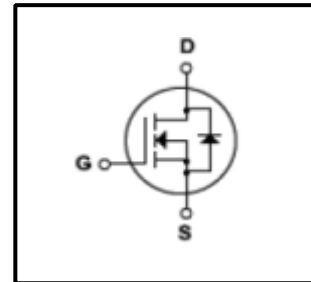


**Silicon N-Channel MOSFET**

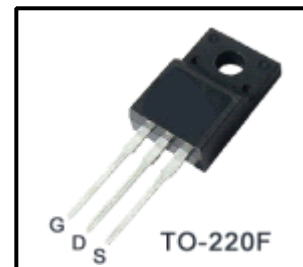
**Features**

- 20A,600V, $R_{DS(on)}$ (Max0.39 $\Omega$ )@ $V_{GS}=10V$
- Ultra-low Gate charge(Typical 50nC)
- Fast Switching Capability
- 100%Avalanche Tested
- Maximum Junction Temperature Range(150 $^{\circ}C$ )



**General Description**

This Power MOSFET is produced using Winsemi's advanced planar stripe, VDMOS technology. This latest technology has been especially designed to minimize on-state resistance, have a high rugged avalanche characteristics. This device is specially well suited for AC-DC switching power supplies, DC-DC power converters, high voltage H-bridge motor drive PWM.



**Absolute Maximum Ratings**

| Symbol         | Parameter                                       | Value    | Units          |
|----------------|---|----------|----------------|
| $V_{DSS}$      | Drain Source Voltage                            | 600      | V              |
| $I_D$          | Continuous Drain Current(@ $T_c=25^{\circ}C$ )  | 20*      | A              |
|                | Continuous Drain Current(@ $T_c=100^{\circ}C$ ) | 12.5*    | A              |
| $I_{DM}$       | Drain Current Pulsed (Note1)                    | 20*      | A              |
| $V_{GS}$       | Gate to Source Voltage                          | $\pm 30$ | V              |
| $E_{AS}$       | Single Pulsed Avalanche Energy (Note2)          | 450      | mJ             |
| $I_{AR}$       | Avalanche Current (Note1)                       | 20       | A              |
| $E_{AR}$       | Repetitive Avalanche Energy (Note1)             | 20.7     | mJ             |
| dv/dt          | Peak Diode Recovery dv /dt (Note3)              | 50       | V/ ns          |
| $P_D$          | Total Power Dissipation(@ $T_c=25^{\circ}C$ )   | 55       | W              |
|                | -Derate above 25 $^{\circ}C$                    | 0.31     | W/ $^{\circ}C$ |
| $T_J, T_{stg}$ | Junction and Storage Temperature                | -55~150  | $^{\circ}C$    |
| $T_L$          | Channel Temperature                             | 300      | $^{\circ}C$    |

\*Drain current limited by maximum junction temperature

**Thermal Characteristics**

| Symbol    | Parameter                                  | Value |     |      | Units         |
|-----------|--|-------|-----|------|---------------|
|           |  | Min   | Typ | Max  |               |
| $R_{QJC}$ | Thermal Resistance , Junction -to -Case    | -     | -   | 2.27 | $^{\circ}C/W$ |
| $R_{QJA}$ | Thermal Resistance , Junction -to -Ambient | -     | -   | 62.5 | $^{\circ}C/W$ |

## Electrical Characteristics(Tc=25°C)

| Characteristics                                | Symbol                         | Test Condition   | Min                      | Type | Max       | Unit     |    |
|--|--------------------------------|--|--------------------------|------|-----------|----------|----|
| Gate leakage current                           | $I_{GSS}$                      | $V_{GS}=\pm 30V, V_{DS}=0V$                            | -                        | -    | $\pm 100$ | nA       |    |
| Gate-source breakdown voltage                  | $V_{(BR)GSS}$                  | $I_G=\pm 10 \mu A, V_{DS}=0V$                          | $\pm 30$                 | -    | -         | V        |    |
| Drain cut -off current                         | $I_{DSS}$                      | $V_{DS}=600V, V_{GS}=0V$                               | -                        | -    | 1         | $\mu A$  |    |
|  |                                | $V_{DS}=480V, T_J=125^\circ C$                         | -                        | -    | 10        | $\mu A$  |    |
| Drain -source breakdown voltage                | $V_{(BR)DSS}$                  | $I_D=250\mu A, V_{GS}=0V$                              | 600                      | -    | -         | V        |    |
| Breakdown voltage Temperature coefficient      | $\Delta BV_{DSS} / \Delta T_J$ | $I_D=250\mu A$ , Referenced to 25°C                    | -                        | 0.5  | -         | V/°C     |    |
| Gate threshold voltage                         | $V_{GS(th)}$                   | $V_{DS}=V_{GS}, I_D=250\mu A$                          | 3                        | -    | 5         | V        |    |
| Drain -source ON resistance                    | $R_{DS(ON)}$                   | $V_{GS}=10V, I_D=10A$                                  | -                        | 0.35 | 0.39      | $\Omega$ |    |
| Forward Transconductance                       | $g_{fs}$                       | $V_{DS}=40V, I_D=10A$ (Note4)                          | -                        | 18   | -         | S        |    |
| Input capacitance                              | $C_{iss}$                      | $V_{DS}=25V,$  | -                        | 2310 | 2920      | pF       |    |
| Reverse transfer capacitance                   | $C_{rss}$                      | $V_{GS}=0V,$   | -                        | 85   | 120       |          |    |
| Output capacitance                             | $C_{oss}$                      | $f=1MHz$   | -                        | 1270 | 1660      |          |    |
| Switching time                                 | Turn-on Rise time              | $t_r$  | $V_{DD}=250V$            | -    | 130       | 270      | ns |
|  | Turn-on delay time             | $t_d(on)$  | $I_D=20A$                | -    | 60        | 128      |    |
|  | Turn-on Fall time              | $t_f$  | $R_G=25\Omega$ (Note4,5) | -    | 70        | 145      |    |
|  | Turn-off delay time            | $t_d(off)$   |                          | -    | 220       | 445      |    |
| Total gate charge(gate-source plus gate-drain) | $Q_g$                          | $V_{DS}=480V,$<br>$V_{GS}=10V,$<br>$I_D=20A$ (Note4,5) | -                        | 50   | 80        | nC       |    |
| Gate-source charge                             | $Q_{gs}$                       |  | -                        | 15   | -         |          |    |
| Gate-drain("miller") Charge                    | $Q_{gd}$                       |  | -                        | 23   | -         |          |    |

## Source-Drain Ratings and Characteristics(Ta=25°C)

| Characteristics                  | Symbol    | Test Condition                 | Min | Type | Max | Unit    |
|----------------------------------|-----------|--------------------------------|-----|------|-----|---------|
| Continuous drain reverse current | $I_{DR}$  | -                              | -   | -    | 20  | A       |
| Forward voltage(diode)           | $V_{DSF}$ | $I_S=20A, V_{GS}=0V$           | -   | -    | 1.4 | V       |
| Reverse recovery time            | $t_{rr}$  | $I_{DR}=20A, V_{GS}=0V,$       | -   | 460  | -   | ns      |
| Reverse recovery charge          | $Q_{rr}$  | $dI_{DR} / dt = 100 A / \mu s$ | -   | 5.1  | -   | $\mu C$ |

Note 1.Pulse width limited by maximum junction temperature

2.L=5.0mH,  $I_{AS}=20A, V_{DD}=50V, R_G=25\Omega$ , Starting  $T_J=25^\circ C$

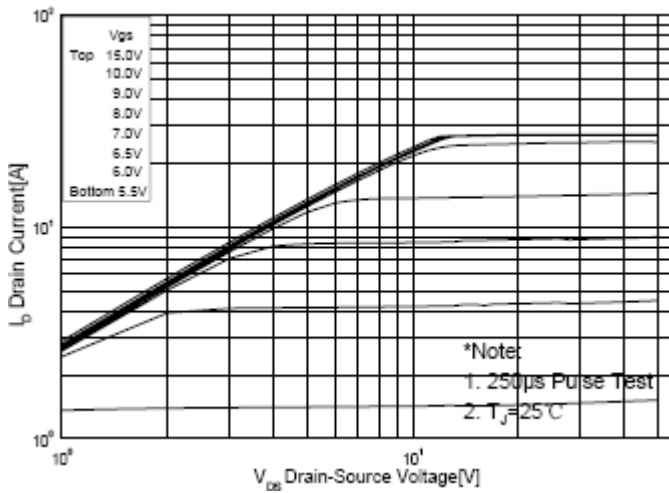
3. $I_{SD} \leq 20A, di/dt \leq 200a/\mu s, V_{DD} \leq BV_{DSS}$ , Starting  $T_J=25^\circ C$

4.Pulse Test:Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$

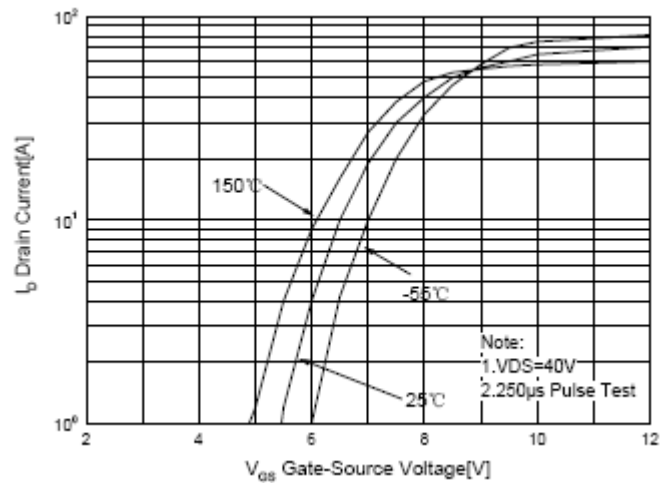
5. Essentially independent of operating temperature.

This transistor is an electrostatic sensitive device

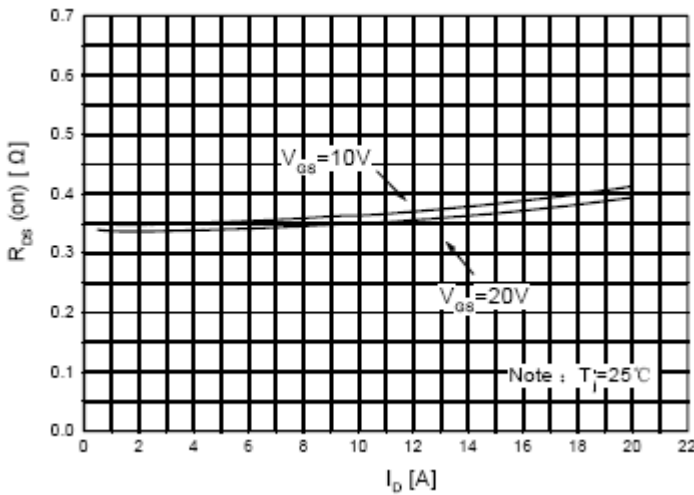
Please handle with caution



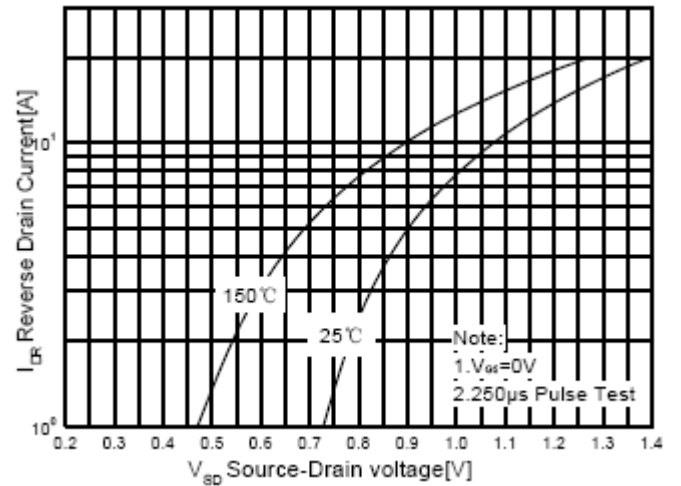
**Fig.1 On Region Characteristics**



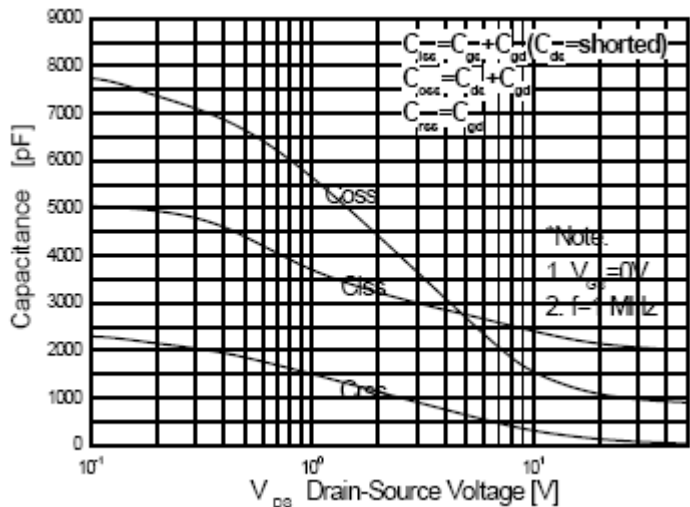
**Fig.2 Transfer Characteristics**



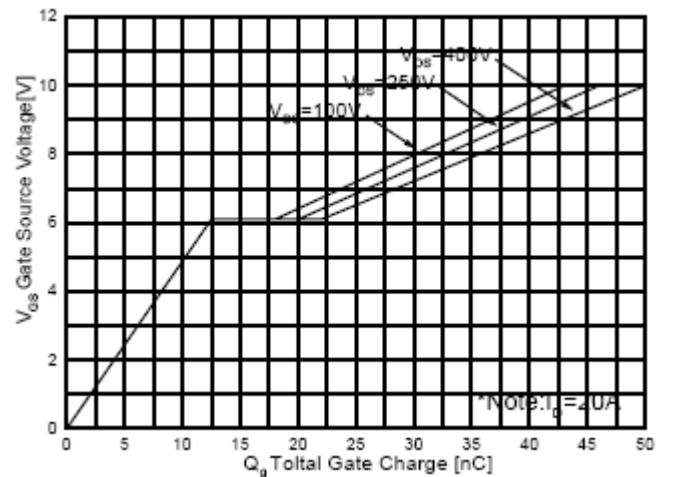
**Fig.3 On-Resistance Variation vs Drain current and Gate Voltage**



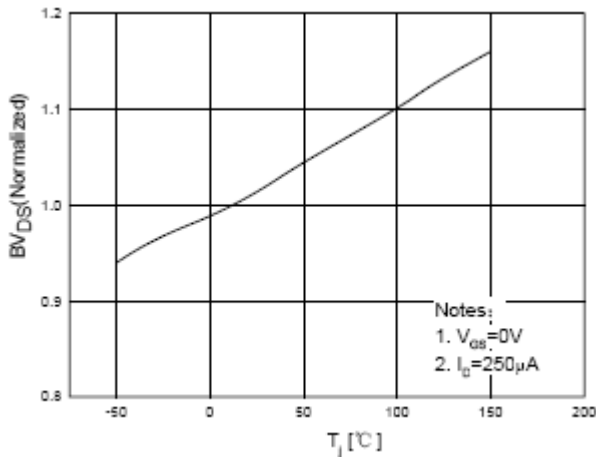
**Fig.4 Body Diode Forward voltage Variation with Source Current And Temperature**



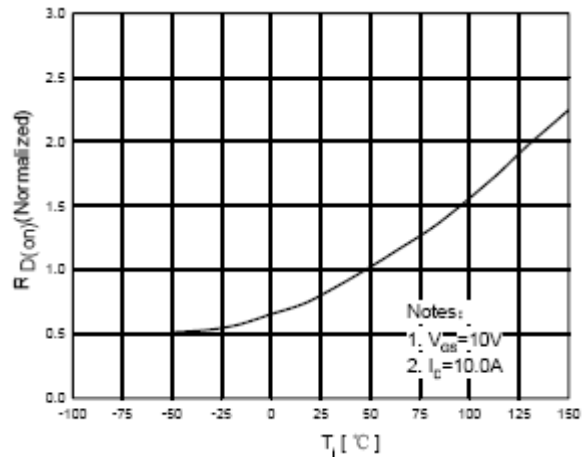
**Fig.5 Capacitance Characteristics**



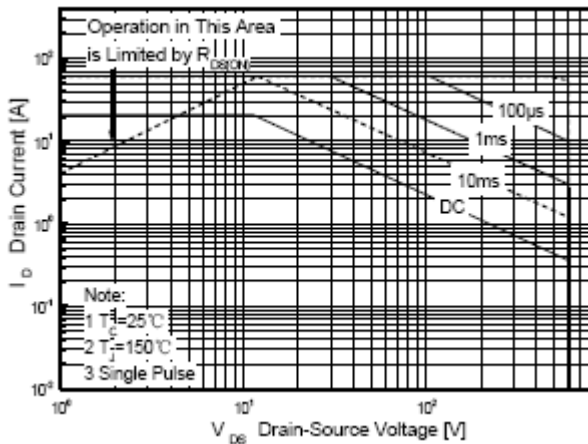
**Fig.6 Gate Charge Characteristics**



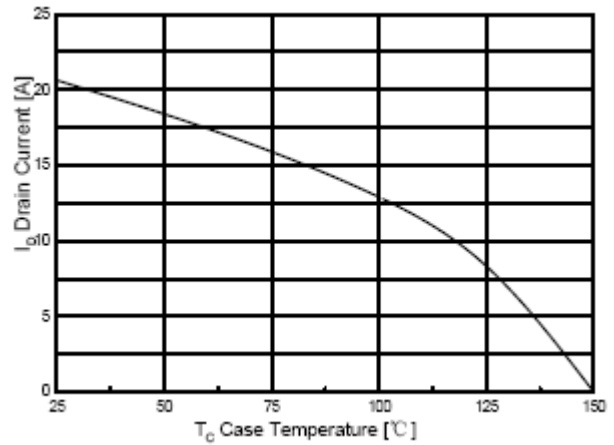
**Fig.7 Breakdown Voltage Variation vs. Temperature**



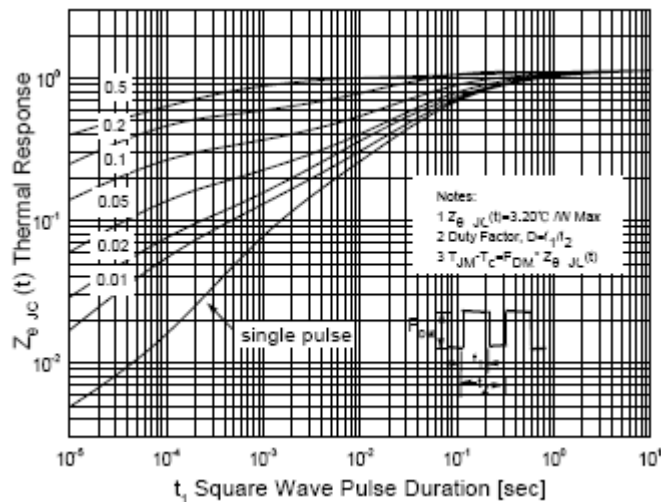
**Fig.8 On-Resistance Variation vs. Temperature**



**Fig.9 Maximum Safe Operation Area**



**Fig.10 Maximum Drain Current vs Case temperature**



**Fig.11 Transient thermal Response Curve**

**TO-220F Package Dimension**

