



# SK07N65B

## 650V N-ch Planar MOSFET

### General Features

- RoHS Compliant
- $R_{DS(ON),typ.}=1.2\ \Omega @V_{GS}=10V$
- Low Gate Charge Minimize Switching Loss
- Fast Recovery Body Diode

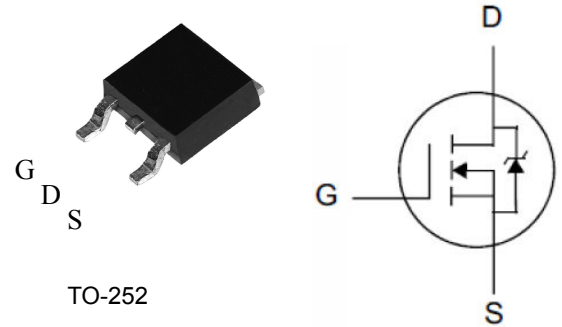
### Applications

- Adaptor
- Charger
- SMPS Standby Power

### Ordering Information

| Part Number | Package |
|-------------|---------|
| SK07N65B    | TO-252  |

| $BV_{DSS}$ | $R_{DS(ON),Typ.}$ | $I_D$ |
|------------|-------------------|-------|
| 650V       | 1.2 $\Omega$      | 7.0A  |



### Absolute Maximum Ratings

$T_C=25^{\circ}C$  unless otherwise specified

| Symbol             | Parameter                                                                                                        | SK07N65B   | Unit           |
|--------------------|------------------------------------------------------------------------------------------------------------------|------------|----------------|
| $V_{DSS}$          | Drain-to-Source Voltage                                                                                          | 650        | V              |
| $V_{GSS}$          | Gate-to-Source Voltage                                                                                           | $\pm 30$   |                |
| $I_D$              | Continuous Drain Current                                                                                         | 7.0        | A              |
| $I_{DM}$           | Pulsed Drain Current at $V_{GS}=10V$                                                                             | 28         |                |
| $E_{AS}$           | Single Pulse Avalanche Energy                                                                                    | 550        | mJ             |
| $P_D$              | Power Dissipation                                                                                                | 126        | W              |
|                    | Derating Factor above $25^{\circ}C$                                                                              | 1.0        | W/ $^{\circ}C$ |
| $T_L$<br>$T_{PAK}$ | Maximum Temperature for Soldering Leads at 0.063in (1.6mm) from Case for 10 seconds, Package Body for 10 seconds | 300<br>260 | $^{\circ}C$    |
| $T_J$ & $T_{STG}$  | Operating and Storage Temperature Range                                                                          | -55 to 150 |                |

Caution: Stresses greater than those listed in the "Absolute Maximum Ratings" may cause permanent damage to the device.

### Thermal Characteristics

| Symbol          | Parameter                               | SK07N65B | Unit          |
|-----------------|-----------------------------------------|----------|---------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case    | 0.99     | $^{\circ}C/W$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient | 75       |               |



## Electrical Characteristics

### OFF Characteristics

$T_J = 25^\circ\text{C}$  unless otherwise specified

| Symbol     | Parameter                         | Min. | Typ. | Max. | Unit    | Test Conditions                                            |
|------------|-----------------------------------|------|------|------|---------|------------------------------------------------------------|
| $BV_{DSS}$ | Drain-to-Source Breakdown Voltage | 650  | --   | --   | V       | $V_{GS}=0V$ , $I_D=250\mu A$                               |
| $I_{DSS}$  | Drain-to-Source Leakage Current   | --   | --   | 1    | $\mu A$ | $V_{DS}=650V$ , $V_{GS}=0V$                                |
|            |                                   | --   | --   | 100  |         | $V_{DS}=520V$ , $V_{GS}=0V$ ,<br>$T_J = 125^\circ\text{C}$ |
| $I_{GSS}$  | Gate-to-Source Leakage Current    | --   | --   | +100 | nA      | $V_{GS}=+30V$ , $V_{DS}=0V$                                |
|            |                                   | --   | --   | -100 |         | $V_{GS}=-30V$ , $V_{DS}=0V$                                |

### ON Characteristics

$T_J = 25^\circ\text{C}$  unless otherwise specified

| Symbol       | Parameter                            | Min. | Typ. | Max. | Unit     | Test Conditions                  |
|--------------|--------------------------------------|------|------|------|----------|----------------------------------|
| $R_{DS(ON)}$ | Static Drain-to-Source On-Resistance | --   | 1.2  | 1.40 | $\Omega$ | $V_{GS}=10V$ , $I_D=3.5A$        |
| $V_{GS(TH)}$ | Gate Threshold Voltage               | 2.0  | --   | 4.0  | V        | $V_{DS}=V_{GS}$ , $I_D=250\mu A$ |
| gfs          | Forward Transconductance             | --   | 11   | --   | S        | $V_{DS}=30V$ , $I_D=3.5A$        |

### Dynamic Characteristics

Essentially independent of operating temperature

| Symbol    | Parameter                     | Min. | Typ. | Max. | Unit | Test Conditions                                   |
|-----------|-------------------------------|------|------|------|------|---------------------------------------------------|
| $C_{iss}$ | Input Capacitance             | --   | 1120 | --   | pF   | $V_{GS}=0V$ ,<br>$V_{DS}=25V$ ,<br>$f=1.0MHz$     |
| $C_{rss}$ | Reverse Transfer Capacitance  | --   | 10   | --   |      |                                                   |
| $C_{oss}$ | Output Capacitance            | --   | 90   | --   |      |                                                   |
| $Q_g$     | Total Gate Charge             | --   | 20   | --   | nC   | $V_{DD}=325V$ ,<br>$I_D=7A$ , $V_{GS}=0$ to $10V$ |
| $Q_{gs}$  | Gate-to-Source Charge         | --   | 5    | --   |      |                                                   |
| $Q_{gd}$  | Gate-to-Drain (Miller) Charge | --   | 5    | --   |      |                                                   |

### Resistive Switching Characteristics

Essentially independent of operating temperature

| Symbol       | Parameter           | Min. | Typ. | Max. | Unit | Test Conditions                                                    |
|--------------|---------------------|------|------|------|------|--------------------------------------------------------------------|
| $t_{d(ON)}$  | Turn-on Delay Time  | --   | 12   | --   | ns   | $V_{DD}=325V$ ,<br>$I_D=7A$ ,<br>$V_{GS}=10V$ ,<br>$R_g=4.7\Omega$ |
| $t_{rise}$   | Rise Time           | --   | 12   | --   |      |                                                                    |
| $t_{d(OFF)}$ | Turn-Off Delay Time | --   | 18   | --   |      |                                                                    |
| $t_{fall}$   | Fall Time           | --   | 10   | --   |      |                                                                    |



## SK07N65B

### Source-Drain Body Diode Characteristics

$T_J=25^{\circ}\text{C}$  unless otherwise specified

| Symbol   | Parameter                                | Min | Typ. | Max. | Unit | Test Conditions                                                         |
|----------|------------------------------------------|-----|------|------|------|-------------------------------------------------------------------------|
| $I_{SD}$ | Continuous Source Current <sup>[2]</sup> | --  | --   | 7.0  | A    | Integral pn-diode<br>in MOSFET                                          |
| $I_{SM}$ | Pulsed Source Current <sup>[2]</sup>     | --  | --   | 28   |      |                                                                         |
| $V_{SD}$ | Diode Forward Voltage                    | --  | --   | 1.5  | V    | $I_S=7\text{A}$ , $V_{GS}=0\text{V}$                                    |
| $t_{rr}$ | Reverse Recovery Time                    | --  | 350  | --   | ns   | $V_{GS}=0\text{V}$<br>$I_F=7\text{A}$ , $di/dt=100\text{A}/\mu\text{s}$ |
| $Q_{rr}$ | Reverse Recovery Charge                  | --  | 1.1  | --   | uC   |                                                                         |

**Note:** [1]  $T_J=+25^{\circ}\text{C}$  to  $+150^{\circ}\text{C}$   
[2] Pulse width $\leq 380\mu\text{s}$ ; duty cycles $\leq 2\%$ .

## Typical Characteristics

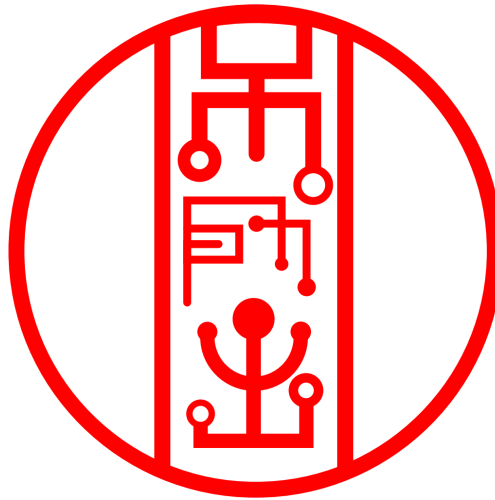


Figure 2 . Max. Power Dissipation vs Case Temperature

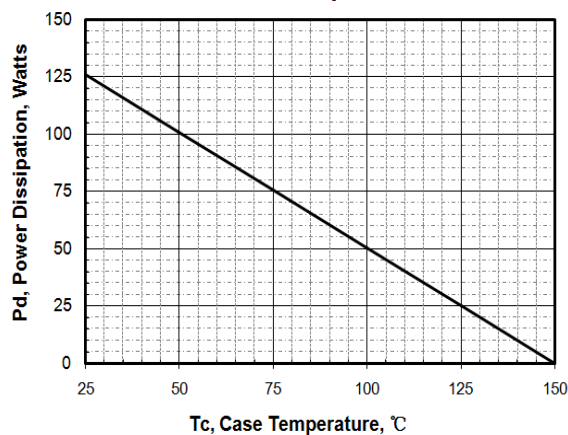


Figure 3. Maximum Continuous Drain Current vs Case Temperature

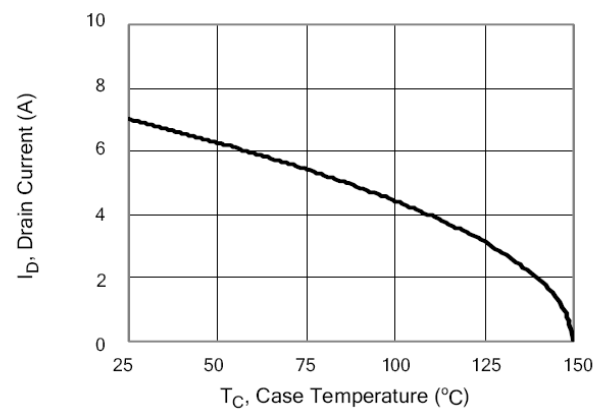


Figure 4. Typical Output Characteristics

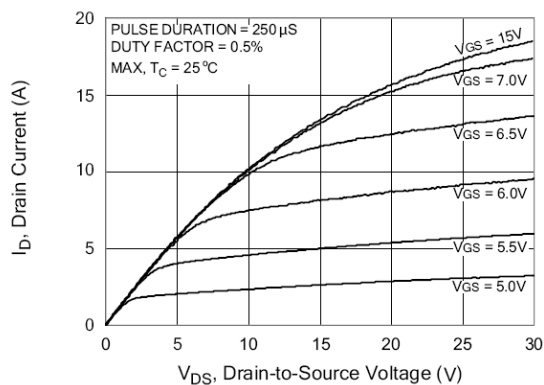
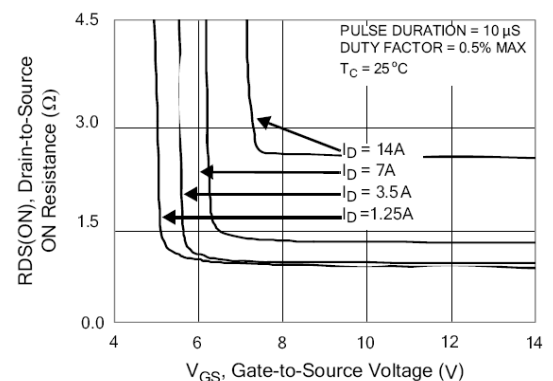


Figure 5. Typical Drain-to-Source ON Resistance vs Gate Voltage and Drain Current



## Typical Characteristics(Cont.)

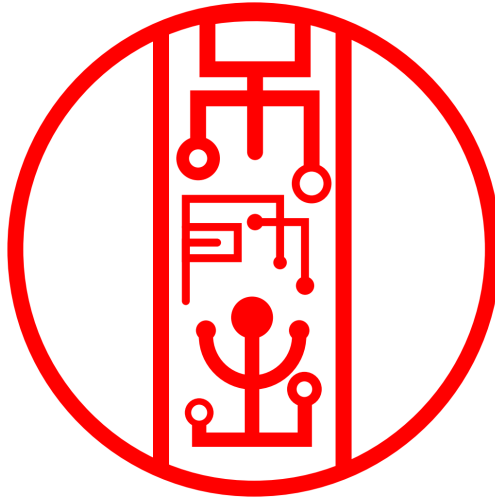


Figure 7. Typical Transfer Characteristics

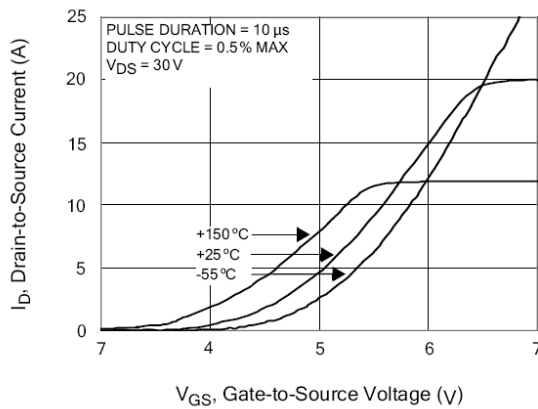


Figure 8. Unclamped Inductive Switching Capability

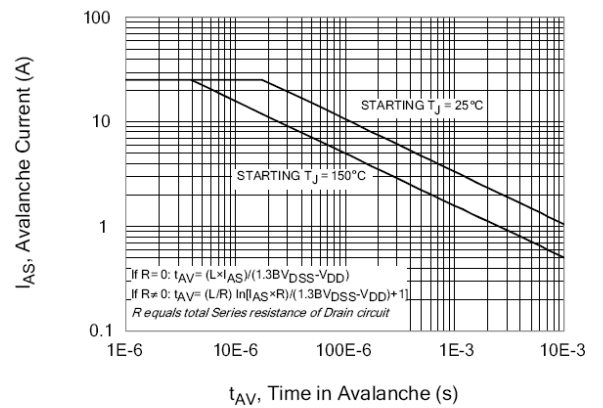


Figure 9. Typical Drain-to-Source ON Resistance vs Drain Current

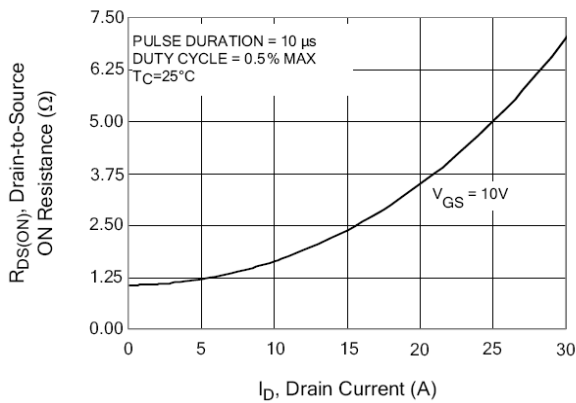
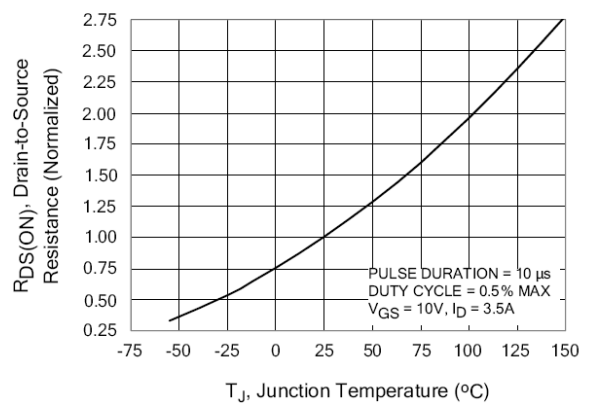


Figure 10. Typical Drain-to-Source ON Resistance vs Junction Temperature



## Typical Characteristics(Cont.)

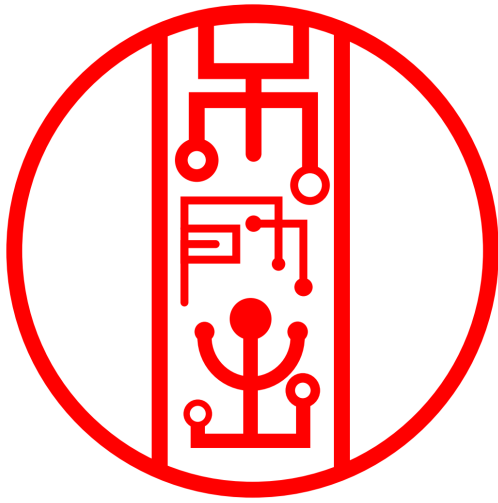


Figure 13 . Maximum Safe Operating Area

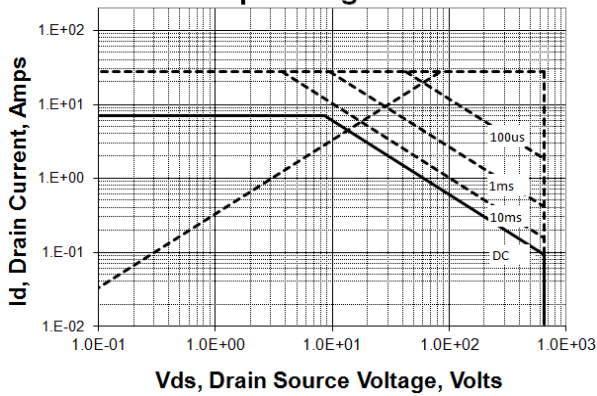


Figure 15 . Typical Gate Charge

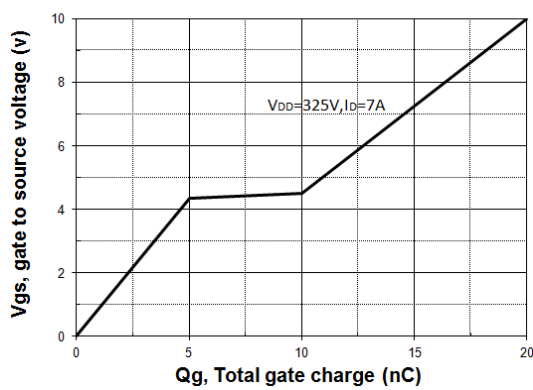


Figure 12. Typical Threshold Voltage vs Junction Temperature

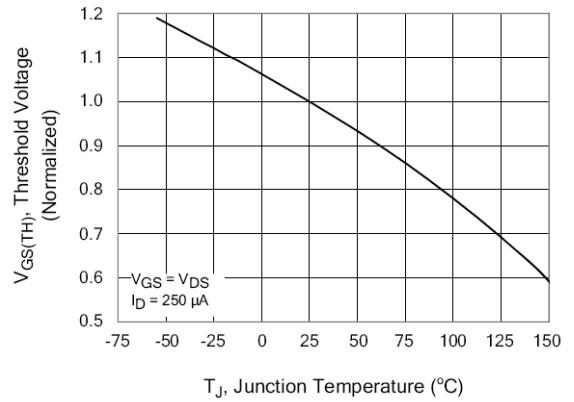


Figure 14. Capacitance vs Vds

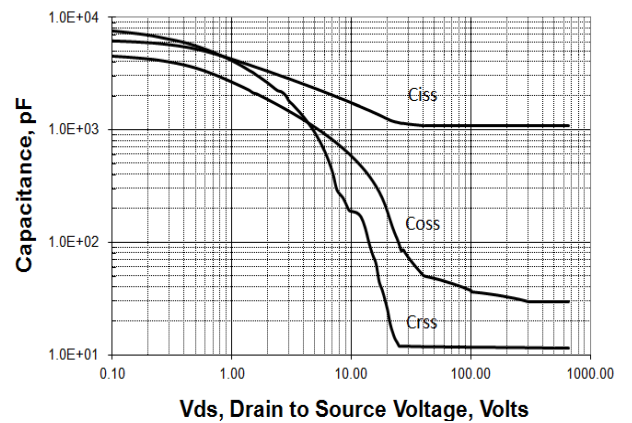
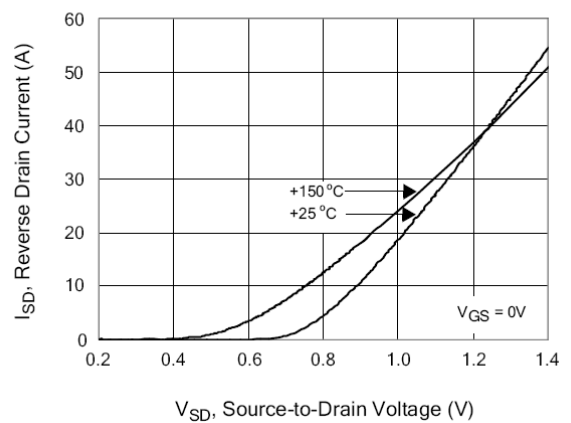


Figure 16. Typical Body Diode Transfer Characteristics



## Test Circuits and Waveforms

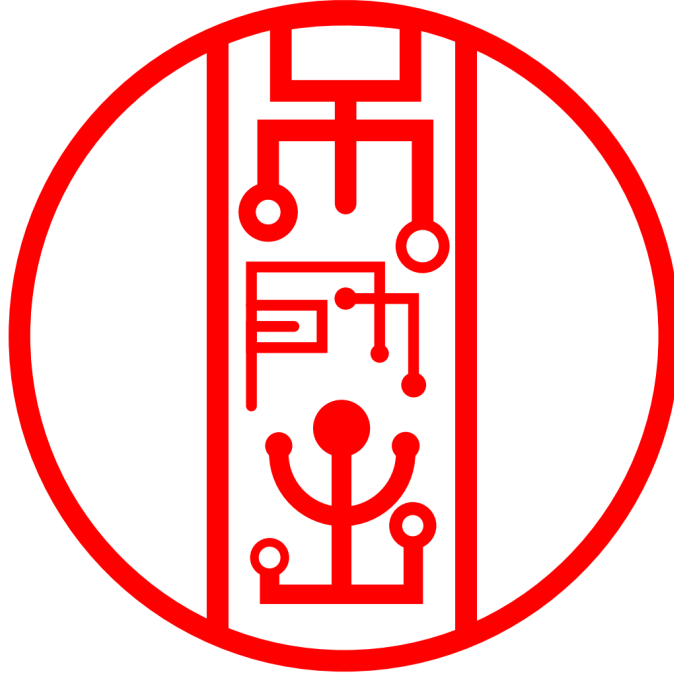


Fig. 1.1 Peak Diode Recovery dv/dt Test Circuit

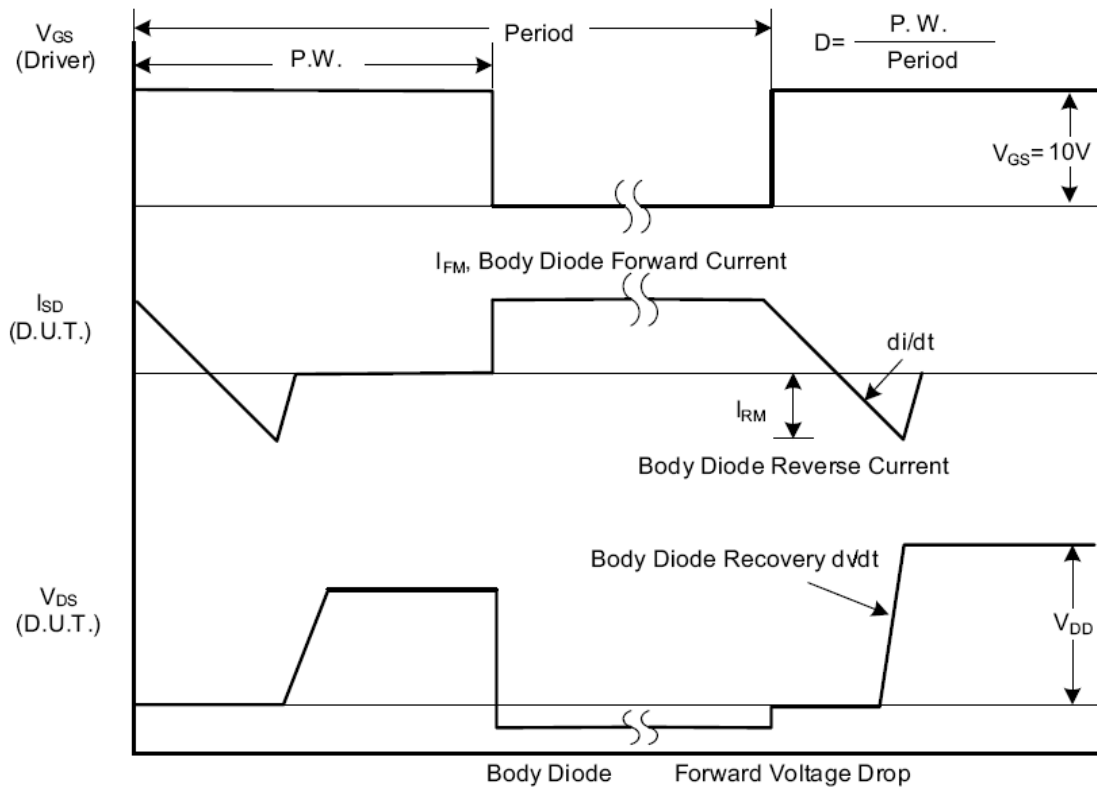


Fig. 1.2 Peak Diode Recovery dv/dt Waveforms

## Test Circuits and Waveforms (Cont.)

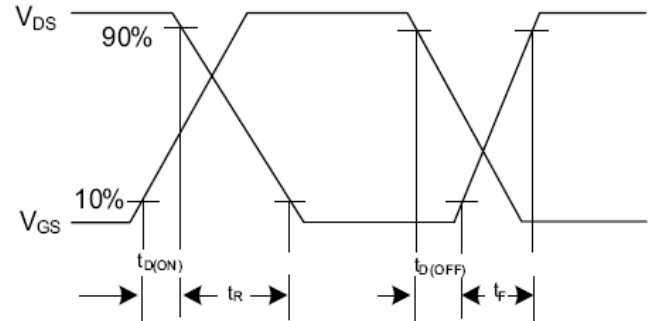
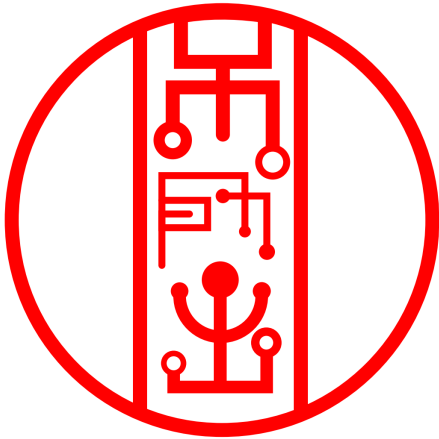


Fig. 2.2 Switching Waveforms

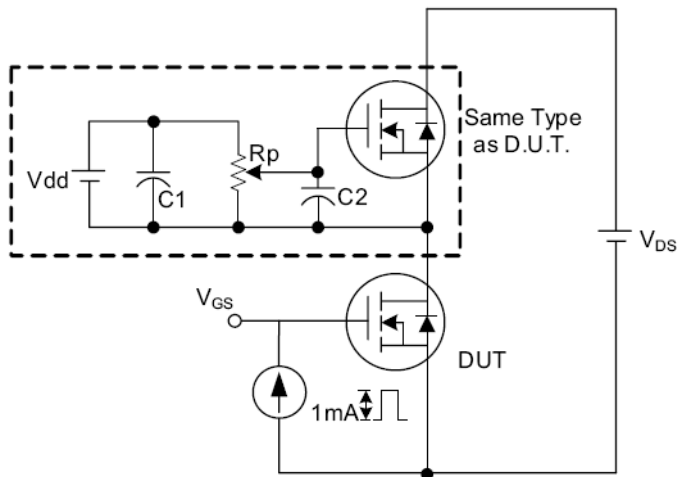


Fig. 3.1 Gate Charge Test Circuit

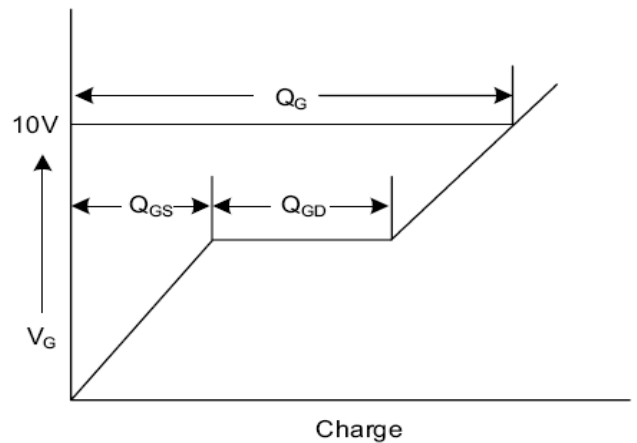


Fig. 3.2 Gate Charge Waveform

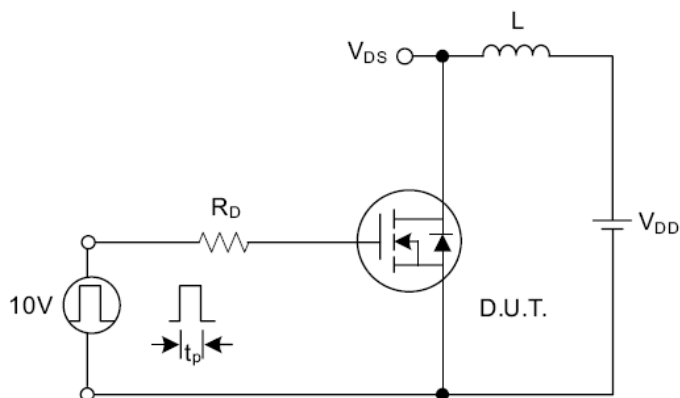


Fig. 4.1 Unclamped Inductive Switching Test Circuit

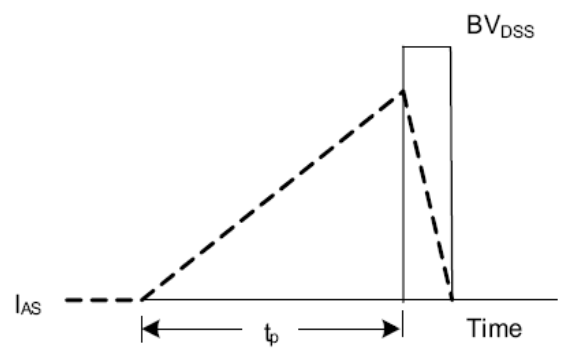
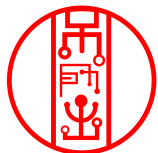


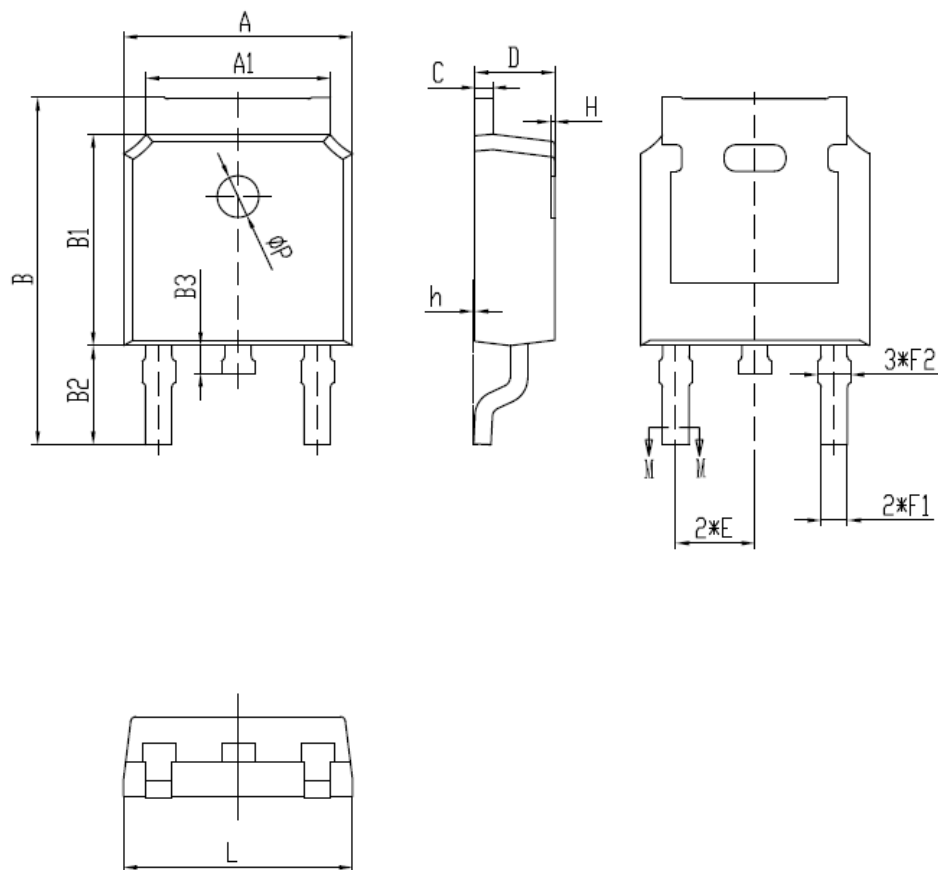
Fig. 4.2 Unclamped Inductive Switching Waveforms



# SK07N65B

## PACKAGE OUTLINE

TO-252



| Symbol | Dimensions In Millimeters |       |
|--------|---------------------------|-------|
|        | MIN                       | MAX   |
| A      | 6.50                      | 6.70  |
| A1     | 5.16                      | 5.46  |
| B      | 9.77                      | 10.17 |
| B1     | 6.00                      | 6.20  |
| B2     | 2.60                      | 3.00  |
| B3     | 0.70                      | 0.90  |
| C      | 0.45                      | 0.61  |
| D      | 2.20                      | 2.40  |
| E      | 2.186                     | 2.386 |
| F1     | 0.67                      | 0.87  |
| F2     | 0.76                      | 0.96  |
| H      | 0.00                      | 0.30  |
| h      | 0.00                      | 0.127 |
| L      | 6.50                      | 6.70  |
| Φ P    | 1.10                      | 1.30  |