KODENSHI AUK

# SMK830P

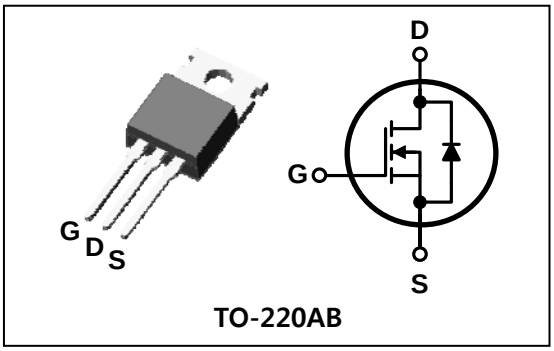
**Advanced N-Ch Power MOSFET**

SWITCHING REGULATOR APPLICATIONS

## Features

- High Voltage : $BV_{DSS}$=500V(Min.)
- Low $C_{rss}$ : $C_{rss}$=33pF(Typ.)
- Low gate charge : Qg=16nC(Typ.)
- Low $R_{DS(on)}$ : $R_{DS(on)}$=1.5Ω(Max.)

## PIN Connection

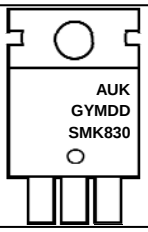



TO-220AB

## Ordering Information

| Type No. | Marking | Package Code |
|---|---|---|
| SMK830P | SMK830 | TO-220AB |

## Marking Diagram




Column 1 : Manufacturer

Column 2 : Production Information
e.g.) GYMDD
-. G : Factory Management Code
-. YMDD : Date Code (Year, Month, Date)

Column 3 : Device Code

## Absolute maximum ratings ($T_C$=25°C unless otherwise noted)

| Characteristic | | Symbol | | Rating | Unit |
|---|---|---|---|---|---|
| Drain-source voltage | | $V_{DSS}$ | | 500 | V |
| Gate-source voltage | | $V_{GSS}$ | | ±30 | V |
| Drain current (DC) * | | $I_D$ | $T_C$=25°C | 4.5 | A |
| | | | $T_C$=100°C | 2.9 | A |
| Drain current (Pulsed) * | | $I_{DM}$ | | 18 | A |
| Power dissipation | | $P_D$ | | 70 | W |
| Avalanche current (Single) | ② | $I_{AS}$ | | 4.5 | A |
| Single pulsed avalanche energy | ② | $E_{AS}$ | | 250 | mJ |
| Avalanche current (Repetitive) | ① | $I_{AR}$ | | 4.5 | A |
| Repetitive avalanche energy | ① | $E_{AR}$ | | 5.0 | mJ |
| Junction temperature | | $T_J$ | | 150 | °C |
| Storage temperature range | | $T_{stg}$ | | -55~150 | |

* Limited by maximum junction temperature

| Characteristic | | Symbol | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Thermal resistance | Junction-case | $R_{th(J-C)}$ | - | 1.78 | °C/W |
| | Junction-ambient | $R_{th(J-A)}$ | - | 62.5 | |

## Electrical Characteristics ($T_C$=25°C unless otherwise noted)

| Characteristic | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Drain-source breakdown voltage | $BV_{DSS}$ | $I_D$=250uA, $V_{GS}$=0V | 500 | - | - | V |
| Gate threshold voltage | $V_{GS(th)}$ | $I_D$=250uA, $V_{DS}$=$V_{GS}$ | 2.0 | - | 4.0 | V |
| Drain-source cut-off current | $I_{DSS}$ | $V_{DS}$=500V, $V_{GS}$=0V | - | - | 1 | uA |
| Gate leakage current | $I_{GSS}$ | $V_{DS}$=0V, $V_{GS}$=±30V | - | - | ±100 | nA |
| Drain-source on-resistance ④ | $R_{DS(on)}$ | $V_{GS}$=10V, $I_D$=2.25A | - | 1.2 | 1.5 | Ω |
| Forward transfer conductance ④ | $g_{fs}$ | $V_{DS}$=10V, $I_D$=2.25A | - | 5.2 | - | S |
| Input capacitance | $C_{iss}$ | $V_{GS}$=0V, $V_{DS}$=25V f=1 MHz | - | 745 | 930 | pF |
| Output capacitance | $C_{oss}$ | | - | 82 | 102 | |
| Reverse transfer capacitance | $C_{rss}$ | | - | 33 | 42 | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD}$=250V, $I_D$=4.5A $R_G$=25Ω ③④ | - | 12 | - | ns |
| Rise time | $t_r$ | | - | 46 | - | |
| Turn-off delay time | $t_{d(off)}$ | | - | 50 | - | |
| Fall time | $t_f$ | | - | 48 | - | |
| Total gate charge | $Q_g$ | $V_{DS}$=400V, $V_{GS}$=10V $I_D$=4.5A ③④ | - | 16 | 20 | nC |
| Gate-source charge | $Q_{gs}$ | | - | 5.5 | - | |
| Gate-drain charge | $Q_{gd}$ | | - | 4.0 | - | |

## Source-Drain Diode Ratings and Characteristics ($T_C$=25°C unless otherwise noted)

| Characteristic | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Source current (DC) | $I_S$ | Integral reverse diode in the MOSFET | - | - | 4.5 | A |
| Source current (Pulsed) ① | $I_{SM}$ | | - | - | 18 | |
| Forward voltage ④ | $V_{SD}$ | $V_{GS}$=0V, $I_S$=4.5A | - | - | 1.4 | V |
| Reverse recovery time | $t_{rr}$ | $I_S$=4.5A, $V_{GS}$=0V $dI_F/dt$=100A/us | - | 263 | - | ns |
| Reverse recovery charge | $Q_{rr}$ | | - | 1.9 | - | uC |

Note ;

① Repetitive rating : Pulse width limited by maximum junction temperature

② L=22.2mH, $I_{AS}$=4.5A, $V_{DD}$=50V, $R_G$=25Ω, Starting $T_J$=25°C

③ Pulse Test : Pulse width≤300us, Duty cycle≤2%

④ Essentially independent of operating temperature

## Electrical Characteristic Curves

**Fig. 1 $I_D$ - $V_{DS}$**

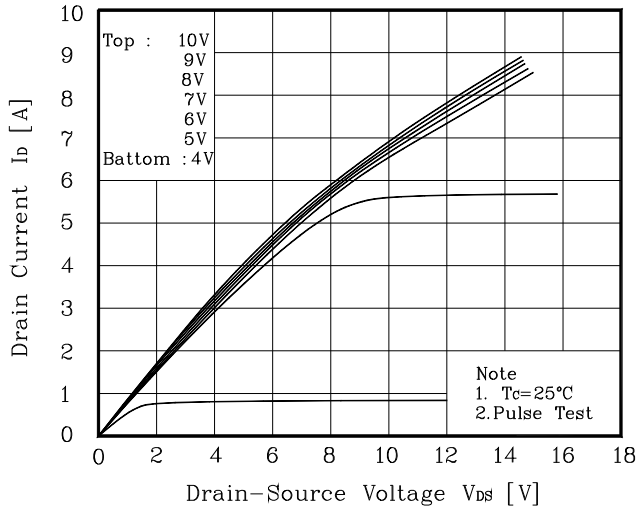



**Fig. 2 $I_D$ - $V_{GS}$**

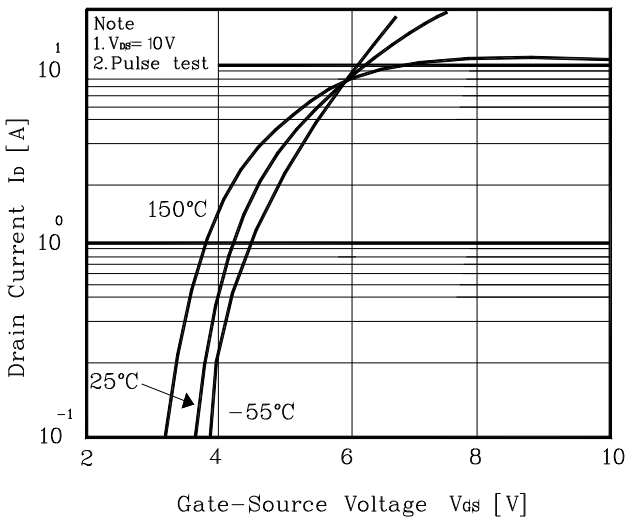



**Fig. 3 $R_{DS(on)}$ - $I_D$**

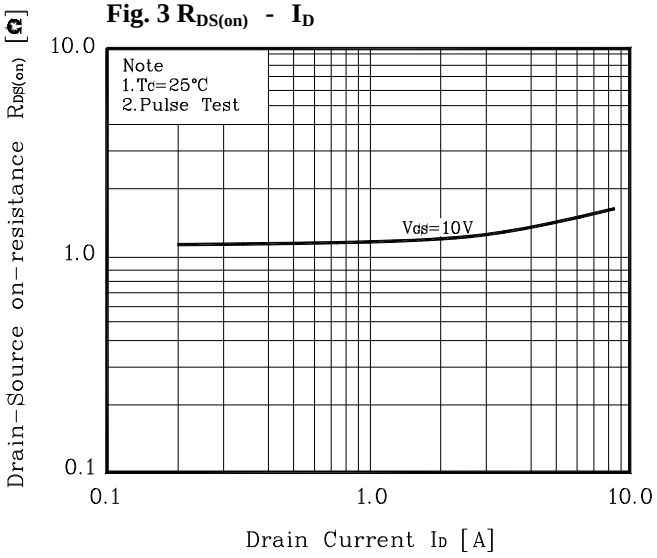



**Fig. 4 $I_S$ - $V_{SD}$**

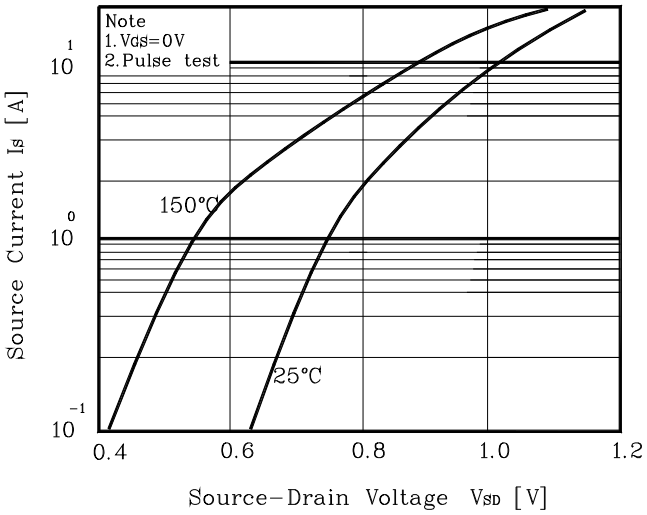



**Fig. 5 Capacitance - $V_{DS}$**

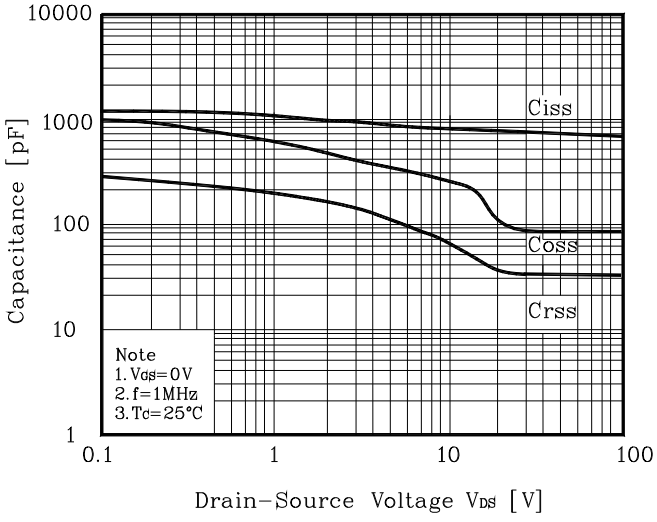



**Fig. 6 $V_{GS}$ - $Q_G$**

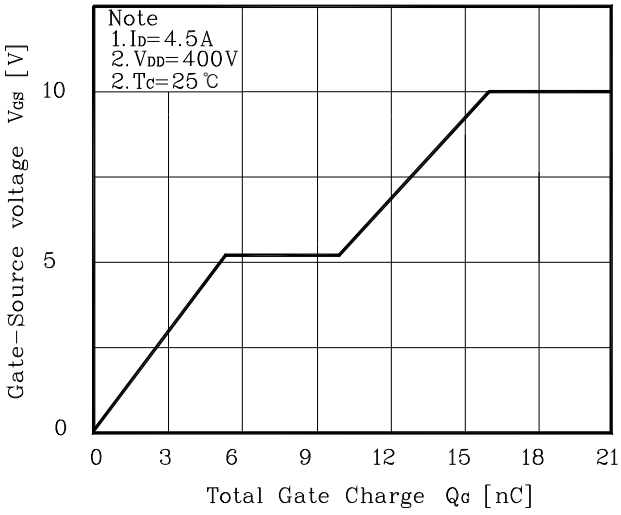


**Fig. 7 $V_{(BR)DSS}$ - $T_J$**

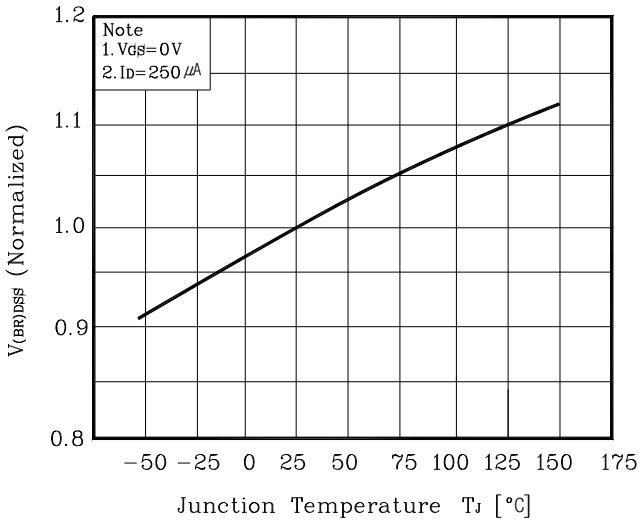



**Fig. 8 $R_{DS(on)}$ - $T_J$**

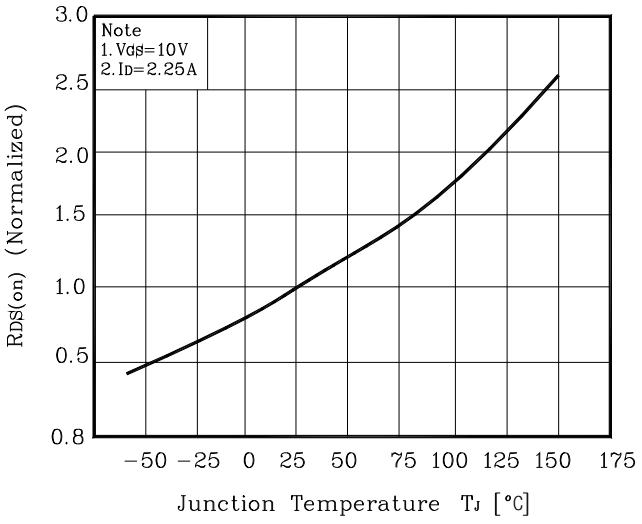



**Fig. 9 $I_D$ - $T_C$**

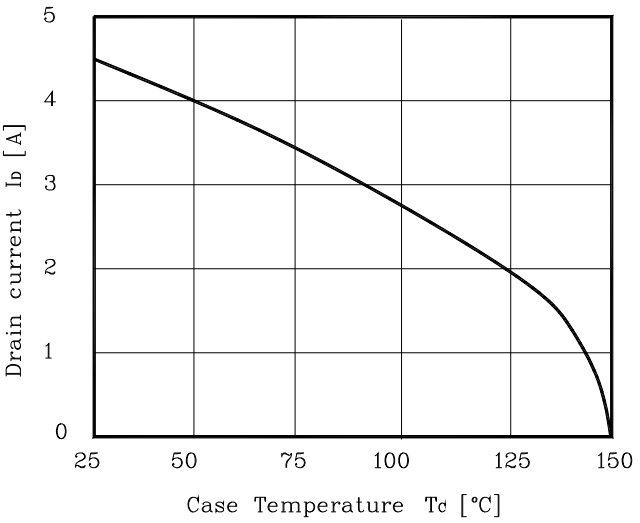



**Fig. 10 Safe Operating Area**

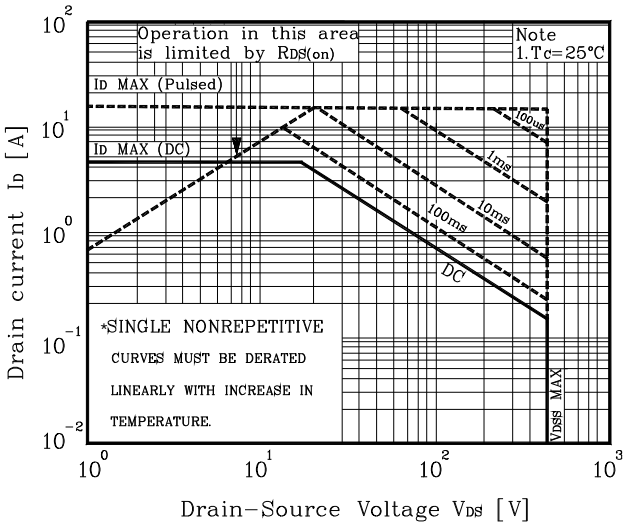


**Fig. 11 Gate Charge Test Circuit & Waveform**

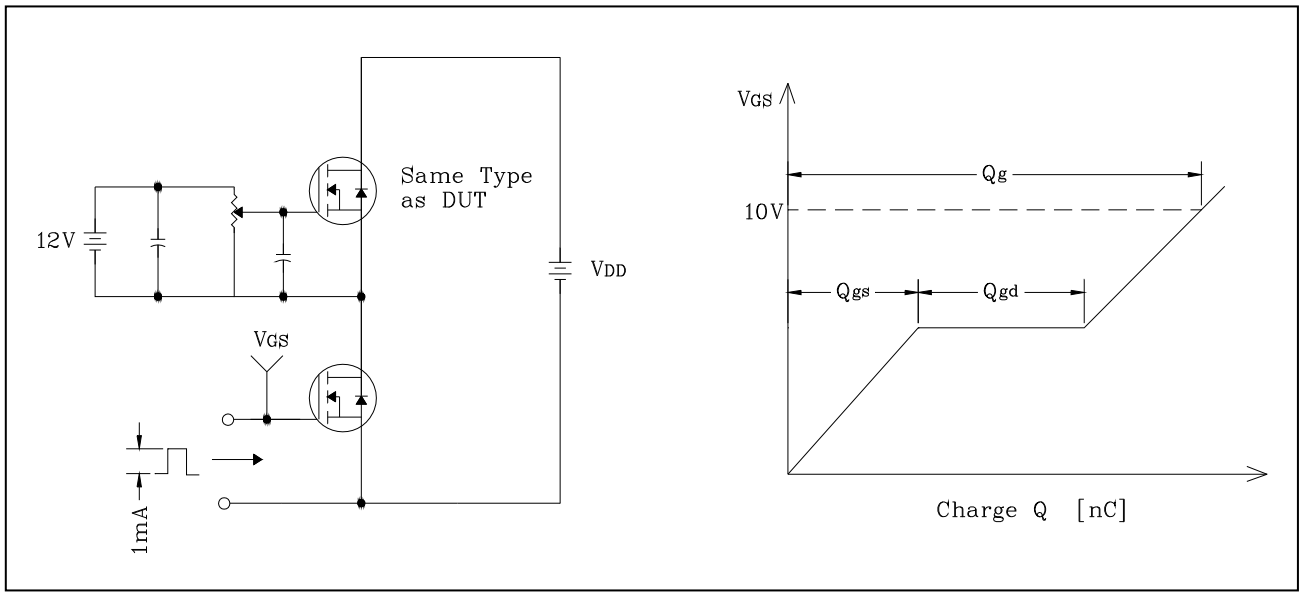



**Fig. 12 Switching Time Test Circuit & Waveform**

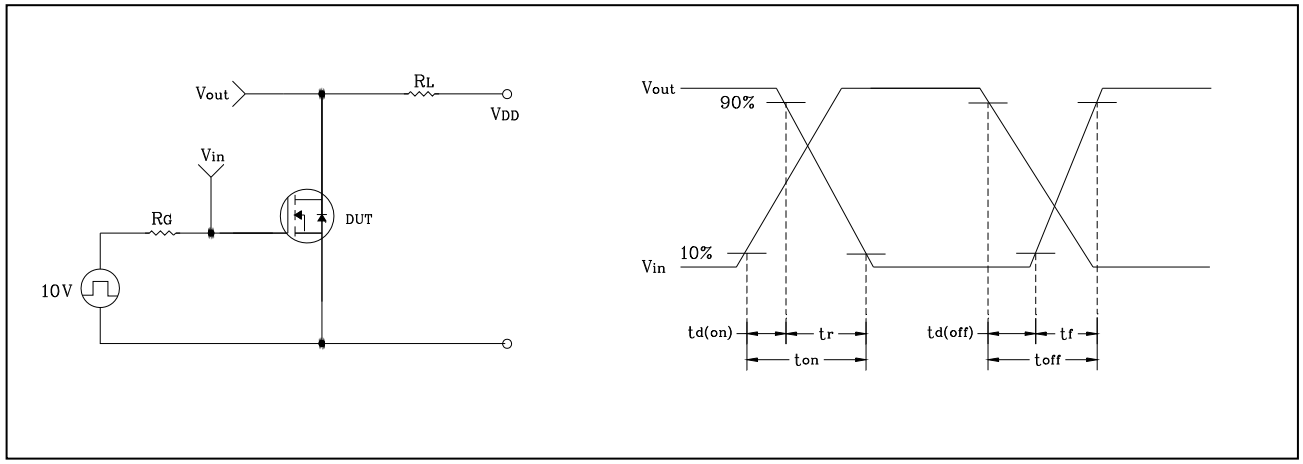



**Fig. 13 $E_{AS}$ Test Circuit & Waveform**

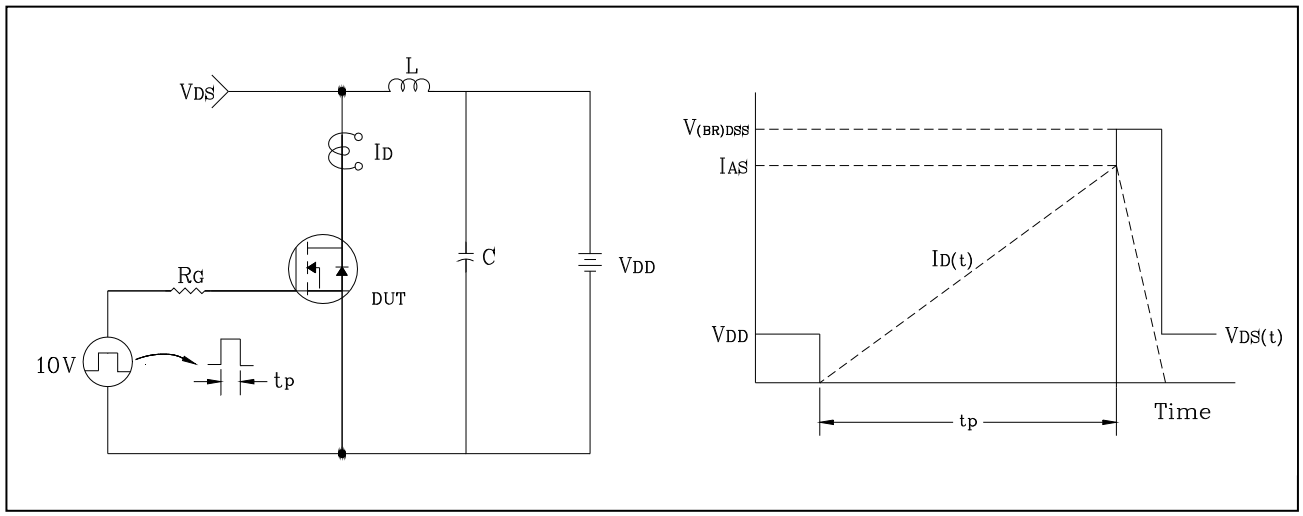
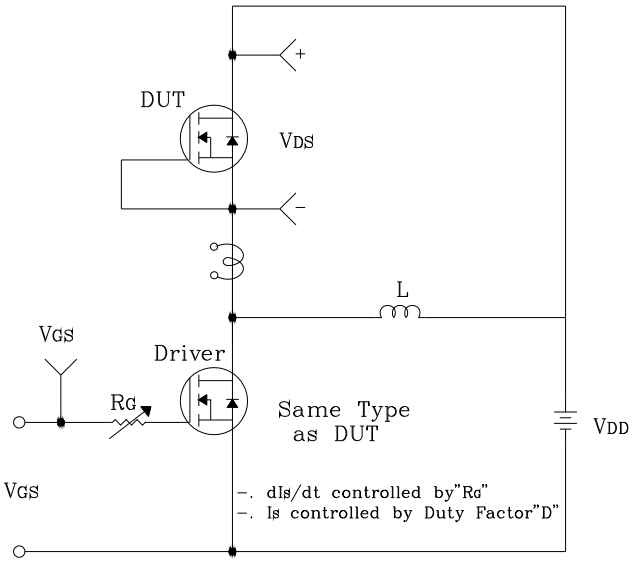
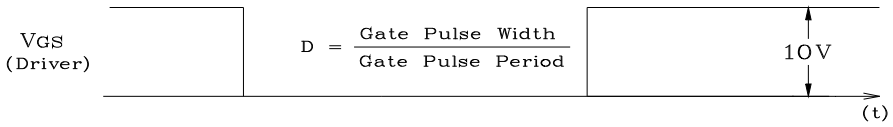
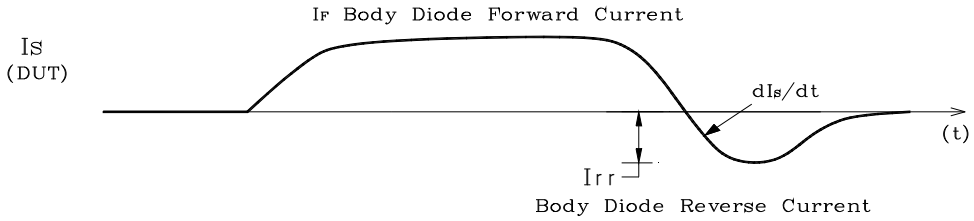
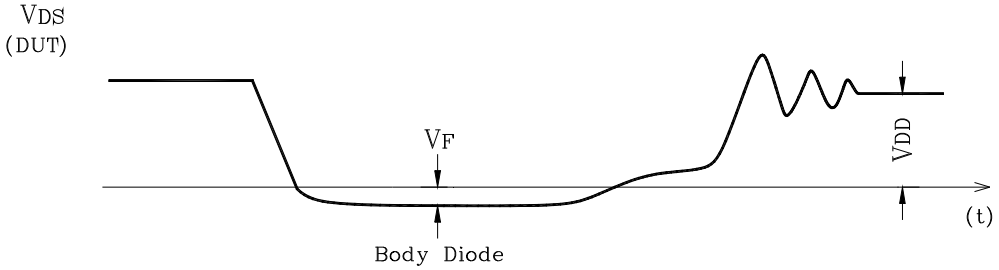


**Fig. 14 Peak Diode Recovery dv/dt Test Circuit & Waveform**



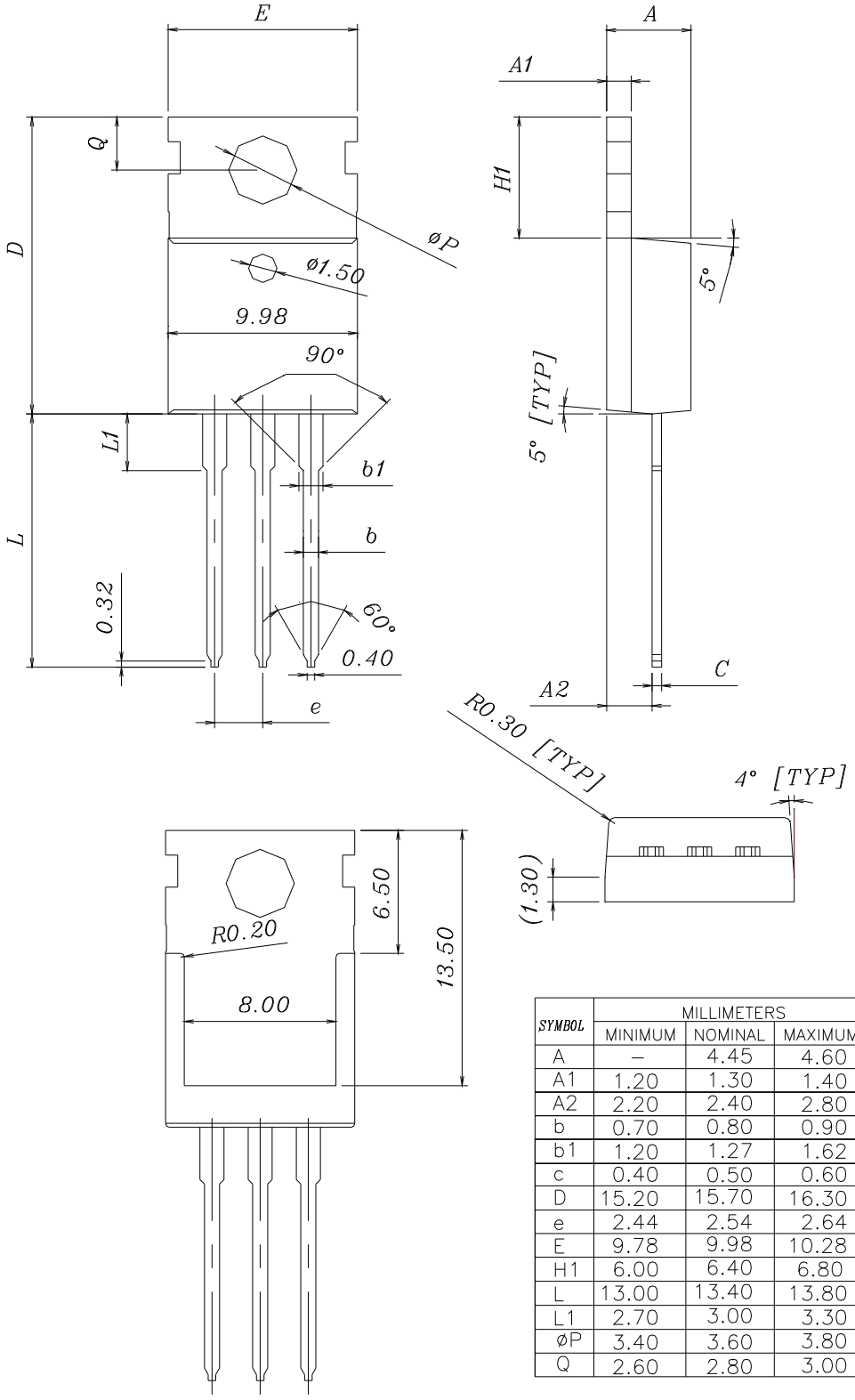



## Outline Dimension

**unit : mm**




| SYMBOL | MILLIMETERS | | | NOTE |
|---|---|---|---|---|
| | MINIMUM | NOMINAL | MAXIMUM | |
| A | – | 4.45 | 4.60 | |
| A1 | 1.20 | 1.30 | 1.40 | |
| A2 | 2.20 | 2.40 | 2.80 | |
| b | 0.70 | 0.80 | 0.90 | |
| b1 | 1.20 | 1.27 | 1.62 | |
| c | 0.40 | 0.50 | 0.60 | |
| D | 15.20 | 15.70 | 16.30 | |
| e | 2.44 | 2.54 | 2.64 | |
| E | 9.78 | 9.98 | 10.28 | |
| H1 | 6.00 | 6.40 | 6.80 | |
| L | 13.00 | 13.40 | 13.80 | |
| L1 | 2.70 | 3.00 | 3.30 | |
| øP | 3.40 | 3.60 | 3.80 | |
| Q | 2.60 | 2.80 | 3.00 | |

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