



Automation



Datacom



IPC



Industry



Measurement



Telecom



Automobile



Boat



Charger



Medical



PV



Railway



1600
VDC
Isolation
Voltage

2 : 1
Input
Range

6 sided
Shielding

NO
Min. Load
Required

REMOTE
**ON
OFF**

OCP

OVP

SCP

TECHNICAL SPECIFICATION All specifications are typical at nominal input, full load and 25°C unless otherwise noted

Model Number	Input Range VDC	Output Voltage VDC	Output Current @Full Load mA	Input Current @ No Load mA	Efficiency %	Maximum Capacitor Load μF
MT20E-2405SI-W	18 ~ 36	5	4000	35	89	6800
MT20E-2412SI-W	18 ~ 36	12	1670	55	87	2200
MT20E-2415SI-W	18 ~ 36	15	1330	40	87	755
MT20E-4805SI-W	36 ~ 75	5	4000	20	89	6800
MT20E-4812SI-W	36 ~ 75	12	1670	35	88	2200
MT20E-48S15SI-W	36 ~ 75	15	1330	50	87	755

INPUT SPECIFICATIONS

Parameter	Conditions		Min.	Typ.	Max.	Unit
Operating input voltage range		12Vin(nom) 24Vin(nom) 48Vin(nom)	9 18 36	12 24 48	18 36 75	VDC
Start up time	Constant resistive load	Power up Remote ON/OFF		10 10		ms
Input surge voltage	100 ms, max.	12Vin(nom) 24Vin(nom) 48Vin(nom)			36 50 100	VDC
Input filter			L-C type			
Remote ON/OFF	Referred to –Vin pin	Positive logic DC-DC ON (Standard) DC-DC OFF Negative logic DC-DC ON (Option) DC-DC OFF Input current of Ctrl pin Remote off input current		Open or 3 ~ 12VDC Short or 0 ~ 1.2VDC Short or 0 ~ 1.2VDC Open or 3 ~ 12VDC -0.5 2.5	+0.5	mA mA

OUTPUT SPECIFICATIONS

Parameter	Conditions			Min.	Typ.	Max.	Unit
Voltage accuracy				-1.0		+1.0	%
Line regulation	Low Line to High Line at Full Load			-0.2		+0.2	%
Load regulation	No Load to Full Load			-0.5		+0.5	%
Cross regulation	Asymmetrical load 25%/100% FL	Dual		-5.0		+5.0	%
Voltage adjustability	Single output			-10		+10	%
Ripple and noise	Measured by 20MHz bandwidth With a 0.1μF/50V MLCC	Single	Others		60		mVp-p
			5Vout, 12Vout, 15Vout		75		
		Dual	All		100		
Temperature coefficient				-0.02		+0.02	%/°C
Transient response recovery time	25% load step change				250		μs
Over voltage protection	Zener diode clamp	1.5Vout			3.9		VDC
		1.8Vout			3.9		
		2.5Vout			3.9		
		3.3Vout			3.9		
		5Vout			6.2		
		12Vout			15		
		15Vout			18		
Over load protection	% of Iout rated					150	%
Short circuit protection				Continuous, automatics recovery			

GENERAL SPECIFICATIONS

Parameter	Conditions		Min.	Typ.	Max.	Unit
Isolation voltage	1 minute	Input to Output Input(Output) to Case	1600 1600			VDC
Isolation resistance	500VDC		1			GΩ
Isolation capacitance					1000	pF
Switching frequency			450	500	550	kHz
Safety approvals	IEC/ EN/ UL 62368-1		UL:E193009 CB: UL(Demko)			
Case material			Nickel-coated copper			
Base material			Non-conductive black plastic			
Potting material			Epoxy (UL94 V-0)			
Weight			27g (0.95oz)			
MTBF	MIL-HDBK-217F, Full load		1.583 x 10 ⁶ hrs			

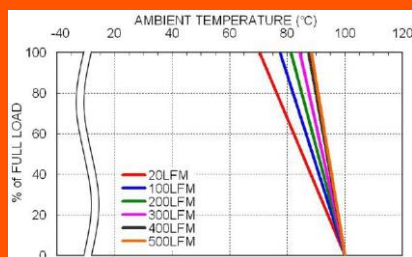
ENVIRONMENTAL SPECIFICATIONS

Parameter	Conditions		Min.	Typ.	Max.	Unit
Operating ambient temperature	Standard	With derating	-40		+100	°C
	M3	With derating	-55		+100	
Maximum case temperature					100	°C
Storage temperature range			-55		+125	°C
Thermal impedance	Without heat-sink			12		°C/W
	With heat-sink			10		
Thermal shock			MIL-STD-810F			
Vibration			MIL-STD-810F			
Relative humidity			5% to 95% RH			

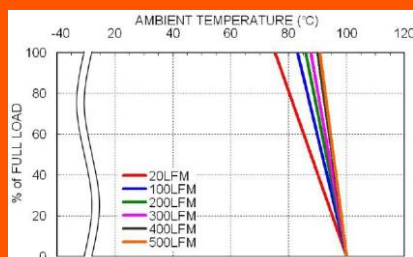
EMC SPECIFICATIONS

Parameter	Conditions		Level
EMI	EN55032	With external components	Class A, Class B
EMS	EN55024		
ESD	EN61000-4-2	Air $\pm 8\text{kV}$ and Contact $\pm 6\text{kV}$	Perf. Criteria B
Radiated immunity	EN61000-4-3	10 V/m	Perf. Criteria A
Fast transient	EN61000-4-4	$\pm 2\text{kV}$	Perf. Criteria A
Surge	EN61000-4-5	With an external input filter capacitor (Nippon chemi-con KY series, $220\mu\text{F}/100\text{V}$)	Perf. Criteria B
		$\pm 1\text{kV}$	
Conducted immunity	EN61000-4-6	10 Vr.m.s	Perf. Criteria A
Power frequency magnetic field	EN61000-4-8	100A/m continuous; 1000A/m 1 second	Perf. Criteria A

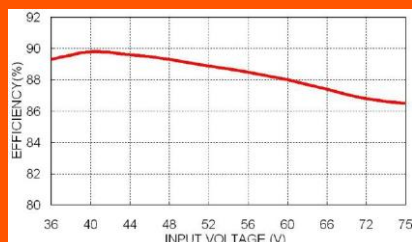
CAUTION: This power module is not internally fused. An input line fuse must always be used.

CHARACTERISTIC CURVE


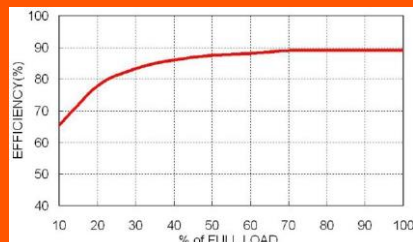
MT20E-48S05 Derating Curve



MT20E-48S05 Derating Curve With Heat-sink



MT20E-48S05 Efficiency vs. Input Voltage



MT20E-48S05 Efficiency vs. Output Load

FUSE CONSIDERATION

This power module is not internally fused. An input line fuse must always be used.

This encapsulated power module can be used in a wide variety of applications, ranging from simple stand-alone operation to an integrated part of sophisticated power architecture.

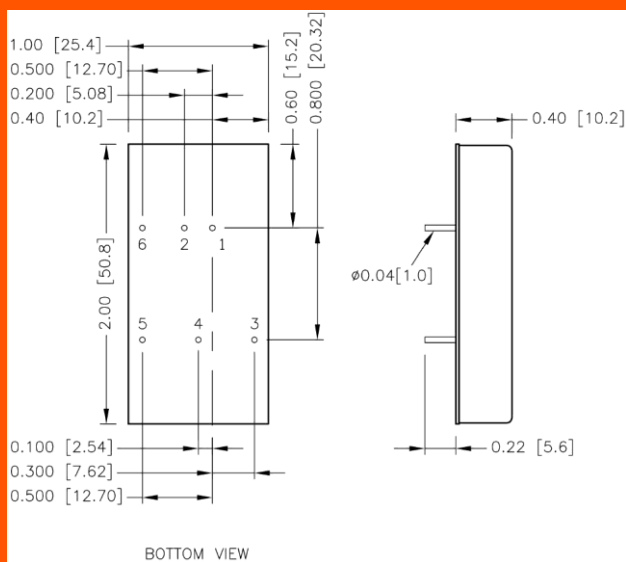
To maximum flexibility, internal fusing is not included; however, to achieve maximum safety and system protection, always use an input line fuse.

The input line fuse suggest as below :

Model	Fuse Rating (A)	Fuse Type
MT20E-12S□□, MT20E-12D□□	4	Slow-Blow
MT20E-24S□□, MT20E-24D□□	2	Slow-Blow
MT20E-48S□□, MT20E-48D□□	1.25	Slow-Blow

The table based on the information provided in this data sheet on inrush energy and maximum DC input current at low Vin.

MECHANICAL DRAWING



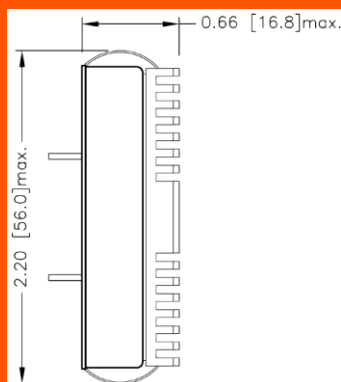
PIN CONNECTION

PIN	SINGLE	DUAL
1	+Vin	+Vin
2	-Vin	-Vin
3	+Vout	+Vout
4	Trim	Common
5	-Vout	-Vout
6	Ctrl	Ctrl

1. All dimensions in inch [mm]
2. Tolerance :x.xx±0.02 [x.x±0.5]
x.xxx±0.01 [x.xx±0.25]
3. Pin pitch tolerance ±0.01 [0.25]
4. Pin dimension tolerance ±0.004 [0.10]

HEAT-SINK OPTIONS

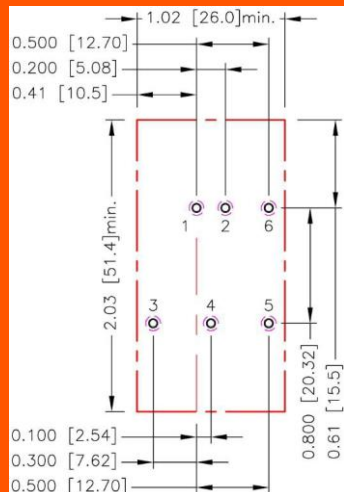
-HC (Heat-sink with clamps)



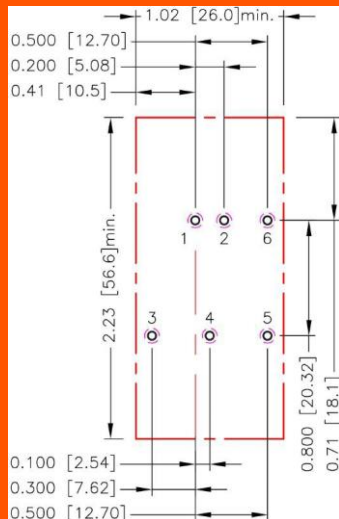
* All dimensions in inch [mm]

RECOMMENDED PAD LAYOUT

Standard



-HC



All dimensions in inch[mm]
 Pad size(lead free recommended)
 Through hole 1.2.3.4.5.6: $\varnothing 0.051[1.30]$
 Top view pad 1.2.3.4.5.6: $\varnothing 0.064[1.63]$
 Bottom view pad 1.2.3.4.5.6: $\varnothing 0.102[2.60]$

THERMAL CONSIDERATIONS

The power module operates in a variety of thermal environments.

However, sufficient cooling should be provided to help ensure reliable operation of the unit.

Heat is removed by conduction, convection, and radiation to the surrounding Environment.

Proper cooling can be verified by measuring the point as the figure below.

The temperature at this location should not exceed "Maximum case temperature".

When Operating, adequate cooling must be provided to maintain the test point temperature at or below "Maximum case temperature".

You can limit this Temperature to a lower value for extremely high reliability.

- Thermal test condition with vertical direction by natural convection (20LFM).



TOP VIEW

OUTPUT VOLTAGE ADJUSTMENT

Output voltage set point adjustment allows the user to increase or decrease the output voltage set point of the module.

This is accomplished by connecting an external resistor between the Trim pin and either the +Output or -Output pins.

With an external resistor between the Trim and -Vout, the output voltage set point increases.

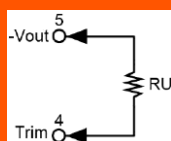
With an external resistor between the Trim and +Vout, the output voltage set point decreases.

The external Trim resistor needs to be at least 1/16W of rated power.

EXTERNAL OUTPUT TRIMMING

Output can be externally trimmed by using the method shown below.

Trim-up



□□S1P5

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	1.515	1.530	1.545	1.560	1.575	1.590	1.605	1.620	1.635	1.650
RU (kΩ)	4.578	2.065	1.227	0.808	0.557	0.389	0.270	0.180	0.110	0.054

□□S1P8

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	1.818	1.836	1.854	1.872	1.89	1.908	1.926	1.944	1.962	1.98
RU (kΩ)	11.639	5.205	3.060	1.988	1.344	0.915	0.609	0.379	0.200	0.057

□□S2P5

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	2.525	2.550	2.575	2.600	2.625	2.650	2.675	2.700	2.725	2.75
RU (kΩ)	37.076	16.675	9.874	6.474	4.434	3.074	2.102	1.374	0.807	0.354

□□S3P3

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	3.333	3.366	3.399	3.432	3.465	3.498	3.531	3.564	3.597	3.630
RU (kΩ)	57.930	26.165	15.577	10.283	7.106	4.988	3.476	2.341	1.459	0.753

□□S05

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	5.050	5.100	5.150	5.200	5.250	5.300	5.350	5.400	5.450	5.500
RU (kΩ)	36.570	16.580	9.917	6.585	4.586	3.253	2.302	1.588	1.032	0.588

□□S12

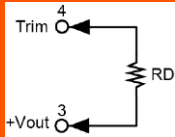
ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	12.120	12.240	12.360	12.480	12.600	12.720	12.840	12.960	13.080	13.200
RU (kΩ)	367.910	165.950	98.636	64.977	44.782	31.318	21.701	14.488	8.879	4.391

□□S15

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	15.150	15.300	15.450	15.600	15.750	15.900	16.050	16.200	16.350	16.500
RU (kΩ)	404.180	180.590	106.060	68.796	46.437	31.531	20.883	12.898	6.687	1.718

OUTPUT VOLTAGE ADJUSTMENT(CONTINUED)

Trim-down



□□S1P5

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	1.485	1.470	1.455	1.440	1.425	1.410	1.395	1.380	1.365	1.350
RD (kΩ)	5.704	2.571	1.527	1.005	0.692	0.483	0.334	0.222	0.135	0.065

□□S1P8

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	1.782	1.764	1.746	1.728	1.710	1.692	1.674	1.656	1.638	1.620
RD (kΩ)	14.66	6.57	3.874	2.525	1.716	1.177	0.792	0.503	0.278	0.098

□□S2P5

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	2.475	2.450	2.425	2.400	2.375	2.350	2.325	2.300	2.275	2.250
RD (kΩ)	49.641	22.481	13.428	8.902	6.186	4.375	3.082	2.112	1.358	0.754

□□S3P3

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	3.267	3.234	3.201	3.168	3.135	3.102	3.069	3.036	3.003	2.970
RD (kΩ)	69.470	31.235	18.490	12.117	8.294	5.745	3.924	2.559	1.497	0.647

□□S05

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	4.950	4.900	4.850	4.800	4.750	4.700	4.650	4.600	4.550	4.500
RD (kΩ)	45.533	20.612	12.306	8.152	5.660	3.999	2.812	1.922	1.230	0.676

□□S12

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	11.880	11.760	11.640	11.520	11.400	11.280	11.160	11.040	10.920	10.800
RD (kΩ)	460.990	207.950	123.600	81.423	56.118	39.249	27.199	18.162	11.132	5.509

□□S15

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	14.850	14.700	14.550	14.400	14.250	14.100	13.950	13.800	13.650	13.500
RD (kΩ)	499.820	223.410	131.270	85.204	57.563	39.136	25.974	16.102	8.424	2.282