

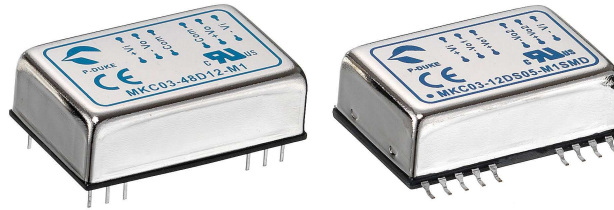


# 3

YEARS  
WARRANTY

ROHS  
COMPLIANT

REACH  
COMPLIANT



Automation



Datacom



IPC



Industry



Measurement



Telecom



Automobile



Boat



Charger



Medical



PV



Railway



2 : 1

Input  
Range

NO

Min. Load  
Required

OCP

SCP

### PART NUMBER STRUCTURE

MKC03 -	48	S	05	-	M1	SMD
Series Name	Input Voltage (VDC)	Output Quantity	Output Voltage (VDC)		Operating Temp Option	Package
	12: 9~18 24: 18~36 48: 36~75	S: Single	33: 3.3 05: 5 12: 12 15: 15		□: -25~+85°C With derating M1: -40~+85°C Without derating	□: DIP type SMD: SMD type
		D: Dual	05: ±5 12: ±12 15: ±15			
		DS: Dual Positive	05: 5 / 5 12: 12 / 12 15: 15 / 15			

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

Model Number	Input Range	Output Voltage	Output Current @Full Load	Input Current @ No Load	Efficiency	Maximum Capacitor Load (1)
	VDC	VDC	mA	mA	%	µF
MKC03-12S33	9 ~ 18	3.3	500	8	74	2200
MKC03-12S05	9 ~ 18	5	500	10	77	1000
MKC03-12S12	9 ~ 18	12	250	13	79	220
MKC03-12S15	9 ~ 18	15	200	13	80	150
MKC03-12D05	9 ~ 18	±5	±250	13	75	± 470
MKC03-12D12	9 ~ 18	±12	±125	16	80	± 100
MKC03-12D15	9 ~ 18	±15	±100	16	80	± 68
MKC03-12DS05	9 ~ 18	+5 / +5	250 / 250	18	75	470 / 470
MKC03-12DS12	9 ~ 18	+12 / +12	125 / 125	18	80	100 / 100
MKC03-12DS15	9 ~ 18	+15 / +15	100 / 100	18	80	68 / 68
MKC03-24S33	18 ~ 36	3.3	500	12	72	2200
MKC03-24S05	18 ~ 36	5	500	12	74	1000
MKC03-24S12	18 ~ 36	12	250	16	78	220
MKC03-24S15	18 ~ 36	15	200	16	78	150
MKC03-24D05	18 ~ 36	±5	±250	18	75	± 470
MKC03-24D12	18 ~ 36	±12	±125	18	78	± 100
MKC03-24D15	18 ~ 36	±15	±100	18	78	± 68
MKC03-24DS05	18 ~ 36	+5 / +5	250 / 250	16	75	470 / 470
MKC03-24DS12	18 ~ 36	+12 / +12	125 / 125	20	78	100 / 100
MKC03-24DS15	18 ~ 36	+15 / +15	100 / 100	20	78	68 / 68
MKC03-48S33	36 ~ 75	3.3	500	8	76	2200
MKC03-48S05	36 ~ 75	5	500	10	74	1000
MKC03-48S12	36 ~ 75	12	250	10	79	220
MKC03-48S15	36 ~ 75	15	200	10	79	150
MKC03-48D05	36 ~ 75	±5	±250	10	74	± 470
MKC03-48D12	36 ~ 75	±12	±125	12	77	± 100
MKC03-48D15	36 ~ 75	±15	±100	12	77	± 68
MKC03-48DS05	36 ~ 75	+5 / +5	250 / 250	18	74	470 / 470
MKC03-48DS12	36 ~ 75	+12 / +12	125 / 125	18	77	100 / 100
MKC03-48DS15	36 ~ 75	+15 / +15	100 / 100	18	77	68 / 68

INPUT SPECIFICATIONS							
Parameter	Conditions			Min.	Typ.	Max.	Unit
Operating input voltage range	12Vin(nom)			9	12	18	VDC
	24Vin(nom)			18	24	36	
	48Vin(nom)			36	48	75	
Input reflected ripple current	Nominal input and Full load			20			mAp-p
Start up time	Constant resistive load			Power up			350 ms
Input surge voltage	100 ms, max.			12Vin(nom)			36
				24Vin(nom)			50
				48Vin(nom)			100
Input filter							Pi type

## 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	-0.2		+0.2	%
	Single Dual / Dual Positive	-1.0		+1.0	
Cross regulation	Asymmetrical load 25%/100% FL	-5.0		+5.0	%
Ripple and noise	Measured by 20MHz bandwidth		50		mVp-p
Temperature coefficient		-0.02		+0.02	%/°C
Transient response recovery time	25% load step change		200		µs
Over load protection	% of Iout rated		180		%
Short circuit protection					Continuous, automatic recovery

## GENERAL SPECIFICATIONS

Parameter	Conditions	Min.	Typ.	Max.	Unit
Isolation voltage	1 minute	500			VDC
	Input to Output	500			
	Input(Output) to Case V1out to V2out(Dual Positive)	500			
Isolation resistance	500VDC	1			GΩ
Isolation capacitance				300	pF
Switching frequency		270	300	330	kHz
Safety approvals	IEC/ UL/ EN60950-1				UL:E193009 CB: UL(Demko)
Case material					Nickel-coated copper
Base material					Non-conductive black plastic
Potting material					Epoxy (UL94 V-0)
Weight	DIP Type				16g (0.55oz)
	SMD Type				18g (0.62oz)
MTBF	MIL-HDBK-217F, Full load				7.213 x 10 <sup>6</sup> hrs

## ENVIRONMENTAL SPECIFICATIONS

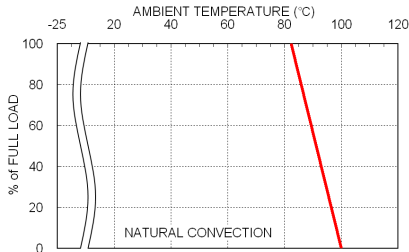
Parameter	Conditions	Min.	Typ.	Max.	Unit
Operating ambient temperature	Standard	-25		+85	°C
	M1 *M1 version is more efficient, therefore, it can be operated in a more extensive temperature range than standard.	-40		+85	
Maximum case temperature				+100	°C
Storage temperature range		-55		+125	°C
Thermal impedance			20		°C/W
Thermal shock					MIL-STD-810F
Vibration					MIL-STD-810F
Relative humidity					5% to 95% RH

## EMC SPECIFICATIONS

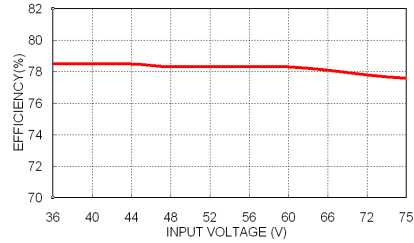
Parameter	Conditions	Level
EMI	EN55022	Class A
ESD	EN61000-4-2 Air ± 8kV and Contact ± 6kV	Perf. Criteria A
Radiated immunity	EN61000-4-3 10 V/m	Perf. Criteria A
Fast transient	EN61000-4-4 ± 2kV	Perf. Criteria B
	With an external input filter capacitor (Nippon chemi-con KY series, 220µF/100V)	
Surge	EN61000-4-5 ± 1kV	Perf. Criteria B
	With an external input filter capacitor (Nippon chemi-con KY series, 220µF/100V)	
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.

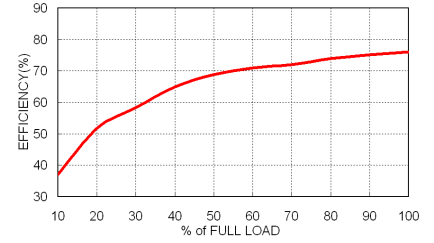
## CHARACTERISTIC CURVE



MKC03-48S05 Derating Curve



MKC03-48S05 Efficiency vs. Input Voltage



MKC03-48S05 Efficiency vs. Output Load

## FUSE CONSIDERATION

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

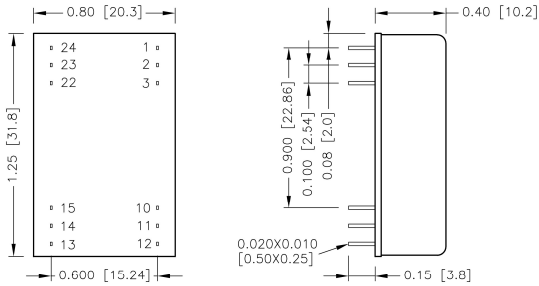
This encapsulated power module can be used in a wide variety of applications, ranging from simple stand-alone operation to an integrated part of sophisticated power architecture.

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

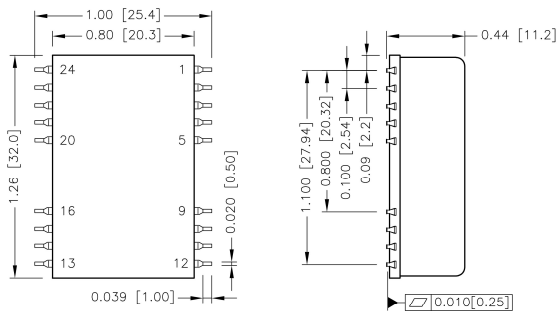
The input line fuse suggest as below :

Model	Fuse Rating (A)	Fuse Type
MKC03-12S□□、MKC03-12D□□、MKC03-12DS□□	0.8	Slow-Blow
MKC03-24S□□、MKC03-24D□□、MKC03-24DS□□	0.5	Slow-Blow
MKC03-48S□□、MKC03-48D□□、MKC03-48DS□□	0.315	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**
**DIP TYPE**


BOTTOM VIEW

**SMD TYPE**


BOTTOM VIEW

**DIP PIN CONNECTION**

PIN	SINGLE	DUAL	DS	PIN	SINGLE	DUAL	DS
1	+Vin	+Vin	+Vin	24	+Vin	+Vin	+Vin
2	NC	-Vout	-V1out	23	NC	-Vout	-V1out
3	NC	Common	+V1out	22	NC	Common	+V1out
10	-Vout	Common	-V2out	15	-Vout	Common	-V2out
11	+Vout	+Vout	+V2out	14	+Vout	+Vout	+V2out
12	-Vin	-Vin	-Vin	13	-Vin	-Vin	-Vin

\* NC : No Connection

**SMD PIN CONNECTION**

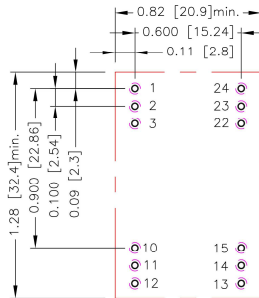
PIN	SINGLE	DUAL	DS	PIN	SINGLE	DUAL	DS
1	+Vin	+Vin	+Vin	24	+Vin	+Vin	+Vin
2	NC	-Vout	-V1out	23	NC	-Vout	-V1out
3	NC	Common	+V1out	22	NC	Common	+V1out
10	-Vout	Common	-V2out	15	-Vout	Common	-V2out
11	+Vout	+Vout	+V2out	14	+Vout	+Vout	+V2out
12	-Vin	-Vin	-Vin	13	-Vin	-Vin	-Vin
Others	NC	NC	NC				

\* NC : No Connection

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(0.1)

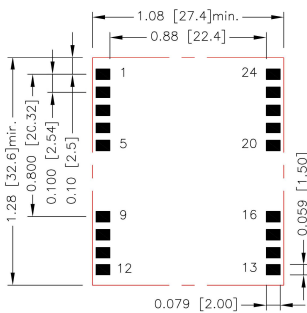
**RECOMMENDED PAD LAYOUT**

**DIP type**



All dimensions in inch[mm]  
 Pad size(lead free recommended)  
 Through hole 1.2.3.10.11.12.13.14.15.22.23.24:Ø0.031[Ø0.80]  
 Top view pad 1.2.3.10.11.12.13.14.15.22.23.24:Ø0.039[Ø1.00]  
 Bottom view pad 1.2.3.10.11.12.13.14.15.22.23.24:Ø0.063[Ø1.60]

**SMD type**



All dimensions in inch[mm]  
 Pad size(lead free recommended)  
 Top view pad:0.079x0.059[2.00x1.50]

**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 100°C. When Operating, adequate cooling must be provided to maintain the test point temperature at or below 100°C. Although the maximum point Temperature of the power modules is 100°C, you can limit this Temperature to a lower value for extremely high reliability.

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

