P-DUKE®

P-DUKE POWER

FKC12 Series

DC-DC Converter
Up to 12 Watts

3 YEARS WARRANTY

RoHS COMPLIANT

REACH COMPLIANT

Automation | Datacom | IPC

Industry | Measurement | Telecom

Automobile | Boat | Charger

Medical | PV | Railway

cULus CB CE

1600 VDC Isolation Voltage | 2 : 1 Input Range | NO Min. Load Required | REMOTE ON OFF | OCP | SCP | UVP

PART NUMBER STRUCTURE

FKC12 - 48 S 05 - SMD

Series Name	Input Voltage (VDC)	Output Quantity	Output Voltage (VDC)	Mounting Type Option
	12:9~18 **24:**18~36 **48:**36~75	**S:**Single	**2P5:**2.5 **3P3:**3.3 **05:**5.1 **12:**12 **15:**15	□: DIP type **SMD:** SMD type
		D:Dual	**05:**±5 **12:**±12 **15:**±15	

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TECHNICAL SPECIFICATION All specifications are typical at nominal input, full load and 25℃ 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
FKC12-12S2P5	9 ~ 18	2.5	3500	50	82	2000
FKC12-12S3P3	9 ~ 18	3.3	3500	60	84	2000
FKC12-12S05	9 ~ 18	5.1	2400	53	86	2000
FKC12-12S12	9 ~ 18	12	1000	15	86	430
FKC12-12S15	9 ~ 18	15	800	17	86	300
FKC12-12D05	9 ~ 18	±5	±1200	24	82	±1250
FKC12-12D12	9 ~ 18	±12	±500	19	87	±200
FKC12-12D15	9 ~ 18	±15	±400	24	87	±120
FKC12-24S2P5	18 ~ 36	2.5	3500	36	83	2000
FKC12-24S3P3	18 ~ 36	3.3	3500	36	85	2000
FKC12-24S05	18 ~ 36	5.1	2400	35	87	2000
FKC12-24S12	18 ~ 36	12	1000	16	87	430
FKC12-24S15	18 ~ 36	15	800	17	87	300
FKC12-24D05	18 ~ 36	±5	±1200	15	83	±1250
FKC12-24D12	18 ~ 36	±12	±500	15	88	±200
FKC12-24D15	18 ~ 36	±15	±400	18	88	±120
FKC12-48S2P5	36 ~ 75	2.5	3500	10	83	2000
FKC12-48S3P3	36 ~ 75	3.3	3500	14	85	2000
FKC12-48S05	36 ~ 75	5.1	2400	23	87	2000
FKC12-48S12	36 ~ 75	12	1000	11	87	430
FKC12-48S15	36 ~ 75	15	800	5	87	300
FKC12-48D05	36 ~ 75	±5	±1200	6	83	±1250
FKC12-48D12	36 ~ 75	±12	±500	6	88	±200
FKC12-48D15	36 ~ 75	±15	±400	6	88	±120

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	
Start up voltage		12Vin(nom)			9	VDC
		24Vin(nom)			18	
		48Vin(nom)			36	
Shutdown voltage		12Vin(nom)	7	8	8.8	VDC
		24Vin(nom)	15	16	17.5	
		48Vin(nom)	32	33.5	35	
Start up time	Constant resistive load	Power up		450		ms
		Remote ON/OFF		5		
Input surge voltage	100 ms, max.	12Vin(nom)			36	VDC
		24Vin(nom)			50	
		48Vin(nom)			100	
Input filter				Pi type		
Remote ON/OFF	Referred to –Vin pin	Positive logic DC-DC ON		Open or 3.0 ~ 12VDC		
		DC-DC OFF		Short or 0 ~ 1.2VDC		
		Input current of Ctrl pin	-0.5		+0.5	mA
		Remote off input current		2.5		mA

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OUTPUT SPECIFICATIONS

Parameter	Conditions			Min.	Typ.	Max.	Unit
Voltage accuracy				-1.2		+1.2	%
Line regulation	Low Line to High Line at Full Load		Single	-0.2		+0.2	%
			Dual	-0.5		+0.5	
Load regulation	No Load to Full Load	DIP type	Single 2.5Vout	-1.0		+1.0	%
			Single others	-0.5		+0.5	
			Dual	-1.0		+1.0	
		SMD type	Single 2.5Vout	-1.0		+1.0	
			Single others	-1.0		+1.0	
			Dual	-1.0		+1.0	
Cross regulation	Asymmetrical load 25%/100% FL		Dual	-5.0		+5.0	%
Ripple and noise	20MHz bandwidth				85		mVp-p
Temperature coefficient				-0.02		+0.02	%/℃
Transient response recovery time	25% load step change				250		μs
Over voltage protection	Single Output		2.5Vout		3.9		VDC
			3.3Vout		3.9		
			5.1Vout		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	DIP type	Input to Output	1600			VDC
			Input (Output) to Case	1600			
		SMD type	Input to Output	1600			
			Input (Output) to Case	1000			
Isolation resistance	500VDC			1			GΩ
Isolation capacitance						1200	pF
Switching frequency				360	400	440	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						18g (0.62oz)	
MTBF	MIL-HDBK-217F					2.064 x 10^6 hrs	

ENVIRONMENTAL SPECIFICATIONS

Parameter	Conditions		Min.	Typ.	Max.	Unit
Operating ambient temperature	2.5Vout, 3.3Vout, ±5Vout	Without derating	-40		+61	℃
		With derating	+61		+100	
	Others	Without derating	-40		+66	
		With derating	+66		+100	
Maximum case temperature					100	℃
Storage temperature range			-55		+125	℃
Thermal impedance				20		℃/W
Thermal shock					MIL-STD-810F	
Vibration					MIL-STD-810F	
Relative humidity					5% to 95% RH	

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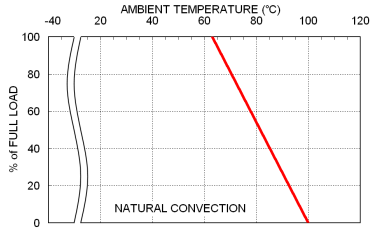
EMC SPECIFICATIONS

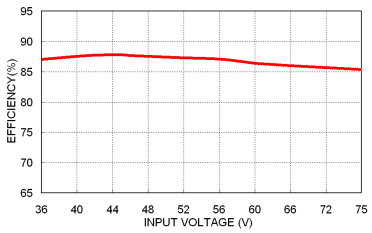
Parameter	Conditions		Level
EMI	EN55032	With external components	Class A、Class B
ESD	EN61000-4-2	Air ± 8kV and Contact ± 6kV	Perf. Criteria A
Radiated immunity	EN61000-4-3	10 V/m	Perf. Criteria A
Fast transient	EN61000-4-4	± 2kV With an external input filter capacitor (Nippon chemi-con KY series, 220μF/100V)	Perf. Criteria A
Surge	EN61000-4-5	± 1kV With an external input filter capacitor (Nippon chemi-con KY series, 220μF/100V)	Perf. Criteria A
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.

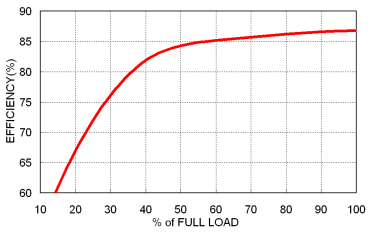
CHARACTERISTIC CURVE



FKC12-48S05 Derating Curve



FKC12-48S05 Efficiency vs. Input Voltage



FKC12-48S05 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
FKC12-12S□□、FKC12-12D□□	2.5	Slow-Blow
FKC12-24S□□、FKC12-24D□□	1.25	Slow-Blow
FKC12-48S□□、FKC12-48D□□	0.8	Slow-Blow

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

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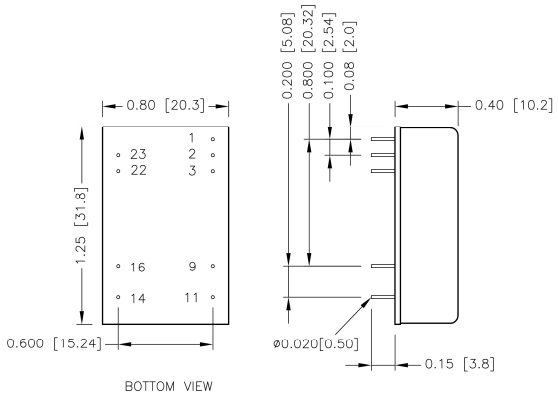
MECHANICAL DRAWING

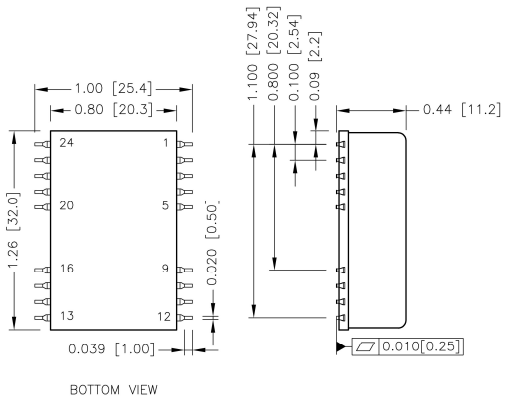
DIP type



PIN CONNECTION

PIN	SINGLE	DUAL	PIN	SINGLE	DUAL
1	Ctrl	Ctrl			
2	-Vin	-Vin	23	+Vin	+Vin
3	-Vin	-Vin	22	+Vin	+Vin
9	NC	Common	16	-Vout	Common
11	NC	-Vout	14	+Vout	+Vout

SMD type



PIN CONNECTION

PIN	SINGLE	DUAL	PIN	SINGLE	DUAL
1	Ctrl	Ctrl			
2	-Vin	-Vin	23	+Vin	+Vin
3	-Vin	-Vin	22	+Vin	+Vin
9	NC	Common	16	-Vout	Common
11	NC	-Vout	14	+Vout	+Vout
Others	NC	NC			

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]

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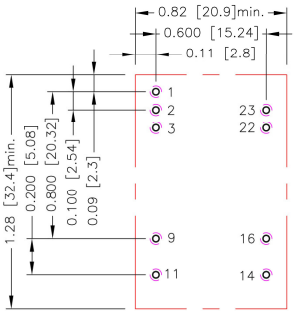
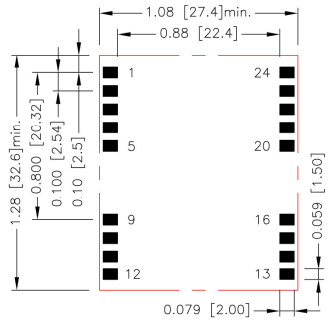
RECOMMENDED PAD LAYOUT

DIP type



All dimensions in inch[mm]
Pad size(lead free recommended)
Through hole 1.2.3.9.11.14.16.22.23: Φ0.031[0.80]
Top view pad 1.2.3.9.11.14.16.22.23: Φ0.039[1.00]
Bottom view pad 1.2.3.9.11.14.16.22.23: Φ0.063[1.60]

SMD type

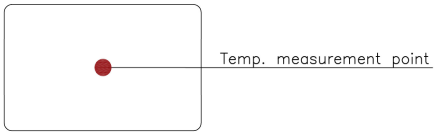


All dimensions in inch[mm]
Pad size(lead free recommended)
Top view pad:0.079x0.059[2.00x1.50]

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℃.
When Operating, adequate cooling must be provided to maintain the test point temperature at or below 100℃.
Although the maximum point Temperature of the power modules is 100℃, 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

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