

# 2SK1231, 2SK1232

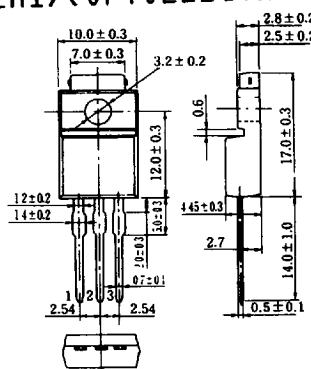
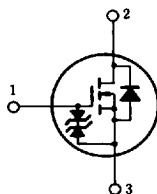
HITACHI/(OPTOELECTRONICS)

SILICON N-CHANNEL MOS FET

## HIGH SPEED POWER SWITCHING

### ■ FEATURES

- Low On-Resistance
- High Speed Switching
- Low Drive Current
- No Secondary Breakdown
- Suitable for Switching Regulator and DC-DC Converter



1. Gate
  2. Drain
  3. Source
- (Dimensions in mm)

(JEDEC TO-220FM)

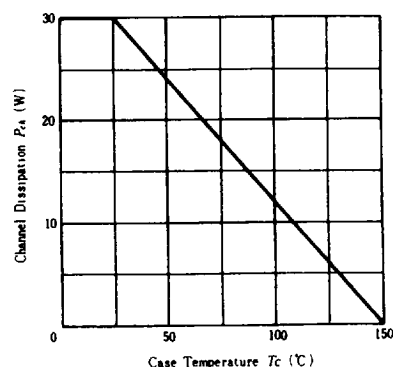
### ■ ABSOLUTE MAXIMUM RATINGS ( $T_a=25^{\circ}\text{C}$ )

| Item                                   | Symbol           | 2SK1231         | 2SK1232 | Unit               |
|----------------------------------------|------------------|-----------------|---------|--------------------|
| Drain-Source Voltage                   | $V_{DS}$         | 450             | 500     | V                  |
| Gate-Source Voltage                    | $V_{GS}$         | $\pm 20$        |         | V                  |
| Drain Current                          | $I_D$            | 5               |         | A                  |
| Drain Peak Current                     | $I_{D(pulse)}$ * | 20              |         | A                  |
| Body-Drain Diode Reverse Drain Current | $I_{DR}$         | 5               |         | A                  |
| Channel Dissipation                    | $P_{ch}$ **      | 30              |         | W                  |
| Channel Temperature                    | $T_{ch}$         | 150             |         | $^{\circ}\text{C}$ |
| Storage Temperature                    | $T_{stg}$        | $-55 \sim +150$ |         | $^{\circ}\text{C}$ |

\* $PW \leq 10\mu\text{s}$ , duty cycle  $\leq 1\%$

\*\*Value at  $T_c=25^{\circ}\text{C}$

### POWER VS. TEMPERATURE DERATING

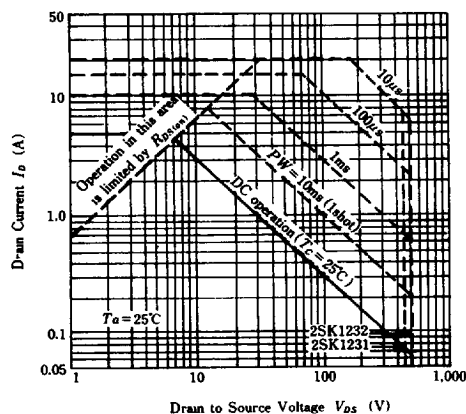


### ■ ELECTRICAL CHARACTERISTICS ( $T_a=25^{\circ}\text{C}$ )

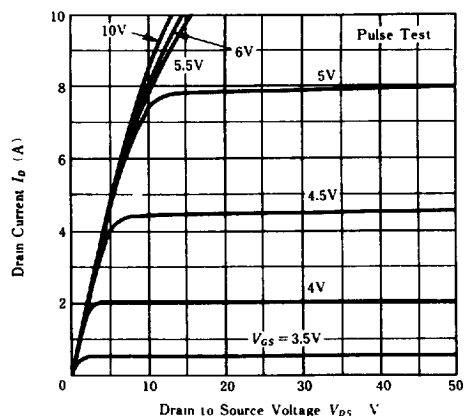
| Item                                    | Symbol        | Test Condition                                                   | min.     | typ. | max.     | Unit          |
|-----------------------------------------|---------------|------------------------------------------------------------------|----------|------|----------|---------------|
| Drain-Source Breakdown Voltage          | 2SK1231       | $I_D=10\text{mA}$ , $V_{GS}=0$                                   | 450      | —    | —        | V             |
|                                         | 2SK1232       |                                                                  | 500      | —    | —        |               |
| Gate-Source Breakdown Voltage           | $V_{BR,GSS}$  | $I_G=\pm 100\mu\text{A}$ , $V_{DS}=0$                            | $\pm 20$ | —    | —        | V             |
| Gate-Source Leak Current                | $I_{GSS}$     | $V_{GS}=\pm 16\text{V}$ , $V_{DS}=0$                             | —        | —    | $\pm 10$ | $\mu\text{A}$ |
| Zero Gate Voltage Drain Current         | 2SK1231       | $V_{DS}=360\text{V}$ , $V_{GS}=0$                                | —        | —    | 250      | $\mu\text{A}$ |
|                                         | 2SK1232       |                                                                  | —        | —    | —        |               |
| Gate-Source Cutoff Voltage              | $V_{GS(off)}$ | $I_D=1\text{mA}$ , $V_{DS}=10\text{V}$                           | 2.0      | —    | 4.0      | V             |
| Static Drain-Source on State Resistance | 2SK1231       | $I_D=2.5\text{A}$ , $V_{GS}=10\text{V}^*$                        | —        | 1.0  | 1.4      | $\Omega$      |
|                                         | 2SK1232       |                                                                  | —        | 1.2  | 1.5      |               |
| Forward Transfer Admittance             | $ y_{fs} $    | $I_D=2.5\text{A}$ , $V_{DS}=10\text{V}^*$                        | 2.5      | 4.0  | —        | S             |
| Input Capacitance                       | $C_{iss}$     | $V_{DS}=10\text{V}$ , $V_{GS}=0$ , $f=1\text{MHz}$               | —        | 820  | —        | pF            |
| Output Capacitance                      | $C_{oss}$     |                                                                  | —        | 300  | —        | pF            |
| Reverse Transfer Capacitance            | $C_{rss}$     |                                                                  | —        | 45   | —        | pF            |
| Turn-on Delay Time                      | $t_{d(on)}$   |                                                                  | —        | 10   | —        | ns            |
| Rise Time                               | $t_r$         | $I_D=2.5\text{A}$ , $V_{GS}=10\text{V}$ , $R_L=12\Omega$         | —        | 35   | —        | ns            |
| Turn-off Delay Time                     | $t_{d(off)}$  |                                                                  | —        | 70   | —        | ns            |
| Fall Time                               | $t_f$         |                                                                  | —        | 45   | —        | ns            |
| Body-Drain Diode Forward Voltage        | $V_{DF}$      | $I_F=4\text{A}$ , $V_{GS}=0$                                     | —        | 1.0  | —        | V             |
| Body-Drain Diode Reverse Recovery Time  | $t_{rr}$      | $I_F=4\text{A}$ , $V_{GS}=0$ , $di_F/dt=100\text{A}/\mu\text{s}$ | —        | 300  | —        | ns            |

\*Pulse Test

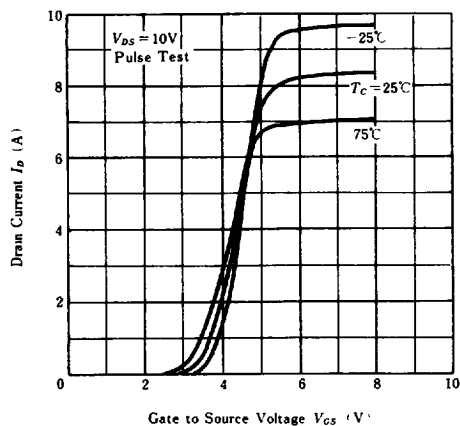
# MAXIMUM SAFE OPERATION AREA



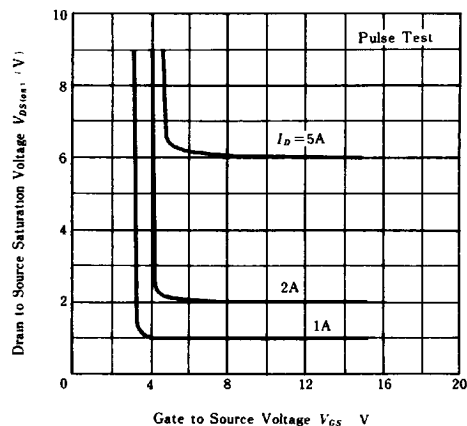
# TYPICAL OUTPUT CHARACTERISTICS



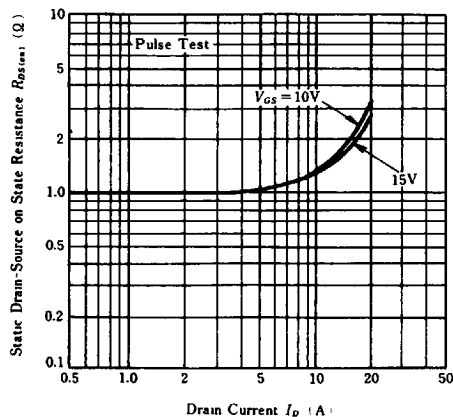
# TYPICAL TRANSFER CHARACTERISTICS



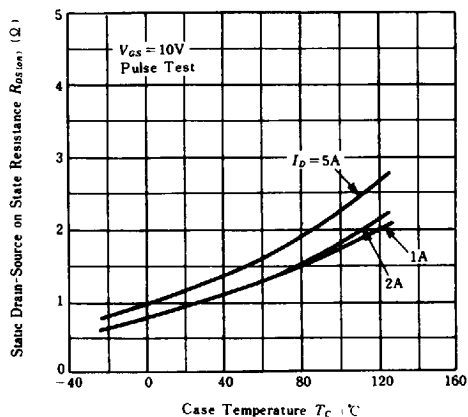
# DRAIN-SOURCE SATURATION VOLTAGE VS. GATE-SOURCE VOLTAGE



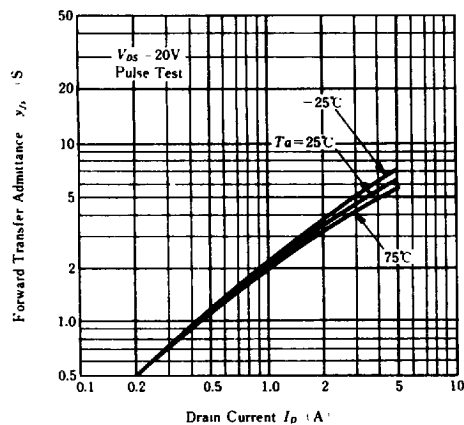
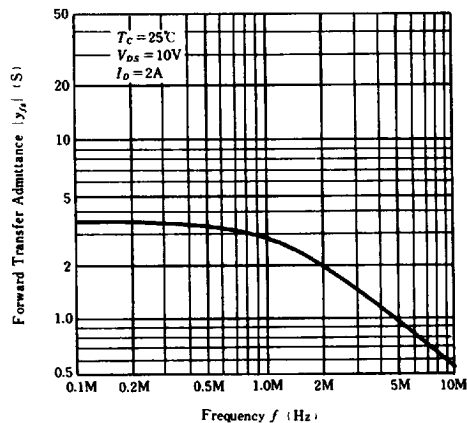
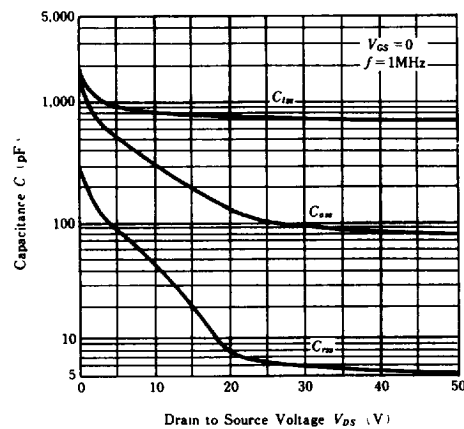
# STATIC DRAIN-SOURCE ON STATE RESISTANCE VS. DRAIN CURRENT



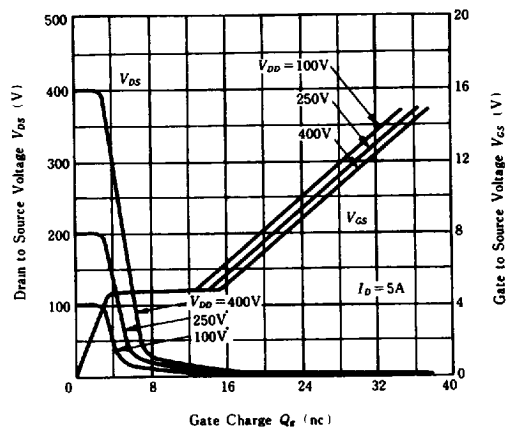
# STATIC DRAIN-SOURCE ON STATE RESISTANCE VS. TEMPERATURE



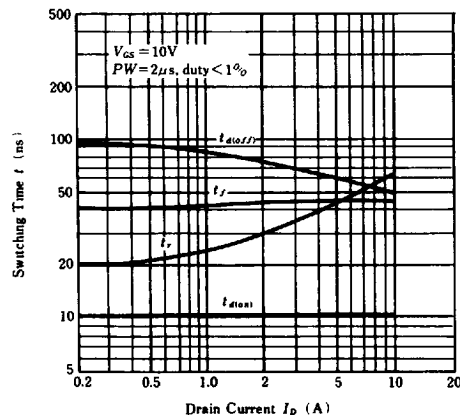
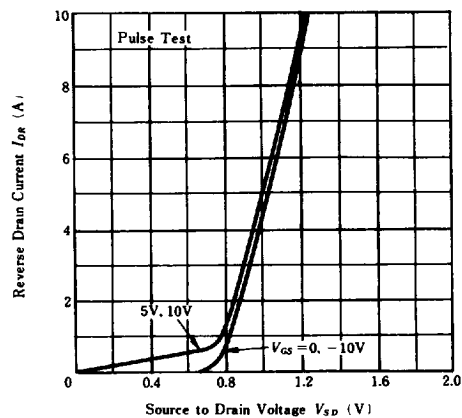
## HITACHI/(OPTOELECTRONICS)

FORWARD TRANSFER ADMITTANCE  
VS. DRAIN CURRENTFORWARD TRANSFER ADMITTANCE  
VS. FREQUENCYTYPICAL CAPACITANCE  
VS. DRAIN-SOURCE VOLTAGE

## DYNAMIC INPUT CHARACTERISTICS

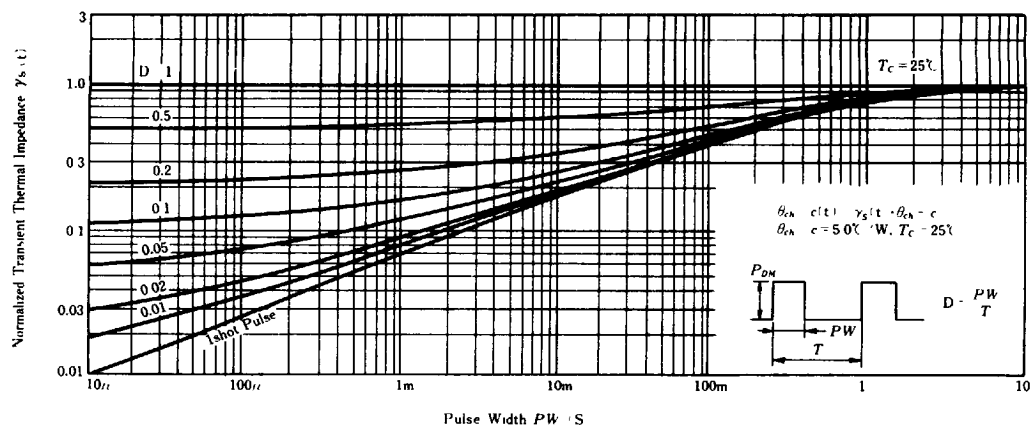


## SWITCHING CHARACTERISTICS

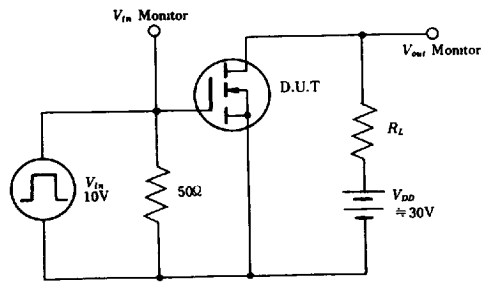
REVERSE DRAIN CURRENT VS.  
SOURCE TO DRAIN VOLTAGE

HITACHI/(OPTOELECTRONICS)

NORMALIZED TRANSIENT THERMAL IMPEDANCE VS. PULSE WIDTH



SWITCHING TIME TEST CIRCUIT



WAVEFORMS

