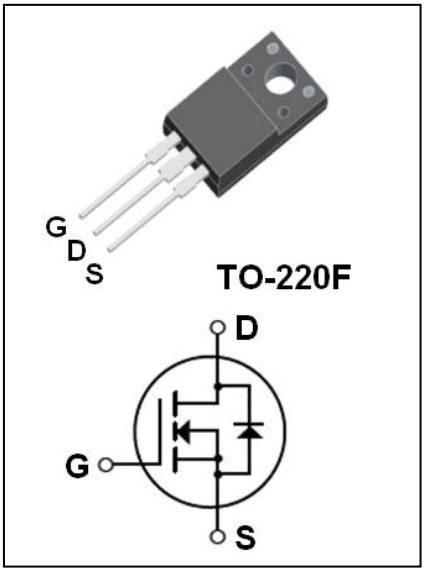
# HCF65R180

650V N-Channnel Super Junction Power MOSFET




## ●Features：

- 20.0A, 650V, $R_{DS(on)(Typ)}$ =180mΩ@$V_{GS}$=10V
- Ultra Low Gate Charge
- Ultra Low $C_{rss}$
- 100% Avalanche Tested
- Fast Switching
- Improved dv/dt Capability

## ●Application:

- High Frequency Switching Mode Power Supply
- Active Power Factor Correction

**Absolute Maximum Ratings**(Tc=25°C unless otherwise noted)

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_{DSS}$ | Drain-Source Voltage | 650 | V |
| $V_{GSS}$ | Gate-Source Voltage | ±30 | V |
| $I_D$ | Drain Current - Continuous(Tc=25°C) | 20.0* | A |
| | - Continuous(Tc=100°C) | 12.5* | A |
| $I_{DM}$ | Drain Current -Pulsed (Note1) | 60* | A |
| $P_D$ | Power Dissipation($T_C$ =25°C) | 34 | W |
| | -Derate above 25°C | 0.27 | W/°C |
| $E_{AS}$ | Single Pulsed Avalanche Energy (Note2) | 600 | mJ |
| $I_{AR}$ | Avalanche Current (Note1) | 7 | A |
| $E_{AR}$ | Repetitive Avalanche Energy, $t_{AR}$ limited by $T_{jmax}$ (Note1) | 1 | mJ |
| dv/dt | Drain Source voltage slope, $V_{DS}$≤480V | 50 | V/ns |
| dv/dt | Reverse diode dv/dt , $V_{DS}$≤480V, $I_{SD}$≤$I_D$ | 15 | V/ns |
| Tj | Operating Junction Temperature | 150 | °C |
| Tstg | Storage Temperature Range | -55 to+150 | °C |

* Drain Current Limited by Maximum Junction Temperature.

**Thermal Characteristics**

| Symbol | Parameter | Max | Unit |
|---|---|---|---|
| $R_{\theta JC}$ | Thermal Resistance,Junction to Case | 3.67 | °C /W |
| $R_{\theta JA}$ | Thermal Resistance,Junction to Ambient | 62.5 | °C /W |

**Electrical Characteristics**(Tc=25°C unless otherwise noted)

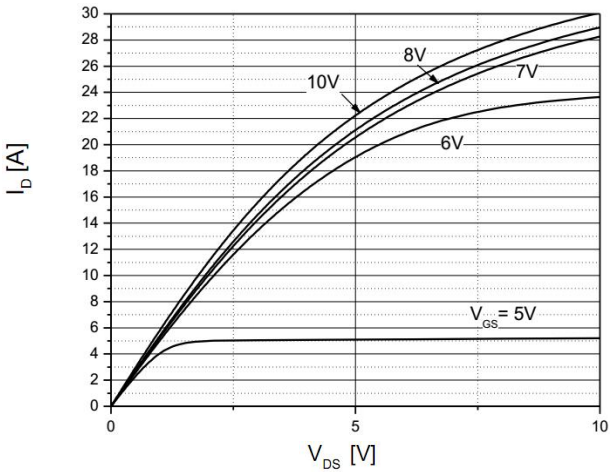
| Symbol | Parameter | Test Conditons | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| $BV_{DSS}$ | Drain-source Breakdown Voltage | $V_{GS}$=0V ,$I_D$=250μA | 650 | -- | -- | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$=650V,$V_{GS}$=0V | -- | -- | 1 | μA |
| | | $V_{DS}$=650V,Tc=125°C | -- | -- | 100 | μA |
| $I_{GSSF}$ | Gate-Body Leakage Current,Forward | $V_{GS}$=+30V, $V_{DS}$=0V | -- | -- | 100 | nA |
| $I_{GSSR}$ | Gate-Body Leakage Current,Reverse | $V_{GS}$=-30V, $V_{DS}$=0V | -- | -- | -100 | nA |
| **On Characteristics** | | | | | | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$= $V_{GS}$, $I_D$=250μA | 2.0 | -- | 4.0 | V |
| $R_{DS(on)}$ | Static Drain-Source On-Resistance | $V_{GS}$=10 V, $I_D$=10.0A | -- | 180 | 210 | mΩ |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$=10 V, $I_D$=10.0A | -- | 15 | -- | S |
| **Dynamic Characteristics** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$=50V,$V_{GS}$=0V, f=1.0MHz | -- | 1440 | -- | pF |
| $C_{oss}$ | Output Capacitance | | -- | 105 | -- | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | -- | 3.94 | -- | pF |
| $Q_g$ | Total Gate Charge | $V_{DS}$ = 480V, $I_D$ =20 A, $V_{GS}$ = 10 V | -- | 23.3 | -- | nC |
| $Q_{gs}$ | Gate-Source Charge | | -- | 6.6 | -- | nC |
| $Q_{gd}$ | Gate-Drain Charge | | -- | 8.3 | -- | nC |
| $R_G$ | Intrinsic gate resistance | f=1MHz open drain | | 1 | | Ω |
| **Switching Characteristics** | | | | | | |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DD}$ = 480V, $I_D$ =20 A, $R_G$ =25 Ω, $V_{GS}$=10 V | -- | 40.3 | -- | ns |
| $t_r$ | Turn-On Rise Time | | -- | 49.3 | -- | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | -- | 60 | -- | ns |
| $t_f$ | Turn-Off Fall Time | | -- | 59.2 | -- | ns |
| **Drain-Source Diode Characteristics and Maximum Ratings** | | | | | | |
| $I_{SD}$ | Maximum Continuous Drain-Source Diode Forward Current | | -- | -- | 20 | A |
| $I_{SDM}$ | Maximum Pulsed Drain-Source Diode Forward Current | | -- | -- | 60 | A |
| $V_{SD}$ | Drain-Source Diode Forward Voltage | $T_J$ = 25°C , $V_{GS}$ =0V,$I_{SD}$=20.0A | -- | -- | 1.2 | V |
| $t_{rr}$ | Reverse Recovery Time | $T_J$ = 25°C , $I_F$=20.0A, $dI_F$ /dt=100A/μs | -- | 367 | -- | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | -- | 4.2 | -- | μC |
| $I_{rrm}$ | Peak Reverse Recovery Current | | -- | 24.3 | -- | A |

Notes:

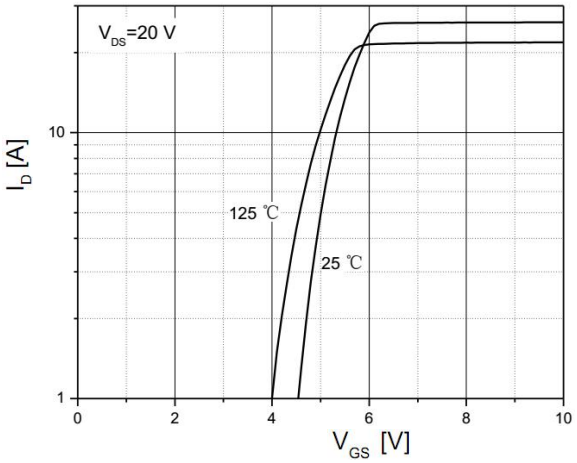
1、Repetitive Rating:Pulse Width Limited by Maximum Junction Temperature.

2、$T_J$ = 25°C ,$V_{DD}$ = 50V, $V_G$ =10V, $R_G$ = 25 Ω.

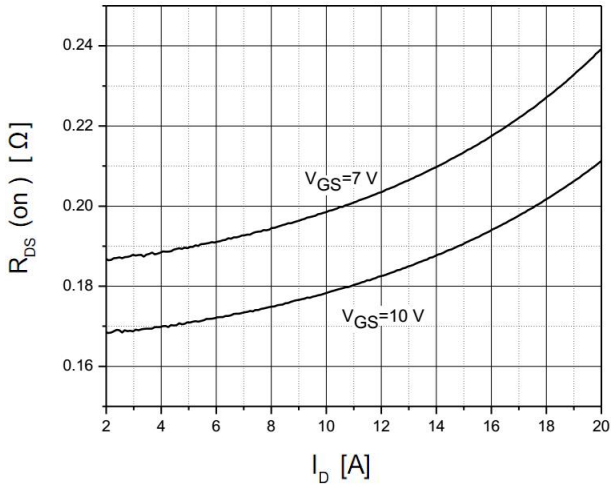
## On-Regin Characteristics



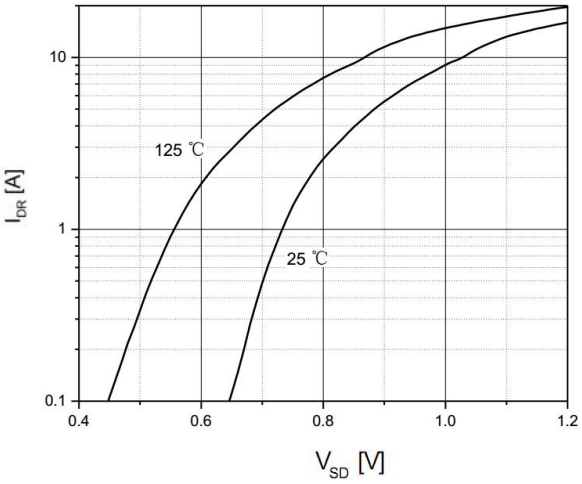

## Transfer Characteristics



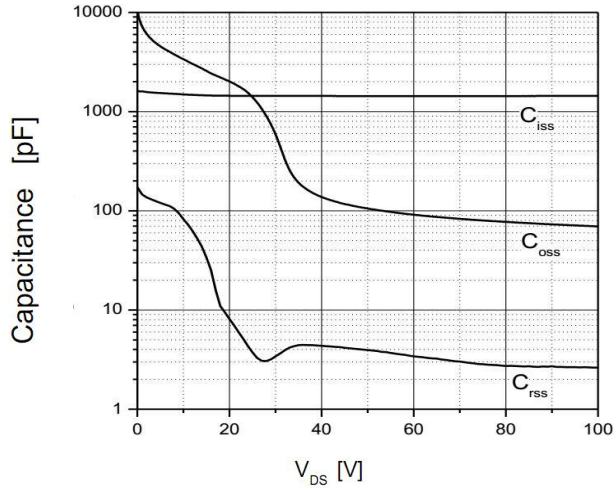

## On-Resistance Variation vs. Drain Current and Gate Voltage



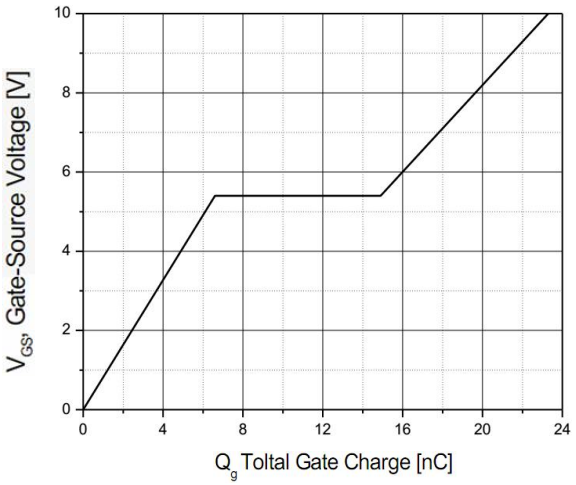

## Body Diode Forward Voltage Variation vs. Source Current and Temperature



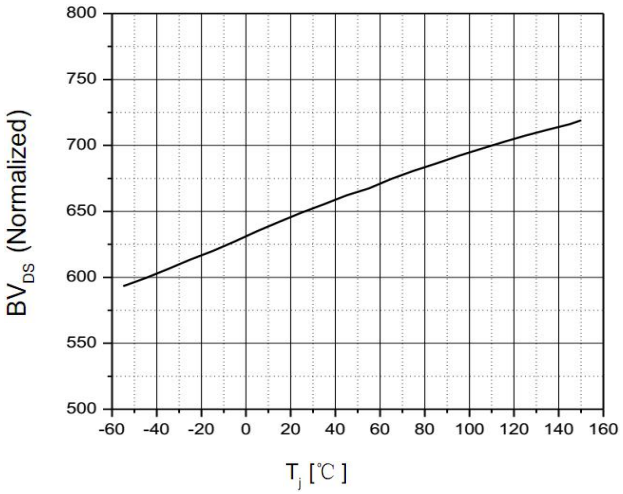

## Capacitance Characteristics



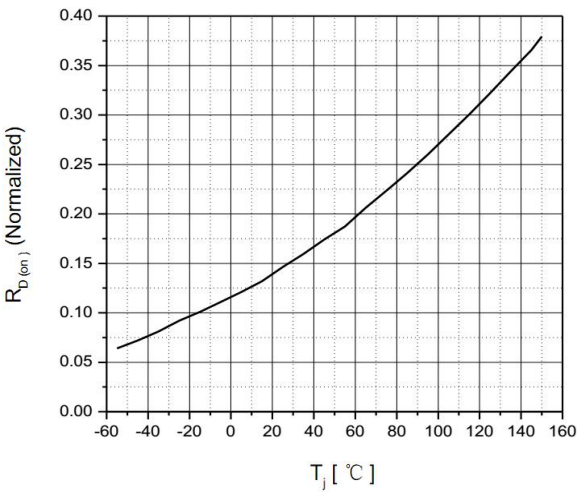

## Gate Charge Characteristics



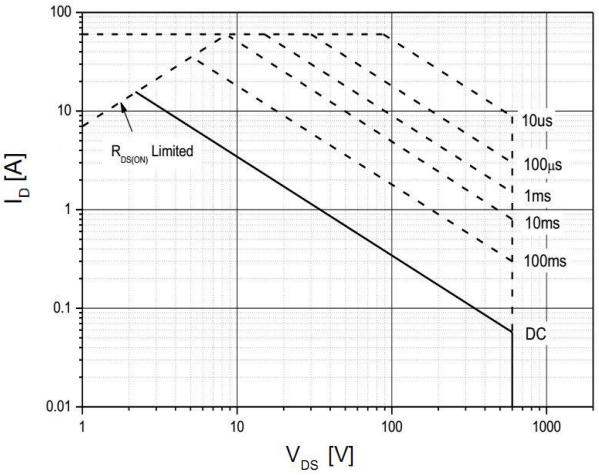
### Breakdown Voltage Variation vs. Temperature



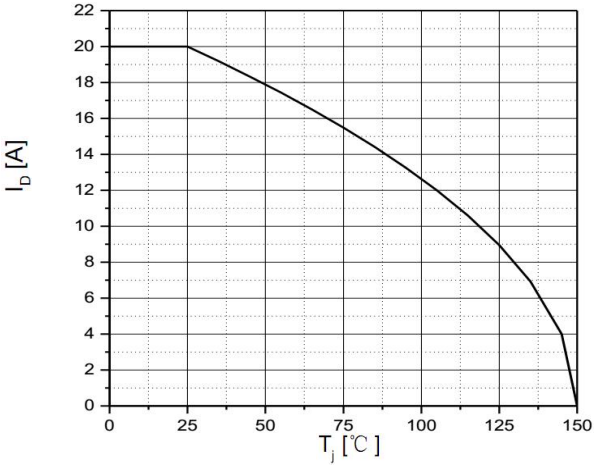

### On-Resistance Variation vs. Temperature




### Maximum Safe Operating Area




### Maximum Drain Current Vs. Case Temperature



# TO-220F Package Dimensions

UNIT：mm

| SYMBOL | min | nom | max | SYMBOL | min | nom | max |
|---|---|---|---|---|---|---|---|
| A | 9.80 | | 10.60 | D | | 2.54 | |
| A1 | | 7.00 | | D1 | 1.15 | | 1.55 |
| A2 | 2.90 | | 3.40 | D2 | 0.60 | | 1.00 |
| A3 | 9.10 | | 9.90 | D3 | 0.20 | | 0.50 |
| B1 | 15.40 | | 16.40 | E | 2.24 | | 2.84 |
| B2 | 4.35 | | 4.95 | E1 | | 0.70 | |
| B3 | 6.00 | | 7.40 | E2 | | 1.0×45° | |
| C | 3.00 | | 3.70 | E3 | 0.35 | | 0.65 |
| C1 | 15.00 | | 17.00 | E4 | 2.30 | | 3.30 |
| C2 | 8.80 | | 10.80 | α（度） | | 30° | |