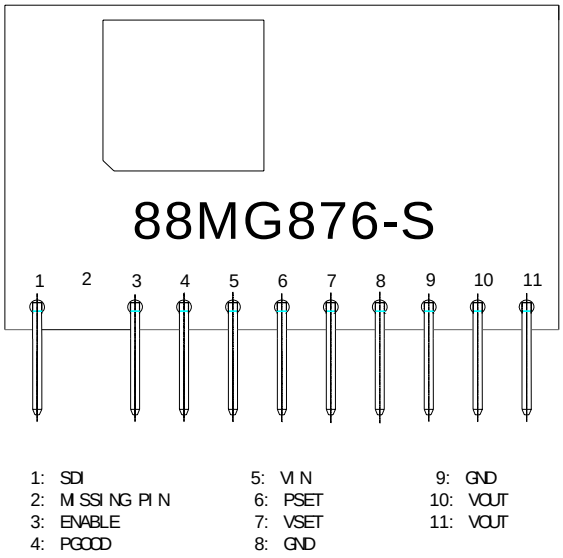


Figure 6: 88MG876-D Package - Component View

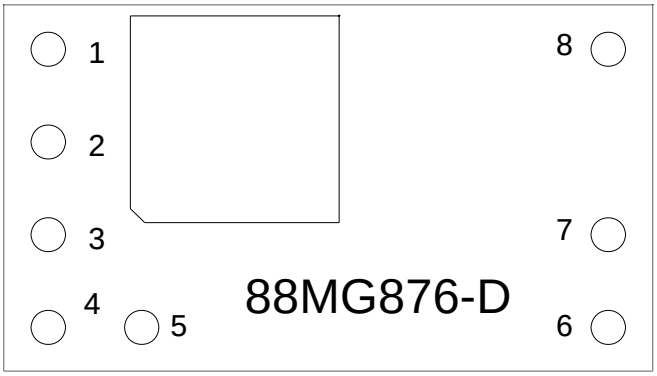
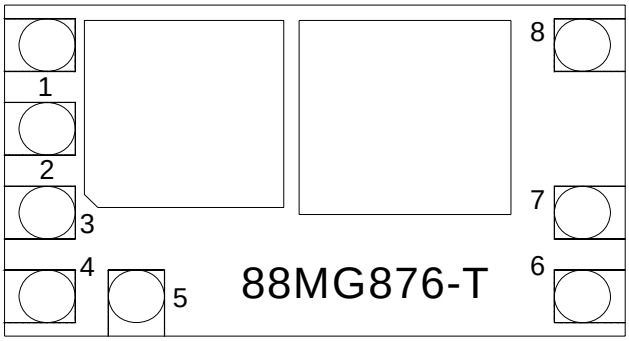
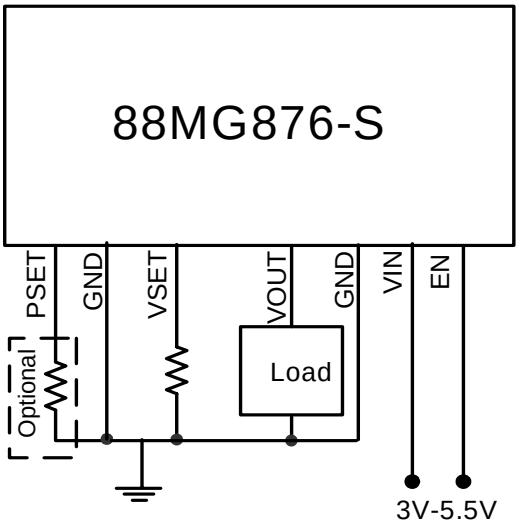


Figure 7: 88MG876-T Package - Component View



1: GND
2: PSET
3: VIN
4: ENABLE
5: SDI
6: VSET
7: PGOOD
8: VOUT

Figure 8: Connection Block Configuration Sample for 88MG876-S



1.2 Pin Description

Name	Pin Description
LDO_OUT[1]	Secondary Output Voltage. Connect directly to load with a short wide PCB trace.
PSET	Percent Set. An external resistor is connected to the ground to trim the set voltage by the percentage value. See Table 3 in the Section 2.1 "Output Voltage - Any Voltage™ Technology" on page 13 for resistor values and percentage options. The total capacitance across this pin and GND should be less than 25 pF. Shorting this pin to ground, floating this pin, or using R_{VSET} > 619K or R_{VSET} < 7.68K does not affect the set voltage. A resistor with tolerance of 5% or better must be used. If this pin is not used, it is recommended that the pin be tied to GND.
GND	Power ground. Connect this pin to a suitable low-impedance ground plane.
NC	Not connected. No pin.
VSET	Voltage set. An external resistor is connected to ground to set the output voltage of the switching regulator. See Table 3 in the Section 2.1 "Output Voltage - Any Voltage™ Technology" on page 13 for resistor values and output voltage options. The total capacitance across this pin and GND should be less than 15 pF. Shorting this pin to ground, floating this pin, or using R_{VSET} > 619K or R_{VSET} < 7.68K disables the switching regulator. A resistor with tolerance of 5% or better must be used.
VOUT	Output voltage. Connect directly to load with a short wide PCB trace.
VIN	3V - 5.5V Input voltage.
EN	Enable Logic low (≤ 0.8V) disables the regulator. Open collector will enable the regulator due to internal pull-up resistor provided. The high signal has to be at least 20 µs in duration to enable the regulator.
TDO	Terminal Data Output. This pin is a special function pin. Contact your Marvell® representative for information otherwise this pin should be left floating.
TDI	Terminal Data Input. This pin is a special function pin. Contact your Marvell® representative for information otherwise this pin should be left floating.
PGOOD	The power good pin (PG) is an active-high, open-drain output pin. Refer to Section 2.7 for further details on the PGOOD pin.

1. This pin is present in 88MG875z.

Table 2: Pin Number Assignment Table

Pin Name	88MG875z-S	88MG875z-D/T	88MG876-S	88MG876-D/T
LDO_OUT	1	5	-	-
SDI	2	6	1	5
GND	9, 10	1	8, 9	1
MISSING PIN	3	-	2	-
VSET	8	7	7	6
VOUT	11, 12	9	10, 11	8
VIN	6	3	5	3
ENABLE	4	4	3	4
PGOOD	5	8	4	7
PSET	7	2	6	2

Section 2. Functional Description

2.1 Output Voltage - Any Voltage™ Technology

The output voltage of the 88MG875z-x/88MG876-x Series devices is programmed by using the look-up Table 3 to select the resistor value for the VSET and PSET pins. The VSET pin sets the output voltage, and the PSET pin trims the set voltage to a percentage value.

For example, to program 2.25V output, a 165k resistor is selected for the VSET pin, and an 11k resistor is selected for the PSET pin. The 165k resistor sets the output voltage to 2.5V and the 11k resistor trims the set voltage off by 10% (or -10%). Using a resistor value greater than 619k or less than 7.68k for the VSET pin disables the switching regulator and sets the SW pin to high impedance. Using a resistor value greater than 619k or less than 7.68k for the PSET pin does not affect the set voltage.

Using a VSET resistor with value greater than 619 kohm or less than 7.68 kohm disables the step-down switching regulator and sets the SW pin to high impedance. If the VSET resistor's value is outside the 5% tolerance, the output can be either higher or lower than the set voltage.

Using a resistor value greater than 619 kohm or less than 7.68 kohm for the PSET pin does not affect the set voltage. When the PSET pin is not used, it must be connected to ground. Like the VSET resistor, the percent value can be either higher or lower if the PSET resistor's value is outside the 5% tolerance.

Table 3: Any Voltage Programming Table for 5% Resistors

		PSET								
		-10.0%	–7.5%	–5.0%	–2.5%		2.5%	5.0%	7.5%	10.0%
		11k	18k	30k	51k	GND	100k	160k	270k	470k
VSET	11k	0.720	0.740	0.760	0.780	0.800	0.820	0.840	0.860	0.880
	18k	0.900	0.925	0.950	0.975	1.000	1.025	1.050	1.075	1.100
	30k	1.080	1.110	1.140	1.170	1.200	1.230	1.260	1.290	1.320
	51k	1.350	1.388	1.425	1.463	1.500	1.575	1.575	1.613	1.650
	100k	1.620	1.665	1.710	1.755	1.800	1.890	1.890	1.925	1.980
	160k	2.250	2.313	2.375	2.438	2.500	2.625	2.625	2.688	2.750
	270k	2.700	2.775	2.850	2.925	3.000	3.150	3.150	3.225	3.300
	470k	2.970	3.053	3.135	3.218	3.300	3.465	3.465	3.548	3.630

Table 4: Any Voltage Programming Table for 1% Resistors

		PSET								
		-10.0%	–7.5%	–5.0%	–2.5%		2.5%	5.0%	7.5%	10.0%
		11k	18.7k	31.6k	53.6k	Open /GND	97.6k	165k	280k	475k
VSET	GND	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	11k	0.720	0.740	0.760	0.780	0.800	0.820	0.840	0.860	0.880
	18.7k	0.900	0.925	0.950	0.975	1.000	1.025	1.050	1.075	1.100
	31.6k	1.080	1.110	1.140	1.170	1.200	1.230	1.260	1.290	1.320
	53.6k	1.350	1.388	1.425	1.463	1.500	1.538	1.575	1.613	1.650
	97.6k	1.620	1.665	1.710	1.755	1.800	1.845	1.890	1.935	1.980
	165k	2.250	2.313	2.375	2.438	2.500	2.563	2.625	2.688	2.750
	280k	2.700	2.775	2.850	2.925	3.000	3.075	3.150	3.225	3.300
	475k	2.970	3.053	3.135	3.218	3.300	3.383	3.465	3.548	3.630
	Open	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

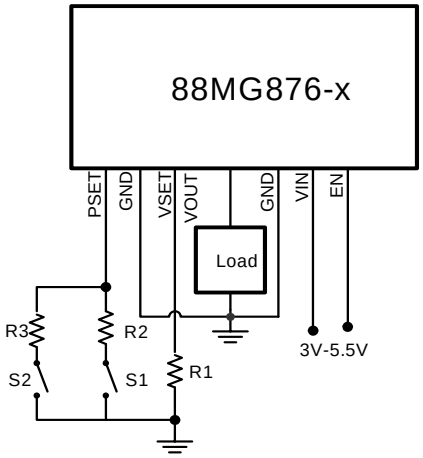
The VSET and PSET resistor are read once during start-up before the output voltage is turned on. After the output voltage is turned on, the VSET and PSET resisters are ignored.The benefit of this is that the output voltage tolerance is not dependant upon the tolerance or thermal characteristics of these resistors.

2.2 Output Voltage Margining

A useful application of the Marvell® Any Voltage™ technology is “output voltage margining”. Voltage margining is commonly used during system qualification to evaluate operation at “corner” conditions of voltage, temperature etc. Typically, output voltage will be offset up and down by some percentage (margin) of the nominal value. For the 88MG875z-x/88MG876-x Series, the VSET pin/resistor controls the nominal voltage of the switching regulator output while the PSET pin/resistor controls the margin voltage. As can be seen in Table 3, the PSET pin allows the margin to be set as high as 10% above and as low as -10% below the nominal setpoint established by VSET. Depending on the value of the PSET resistor intermediate points of ±7.5%, ±5% and ±2.5% can also be accessed.

For example, if an application calls for a nominal output voltage of 1.5V then Table 3 prescribes a value of R1 for the VSET resistor. This selection is shown in Figure 9 connected to the VSET pin. To offset the voltage above and below the nominal value, the PSET pin can be used with resistor values again from Table 3. Additionally, switches S1 and S2 can be alternately closed to select from the two resistors R3 and R2 (offset values) for PSET. If more offsets are required more switches and resistors may be used. As shown in Figure 9, if S1 is closed and S2 opened a positive 5% offset would be added to the nominal 1.5V output yielding 1.575V. Conversely, if S1 is opened and S2 closed the output would be offset to -5% from 1.5V, or 1.425V. Finally with both S1 and S2 opened the output would return to the nominal 1.5V. Thus voltage margining can be simply and reliably implemented with a minimum of components and design effort.

Figure 9: Output Voltage Margining

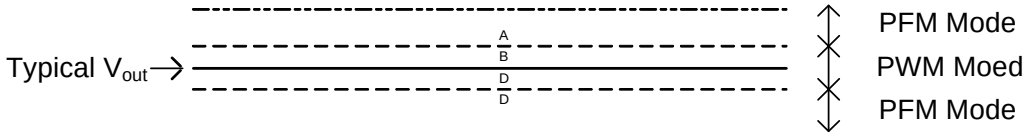


2.3 Regulation and Start-up

The step-down switching regulator uses Pulse Width Modulation (PWM) And Pulse Frequency Modulation (PFM) modes to regulate the output voltage using digital control. The mode of operation depends on the level of output current and the output voltage.

In steady states, the step-down switching regulator monitors the current flowing through the inductor to determine if the regulator is handling heavy or light load applications. For heavy load applications, the step-down regulator operates in the PWM mode (B and C) to minimize the ripple current for optimum efficiency and to minimize the ripple output voltage. The step-down regulator operates in the PFM and Discontinuous Conduction Mode (DCM) (A and D) to limit the switching action for optimum efficiency in light load applications. In this mode, the average output voltage is slightly higher than the average output voltage for heavy transient load applications.

Figure 10: Output Voltage Window

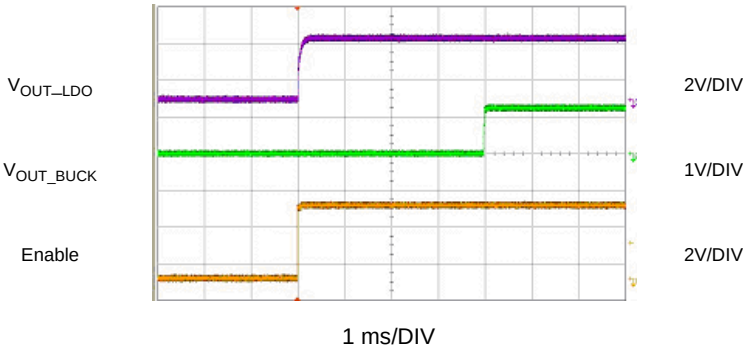


2.4 Digital Soft Start

During start-up, the 88MG875z-x/88MG876-x provides a soft start function. Soft start reduces surge currents from input voltage and provides a well-controlled output voltage rise characteristics. The rate of the output voltage start-up is limited by the value of the output capacitor and the internal current limit circuitry. This combination forces the output voltage to come up slowly, providing a soft-start characteristic.

During soft start, the 88MG875z-x/88MG876-x feeds a constant current to the output capacitor in several steps. Figure 11 shows the inductor current waveform during startup. The current limit is ramped up in 7 steps beginning at approximately 40% of the current limit rating and ending at 100% at 25 µs per step. The buck regulator behaves like a current source during this time as the output ramps up slowly.

Figure 11: Start-up Using the Enable Pin



2.5 Undervoltage Lockout (UVLO)

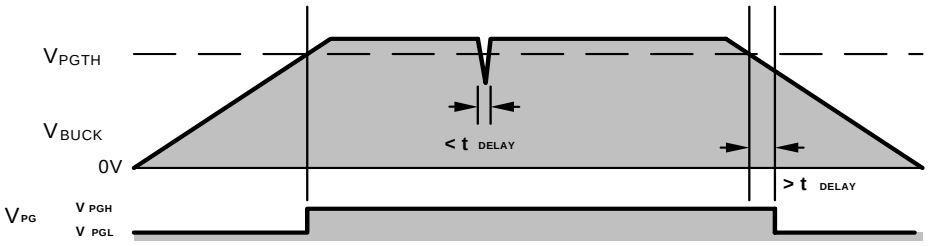
The 88MG875z-x/88MG876-x Series incorporates undervoltage-lockout circuitry to disable the step-down regulator when the input voltage is below 2.75V (typical). The step-down regulator is enabled when the input voltage is above 2.85V (typical).

2.6 Thermal Shutdown

If the junction temperature of the Control IC on 88MG875z-x/88MG876-x Series exceeds 150°C (typical), the thermal shutdown circuitry disables the step-down regulator. The step-down regulator is enabled when the junction temperature falls to 120°C (typical).

2.7 PGOOD

The power good pin (PG) is an active-high, open-drain output pin. It is asserted when the output voltage of the step-down regulator is below the threshold. When the output voltage is above the threshold, the power good pin is de-asserted. Setting the output voltage greater than 1.35V, the threshold voltage is 0.9% * VOUT (typical). Setting the output voltage less than 1.32V, the threshold voltage is V_{OUT} – 130mV (typical). A built-in 25µs (t_{DELAY}) delay is incorporated to prevent nuisance tripping.



Section 3. Electrical Specifications

3.1 Absolute Maximum Ratings

Stresses above those listed in Absolute Maximum Ratings may cause permanent device failure. Functionality at or above those limits is not implied. Exposure to absolute maximum ratings for extended periods may affect device reliability.

Parameter	Symbol	Range	Units
Input Voltage to GND	V_{IN}	-0.3 to 6.0	V
Voltage Set to GND	V_{SET}	-0.6 to (V_{IN} + 0.3)	V
Percentage Set Voltage to GND	V_{PSET}	-0.6 to (V_{IN} + 0.3)	V
Shutdown Voltage to GND	V_{SHDN}	-0.6 to (V_{IN} + 0.3V)	V
Storage Temperature Range	T_{STOR}	-65 to +150	°C
Peak Switch Current	I_{PEAK}	7.5	A
Rated Output Current	I_{OUT}	5	A
LDO Output Current (Peak)	I_{OUT_LDO}	450	mA

3.2 Recommended Operating Conditions[1]

Parameter	Symbol	Range	Units
Input Voltage	V_{IN}	3 to 5.5	V
Operating Temperature Range[2]	T_{OP}	-40 to +85	°C

1. This device is not guaranteed to function outside the specified operating range.
2. This device is guaranteed to meet the specifications from 0°C to 70°C. Any specifications that pertains to the operating temperature range -40°C to +85°C are assured by design, characterization, and correlation with statistical process controls.

3.3 Electrical Characteristics

The following applies unless otherwise noted: V_{IN} = 5.0V. T_A = 25°C. Bold values indicate -40°C ≤ T_A ≤ 85°C.

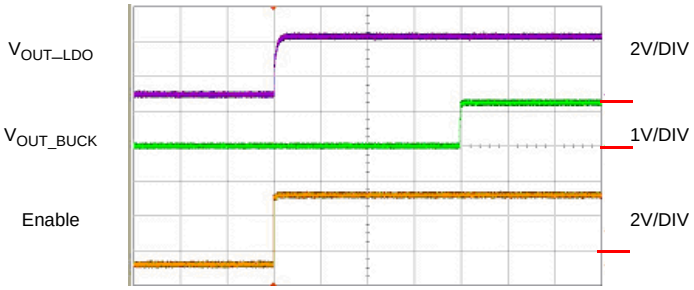
Parameter	Symbol	Condition	Min	Typ	Max	Units
Input Voltage Range	V_{IN}		3.0		5.5	V
Total Quiescent Current (No Load)	I_{IN}			10		mA
Shutdown Supply Current	I_{IN}	V_{SHDN} = V_{IN} = 5.5V		1	10	µA
Undervoltage Lockout	V_{UVLO}	High threshold, V_{IN} increasing		2.85	3.00	V
		Low threshold, V_{IN} decreasing	2.65	2.75		V
Enable Input Voltage Logic	V_{EN}	Enable regulator (5V)	3			V
		Enable regulator (3.3V)	2.4			V
		Disable regulator (3.3V/5V)			0.8	V
Shutdown Input Current	I_{SHDN}	V_{SHDN} = GND or 5.5V			±1	µA
Over-Temperature Thermal Shutdown	T_{OTS}	T_J increasing (disable regulator)		150		°C
		T_J decreasing (enable regulator)		120		°C
Switching Frequency	f_{SW}			1		MHz
Output Voltage Tolerance	ΔV_{OUT}			1		%
Line Regulation		I_{OUT} = 5A		0.2		%
		V_{IN} = 3.0V to 5.5V				
Load Regulation		V_{OUT} = 1.5V I_{OUT} = 0.5A to 5.0A		0.5		%
Input Current Ripple	I_{IN} ripple	V_{OUT} = 0.8V I_{OUT} = 5A (without external filter)		10.5		mA pk-pk
Input Voltage Ripple	V_{IN} ripple			50.0		mV pk-pk
Output Voltage Noise		V_{IN} = 5.0V V_{OUT} = 1.8V I_{OUT} = 5.0A		6.0		mV RMS
				11.0		mV pk-pk
Electrical Material Rating						
Flammability Rating		UL94V-0				
Material Type		FR4-PCB				

Table 5: LDO Output Electrical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Units
Line Regulation LDO		I_{OUT} = 800 mA		0.2		%
		V_{IN} = -4.0V to 5.5V				
Load Regulation LDO		I_{OUT} = 10 mA to 800 mA		0.5		%

3.4 Startup Waveforms

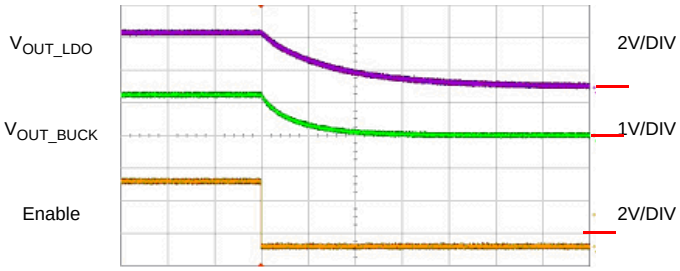
Start-up Using the Enable Pin



1 ms/DIV

V_{IN} = 5.0V
V_{LDO} = 3.3V
V_{BUCK} = 1.2V
I_{LOAD} = No Load
t_{DLY} ~ 4 ms

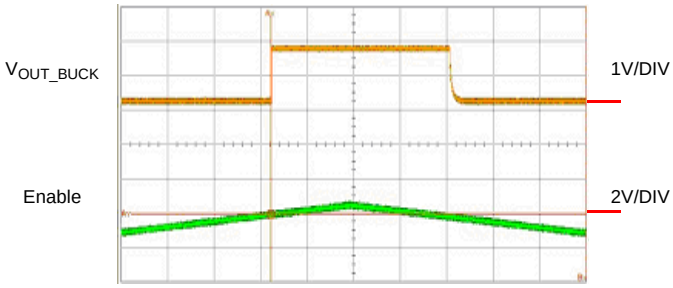
Turn Off Using the Enable Pin



1 ms/DIV

V_{IN} = 5.0V
V_{LDO} = 3.3V
V_{BUCK} = 1.2V
I_{LOAD} = No Load

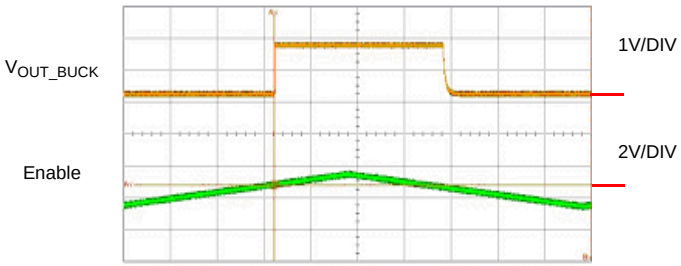
Enable Threshold at V_{IN} = 3.0V



10 ms/DIV

V_{IN} = 3.0V
V_{LDO} = 3.3V
V_{BUCK} = 1.2V
I_{LOAD} = No Load
V_{TH} = 1.47V (Note)

Enable Threshold at V_{IN} = 5.0V

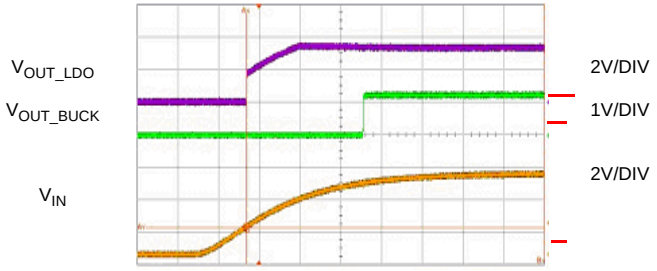


10 ms/DIV

V_{IN} = 5.0V
V_{LDO} = 3.3V
V_{BUCK} = 1.2V
I_{LOAD} = No Load
V_{TH} = 2.33V (Note)

NOTE: There is a delay (3.5 ms typ) before the output voltage turns on. The actual threshold is before delay.

VIN Soft Start



2 ms/DIV

V_{IN} = 5.0V

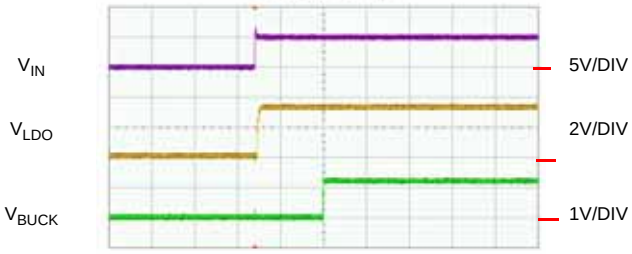
V_{LDO} = 3.3V

V_{BUCK} = 1.2V

I_{LOAD} = No Load

LDO Start = 1.7V

VIN Hot Plug



1 ms/DIV

V_{IN} = 5.0V

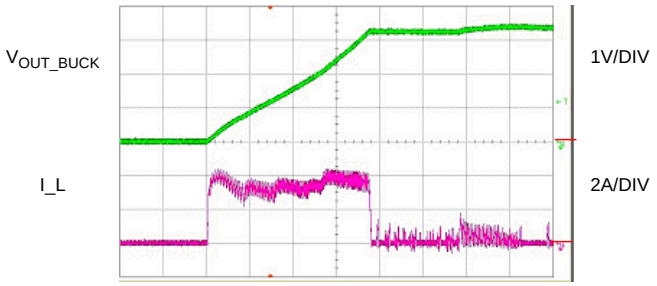
V_{LDO} = 3.3V

V_{BUCK} = 1.2V

I_{LOAD} = No Load

t_{DLY} = 4 ms

Buck Rise Time



20 µs/DIV

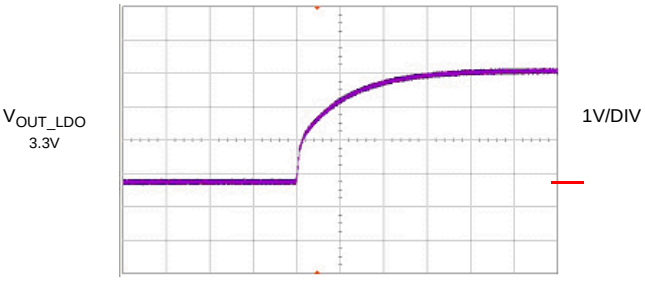
V_{IN} = 5V

V_{OUT}= 3.3V

I_{LOAD} = 7.5A

t_{RISE} = 75 µs

LDO Rise Time



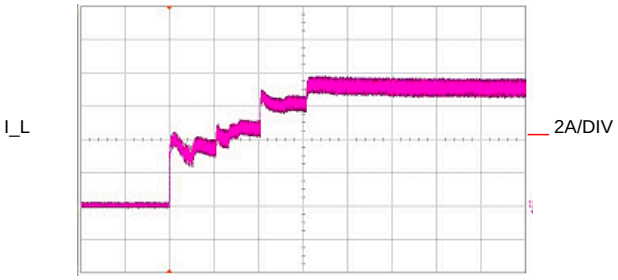
50 µs/DIV

V_{IN} = 5.0V

V_{LDO}= 3.3V

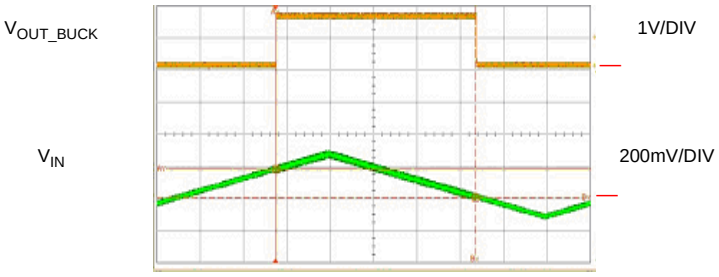
t_{RISE} = 100 µs

Soft Start Current Limit



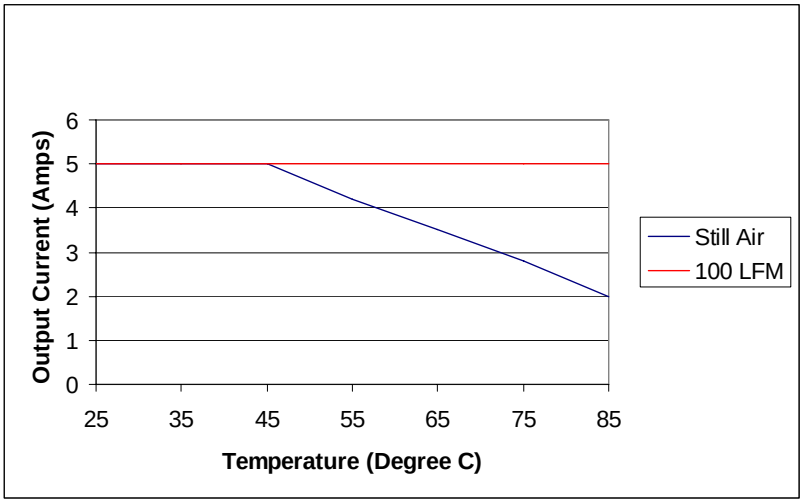
V_{IN} = 5.0V
V_{LDO} = 3.3V
V_{BUCK} = 1.2V
I_{LIMIT} = 7.5A

UVLO Threshold



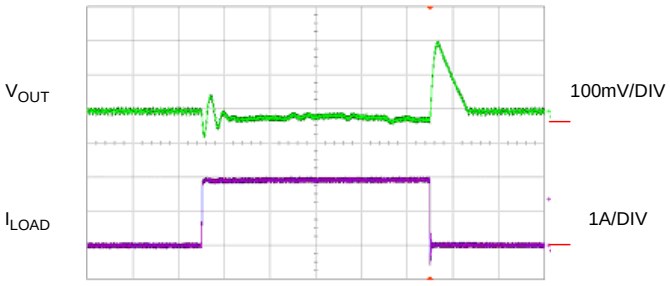
V_{LDO}= 3.3V
V_{BUCK} = 1.2V
I_{LOAD} = No Load
V_{HTH} = 2.966V
V_{LTH} = 2.792V

Temperature Derating



3.5 Load Transient Response Waveforms

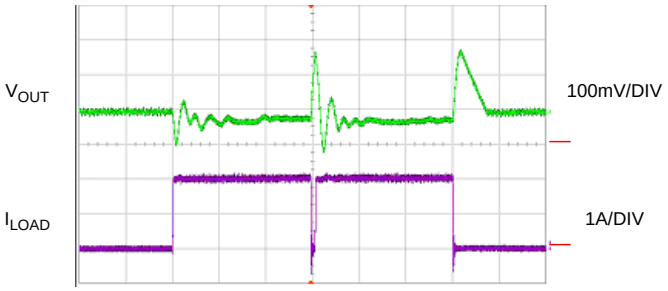
Load Transient Response



20 µs/DIV

V_{IN} = 5.0V
V_{BUCK} = 1.0V
I_{LOAD} = 0.5A to 5A
t_{RISE} = 11 A/µs
t_{FALL}= 176 A/µs

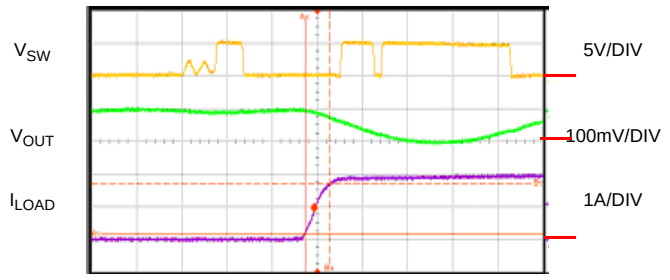
Double-Pulsed Load Response



20 µs/DIV

V_{IN} = 5.0V
V_{OUT} = 1.0V
I_{LOAD} = 0.5A to 5A
t_{RISE} = 11 A/µs
t_{FALL}= 176 A/µs

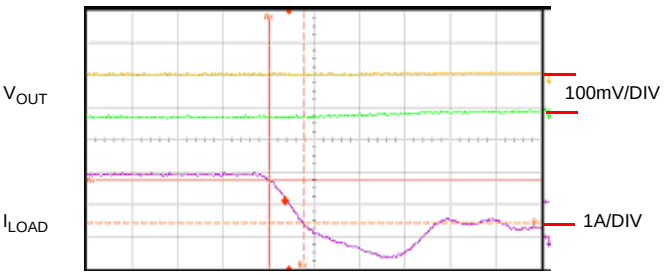
Rise Time



20 µs/DIV

V_{IN} = 5.0V
V_{BUCK} = 1.0V
I_{LOAD} = 0.5A to 5A
t_{RISE} = 11 A/µs
t_{FALL}= 176 A/µs

Fall Time

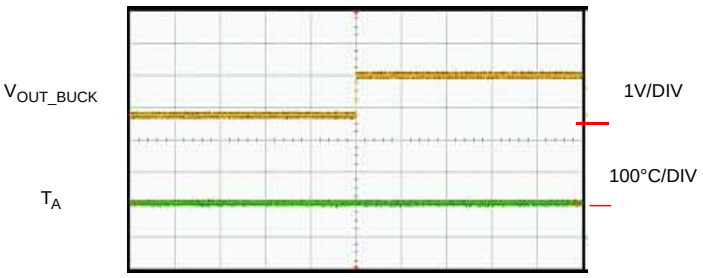


20 µs/DIV

V_{IN} = 5.0V
V_{BUCK} = 1.0V
I_{LOAD} = 0.5A to 5A
t_{RISE} = 11 A/µs
t_{FALL}= 176 A/µs

3.6 Thermal Shutdown

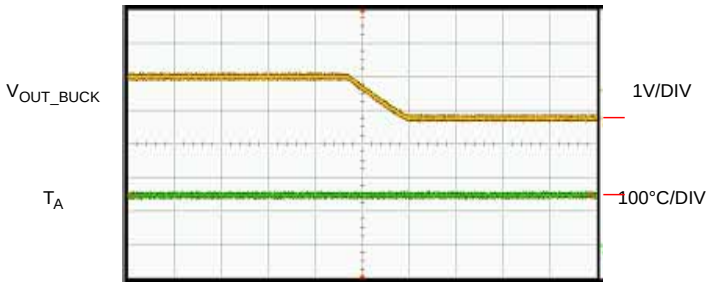
G75 Lower Thermal Shutdown



5 ms/DIV

V_{IN} = 5.0V
I_{LOAD} = 5.0A
V_{BUCK} = 1.2V
L_{TH} = 107.65 °C

G75 Upper Thermal Shutdown

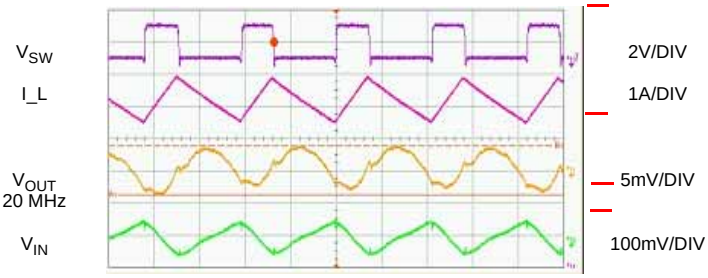


5 ms/DIV

V_{IN} = 5.0V
I_{LOAD} = 5.0A
V_{BUCK} = 1.2V
U_{TH} = 150.68 °C

3.7 Switching Waveforms

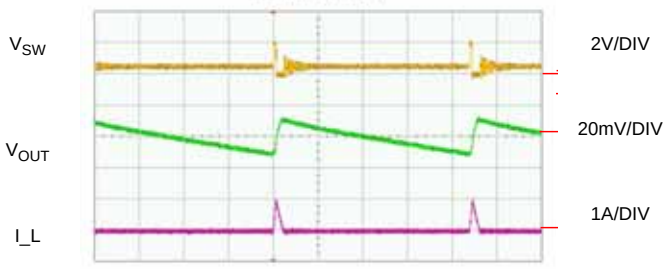
PWM mode



500 ns/DIV

V_{IN} = 5.0V
$V_{IN(PK-PK)}$ = 110 mV
V_{BUCK} = 1.5V
$I_{IND(PK-PK)}$ = 1.5A
I_{OUT} = 5A
$I_{IND(PK)}$ = 5.87A
$V_{OUT(PK-PK)}$ = 7.62 mV
Freq = 950 KHz

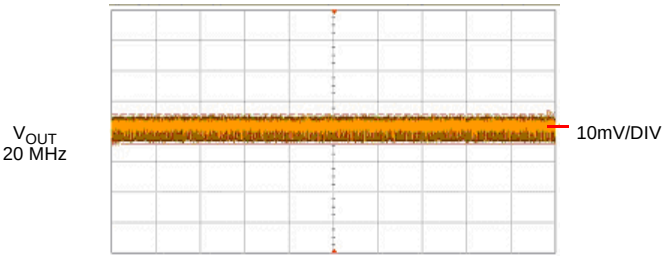
DCM Mode



5 µs/DIV

V_{IN} = 5.0V
$I_{IND(PK)}$ = 1.33A
V_{BUCK} = 1.5V
Freq = 105 KHz
I_{OUT} = 50 mA
$V_{OUT(PK-PK)}$ = 3. mV

PWM Mode Output Ripple



10 ms/DIV

V_{IN} = 5.0V

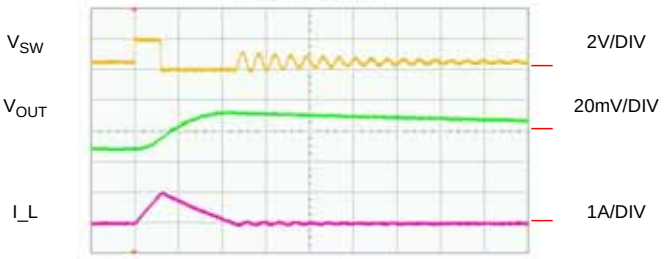
V_{LDO} = 3.3V

V_{BUCK} = 1.5V

I_{LOAD} = 5.0A

$V_{OUT(PK-PK)}$ = 9.79.mV

DCM Mode



500 ns/DIV

V_{IN} = 5.0V

V_{LDO} = 3.3V

V_{BUCK} = 1.5V

I_{LOAD} = 50 mV

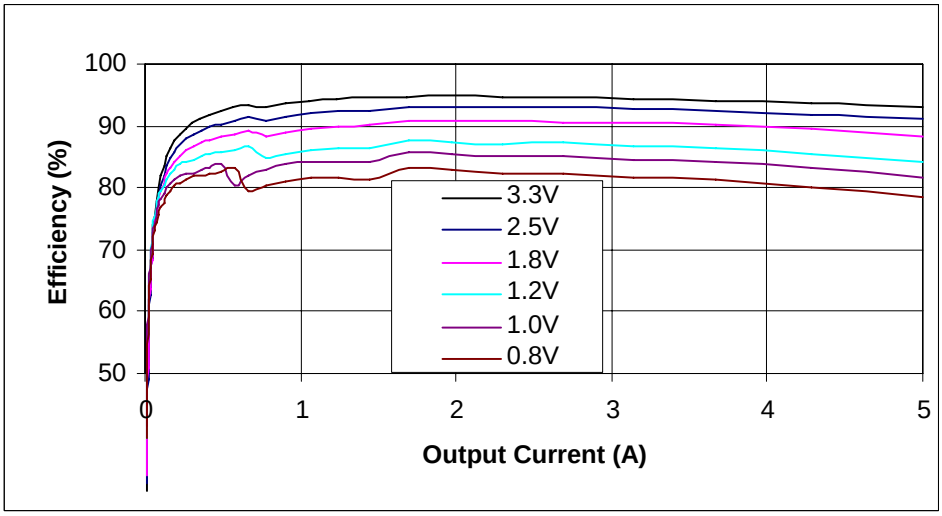
Freq Ringing = 5.09 MHz

NOTE: For repeatability of measuring output ripple ($V_{OUT(P-P)}$), the test procedure is to set the scope bandwidth to 20 MHz and use a coax cable with very short leads terminated into 50Ω. The coax leads must be routed as far as possible from the switching node.

3.8 Efficiency

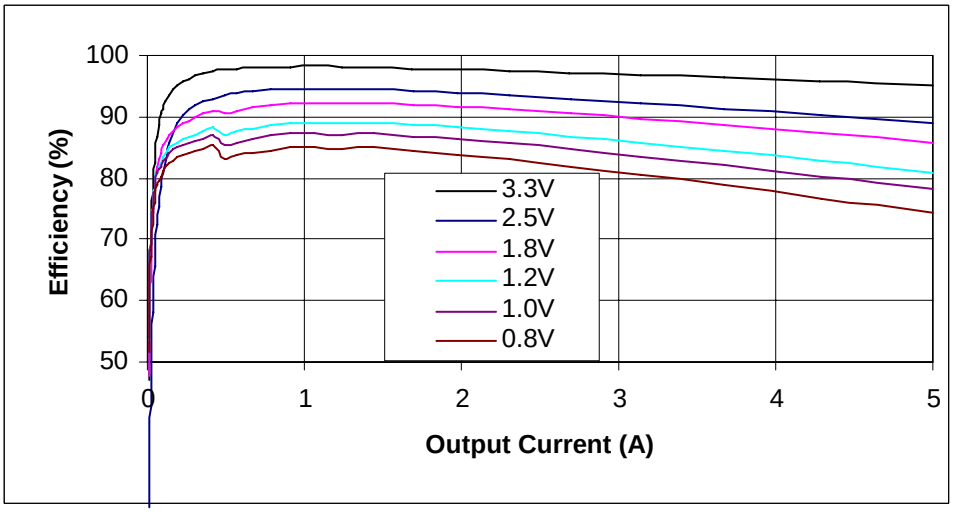
EFFICIENCY VS. OUTPUT CURRENT

V_{IN} = 5.0V @ 25°C



EFFICIENCY VS. OUTPUT CURRENT

V_{IN} = 3.3V @ 25°C



Section 4. Mechanical Drawings

4.1 Mechanical Drawings for 88MG875z-x

Figure 12: 88MG875z-S Mechanical Dimensions (SIP Package)

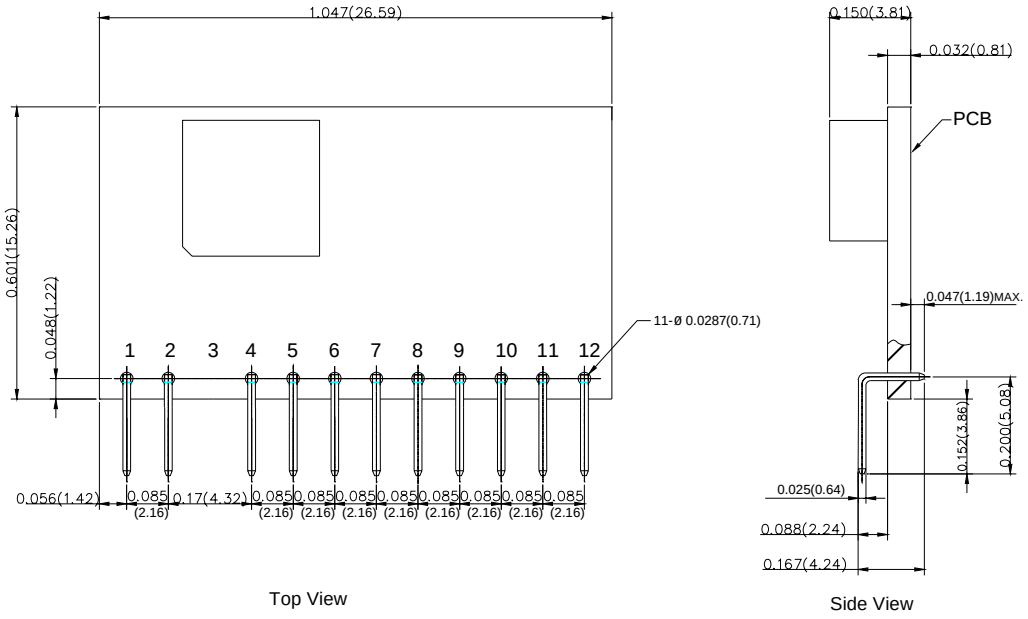
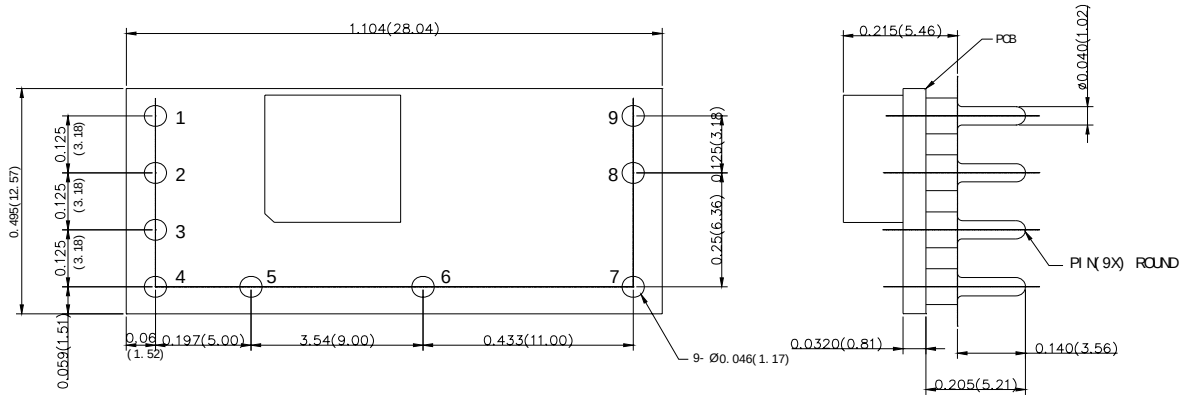


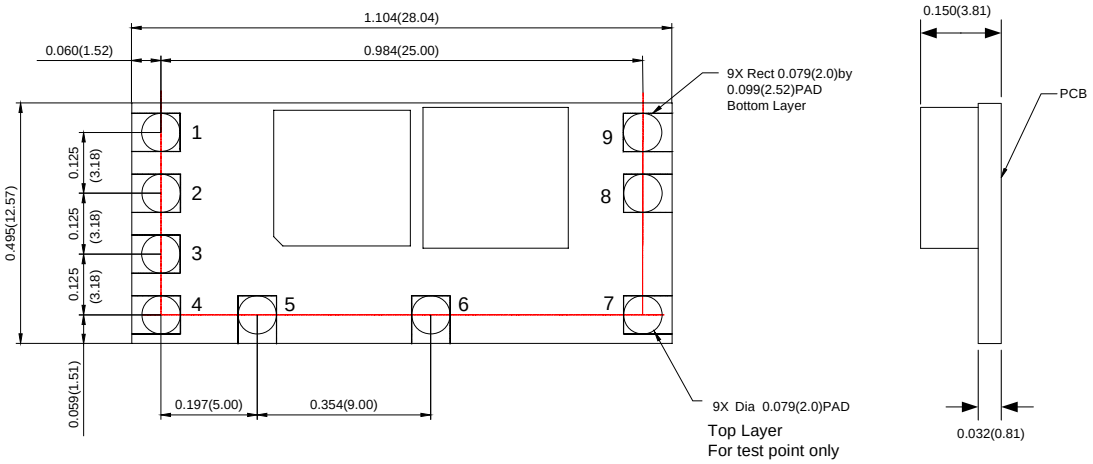
Figure 13: 88MG875z-D Mechanical Dimensions (DIP Package)



Top View

Side View

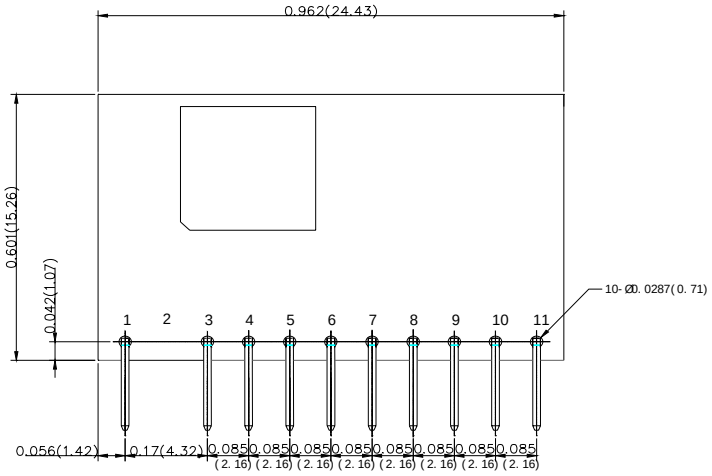
Figure 14: 88MG875z-T Mechanical Dimensions (SMT Package)



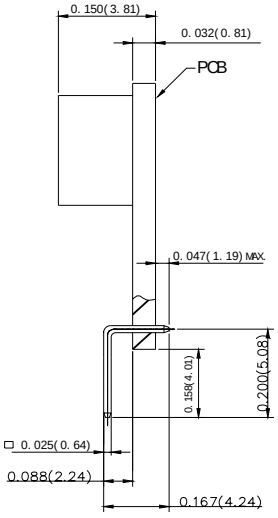
TOP VIEW SIDE VIEW

4.2 Mechanical Drawings for 88MG876-x

Figure 15: 88MG876-S Mechanical Dimensions (SIP Package)

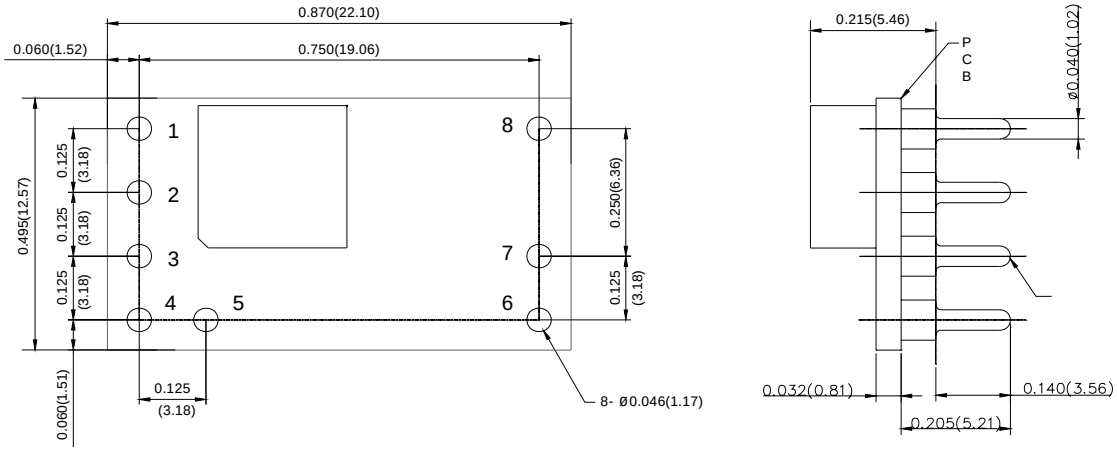


Top View



Side View

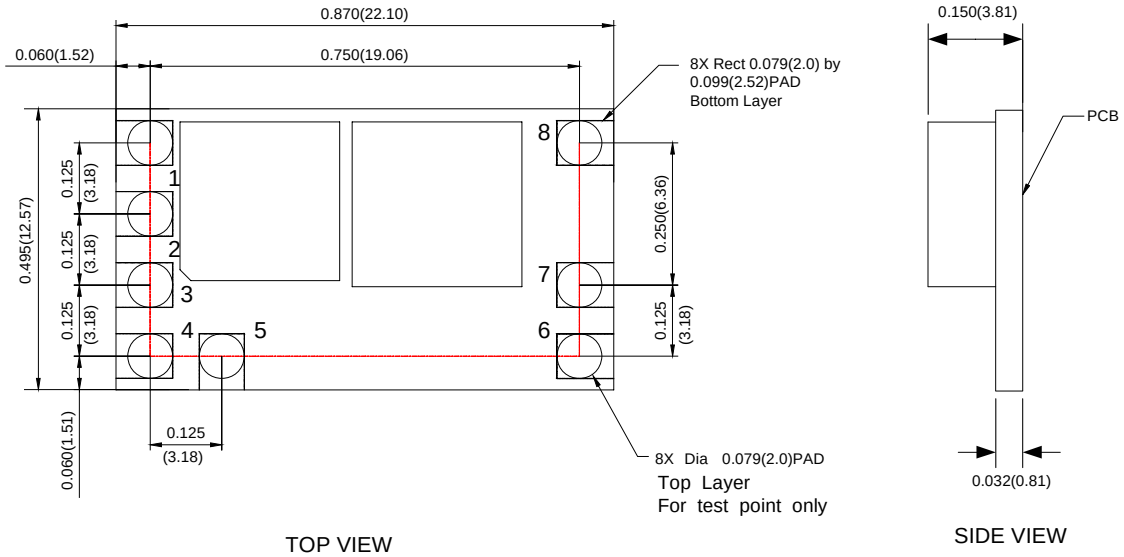
Figure 16: 88MG876-D Mechanical Dimensions (DIP Package)



Top View

Side View

Figure 17: 88MG876-T Mechanical Dimensions (SMT Package)



TOP VIEW

SIDE VIEW

Section 5. Ordering Information

5.1 Ordering Part Numbers and Package Markings

Figure 18 shows the typical ordering part numbering scheme for the MDS-G76 part. Markings for the other variants are similar. For complete ordering information, contact your Marvell FAE or sales representative.

Figure 18: 88MG875z Sample Ordering Part Number

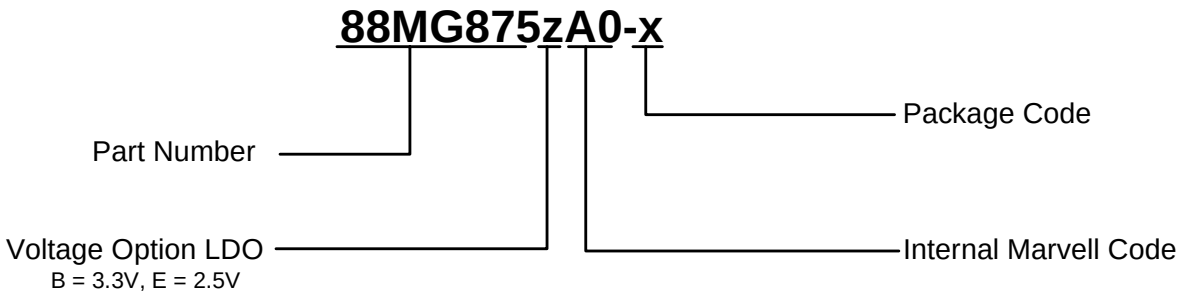
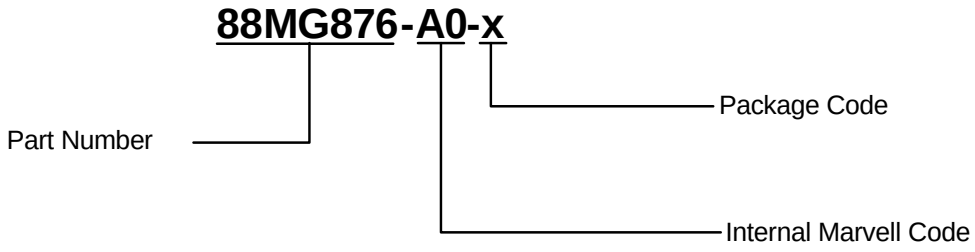


Figure 19: 88MG876 Sample Ordering Part Number



The standard ordering part number for the respective solution is shown in Table 6.

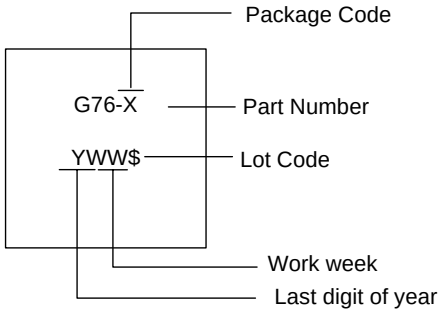
Table 6: Ordering Part Numbers

Part Number	Switcher Output Voltage	LDO Output Voltage	Rated Output Current	Ambient Temperature Range[1]	Package
88MG875B-S	Programmable	3.3V	5A	-40°C to 85°C	12-pin SIP
88MG875B-D	Programmable	3.3V	5A	-40°C to 85°C	9-pin DIP
88MG875B-T	Programmable	3.3V	5A	-40°C to 85°C	9-pin SMT
88MG875E-S	Programmable	2.5V	5A	-40°C to 85°C	12-pin SIP
88MG875E-D	Programmable	2.5V	5A	-40°C to 85°C	9-pin DIP
88MG875E-T	Programmable	2.5V	5A	-40°C to 85°C	9-pin SMT
88MG876-S	Programmable	--	5A	-40°C to 85°C	11-pin SIP
88MG876-D	Programmable	--	5A	-40°C to 85°C	8-pin DIP
88MG876-T	Programmable	--	5A	-40°C to 85°C	8-pin SMT

1. Any specifications that pertains to the operating temperature range -40°C to 85°C are assured by design, characterization, and correlation with statistical process controls.

Figure 20 shows a typical package marking and pin 1 location for the 88MG876 part. Markings for the other variants are similar.

Figure 20: 88MG876 Package Marking



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