

25mΩ/45V,

High Performance Synchronous Rectifier IC

Product Description

DK5V45R25S is a simple but high efficiency synchronous rectifier solution with only two function pins A-K, corresponding A-K pins of Schottky diode. With 45V power NMOS integrated, DK5V45R25S can significantly reduce conduction loss of traditional Schottky diode. Hence the overall efficiency can be improved. The package of DK5V45R25S is SM-7(compatible with TO-277).

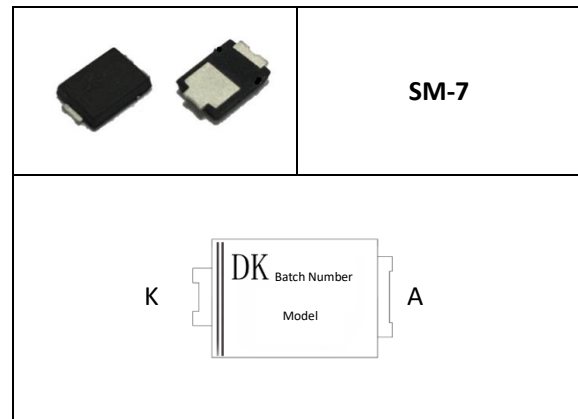
Product Feature

- Suitable for PSR/SSR feedback mode
- Ultra low V_F , ultra low temperature rise
- CCM/QR/DCM flyback mode support
- 45V/25mΩ NMOS integrated
- Positive/negative rectification support
- Patented self power supply, no need of external power supply component
- Self ON/OFF status detection, no need of external sync signal
- Improve EMC/EMI effect
- Replace Schottky Barrier Diode directly

Applications

- USB Charger
- Adapter
- LED Driver
- etc

PINS



Pins Function

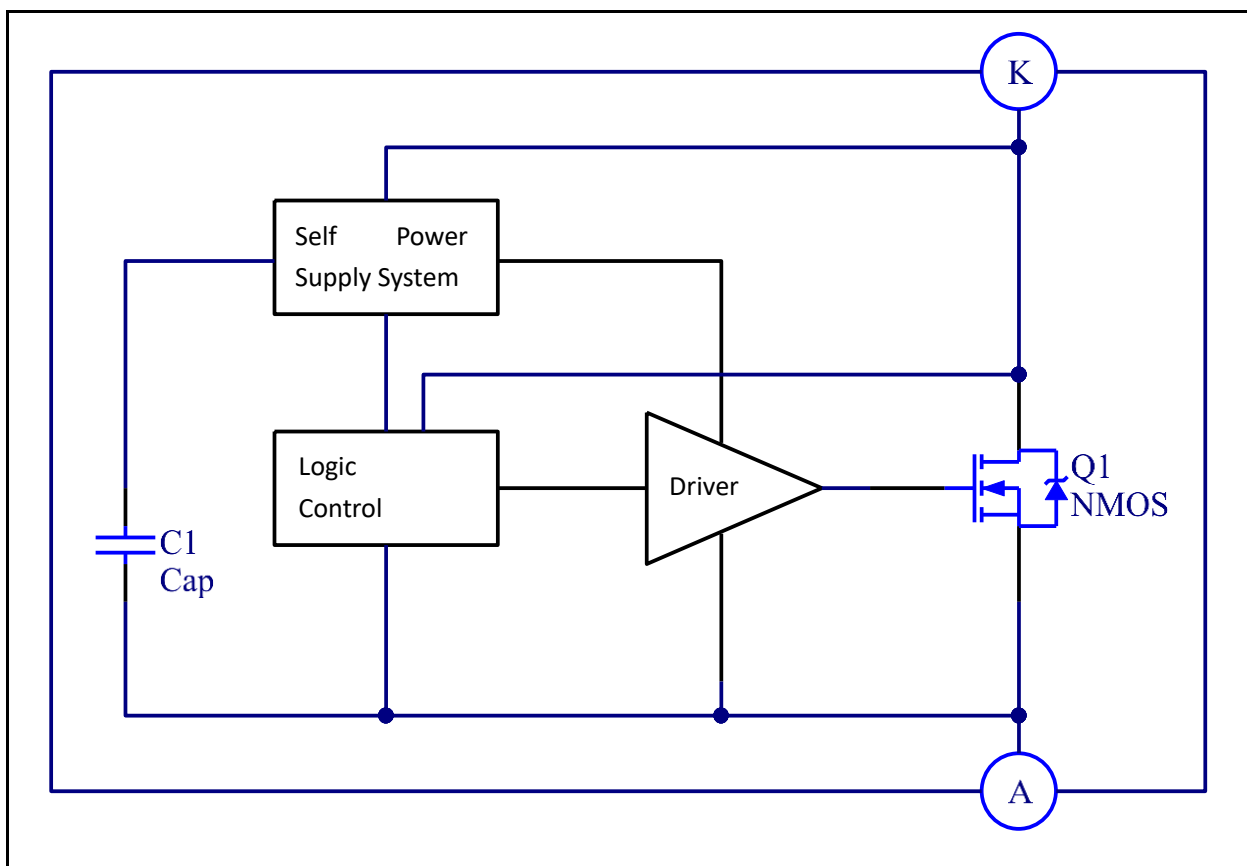
No.	Name	Description
1	K	Same as diode cathode in application
2	A	Same as diode anode in application

Typical Power Range

Model No.	Input Voltage	Typical Output Power
DK5V45R25S	85-265V AC	5V 2.1A

Remarks: The typical power is tested at 45 °C in closed environment, and the rated output current of is recommended not to exceed 2.1A

Functional Structure Diagram



Absolute Maximum Rating

Parameter	Symbol	Min	Typ	Max	Unit
NMOS Breakdown Voltage	$V_{(BR)DSS}$	45			V
NMOS MAX. Average current	I_D			30	A
NMOS Peak current	I_{DS}			40	A
SM-7 Dissipation power	P_{DMAX}		1		W

Thermal Resistance (junction to ambient)	$R\theta_{JA}$		76		$^{\circ}\text{C}/\text{W}$
Thermal Resistance (junction to tube)	$R\theta_{JC}$		4		$^{\circ}\text{C}/\text{W}$
Case/Working Temperature Range	T_C				$^{\circ}\text{C}$
Storage Temperature Range	T_{STG}	-55		155	$^{\circ}\text{C}$
Junction Temperature	T_J	-40		150	$^{\circ}\text{C}$
Soldering Temperature			260/5S		$^{\circ}\text{C}$

Electrical Characteristics ($T_A = 25^{\circ}\text{C}$)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Power Supply Section						
V_{CC} Start-up Voltage ^①	V_{CC_ON}			7.2		V
Undervoltage Protection Threshold ^①	V_{CC_uvlo}			3.3		V
Overvoltage Protection Threshold ^①	V_{OVP}			11		V
Smart Detection and Control Section						
NMOS Turn-on Voltage	V_{ON}	K voltage	-210	-213	-216	mV
NMOS Turn-on Delay	T_{DON}				150	ns
NMOS Turn-off Delay	T_{DOFF}				50	ns
NMOS Max. Conduction Duration	T_{ON_MAX}			20	25	μs
NMOS Min. Conduction Duration	T_{ON_MIN}		166	197	222	ns
NMOS Min. Turn-off Duration	T_{OFF_MIN}		495	596	686	ns
Deadtime Duration ^②	T_D			450		ns
Max	F_{S_MAX}				150	KHz
NMOS Section						
NMOS Conduction Resistance	R_{DS_ON}				25	m Ω

Remarks: ①. Voltages in specification are referenced at pin A.

②. No Deadtime duration, no NMOS Max. Conduction Duration.

Operation Principle

• Patented self power supply

DK5V45R25S series has patented built in capacitor for energy storage and self power supply circuit, which can meet the demand of control circuit and the drive of MOSFET, no need of external power supply circuit and energy storage component.

• Start up

When K point has a higher voltage than A point, V_{CC} voltage will gradually increased through self power supply circuit. When V_{CC} voltage is lower than starting voltage V_{CC_on} , the built-in power MOSFET is closed. When V_{CC} voltage exceed V_{CC_on} , the starting status finishes. When V_{CC} voltage falls below reset

voltage V_{cc_uvlo} , the synchronous rectifier IC re-enters starting status.

· **Power MOSFET control**

When the circuit detects the voltage over A-K is higher than the turn-on voltage V_{on} , the power MOSFET will be turned on. The control circuit can real time monitoring K point voltage variation. According to the change of charge and discharge time of previous cycle, control circuit can deduce the turn-on time of

power MOSFET of current cycle. When the turn-on time of the power MOSFET reaches T_{on} , or when the current flows through the MOSFET is detected reduced to 0, power MOSFET is turned off.

· **RC Snubber**

During start-up, output short circuit, input over voltage, continuous current mode may induce spike voltage across the power MOSFET. To prevent built-in power MOSFET avalanche breakdown due to over voltage, a RC snubber can be introduced across A-K to reduce the spike voltage.

· **Conduction Resistance**

During operating process, the conduction resistance increases with the temperature rising, the efficiency will fall as a result. Increase the heat dissipation area appropriately can reduce the working temperature of the synchronous rectifier IC.

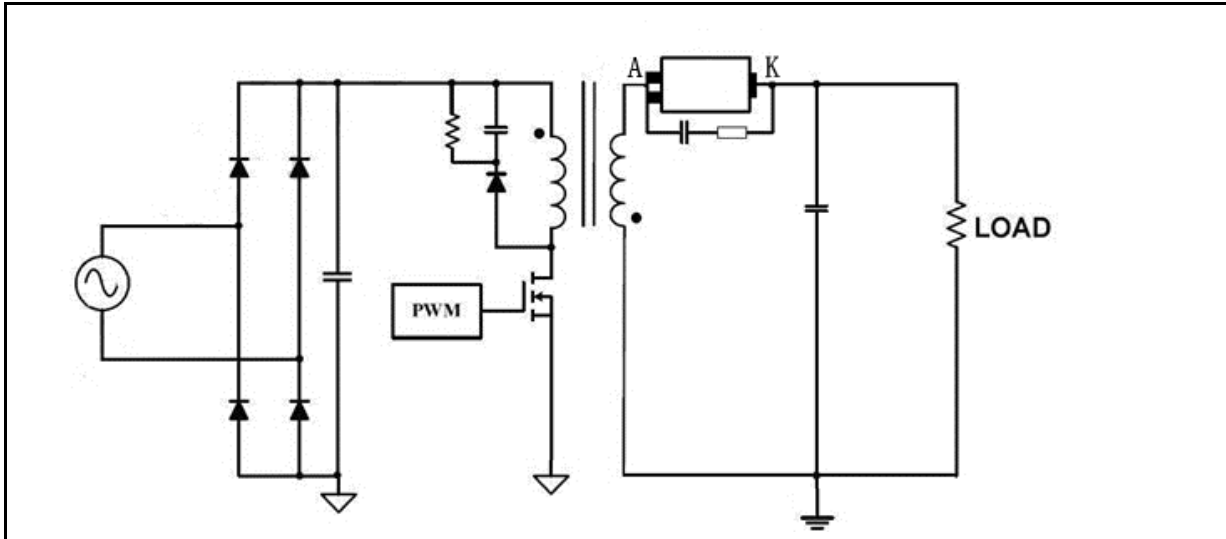
· **Caution!**

Make sure the working voltage of the IC is lower than its breakdown voltage (V_{BVDSS}).

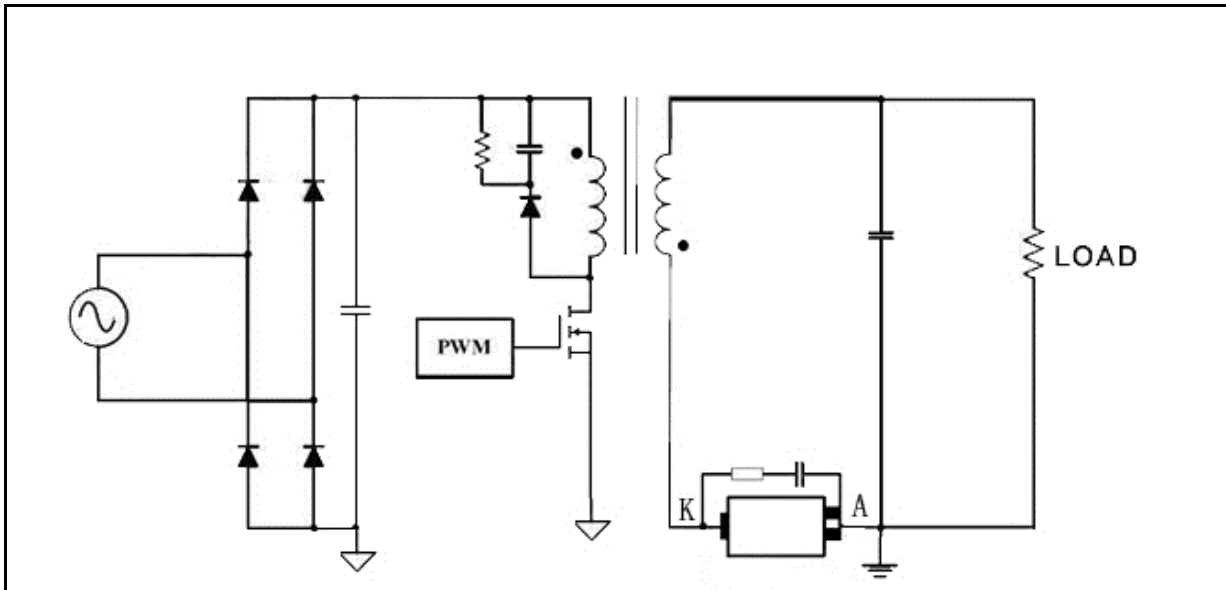
Make sure the IC works with the operating range, specially the working temperature could not be higher than Operating Junction Temperature.

Typical Application

1. High side

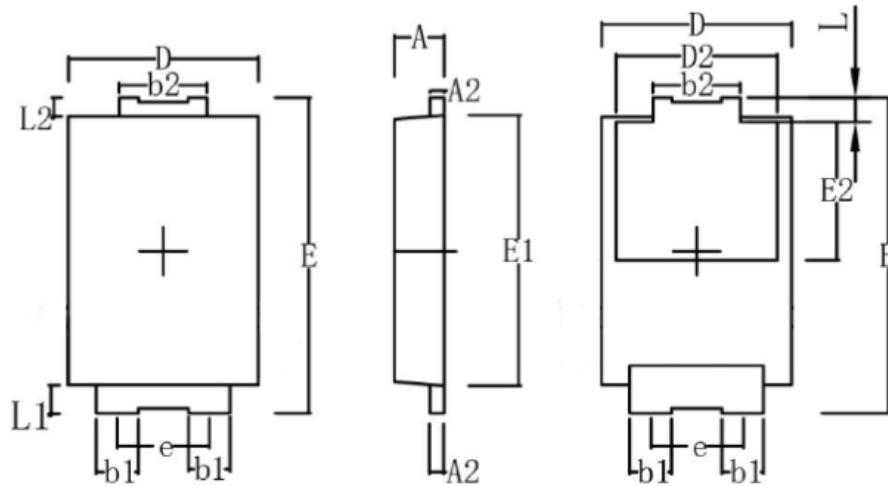


2. Low side



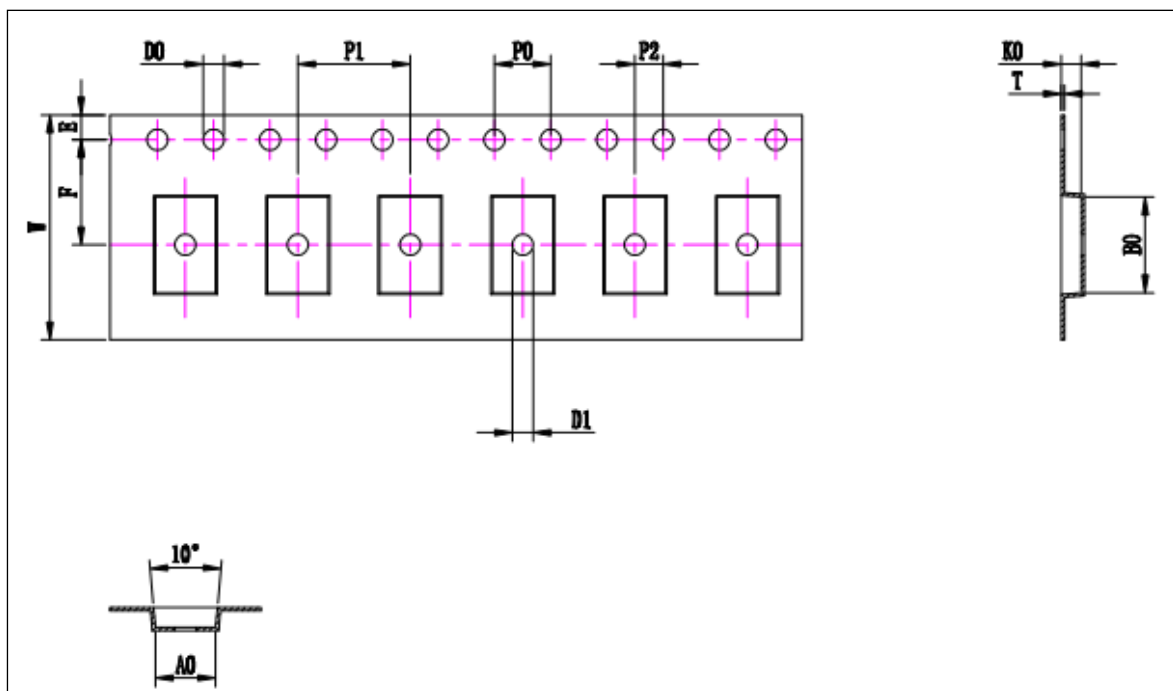
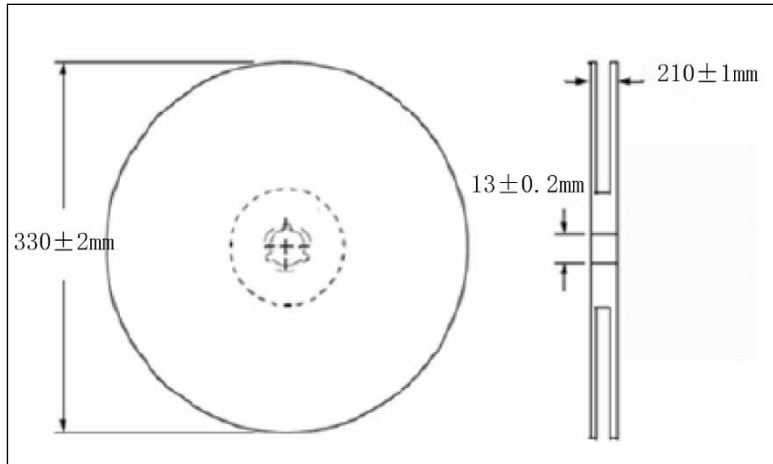
Package and Packing Information

1. SM-7 Package



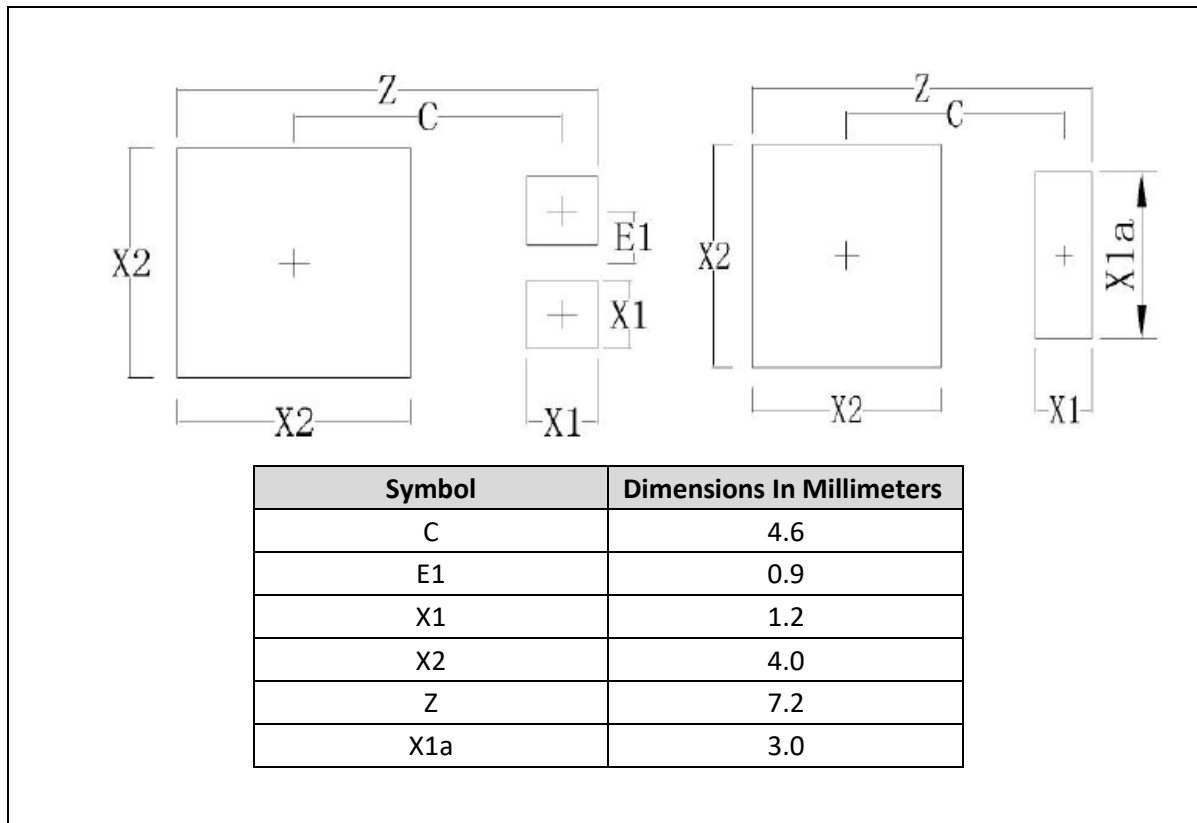
Symbol	Dimensions In Millimeters		
	Min	Nom	Max
A	1.2	1.3	1.4
A2	0.25	0.3	0.35
b1	0.8	0.9	1.0
b2	1.8	1.9	2.0
D	4.0	4.15	4.3
D2		3.2	
E	6.4	6.5	6.6
e		1.8	
E1	5.5	5.65	5.8
E2		2.5	
L	0.8	0.9	1.0
L1	0.3	0.4	0.5
L2	0.3	0.4	0.5

2. Packing Information: 5K/reel




Symbol	A0	B0	K0	P0	P1	W
SPEC (mm)	4.30 ± 0.1	6.8 ± 0.1	1.4 ± 0.1	4.00 ± 0.1	8.00 ± 0.1	16.00 ± 0.3
Symbol	P2	T	E	F	D0	D1
SPEC (mm)	2.00 ± 0.1	0.25 ± 0.05	1.75 ± 0.1	7.50 ± 0.1	$1.50 \pm 0.1 / -0$	$1.50 \pm 0.1 / -0$

3. Welding Specification Reference



WARNING!



ESD SENSITIVE DEVICE

Caution: This product is a static sensitive component, please pay a attention to protect! The scope of ESD damage can be extended from minor performance to equipment failure. Precision IC may be damaged, which may result in component parameters not meeting the published specifications.

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