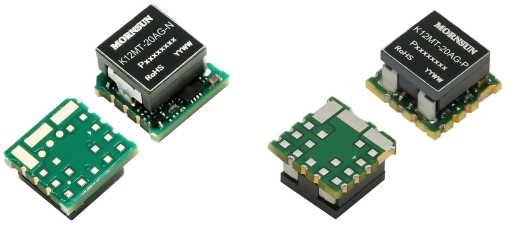
DC/DC Converter

K12MT-20AG-P(N) Series

MORNSUN®

Non-isolated & regulated 20A single output POL power converter



RoHS

FEATURES

- High efficiency up to 95%
- Wide input voltage range: 4.5VDC-14.4VDC
- Adjustable output voltage: 0.6VDC-5VDC
- Operating ambient temperature range: -40℃ to +105℃
- Output short-circuit protection
- Compact SMD package: 12.20 x 12.20 x 8.60mm

K12MT-20AG-P(N) series is a high-efficiency POL switching regulator, it features load capacity of 20A, the output voltage is precisely adjustable from 0.6V-5V, high conversion efficiency, fast transient response, and output short circuit protection. It is widely used in communications, computer network industries, and power distributed architecture, workstations, servers, LANs/WANs, providing high current with fast transient response for high-speed chips of FPGA, DSP and ASIC.

Selection Guide

Certification	Part No.①	Input Voltage (VDC)		Output		Full Load Efficiency(%) Min./Typ.	Capacitive Load(μF) Max.
		Nominal (Range)	Max.②	Voltage(VDC)③ (Range)	Current (A) Min./Max.		
--	K12MT-20AG-P	12 (4.5-14.4)	15	0.6-5	0/20	92/95	1000 μF
	K12MT-20AG-N						

Notes: ① "P" and "N" respectively indicate that the remote control pin (Ctr) is controlled by positive and negative logic;
② Exceeding the maximum input voltage may cause permanent damage;
③ The default output voltage is 0.6VDC, which can be adjusted to 1.2VDC, 1.8VDC, 2.5VDC, 3.3VDC, 5VDC. See Trim instructions for specific output voltage adjustment;
④ Unless otherwise stated, the indicators in this table are for Vin=12VDC and Vo=5VDC.

Input Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Current(no-load)	Nominal input voltage, Vo=0.6V		--	50	--	mA
	Nominal input voltage, Vo=3.3V		--	80	--	
	Nominal input voltage, Vo=5V		--	105	--	
Start-up Voltage①			--	--	4.5	VDC
Reverse Polarity Input			Avoid / Not protected			
Hot Plug			Unavailable			
Input Filter			Capacitance filter			
ON/OFF②	Module on	K12MT-20AG-P (Positive logic)	ON/OFF pin pulled high (3VDC ~ 12VDC) or open			
		K12MT-20AG-N (Negative logic)	ON/OFF pin pulled low to GND (-0.2VDC ~ 0.2VDC) or open			
	Module off	K12MT-20AG-P (Positive logic)	ON/OFF pin pulled low to GND (-0.2VDC ~ 0.2VDC)			
		K12MT-20AG-N (Negative logic)	ON/OFF pin pulled high (3VDC ~ 12VDC)			
	Input current when off		--	1	--	mA

Notes: ① The minimum input/output voltage drop is 3VDC, Vin-Vo≥3VDC, When Vo≥4.3V, the input voltage should be ≥7V to stabilize the output;
② The ON/OFF pin voltage is referenced to SIG_GND;
③ Unless otherwise specified, the indicators in the table are for Vin=12VDC and Vo=5VDC.

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Voltage Accuracy	Input voltage range, 0% -100% load	Trim resistor with 0.1% tolerance	--	--	±1	%
		Trim resistor with 1% tolerance	--	--	±3	

Linear Regulation	Full load, input voltage range	Other output voltage	--	4	--	mV
		Vo=5V	--	10	--	
Load Regulation	Nominal input voltage, 10% -100% load	Other output voltage	--	2	--	
		Vo=5V	--	10	--	
Ripple & Noise①	20MHz bandwidth, nominal input voltage, 10%-100% load		--	40	--	mVp-p
Trim			0.6	--	5	VDC
SENSE function			0.1	--	--	V
Transient Response Deviation	Nominal input voltage, 50%-100%-50% load step change, di/dt=2.5A/us	Vo=0.6VDC	--	±12mV	--	mV
		Vo=1.2VDC	--	±20mV	--	
		Vo=1.8VDC	--	±30mV	--	
		Vo=2.5VDC	--	±40mV	--	
		Vo=3.3VDC	--	±50mV	--	
		Vo=5VDC	--	±70mV	--	
Short-circuit Protection	Nominal input voltage		Continuous, self-recovery			
Temperature Coefficient	100% load		--	--	±0.4	%/℃

Notes: ① Ripple & noise should be measured at Cin =100μF// 6x10μF, Co= 330μF //4x22μF//1μF//10μF (tantalum capacitor);
② Vo=5VDC 时 Co=330μF//4x22μF//1μF//10μF(tantalum capacitor)//100μF(ceramic capacitor);
③ Unless otherwise stated, the indicators in this table are for Vin=12VDC and Vo=5VDC.

General Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Operating Temperature	See Fig. 1	-40	--	+105	℃
Storage Temperature		-55	--	+125	
Storage Humidity	Non-condensing	5	--	95	%RH
Reflow Soldering Temperature①		Peak temp. Tc ≤245℃, maximum duration time≤60s over 217℃. For actual application, please refer to IPC/JEDEC J-STD-020D.1.			
Vibration		10-150Hz, 5G, 0.75mm. along X, Y and Z			
Switching Frequency	Full load, nominal input voltage	--	500	--	kHz
MTBF	MIL-HDBK-217F@25℃	--	20581	--	k hours
MSL	IPC/JEDEC J-STD-020D.1	MSL3			

Notes: ① This module is not recommended for assembly on the bottom side of a customer board. If such an assembly is attempted, components may fall off the module during the second reflow process.

Mechanical Specifications

Dimensions	12.20 x 12.20 x 8.6mm
Weight	3.2g
Cooling Method	Nature convection or forced convection

Typical Characteristic Curves

Unless otherwise specified, the test input conditions in the figure are all Vin=12VDC.

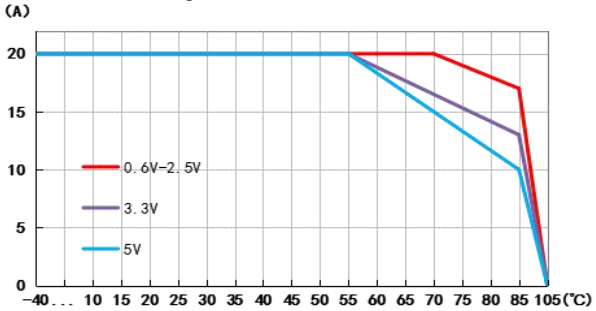
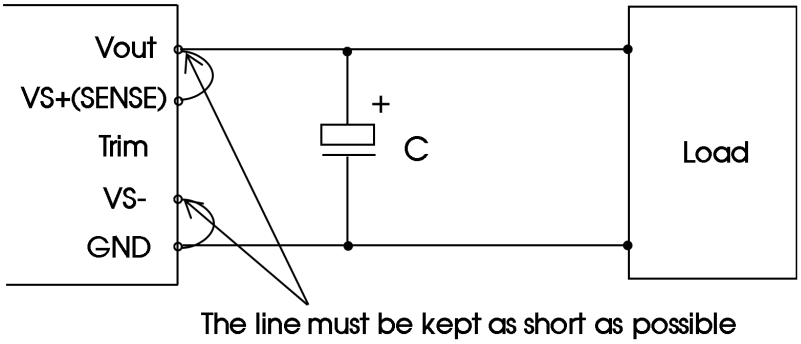


Fig. 1

Remote Sense Application

1. Remote sense connection if not used

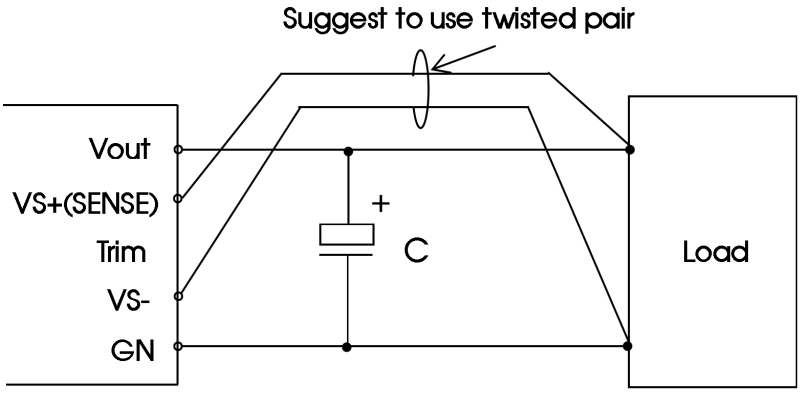


The line must be kept as short as possible

Notes:

1. If the sense function is not used for remote regulation the user must connect the VS+(SENSE) to VOUT and VS- to GND at the DC-DC converter pins and will compensate for voltage drop across pins only;
2. The connections between sense lines and their respective power lines must be kept as short as possible, otherwise they may be picking up noise, interference and/or causing unstable operation of the power module.

2. Remote sense connection used for compensation



Notes:

1. Using remote sense with long wires may cause unstable output, please contact technical support if long wires must be used;
2. We recommend using adequate cross section for PCB-track layout and/or cables to connect the power supply module to the load in order to keep the voltage drop below 0.5V and to make sure the power supply's output voltage remains within the specified range;
3. Note that large wire impedance may cause oscillation of the output voltage and/or increased ripple. Consult technical support or factory for further advice of sense operation.

PGOOD Application

PGOOD recommended circuit

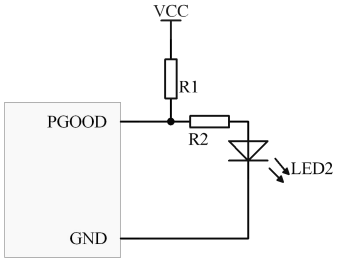


Table 1

VCC	3.3VDC
R1	100kΩ
R2	25-500Ω
LED2	MS-PT2012ZGSC

Notes:

1. PGOOD is the power good detection pin. When the product is working normally, LED2 on. when the product is abnormal, PGOOD is pulled to low level (0V-0.8V), and LED2 off;
2. PGOOD pin applied voltage is VCC, maximum is 4V.

Design Reference

1. Typical application

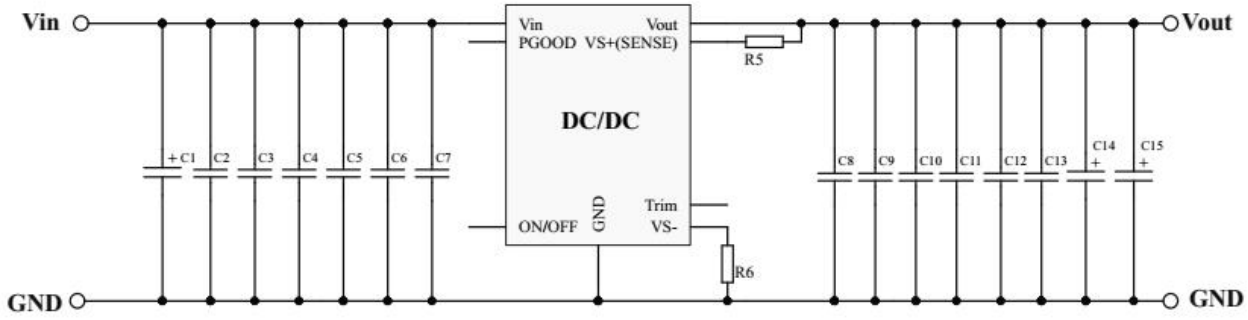


Fig. 2

Table 2

C1	100 μ F(Polymer)
C2, C3, C4, C5, C6, C7	10 μ F(Ceramic)
C8 ,C9, C10, C11	22 μ F(Ceramic)
C12	1 μ F(Ceramic)
C13	100 μ F(Vo≥3.3V), NC(Vo<3.3V)
C14	10 μ F(Tantalum capacitor)
C15	330 μ F(Vo>0.6V), 330 μ F//330 μ F(Vo=0.6V)

Notes:
1. The required capacitors Cin and Co must be connected as close as possible to the terminals of the module, to ensure the stability of the converter;
2. To reduce the output ripple furtherly, increased Co values and/or tantalum or low ESR polymer capacitors may also be used instead;
3. Refer to Table 1 for Cin and Co capacitor values;
4. Converter cannot be used for hot swap and with output in parallel.
5. In order to reduce the disturbance of large current to GND, the TRIM and ON/OFF pins should be designed with SIG_GND as the reference point. SIG_GND has been connected to GND in the product, and the application periphery does not need to be connected again.

2. Trim function for output voltage adjustment (open if unused)

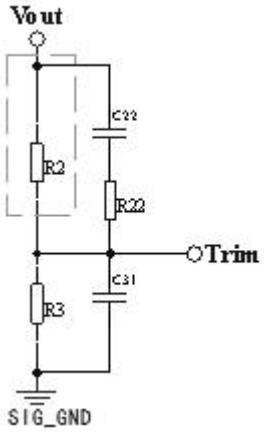


Fig. 3 Trim resistor connection (dashed line shows internal resistor network)

Table 3

Vout (VDC)	R3 (kΩ)	C31 (nF)	R22 (kΩ)	C22 (nF)
0.6	Open	0.1	0.051	1
1.2	20	0.1	1	1
1.8	10	0.1	1	1
2.5	6.32	0.1	1	1
3.3	4.44	0.47	1	1
5	2.73	1.5	5.1	1.5

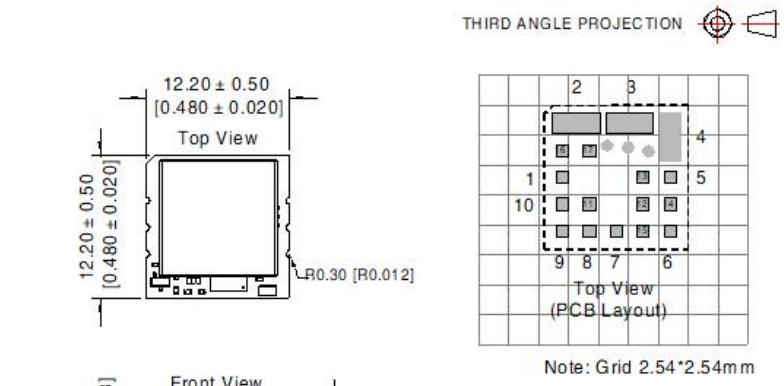
Calculating Trim resistor (RT) values:

$$R_T(k\Omega) = \frac{12}{V_O - 0.6}$$

Notes: 1. R_T: Resistance of Trim; VOUT: The Trim up voltage;
2. If $R_T = \infty$ or Trim pin open, VOUT = 0.6 VDC.

3. For additional information please refer to DC-DC converter application notes on www.mornsun-power.com

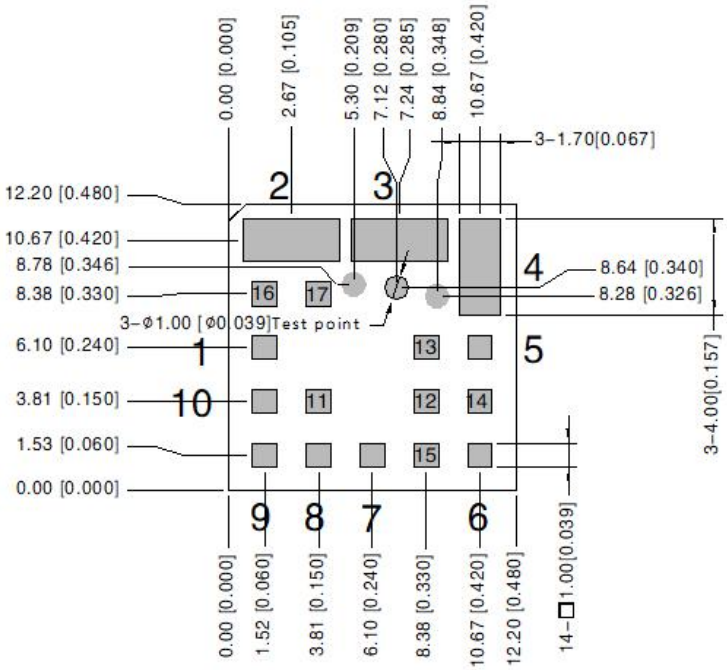
Dimensions and Recommended Layout



Note: Grid 2.54*2.54mm

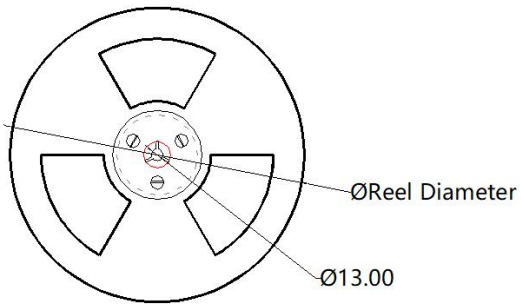
Pin-Out			
Pin	Mark	Pin	Mark
1	ON/OFF	10	PGOOD
2	Vin	11	NC
3	GND	12	VS-
4	Vout	13	SIG_GND
5	VS+(SENSE)	14	NC
6	Trim	15	NC
7	GND	16	NC
8	NC	17	NC
9	NC		

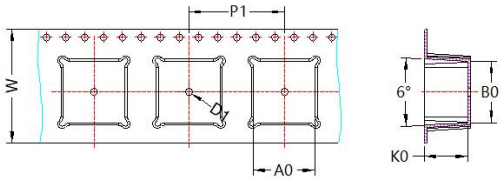
Note:
Unit: mm[inch]
General tolerances: ±0.25[±0.010]
The layout of the device is for reference only,
please refer to the actual product

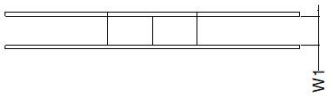


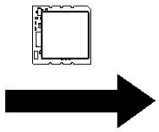
Top View
(PCB Layout)
Scale 2：1

Tape and Reel Info



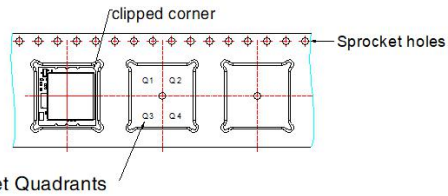






User Direction of Feed

Quadrant assignments for PIN 1 orientation in tape



Device	Package Type	Pin	MPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Clipped corner Quadrant
K12MT-20AG-P(N)	SMD	17	340	330.0	24.4	12.95	12.95	9.1	20	24	Q2

Notes:

1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58210419;
2. The maximum capacitive load offered were tested at input voltage range and full load;
3. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25℃, humidity<75%RH with nominal input voltage, 3.3VDC output voltage and rated output load;
4. All index testing methods in this datasheet are based on company corporate standards;
5. We can provide product customization service, please contact our technicians directly for specific information;
6. Products are related to laws and regulations: see "Features" and "EMC";
7. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.

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