HITACHI

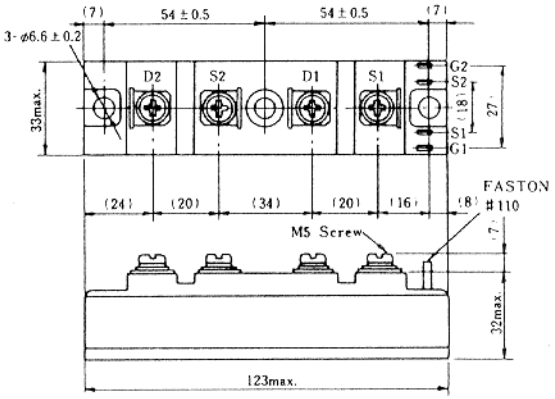
# PM50502C

## SILICON N-CHANNEL POWER MOS FET MODULE

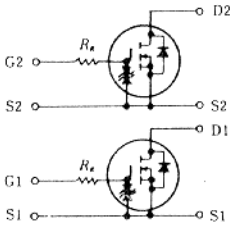
### HIGH SPEED POWER SWITCHING

### ■ FEATURES

- Equipped with Power MOS FET
- Low On-Resistance
- High Speed Switching
- Low Drive Current
- Wide Area of Safe Operation
- Inherent Parallel Diod between Source and Drain
- Isolated Base from Terminal
- Suitable for Motor Driver, Switching Regulator and etc.




(Dimensions in mm)



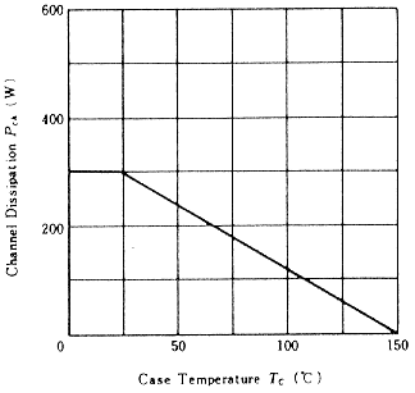

| Symbol | Electrode | Terminals | Remarks |
|---|---|---|---|
| S 1 | Source 1 | M5 Screw | Power terminals |
| D 1 | Drain 1 | M5 Screw | Power terminals |
| S 2 | Source 2 | M5 Screw | Power terminals |
| D 2 | Drain 2 | M5 Screw | Power terminals |
| G 1 | Gate 1 | #110 | Signal terminals |
| S 1 | Source 1 | #110 | Signal terminals |
| G 2 | Gate 2 | #110 | Signal terminals |
| S 2 | Source 2 | #110 | Signal terminals |

### ■ ABSOLUTE MAXIMUM RATINGS ($Ta$=25℃) (Per FET chip)

| Item | Symbol | Rating | Unit |
|---|---|---|---|
| Drain-Source Voltage | $V_{DSS}$ | 500 | V |
| Gate-Source Voltage | $V_{GSS}$ | ±20 | V |
| Drain Current | $I_D$ | 50 | A |
| Drain Peak Current | $I_{D(peak)}$ | 100 | A |
| Body-Drain Diode Reverse Drain Current | $I_{DR}$ | 50 | A |
| Body-Drain Diode Reverse Drain Peak Current | $I_{DR(peak)}$ | 100 | A |
| Channel Dissipation | $P_{ch}$* | 300 | W |
| Channel Temperature | $T_{ch}$ | 150 | ℃ |
| Storage Temperature | $T_{stg}$ | −45~+125 | ℃ |
| Insulation Dielectric | $V_{isol}$** | 2000 | V |

*Value at Tc=25℃ **Base to Terminals AC minute

POWER VS. TEMPERATURE DERATING



## ■ ELECTRICAL CHARACTERISTICS ($T_a$=25℃) (Per FET chip)

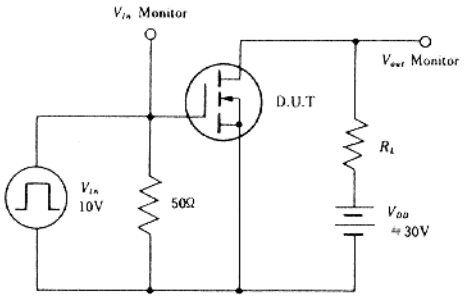
| Item | Symbol | Test Condition | min. | typ. | max. | Unit |
|---|---|---|---|---|---|---|
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $I_D$=10mA, $V_{GS}$=0 | 500 | — | — | V |
| Gate-Source Leak Current | $I_{GSS}$ | $V_{GS}$=±16V, $V_{DS}$=0 | — | — | ±50 | μA |
| Gate-Source Breakdown Voltage | $V_{(BR)GSS}$ | $I_G$=±100μA, $V_{DS}$=0 | ±20 | — | — | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=400V, $V_{GS}$=0 | — | — | 1 | mA |
| Gate-Source Threshold Voltage | $V_{GS(th)}$ | $I_D$=1 mA, $V_{DS}$=10V | 1.5 | — | 4.0 | V |
| Drain-Source Saturation Voltage | $V_{DS(on)}$ | $I_D$=25A, $V_{GS}$=10V* | — | 2.25 | 3.0 | V |
| Static Drain-Source On State Resistance | $R_{DS(on)}$ | $I_D$=25A, $V_{GS}$=10V* | — | 0.09 | 0.12 | Ω |
| Forward Transfer Admittance | $\|y_{fs}\|$ | $I_D$=25A, $V_{DS}$=10V* | 25 | 40 | — | S |
| Input Capacitance | $C_{iss}$ | $V_{DS}$=10V, $V_{GS}$=0, $f$=1 MHz | — | 10250 | — | pF |
| Output Capacitance | $C_{oss}$ | | — | 3600 | — | pF |
| Reverse Transfer Capacitance | $C_{rss}$ | | — | 400 | — | pF |
| Turn-on Delay Time | $t_{d(on)}$ | $I_D$=25A, $V_{GS}$=10V, $R_L$=1.2Ω | — | 150 | — | ns |
| Rise Time | $t_r$ | | — | 700 | — | ns |
| Turn-off Delay Time | $t_{d(off)}$ | | — | 800 | — | ns |
| Fall Time | $t_f$ | | — | 600 | — | ns |
| Body-Drain Diode Forward Voltage | $V_{DF}$ | $I_F$=25A, $V_{GS}$=0 | — | 1.2 | — | V |
| Body-Drain Diode Reverse Recovery Time | $t_{rr}$ | $I_F$=25A, $V_{GS}$=0, $di_F/dt$=100A/μs | — | 200 | — | ns |

* Pulse Test

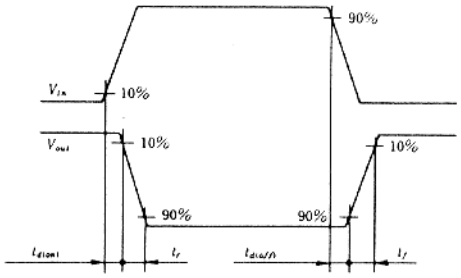
## ■ MECHANICAL CHARACTERISTICS

| Item | Symbol | Condition | Rating | Unit |
|---|---|---|---|---|
| Fixing Strength | — | Mounted into main-terminal with M5 screw | 15~20 | kg · cm |
| | — | Mounted into heat sink with M6 screw | 20~30 | kg · cm |
| Weight | — | Typical value | 300 | g |

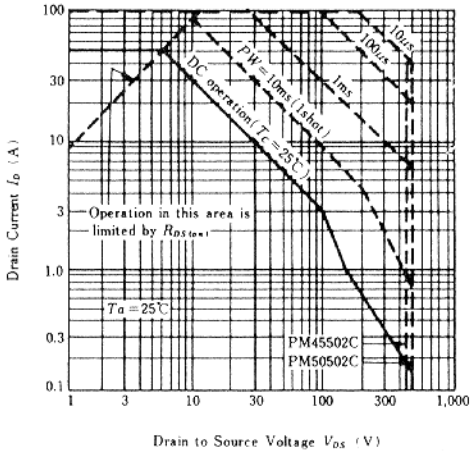
### SWITCHING TIME TEST CIRCUIT



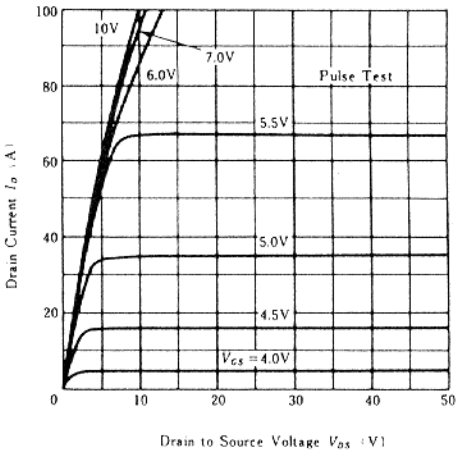

### WAVEFORMS



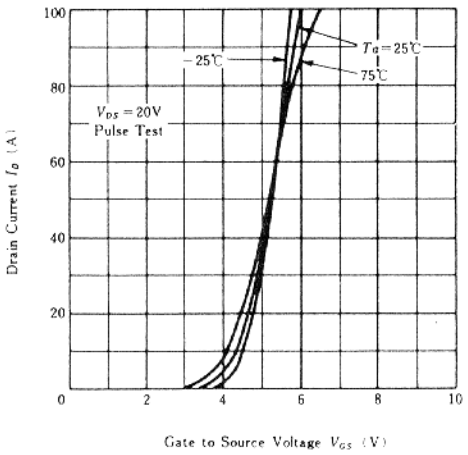
## MAXIMUM SAFE OPERATION AREA



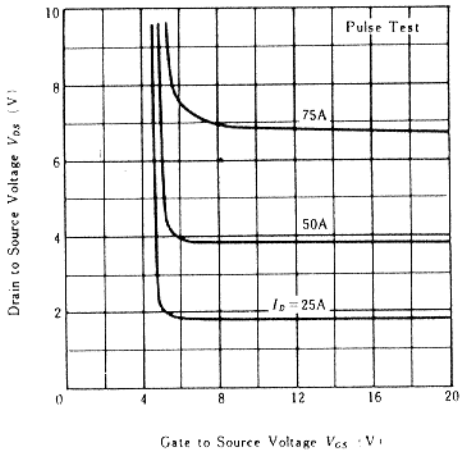

## TYPICAL OUTPUT CHARACTERISTICS



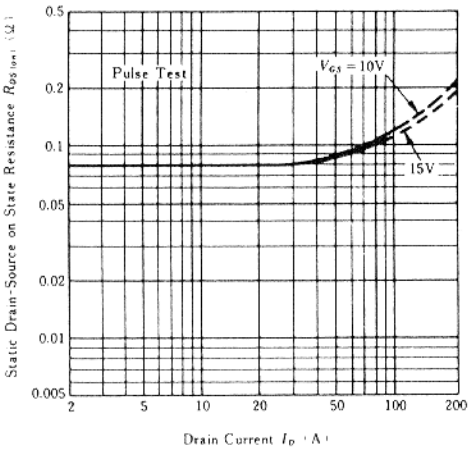

## TYPICAL TRANSFER CHARACTERISTICS



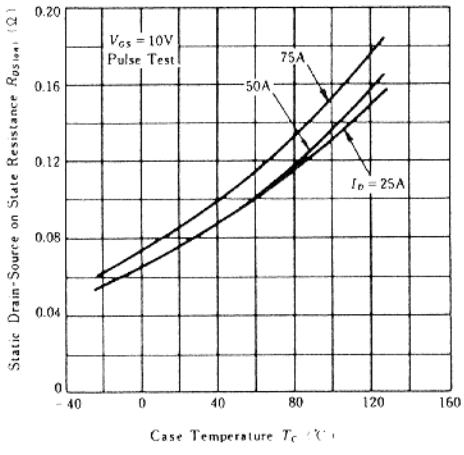

## DRAIN-SOURCE SATURATION VOLTAGE VS. GATE-SOURCE VOLTAGE



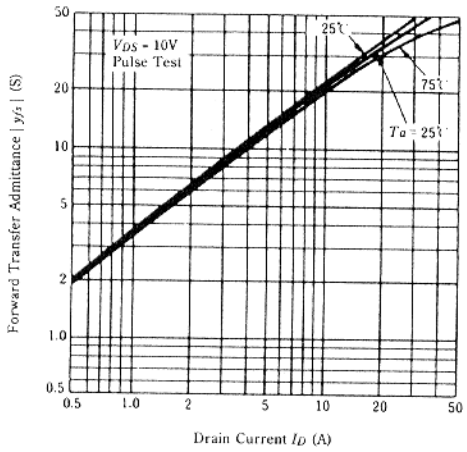

## STATIC DRAIN-SOURCE ON STATE RESISTANCE VS. DRAIN CURRENT



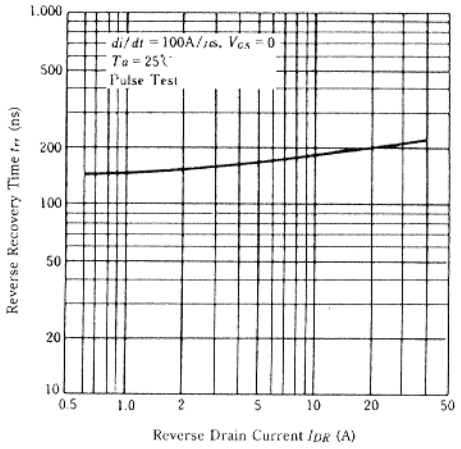

## STATIC DRAIN-SOURCE ON STATE RESISTANCE VS. TEMPERATURE



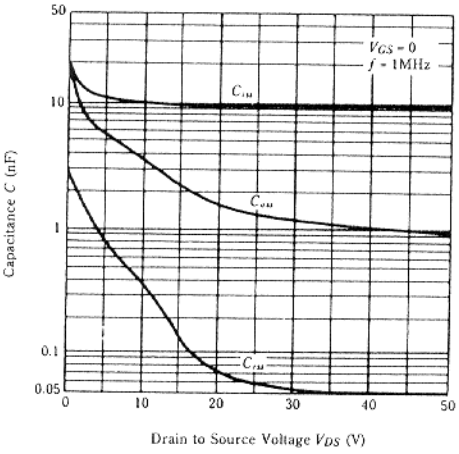
## FORWARD TRANSFER ADMITTANCE VS. DRAIN CURRENT



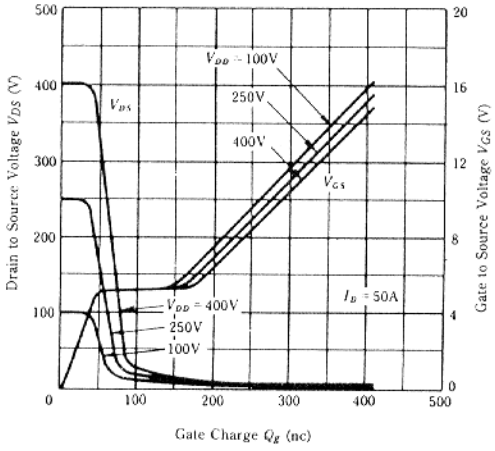

## BODY DRAIN DIODE REVERSE RECOVERY TIME



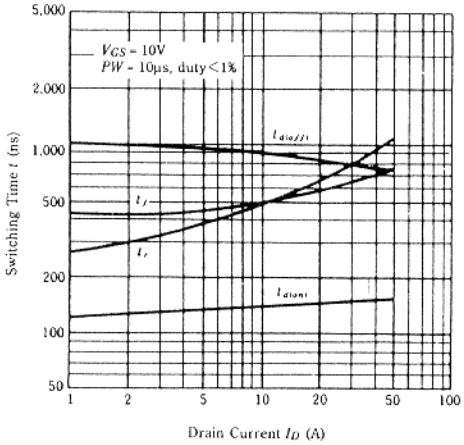

## TYPICAL CAPACITANCE VS. DRAIN-SOURCE VOLTAGE



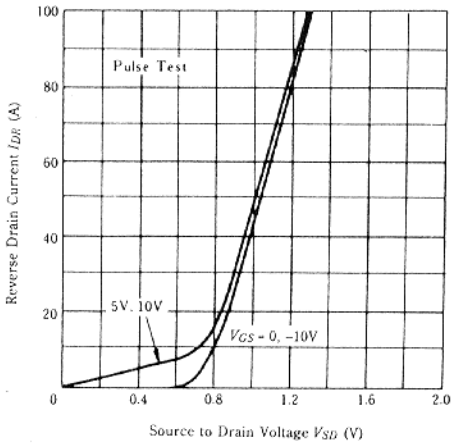

## DYNAMIC INPUT CHARACTERISTICS




## SWITCHING CHARACTERISTICS




## REVERSE DRAIN CURRENT VS. SOURCE TO DRAIN VOLTAGE



NORMALIZED TRANSIENT THERMAL IMPEDANCE VS. PULSE WIDTH