

# SPECIFICATION

## 1. DESCRIPTION

DK5V45R20 is a synchronous rectifying IC with 20mΩ /45V NMOS and synchronous rectification control IC integrated. It is suitable for flyback switch mode power supply of up to 5V /2.5A. Efficiency increased by 4-5% and temperature decreased by up to 50% compared with normal Schottky Barrier Diode, or more than 2% efficiency increase and 20% temperature decrease compared with low VF diode.

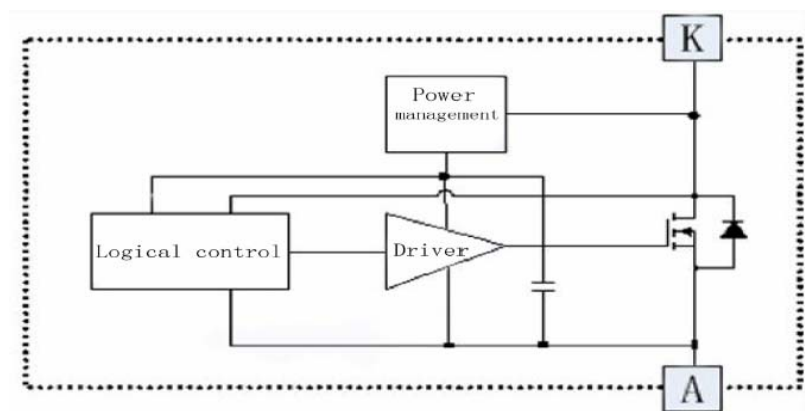
## 2. APPLICATIONS

- Flyback power adapters
- Flyback power converter

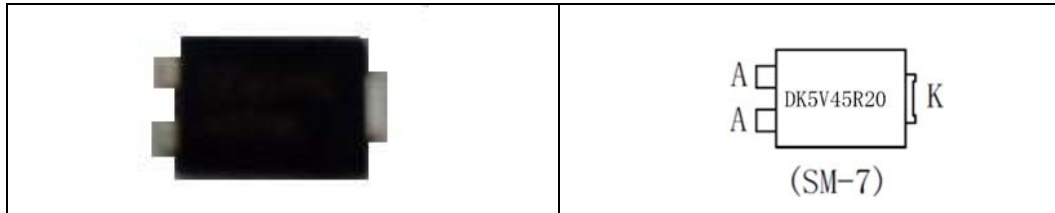
## 3. MAIN FEATURES

- High efficiency, Low temperature
- Synchronous rectification, support DCM and QR mode flyback system
- Internal integrated 20mΩ /45V NMOS
- Self-power supply design, no need for external winding power supply
- Self-detection, no need for external synchronous signal
- Only 2 poles (A-K), can directly replace Schottky Barrier Diode

## 4. FUNCTIONAL STRUCTURE



## 5. CONNECTION DIAGRAM (SM-7)



### PIN FUNCTION:

| Pin Name | Function                       |
|----------|--------------------------------|
| K        | Same as negative pole of Diode |
| A        | Same as positive pole of Diode |

## 6. ABSOLUTE MAXIMUM RATINGS

| Parameter                  | Value     | Unit  |
|----------------------------|-----------|-------|
| P,N reverse voltage        | 45        | V     |
| Operating temperature      | -25--+120 | °C    |
| Storage temperature        | -55--+155 | °C    |
| Lead soldering temperature | +280      | °C/5S |

## 7. ELECTRICAL CHARACTERISTIC

TA=25°C

| Item                         | Symbol   | Condition            | Min  | Typ | Max | Unit |
|------------------------------|----------|----------------------|------|-----|-----|------|
| Power MOS turn-on voltage    | Von      | N point tested first | -230 |     |     | mV   |
| Power MOS turn-on delay      | Tdon     |                      |      |     | 150 | ns   |
| Power MOS turn-off delay     | Tdoff    |                      |      |     | 50  | ns   |
| Power MOS turn-on resistance | Rdson    |                      | 15   |     | 20  | mΩ   |
| Peak current                 | Ipeak    |                      |      |     | 60  | A    |
| Breakdown voltage            | Vbr      |                      | 40   | 45  | 50  | V    |
| VCC start-up voltage         | VCC_on   |                      |      | 5   |     | V    |
| VCC Reset/Recovery voltage   | VCC_uvlo |                      |      | 4   |     | V    |
| VCC voltage                  |          |                      |      | 11  |     | V    |

## 8. OPERATION PRINCIPLE

### 8.1 Self-Power Supply Circuit (National patent owned)

There is self-power supply circuit with capacitor inside the IC, which can drive the IC and MOS without external winding power supply.

### 8.2 Start Up

With K pole voltage is lower than A pole, self-power supply circuit will support the power of VCC, VCC voltage increases. If VCC voltage is lower than start up voltage VCC<sub>on</sub>, internal MOS is off. When VCC voltage is higher than VCC<sub>on</sub>, start up mode finished. When VCC voltage is lower than VCC<sub>uvlo</sub>, IC returns to start up mode again.

### 8.3 Power MOS control

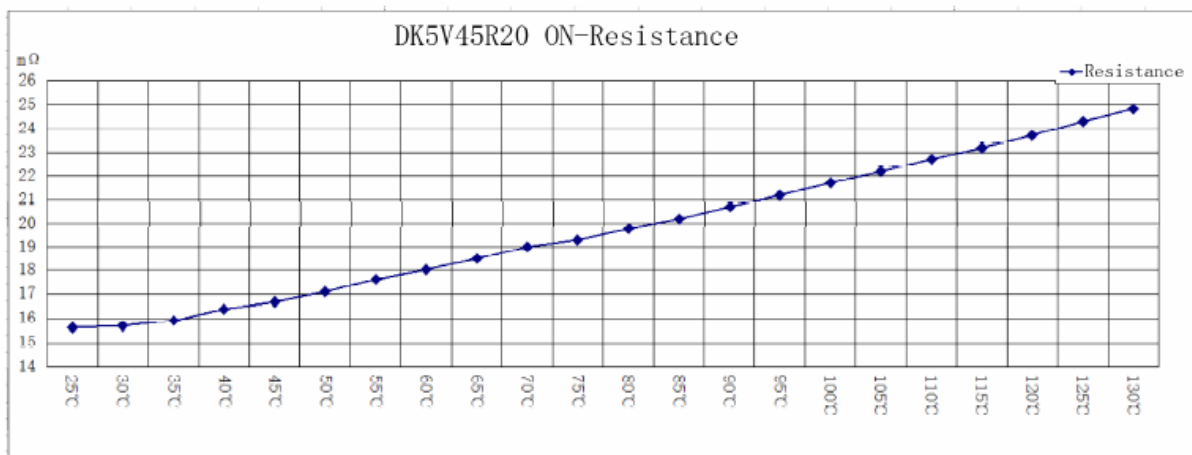
If the detected voltage of forward rectification between A and K is higher than V<sub>on</sub>, MOS open. If the detected current through MOS is decreasing and reaches 0, voltage of forward rectification between A and K is 0, and MOS will be closed.

### 8.4 RC absorbing circuit

In status of starting up, output short circuit, over input voltage and CCM modes, there will be peak voltage, as to avoid the breaking of MOS, can add RC absorbing circuit between A and K, so that the peak voltage on N can be reduced.

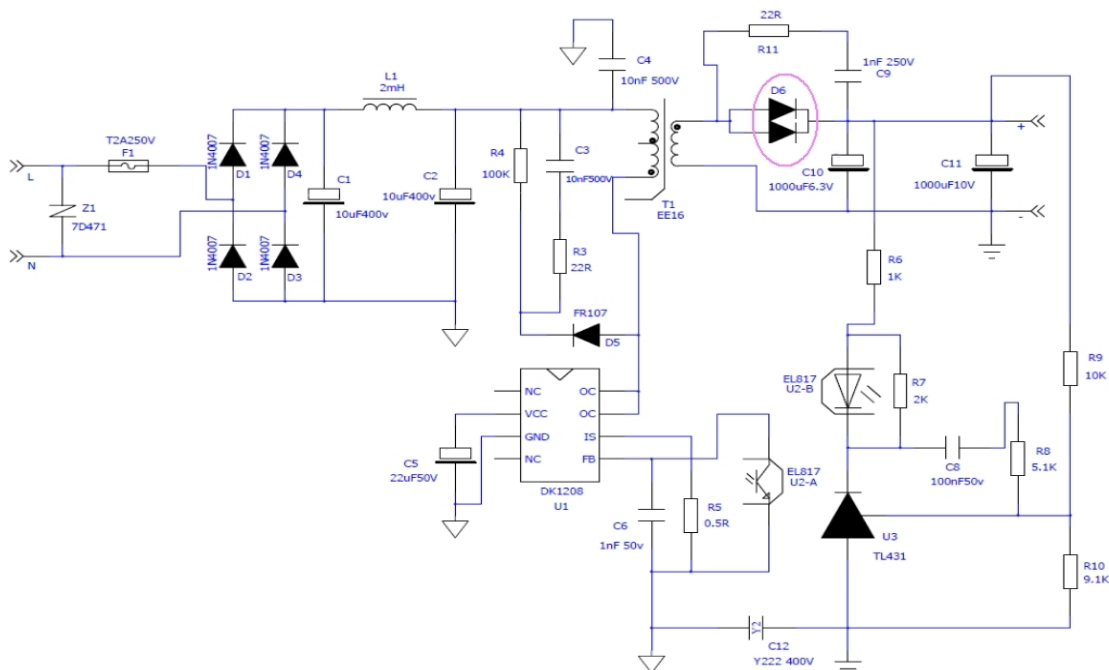
### 8.5 On-Resistance

During operation, internal resistance increases together with the temperature, efficiency decreases accordingly. It is better to enlarge the heat releasing area so that the IC temperature can be decreased.



### 8.6 Comparison of efficiency (with diode model 10V45)

When in the same PCB, as below showed, we use DK5V45R20 and 10V45 on position of D6, get the different result as below:

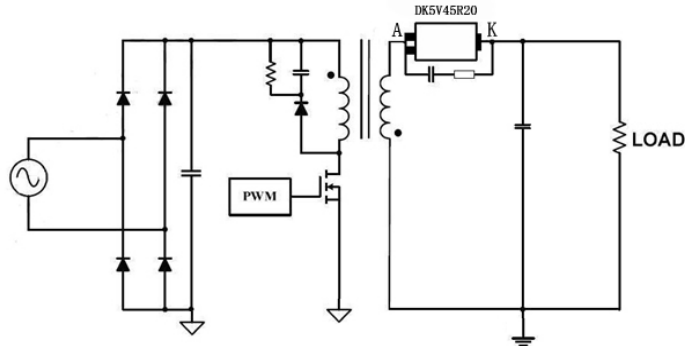


| DEMO designed with DIODE 10V45 |          |        |            |                    |                     |
|--------------------------------|----------|--------|------------|--------------------|---------------------|
| Vin115V, 60HZ.                 |          |        |            | Average Efficiency | Energy Star Level 6 |
|                                | Vout (V) | Pin(W) | Efficiency |                    |                     |
| No load                        | 5.22     | 0.03   |            | 0.03               | <0.1W               |
| 0.6                            | 5.22     | 3.78   | 82.86%     | 83.04%             | 80.20%              |
| 1.2                            | 5.22     | 7.5    | 83.52%     |                    |                     |
| 1.8                            | 5.22     | 11.25  | 83.52%     |                    |                     |
| 2.4                            | 5.22     | 15.23  | 82.26%     |                    |                     |
| Vin230V, 50HZ.                 |          |        |            | Average Efficiency | Energy Star Level 6 |
|                                | Vout (V) | Pin(W) | Efficiency |                    |                     |
| No load                        | 5.22     | 0.05   |            | 0.05               | <0.1W               |
| 0.6                            | 5.22     | 3.77   | 83.08%     | 84.10%             | 80.20%              |
| 1.2                            | 5.22     | 7.44   | 84.19%     |                    |                     |
| 1.8                            | 5.22     | 11.1   | 84.65%     |                    |                     |
| 2.4                            | 5.22     | 14.83  | 84.48%     |                    |                     |

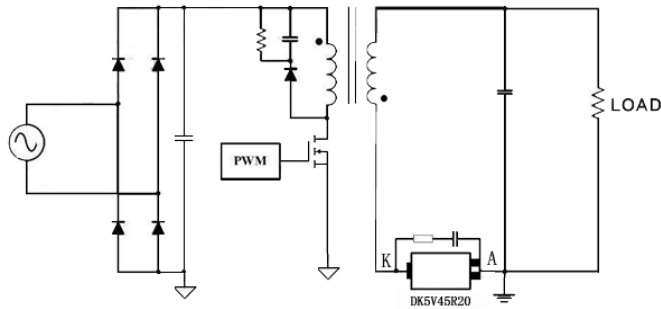
| DEMO designed with DK5V45R20 |         |        |            |                    |                     |
|------------------------------|---------|--------|------------|--------------------|---------------------|
| Vin115V, 60HZ.               |         |        |            | Average Efficiency | Energy Star Level 6 |
|                              | Vout(V) | Pin(W) | Efficiency |                    |                     |
| No load                      | 5.22    | 0.02   |            | 0.02               | <0.1W               |
| 0.6                          | 5.22    | 3.63   | 86.28%     | 86.70%             | 80.20%              |
| 1.2                          | 5.22    | 7.2    | 87.00%     |                    |                     |
| 1.8                          | 5.22    | 10.77  | 87.24%     |                    |                     |
| 2.4                          | 5.22    | 14.52  | 86.28%     |                    |                     |
| Vin230V, 50HZ.               |         |        |            | Average Efficiency | Energy Star Level 6 |
|                              | Vout(V) | Pin(W) | Efficiency |                    |                     |
| No load                      | 5.22    | 0.04   |            | 0.04               | <0.1W               |
| 0.6                          | 5.22    | 3.64   | 86.04%     | 87.08%             | 80.20%              |
| 1.2                          | 5.22    | 7.2    | 87.00%     |                    |                     |
| 1.8                          | 5.22    | 10.72  | 87.65%     |                    |                     |
| 2.4                          | 5.22    | 14.3   | 87.61%     |                    |                     |

## 9. TYPICAL APPLICATION

**Forward rectification:**



**Reverse rectification:**



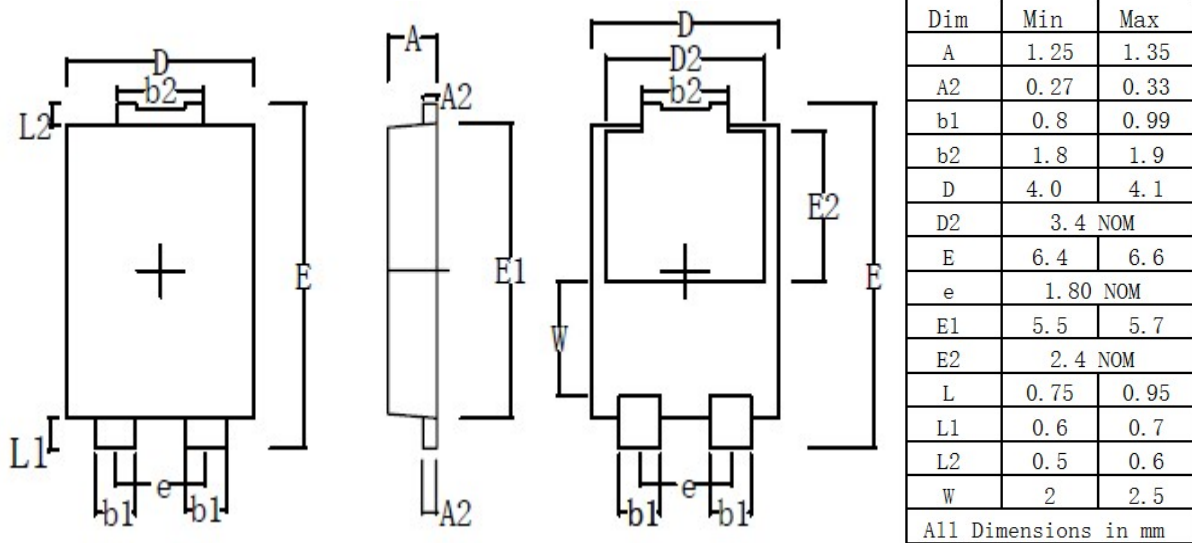
## 10. SPECIAL NOTICE FOR PBC LAYOUT DESIGN

**10.1** Must take care and make sure the working voltage of the IC is lower than its breakdown voltage.

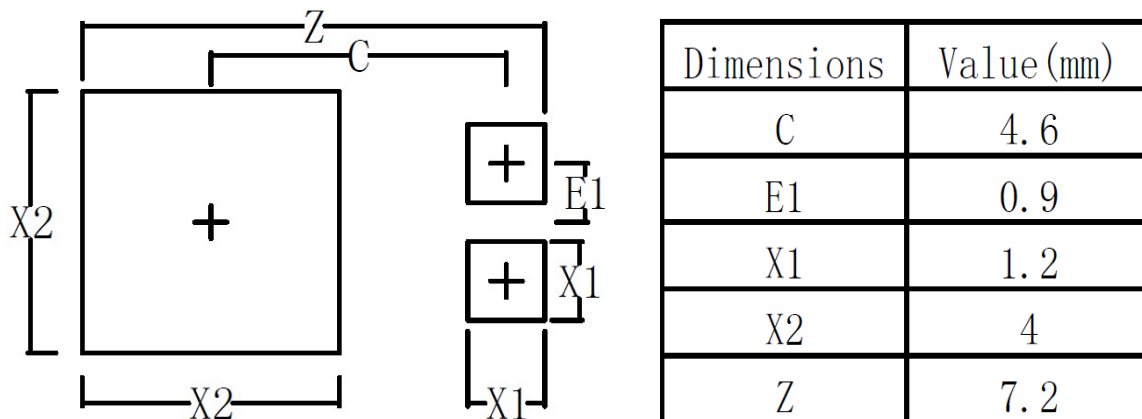
**10.2** Take care of the IC temperature in use, to make sure that the working temp. is not higher than its limit.

**10.3** When directly replace the PSR model of 10V45, output voltage will increase 0.2-0.4V, this voltage is same as the turn-on voltage drop in original diode, output power will increase. User should consider and decide whether to low down the output voltage.

## 11. MECHANICAL AND PACKING INFORMATION



Soldering specification reference:



Reel package: 5K/reel

