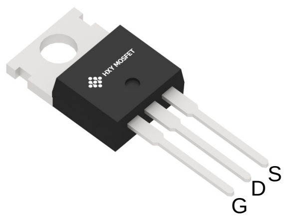
## Description

The IRFB4410PBF use advanced SGT MOSFET technology to provide low RDS(ON), low gate charge, fast switching and excellent avalanche characteristics. This device is specially designed to get better ruggedness and suitable.

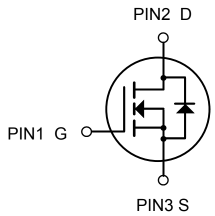



**TO-220C**

## General Features

$V_{DS}$ = 100V $I_D$ = 70A

$R_{DS(ON)}$ < 10.5mΩ @ $V_{GS}$=10V




N-Channel MOSFET

## Application

Battery protection

Load switch

Uninterruptible power supply

## Package Marking and Ordering Information

| Product ID | Pack | Brand | Qty(PCS) |
|---|---|---|---|
| IRFB4410PBF | TO-220C | HXY MOSFET | 50 |

## Absolute Maximum Ratings ($T_C$=25°C unless otherwise noted)

| Symbol | Parameter | Rating | Units |
|---|---|---|---|
| $V_{DS}$ | Drain-Source Voltage | 100 | V |
| $V_{GS}$ | Gate-Source Voltage | ±20 | V |
| $I_D$ | Continuous Drain Current@Tc=25°C | 70 | A |
| $I_{DM}$ | Puled Drain Current [1] | 280 | A |
| EAS | Single Pulse Avalanche Energy [3] | 110 | mJ |
| $P_D$@$T_C$=25˚C | Total Power Dissipation [4] | 100 | W |
| $T_{STG}$ | Storage Temperature Range | -55 to 150 | ˚C |
| $T_J$ | Operating Junction Temperature Range | -55 to 150 | ˚C |
| $R_{θJA}$ | Thermal Resistance Junction-Ambient [1] | 64 | ˚C/W |
| $R_{θJC}$ | Thermal Resistance Junction-Ambient [1] | 1.25 | ˚C/W |

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

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$=0V , $I_D$=250uA | 100 | --- | --- | V |
| △$BV_{DSS}$/△$T_J$ | BVDSS Temperature Coefficient | Reference to 25°C , $I_D$=1mA | --- | 0.098 | --- | V/°C |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance[2] | $V_{GS}$=10V , $I_D$=20A | --- | 8.5 | 10.5 | mΩ |
| | | $V_{GS}$=4.5V , $I_D$=15A | --- | 9.5 | 15 | mΩ |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS}$=$V_{DS}$ , $I_D$ =250uA | 1.0 | --- | 2.5 | V |
| △$V_{GS(th)}$ | $V_{GS(th)}$ Temperature Coefficient | | --- | -4.57 | --- | mV/°C |
| $I_{DSS}$ | Drain-Source Leakage Current | $V_{DS}$=80V , $V_{GS}$=0V , $T_J$=25°C | --- | --- | 1 | uA |
| | | $V_{DS}$=80V , $V_{GS}$=0V , $T_J$=55°C | --- | --- | 5 | |
| $I_{GSS}$ | Gate-Source Leakage Current | $V_{GS}$=±20V , $V_{DS}$=0V | --- | --- | ±100 | nA |
| $R_g$ | Gate Resistance | $V_{DS}$=0V , $V_{GS}$=0V , f=1MHz | --- | 0.48 | --- | Ω |
| $Q_g$ | Total Gate Charge (10V) | $V_{DS}$=50V , $V_{GS}$=50V , $I_D$=10A | --- | 31.3 | --- | nC |
| $Q_{gs}$ | Gate-Source Charge | | --- | 3.49 | --- | |
| $Q_{gd}$ | Gate-Drain Charge | | --- | 7.63 | --- | |
| $T_{d(on)}$ | Turn-On Delay Time | $V_{DD}$=50V , $V_{GS}$=10V , $R_G$=4Ω $I_D$=10A | --- | 16 | --- | ns |
| $T_r$ | Rise Time | | --- | 10 | --- | |
| $T_{d(off)}$ | Turn-Off Delay Time | | --- | 40 | --- | |
| $T_f$ | Fall Time | | --- | 6 | --- | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$=50V , $V_{GS}$=0V , f=1MHz | --- | 1368 | --- | pF |
| $C_{oss}$ | Output Capacitance | | --- | 451 | --- | |
| $C_{rss}$ | Reverse Transfer Capacitance | | --- | 12.9 | --- | |
| $I_S$ | Continuous Source Current[1,5] | $V_G$=$V_D$=0V , Force Current | --- | --- | 70 | A |
| $I_{SM}$ | Pulsed Source Current[2,5] | | --- | --- | 280 | A |
| $V_{SD}$ | Diode Forward Voltage[2] | $V_{GS}$=0V , $I_S$=1A , $T_J$=25°C | --- | --- | 1.2 | V |
| $t_{rr}$ | Reverse Recovery Time | $I_F$=10A,dI/dt=100A/μs, $T_J$=25°C | --- | 103 | --- | nS |
| $Q_{rr}$ | Reverse Recovery Charge | | --- | 187 | --- | nC |

Note :

1.The data tested by surface mounted on a 1 inch$^2$ FR-4 board with 2OZ copper.

2.The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%

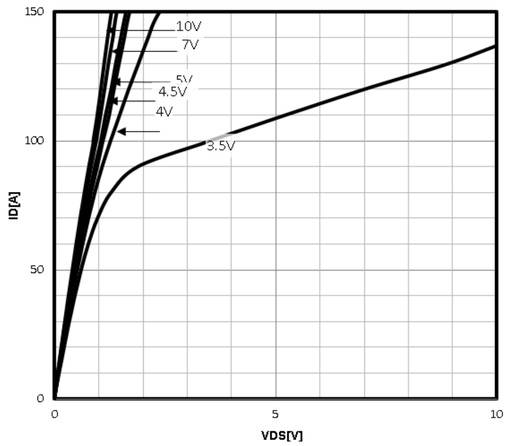
3.The EAS data shows Max. rating . The test condition is $V_{DD}$=25V,$V_{GS}$=10V,L=0.1mH,$I_{AS}$=11A

4.The power dissipation is limited by 150˚C junction temperature

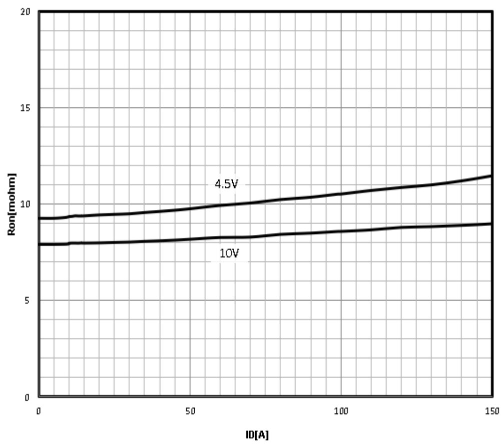
5 .The data is theoretically the same as $I_D$ and $I_{DM}$ , in real applications , should be limited by total power dissipation.

## Typical Characteristics

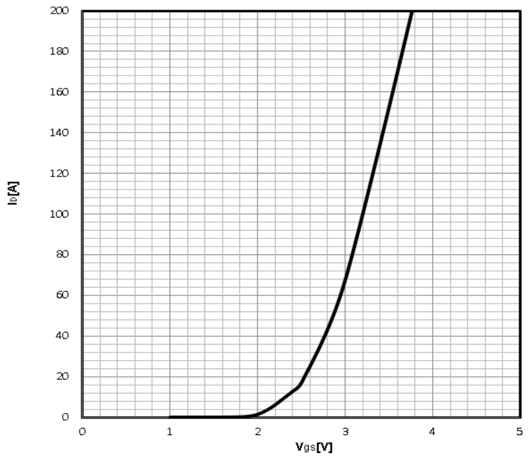
**Typ. output characteristics**
$I_D=f(V_{DS})$



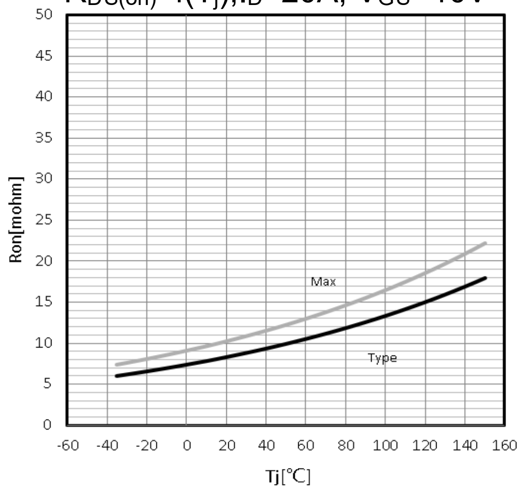

**Typ. drain-source on resistance**
$R_{DS(on)}=f(I_D)$



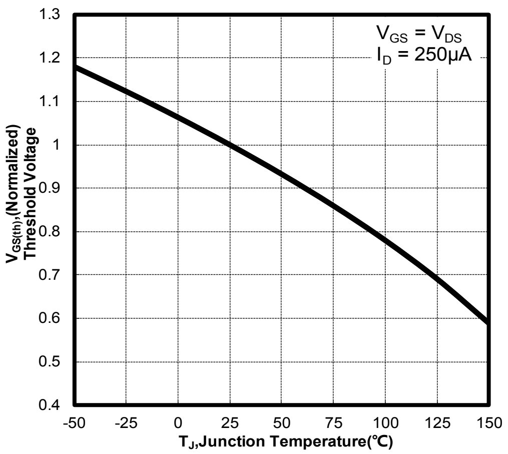

**Typ. transfer characteristics**
$I_D=f(V_{GS})$



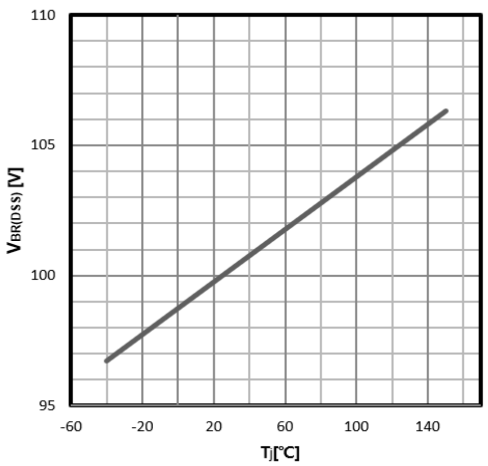

**Drain-source on-state resistance**
$R_{DS(on)}=f(T_j);I_D=20A;\ V_{GS}=10V$



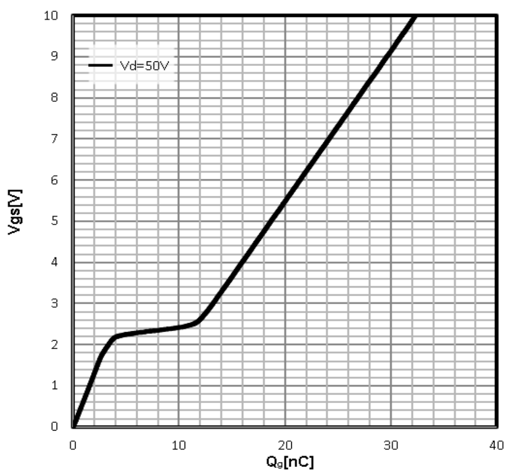

**Gate Threshold Voltage**
$V_{TH}=f(T_j);\ I_D=250uA$



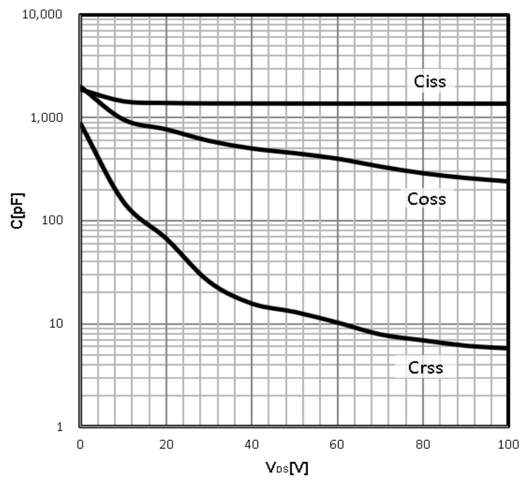

**Drain-source breakdown voltage**
$V_{BR(DSS)}=f(T_j);\ I_D=250uA$



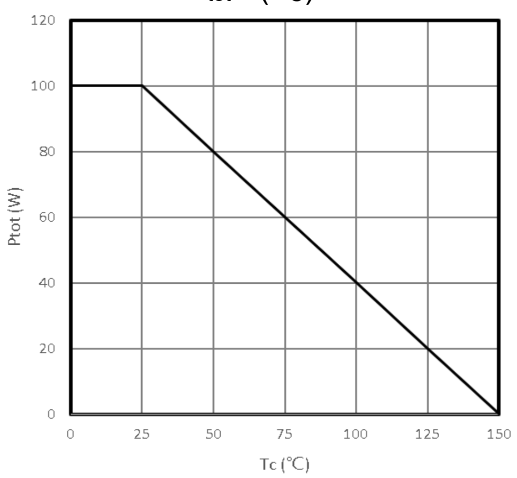
### Typ. gate charge
$V_{GS}$=f($Q_g$) ; $I_D$=10A



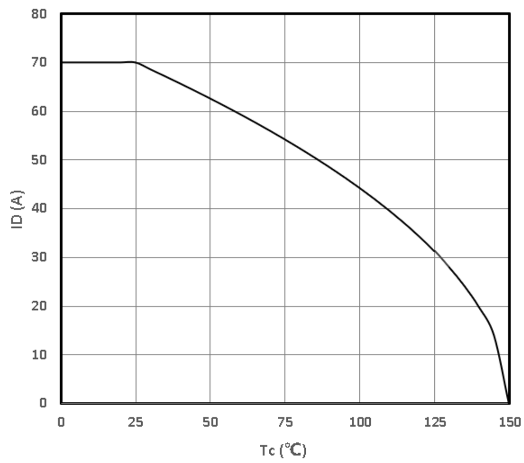

### Typ. capacitances
C =f($V_{DS}$); $V_{GS}$=0V; f =1MHz



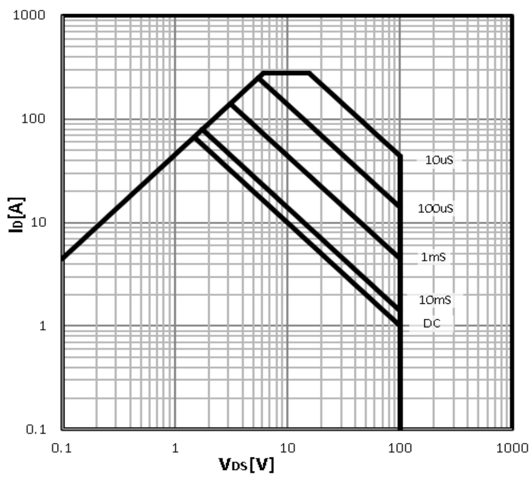

### Power Dissipation
$P_{tot}$=f($T_C$)



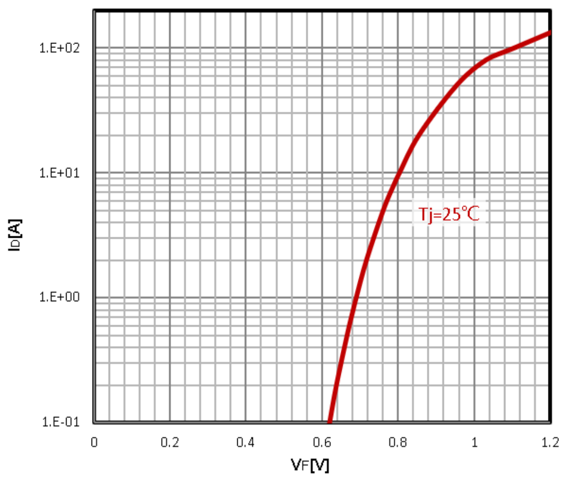

### Maximum Drain Current
$I_D$=f($T_C$)




### Safe operating area
$I_D$=f($V_{DS}$)

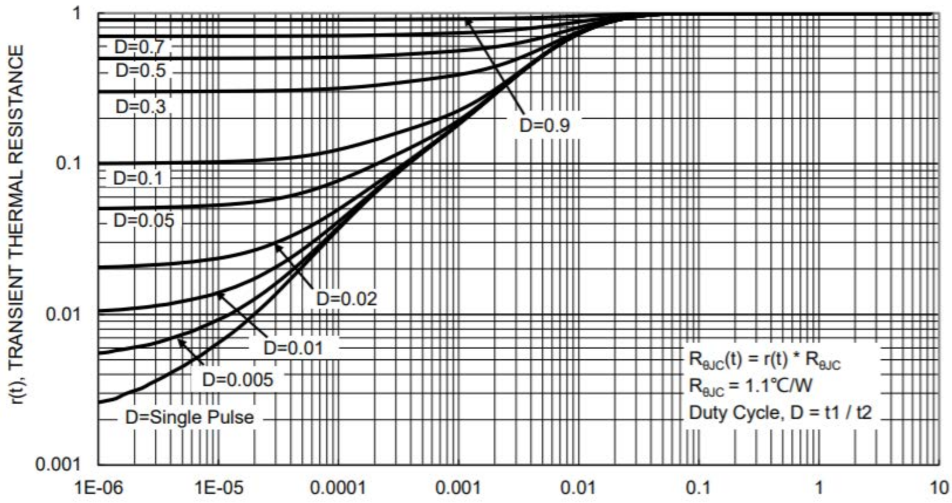



### Body Diode Forward Voltage Variation
$I_F$=f($V_{GS}$)



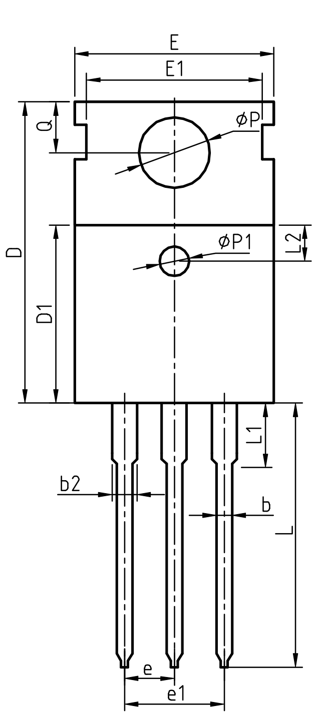
**Max. transient thermal impedance**

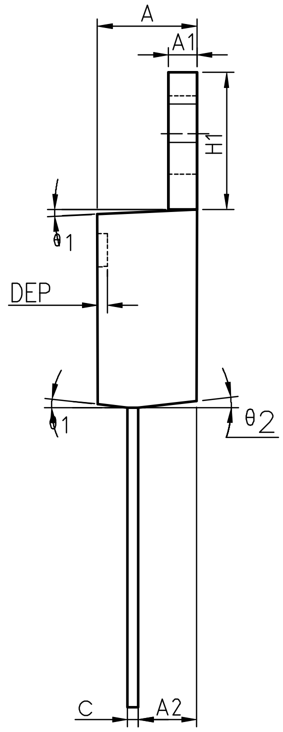
$Z_{thJC}=f(t_p)$

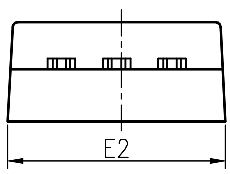


## Package Information

## TO-220C




COMMON DIMENSIONS

| SYMBOL | MIN | NOM | MAX | MIN | NOM | MAX |
|---|---|---|---|---|---|---|
| A | 4.40 | 4.57 | 4.70 | 0.173 | 0.180 | 0.185 |
| A1 | 1.27 | 1.30 | 1.33 | 0.050 | 0.051 | 0.052 |
| A2 | 2.35 | 2.40 | 2.50 | 0.093 | 0.094 | 0.098 |
| b | 0.77 | 0.80 | 0.90 | 0.030 | 0.031 | 0.035 |
| b2 | 1.17 | 1.27 | 1.36 | 0.046 | 0.050 | 0.054 |
| c | 0.48 | 0.50 | 0.56 | 0.019 | 0.020 | 0.022 |
| D | 15.40 | 15.60 | 15.80 | 0.606 | 0.614 | 0.622 |
| D1 | 9.00 | 9.10 | 9.20 | 0.354 | 0.358 | 0.362 |
| DEP | 0.05 | 0.10 | 0.20 | 0.002 | 0.004 | 0.008 |
| E | 9.80 | 10.00 | 10.20 | 0.386 | 0.394 | 0.402 |
| E1 | - | 8.70 | - | - | 0.343 | - |
| E2 | 9.80 | 10.00 | 10.20 | 0.386 | 0.394 | 0.402 |
| e | | 2.54 | BSC | | 0.100 | BSC |
| e1 | | 5.08 | BSC | | 0.200 | BSC |
| H1 | 6.40 | 6.50 | 6.60 | 0.252 | 0.256 | 0.260 |
| L | 12.75 | 13.50 | 13.65 | 0.502 | 0.531 | 0.537 |
| L1 | - | 3.10 | 3.30 | - | 0.122 | 0.130 |
| L2 | | 2.50 | REF | | 0.098 | REF |
| P | 3.50 | 3.60 | 3.63 | 0.138 | 0.142 | 0.143 |
| P1 | 3.50 | 3.60 | 3.63 | 0.138 | 0.142 | 0.143 |
| Q | 2.73 | 2.80 | 2.87 | 0.107 | 0.110 | 0.113 |
| θ1 | 5° | 7° | 9° | 5° | 7° | 9° |
| θ2 | 1° | 3° | 5° | 1° | 3° | 5° |
| θ3 | 1° | 3° | 5° | 1° | 3° | 5° |

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