



- COTS Component for Defense & Avionics Applications
- Environmental Performance to MIL-STD 810
- 10 to 50 VDC Transient Input Range
- 15 to 40 VDC Steady State Input Range
- 35W Max Output Power
- -55°C to 100°C Operation
- Cooling Plates and Mounting Holes for Easy Integration
- Synchronous Rectification on Low Voltage Outputs
- MIL-STD 461E EMI Performance
- Frequency Synchronization
- Thermal Warning (Battle Mode) Signal

Introduction

The MTC30 is a COTS DC-DC converter developed specifically for the defense and avionics market. This product has a full military specification while offering the short lead-times and cost benefits of a COTS component.

The MTC30 uses a forward converter design switching at 450 kHz giving excellent size, efficiency and EMC performance. The input range is designed to provide short term operation over 10 – 50 VDC to enable the converter to work at full power through the dips and surges commonly seen in vehicle and aircraft applications. A soft start circuit provides well-controlled outputs with no overshoot.

Comprehensive control functions such as voltage trim, remote sense, inhibit and frequency synchronization to an external source are standard features. The MTC30 contains an over temperature warning signal (battle mode) that gives user control over the temperature shutdown function of the converter.

The internal filtering meets the conducted emission requirements of MIL-STD 461E without external components. When used in conjunction with the MTF input filter module the MTC30 complies to MIL-STD 461E CE/CS, MIL-STD 1275A/B/C and MIL-STD 704A-F.

Input Characteristics

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Input Voltage	15.5	28	40	VDC	Continuous
Transient Input Voltage Range	10		50	VDC	10V for 10 s, 50V for 1 s at full load
UVLO Turn On	13.5		14.8	VDC	
UVLO Turn Off	8.5		9.8	VDC	
Maximum Input Current				A	See models and ratings table for details
Inrush Current		52		A	Peak value
Input Reverse Voltage Protection					External components required

Output Characteristics

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Output Voltage				VDC	See models and ratings table for details
Output Current				A	See models and ratings table for details
Output Set Tolerance			±100	mV	
Minimum Load	0			A	No minimum load required
Ripple & Noise Vout ≤5V Vout >5V		40	60 1	mV %	100% load and 20 MHz BW 100% load and 20 MHz BW
Overvoltage Protection	110		120	%	Vout nominal
Overcurrent Protection	105		150	%	At Vin nominal
Overtemperature Protection	102		107	ºC	Baseplate temp. with 2ºC to 5ºC hysteresis
Remote Sense			0.5	V	Total voltage compensation
Load Regulation			±1	%	Vout nominal
Load Step Output Transient			±3	%	Vout nominal 75-25% or 25-75% load changes
Load Step Recovery			500	µs	Within 1% of Vout nom
Line Regulation			±1	%	Vout nominal at 15.5-40 Vin
Line Step Output Transient			±3	%	Vout nominal at 15.5-40 Vin
Line Step Recovery			500	µs	Time for Vout to recover to 1% of Vout nom, with line step 15.5-40 Vin
Maximum Output Capacitance			300 x Iout max	µF	
Start Up Time		45		ms	See fig. 18 to 21

Models & Ratings

Power	Output Voltage			Output Current	Input Current [3]		Efficiency	Model Number
	Nominal	Min[1]	Max[1]		No Load	Full Load		
20 W	3.3 VDC	3.3 VDC	4.0 VDC	6.06 A	0.06 A	0.89 A	80%	MTC3028S3V3
25 W	5 VDC	4.0 VDC	6.0 VDC	5.00 A	0.09 A	1.08 A	83%	MTC3028S05
32 W	12 VDC	9.0 VDC	13.8 VDC [2]	2.70 A	0.05 A	1.41 A	81%	MTC3028S12
35 W	15 VDC	11.0 VDC	17.0 VDC [2]	2.33 A	0.06 A	1.54 A	81%	MTC3028S15
35 W	28 VDC	20.0 VDC	30.0 VDC	1.25 A	0.07 A	1.51 A	83%	MTC3028S28

1. Indicates maximum and minimum voltage adjustment (Maximum includes Remote Sense adjustment).
2. The full trim range is not available when the input is <15.5V.
3. Vin = 28 VDC

General Specifications

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Efficiency				%	See models table and performance graphs
Isolation Voltage			1500	VDC	Input to output
			1000	VDC	Input to case
			500	VDC	Output to case
Switching Frequency	400	450	500	kHz	Frequency synch 400-500 kHz. See note
MTBF					Consult technical sales
Inhibit	On = TTL High or open circuit; Off = TTL Low or short circuit				
Rth Case - Ambient	Output Voltage			Rth Case - Ambient	
	3.3 V 5 V 12 V 15 V 28 V			9.2 °C/W 9.3 °C/W 8.7 °C/W 8.6 °C/W 8.8 °C/W	

Note. Control signal needs to be TTL 0-5 VDC square wave. The trigger is the falling edge.

Environmental

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Operating Case Temperature	-40		+100	°C	Baseplate temperature
Operating Ambient Temperature	-40		+85	°C	
Extended Temperature Range	-55		+100	°C	Baseplate temperature. See note.
Storage Temperature	-55		+100	°C	
Humidity			88	%	Relative humidity
Salt Atmosphere			48	Hours	MIL-STD 810E Method 509.1
Altitude			70000	Ft	MIL-STD 810D Method 500.2
Shock			100	g	MIL-STD 810D Method 516.3
Vibration	10		2000	Hz	MIL-STD 810D Method 514.3
Bump			40	g	2000 bumps in each axes MIL-STD 810D Method 516.3

Note. For -55 °C extended operating range, add suffix '-LT' to the part number. e.g. MTC3028S05-LT

Electromagnetic Compatibility

	Standard	Test Level	Criteria	Notes & Conditions
Conducted Emissions	MIL-STD-461E	CE101/CE102		
	DEF-STAN-59-41	TBA		MTF50 module is required
Immunity	MIL-STD-1275A/B/C	Spikes Surges Ripple	±250 V for 100 µs 100 V for 50 ms (see note) 14 VAC pk-pk	MTF50 module is required
	MIL-STD-704A	600 V input transient	10µs 50Ω source impedance	MTF50 module is required
	MIL-STD-704B-F		50 V for 10 ms	
Conducted Susceptibility	MIL-STD-461E	CS101, CS114, CS115, CS116		MTF50 module is recommended

Note. 0.5 Ω source impedance

Safety Approvals

Standard	Category
CE	LVD

Block Diagram

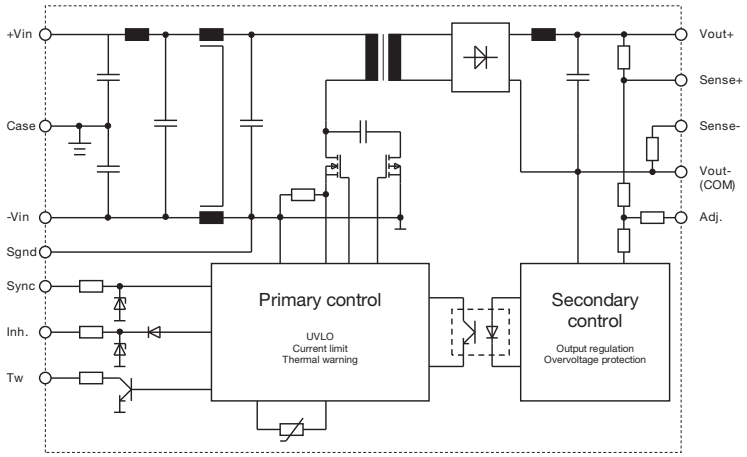
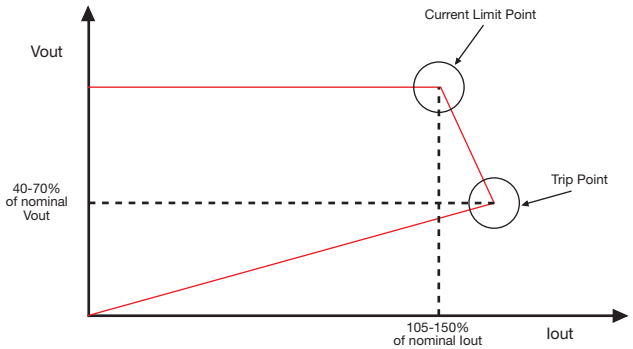


Figure 1. MTC30 Block Diagram

Overcurrent Protection



MTC3028SXX has constant current protection. After reaching the limit between 105% to 150% of Iout (current limit point) it will reduce the output voltage protecting the converter from overheating. When Vout nom is in the range of 40% to 70% the power will drop to 0 (trip point). The unit will attempt to restart after 700ms typical.

Figure 2. Overcurrent Protection

Remote Sensing

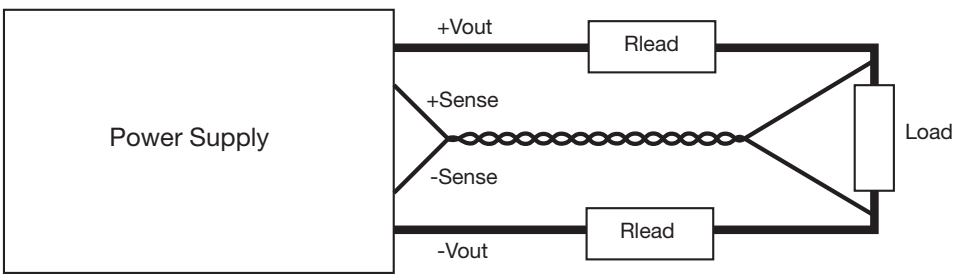


Figure 3. MTC30 - Remote Sense Connection Diagram

Notes.
1. To use the remote sense connect +Sense pin to +Vout and -Sense pin to -Vout.
2. When trim or remote sense are not in use leave ±Sense pins not connected or connected locally to ±Vout respectively.

Voltage Trim

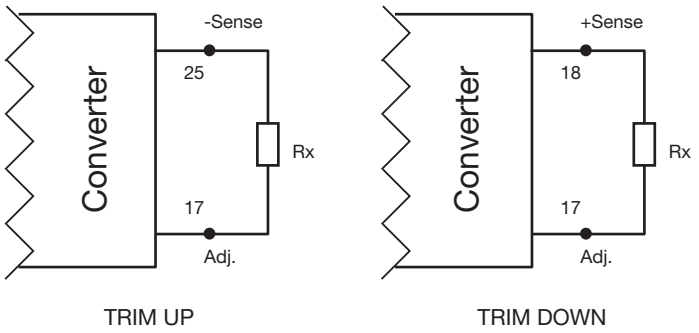


Figure 4. MTC30 - Trim connections

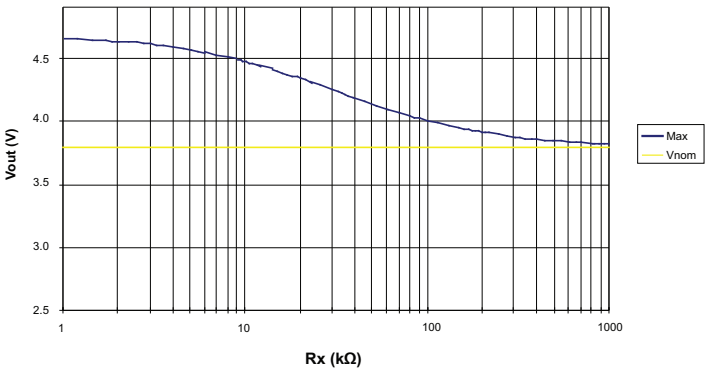


Figure 5. MTC3028S3V3 - Max and Min Adjustment

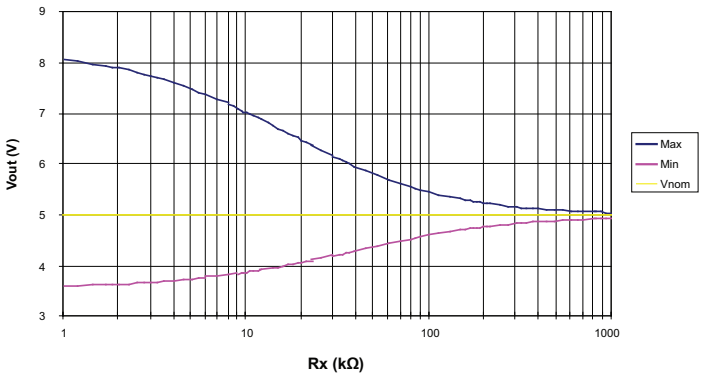


Figure 6. MTC3028S05 - Max and Min Adjustment

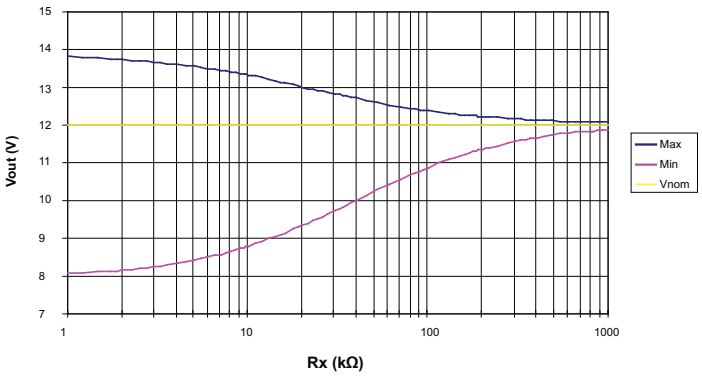


Figure 7. MTC3028S12 - Max and Min Adjustment

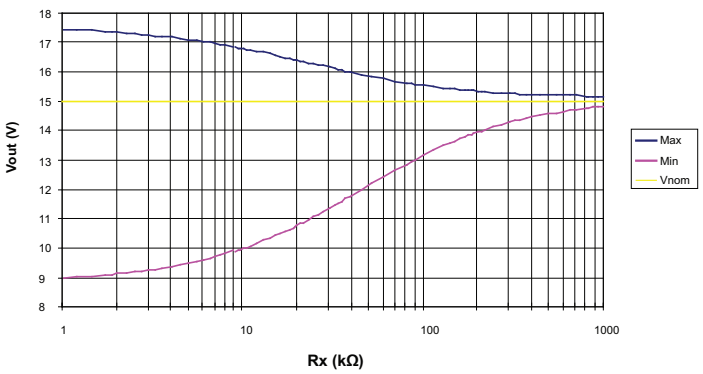


Figure 8. MTC3028S15 - Max and Min Adjustment

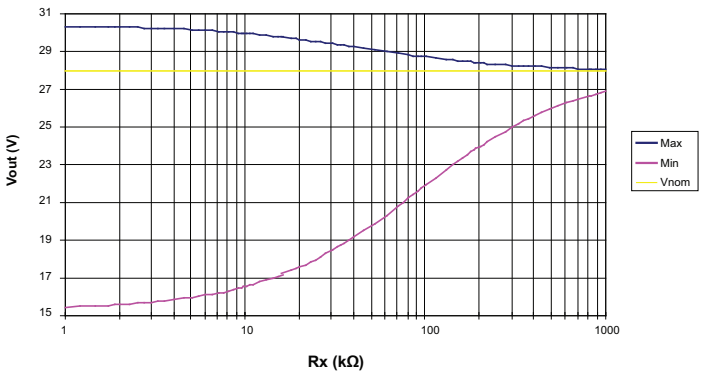


Figure 9. MTC3028S28 - Max and Min Adjustment

Notes.

1. When adjusting the output voltage do not go above the specified output voltage range (refer to tables) as the Over Voltage Protection may be triggered when fitted.

EMC Performance Curves

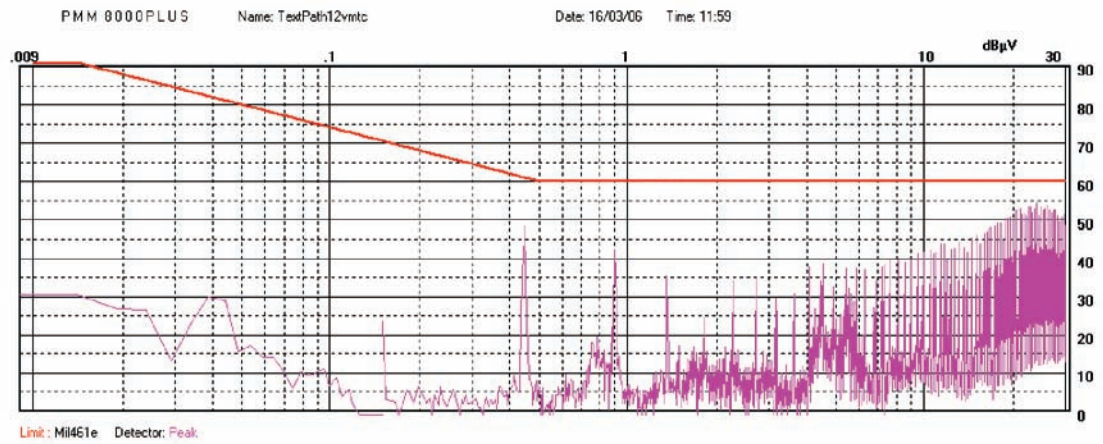


Figure 10. MTC3028S12 without a filter

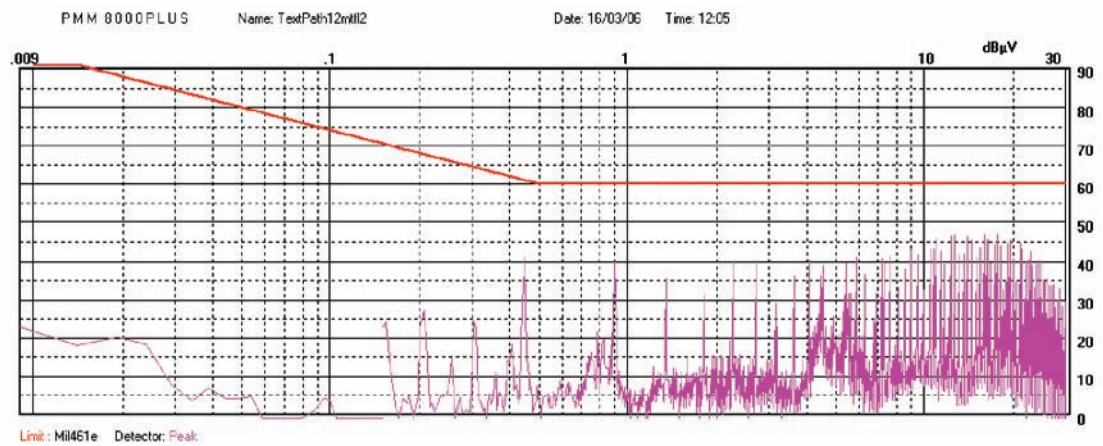


Figure 11. MTC3028S12 with MTF50 filter

EMC Filter Connection Diagram

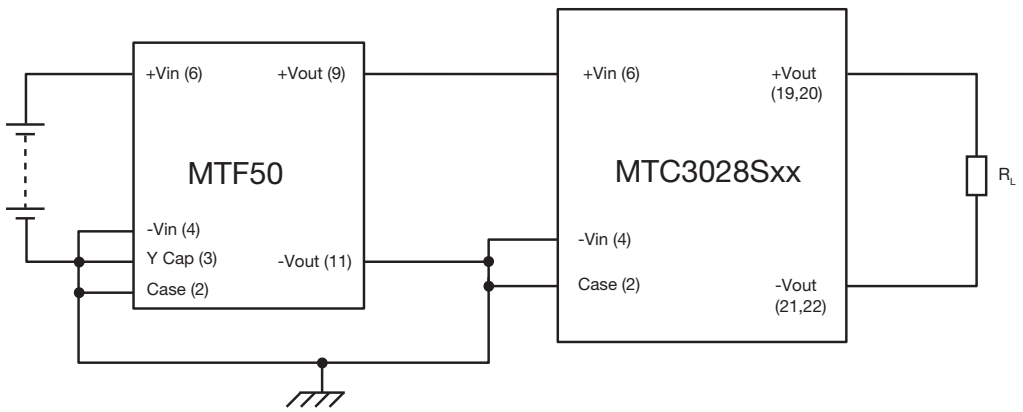


Figure 12. MTC30 - EMC Filter connection diagram

Parallel Configuration

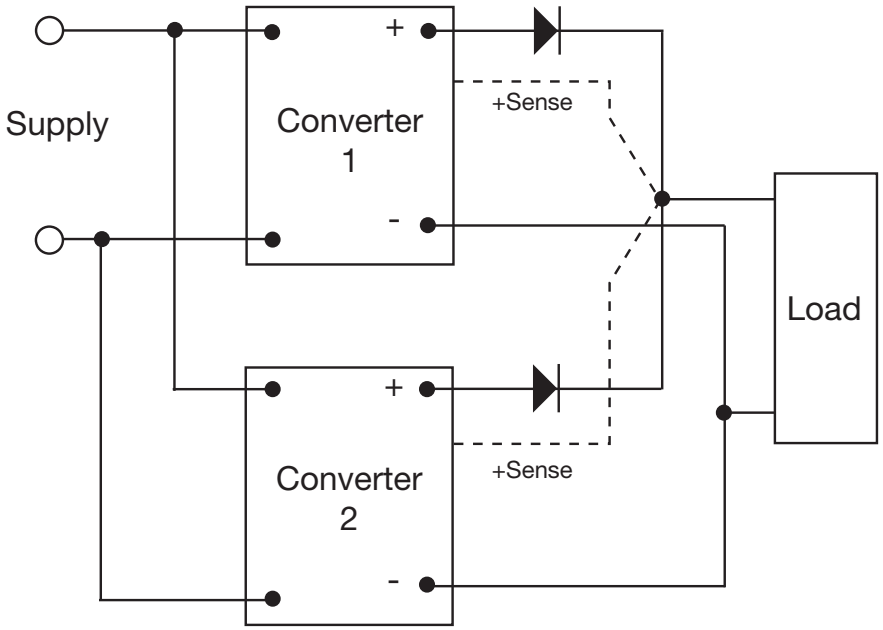


Figure 13. Parallel configuration suitable for redundant operation

Efficiency

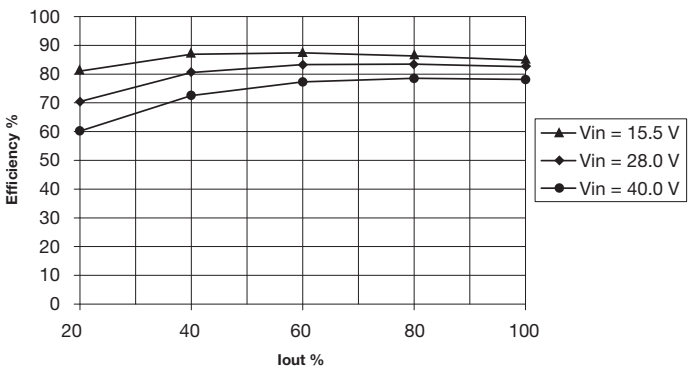


Figure 16. Typical efficiency for MTC3028S05

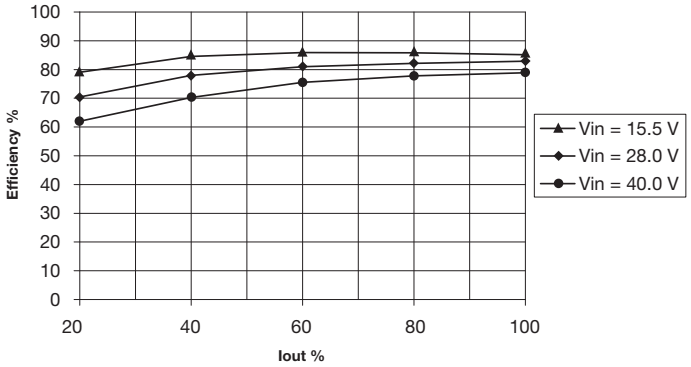


Figure 17. Typical efficiency for MTC3028S28

Start Up Time

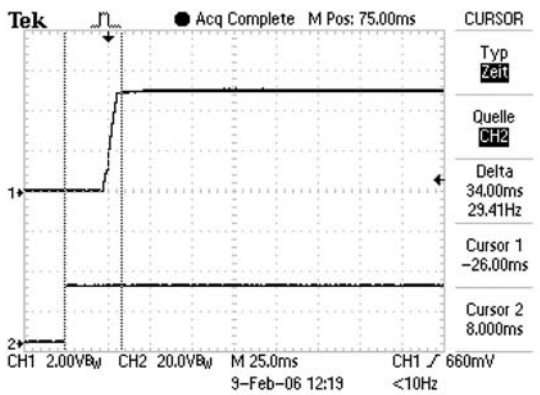


Figure 18. Start up time for MTC3028S05 with full resistive load - 34 ms

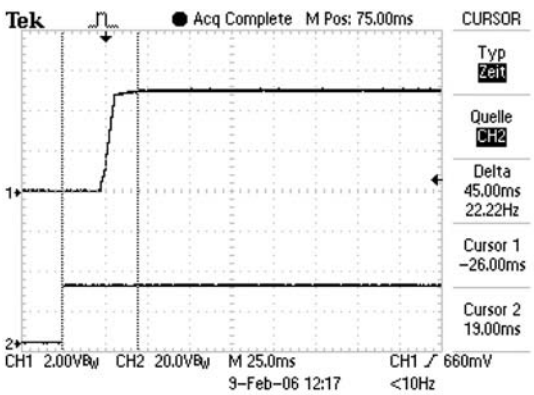


Figure 19. Start up time for MTC3028S05 at full load and 1500 µF - 45 ms

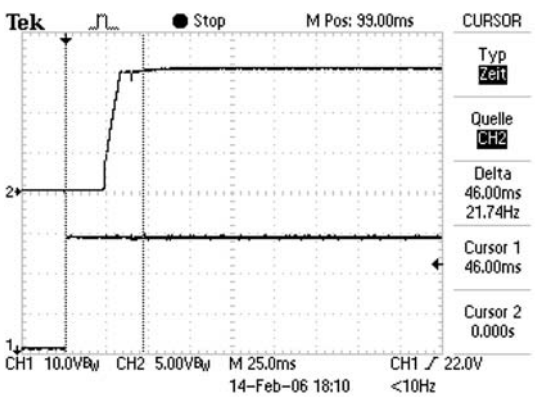


Figure 20. Start up time for MTC3028S15 with full resistive load - 46 ms

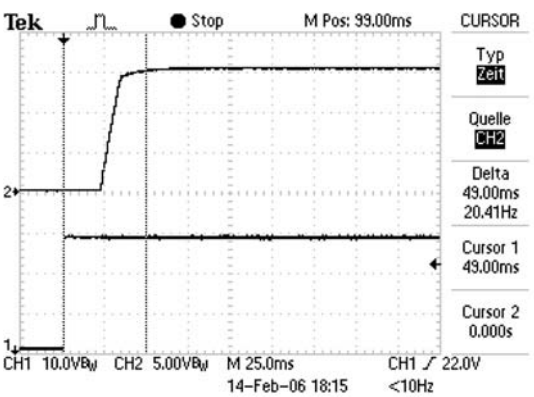
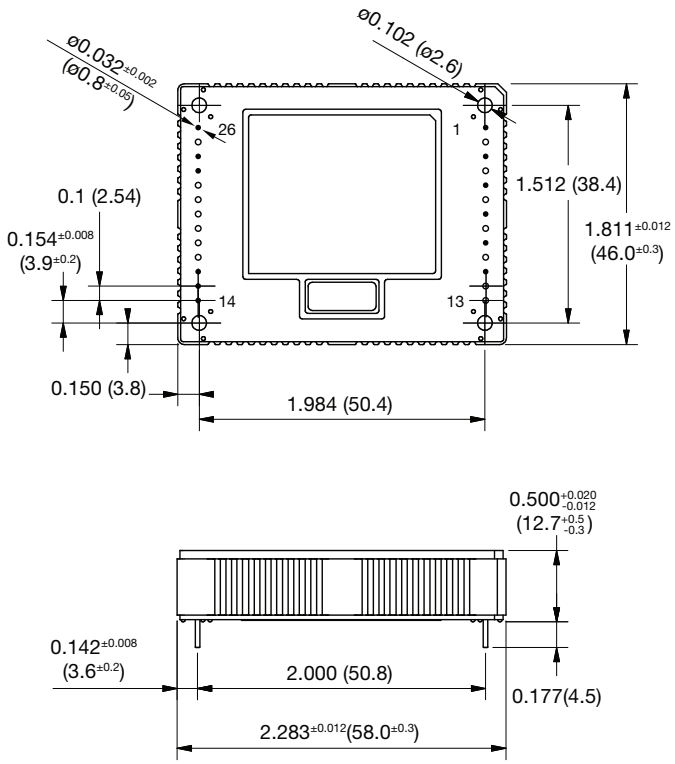


Figure 21. Start up time for MTC3028S15 at full load and 700 µF - 47 ms

Mechanical Details



MTC30 Connections	
Pin	Function
1	No Pin
2	Case
3	No Pin
4	- Vin
5	No Pin
6	+ Vin
7	No Pin
8	Synchronisation
9	No Pin
10	Inhibit
11	No Pin
12	Thermal Warning (TW)
13	Signal GND (SGND)
14	No Pin
15	No Pin
16	No Pin
17	Adjust
18	+ Sense
19	+ Vout
20	+ Vout
21	- Vout (COM)
22	- Vout (COM)
23	No Pin
24	No Pin
25	- Sense
26	No Pin

Notes.
1. Dimensions are in inches (mm)
2. Tolerance: ±0.02 inches (±0.5 mm)
3. Weight: 0.15 lb (70 g)
4. Materials & Finish:
   Pin - Material: Cu Zn30 2.5µm Ni
   Finish: 0.2-0.5µm AU (HV 170-200)
   Case - Material: Aluminium (Al Mg Si 0.5)
   Finish: Chromated
   Nameplate - Non-conductive plastic



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