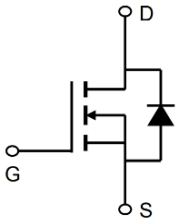
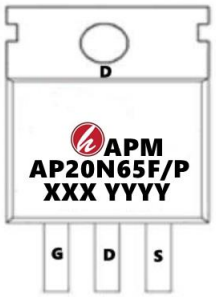
# AP20N65F/P

## 650V N-Channel Enhancement Mode MOSFET

### Description

The AP20N65F/P is silicon N-channel Enhanced VDMOSFETs, is obtained by the self-aligned planar Technology which reduce the conduction loss, improve switching performance and enhance the avalanche energy. The transistor can be used in various power switching circuit for system miniaturization and higher efficiency.




### General Features

$V_{DS}$ = 650V $I_D$ =20A

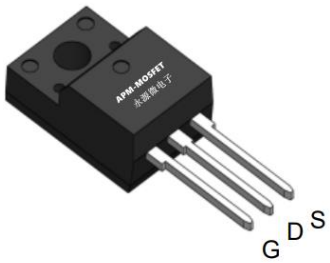
$R_{DS(ON)}$ < 480mΩ @ $V_{GS}$=10V （**Type：380mΩ**）

### Application

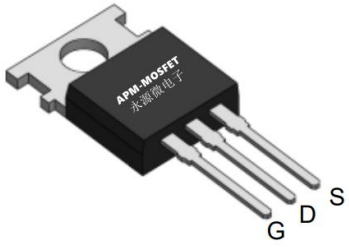
Uninterruptible Power Supply(UPS)

Power Factor Correction (PFC)

**TO-220F**




**TO-220**




## Package Marking and Ordering Information

| Product ID | Pack | Marking | Qty(PCS) |
|---|---|---|---|
| AP20N65F | TO-220F-3L | AP20N65F XXX YYYY | 1000 |
| AP20N65P | TO-220-3L | AP20N65P XXX YYYY | 1000 |

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

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| | | TO-220F TO-220 | |
| VDSS | Drain-Source Voltage ($V_{GS}$ = 0V) | 650 | V |
| ID | Continuous Drain Current | 20 | A |
| IDM | Pulsed Drain Current (note1) | 72 | A |
| VGS | Gate-Source Voltage | ±30 | V |
| $E_{AS}$ | Single Pulse Avalanche Energy (note2) | 340 | mJ |
| IAR | Avalanche Current (note1) | 18 | A |
| $E_{AR}$ | Repetitive Avalanche Energy note1) | 48 | mJ |
| $P_D$ | Power Dissipation ($T_C$ = 25ºC) | 35 | W |
| TJ, Tstg | Operating Junction and Storage Temperature Range | -55~+150 | ºC |
| RthJC | Thermal Resistance, Junction-to-Case | 3.55 | ºC/W |
| RthJA | Thermal Resistance, Junction-to-Ambient | 62.5 | ºC/W |

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

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| V(BR)DSS | Drain-Source Breakdown Voltage | $V_{GS}$ = 0V, $I_D$ = 250μA | 650 | 690 | -- | V |
| IDSS | Zero Gate Voltage Drain Current | $V_{DS}$ = 500V, $V_{GS}$ = 0V, $T_J$ = 25ºC | -- | -- | 1 | μA |
| IGSS | Gate-Source Leakage | $V_{GS}$ = ±30V | -- | -- | ±100 | nA |
| VGS(th) | Gate-Source Threshold Voltage | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA | 3.0 | 3.2 | 5.0 | V |
| RDS(on) | Drain-Source On-Resistance (Note3) | $V_{GS}$ = 10V, $I_D$ = 9A | -- | 380 | 480 | mΩ |
| $C_{iss}$ | Input Capacitance | $V_{GS}$ = 0V, $V_{DS}$ = 25V, f = 1.0MHz | -- | 2150 | -- | pF |
| $C_{oss}$ | Output Capacitance | | -- | 265 | -- | |
| $C_{rss}$ | Reverse Transfer Capacitance | | -- | 6.2 | -- | |
| $Q_g$ | Total Gate Charge | VDS=335V, ID=18A, VGS =10V | -- | 38 | -- | nC |
| $Q_{gs}$ | Gate-Source Charge | | -- | 12 | -- | |
| $Q_{gd}$ | Gate-Drain Charge | | -- | 13 | -- | |
| td(on) | Turn-on Delay Time | VDD=335V, ID=18A, RG = 25 Ω | -- | 36 | -- | ns |
| $t_r$ | Turn-on Rise Time | | -- | 51 | -- | |
| td(off) | Turn-off Delay Time | | -- | 80 | -- | |
| $t_f$ | Turn-off Fall Time | | -- | 44 | -- | |
| $I_S$ | Continuous Body Diode Current | $T_C$ = 25 ºC | -- | -- | 18 | A |
| ISM | Pulsed Diode Forward Current | | -- | -- | 72 | |
| $V_{SD}$ | Body Diode Voltage | $T_J$ = 25ºC, $I_{SD}$ = 18A, $V_{GS}$ = 0V | -- | -- | 1.4 | V |
| trr | Reverse Recovery Time | $V_{GS}$ = 0V,$I_S$ = 18A, $di_F/dt$ =100A /μs | -- | 456 | -- | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | -- | 5.9 | -- | μC |

**Note :**

1、The data tested by surface mounted on a 1 inch2 FR-4 board with 2OZ copper.

2、The EAS data shows Max. rating . L=4.1Mh IAS=18A, VDD=50V, RG=25Ω, Starting TJ = 25 ºC

3、The test condition is Pulse Test: Pulse width ≤ 300μs, Duty Cycle ≤ 1%

4、The power dissipation is limited by 150℃ junction temperature

5、The data is theoretically the same as ID and IDM , in real applications , should be limited by total power dissipation.

## Typical Characteristics

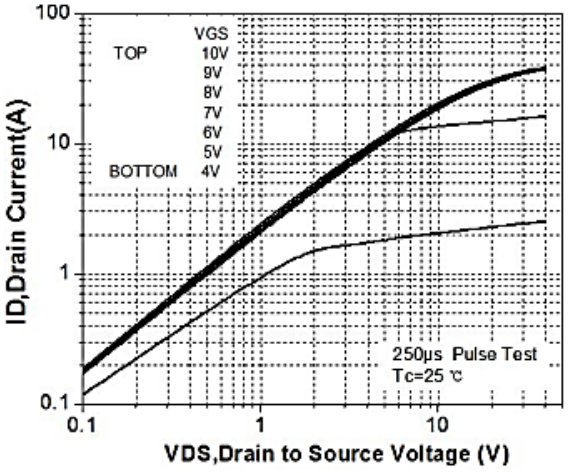



Figure 1. On-Region Characteristics

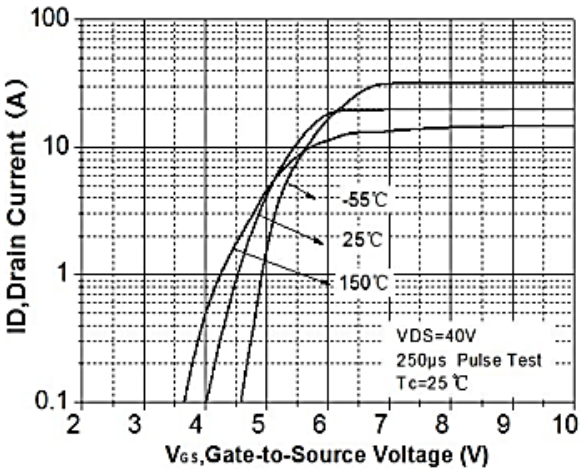



Figure 2. Transfer Characteristics

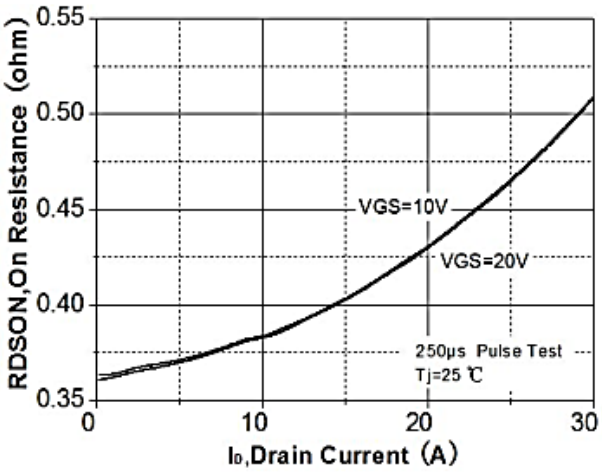



Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

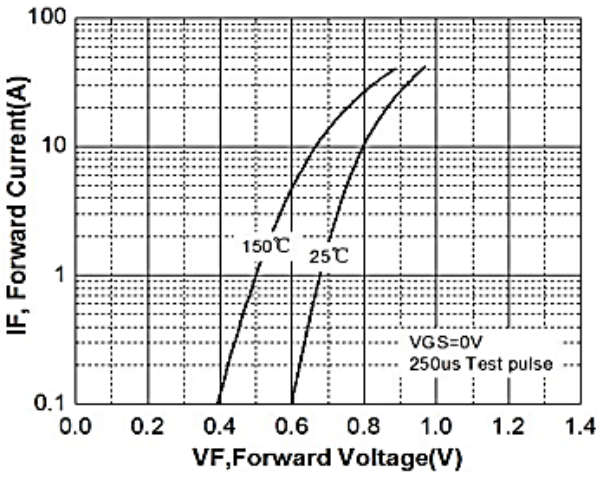



Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

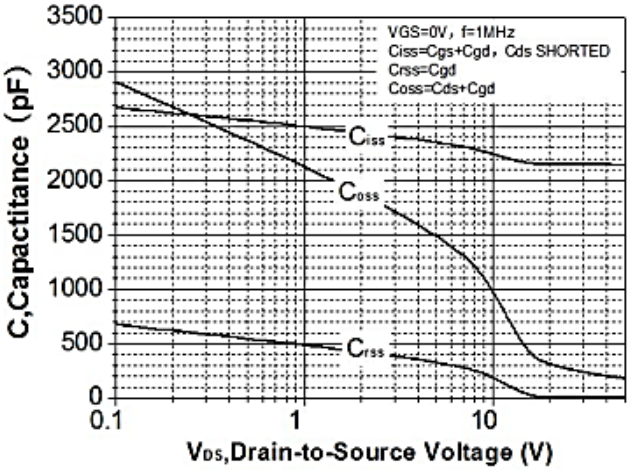



Figure 5. Capacitance Characteristics

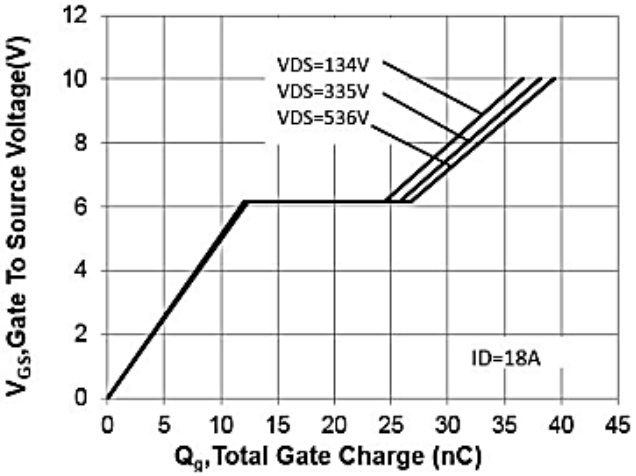



Figure 6. Gate Charge Characteristics

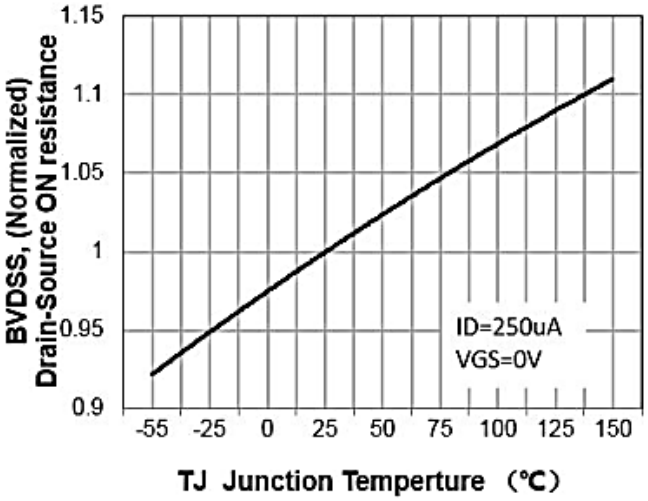



Figure 7. Breakdown Voltage Variation vs Temperature

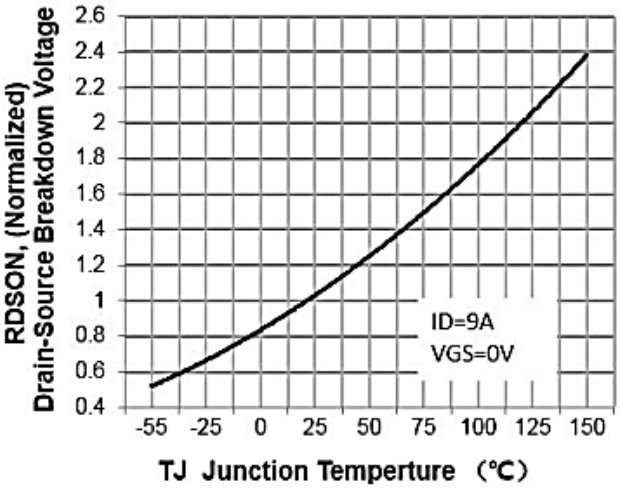



Figure 8. On-Resistance Variation vs Temperature

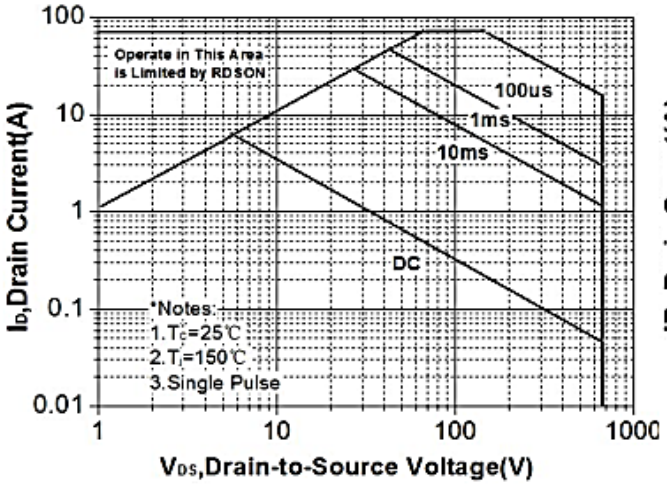



Figure 9. Maximum Safe Operating Area

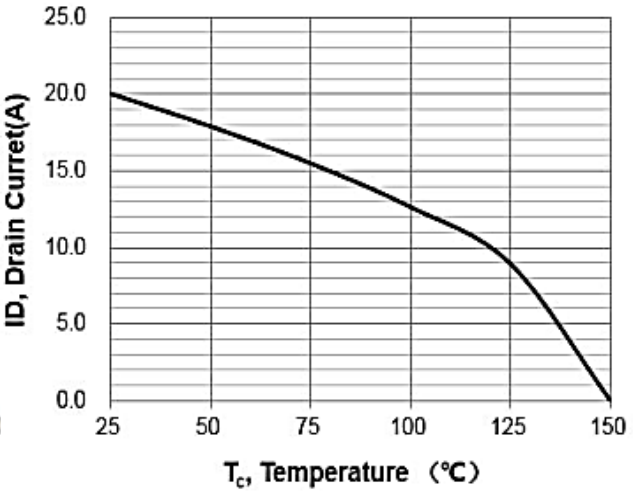



Figure 10. Maximum Drain Current vs Case Temperature

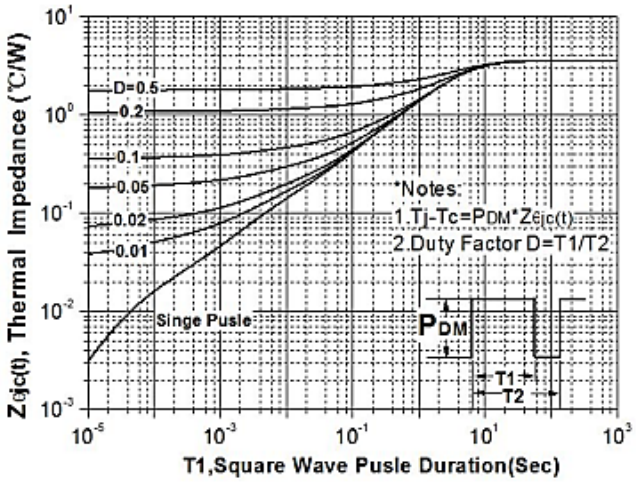



Figure 11. Transient Thermal Response Curve

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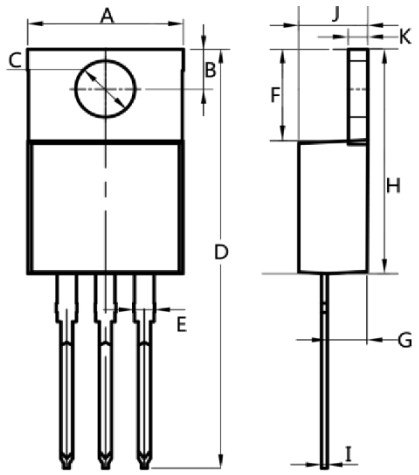


| Dim. | Min. | Max. |
|---|---|---|
| A | 10.0 | 10.4 |
| B | 2.5 | 3.0 |
| C | 3.5 | 4.0 |
| D | 28.0 | 30.0 |
| E | 1.1 | 1.5 |
| F | 6.2 | 6.6 |
| G | 2.9 | 3.3 |
| H | 15.0 | 16.0 |
| I | 0.35 | 0.45 |
| J | 4.3 | 4.7 |
| K | 1.2 | 1.4 |
| All Dimensions in millimeter | | |

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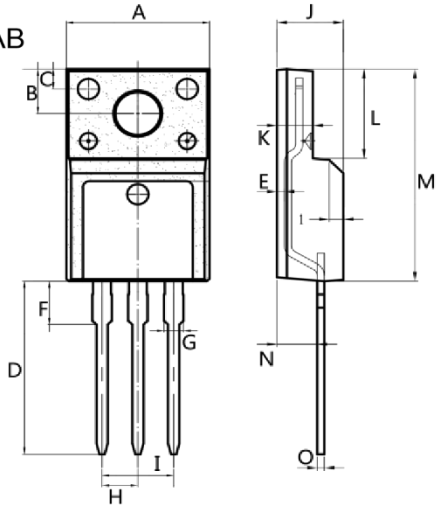


| Dim. | Min. | Max. |
|---|---|---|
| A | 9.9 | 10.3 |
| B | 2.9 | 3.5 |
| C | 1.15 | 1.45 |
| D | 12.75 | 13.25 |
| E | 0.55 | 0.75 |
| F | 3.1 | 3.5 |
| G | 1.25 | 1.45 |
| H | Typ 2.54 | |
| I | Typ 5.08 | |
| J | 4.55 | 4.75 |
| K | 2.4 | 2. 7 |
| L | 6.35 | 6.75 |
| M | 15.0 | 16.0 |
| N | 2.75 | 3.15 |
| O | 0.45 | 0.60 |
| All Dimensions in millimeter | | |

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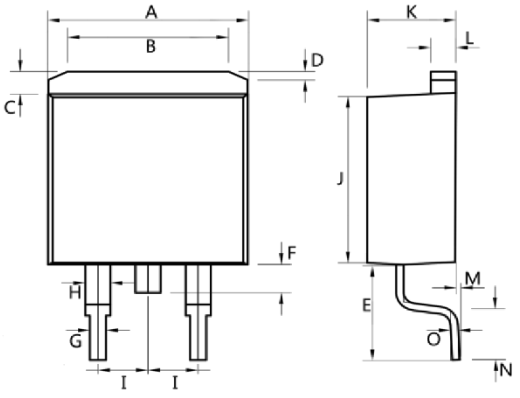


| Dim. | Min. | Max. |
|---|---|---|
| A | 10.0 | 10. 5 |
| B | 7.25 | 7.75 |
| C | 1.3 | 1.5 |
| D | 0.55 | 0.75 |
| E | 5.0 | 6.0 |
| F | 1.4 | 1.6 |
| G | 0.75 | 0.95 |
| H | 1.15 | 1.35 |
| I | Typ 2.54 | |
| J | 8.4 | 8.6 |
| K | 4.4 | 4.6 |
| L | 1.25 | 1.45 |
| M | 0.02 | 0.1 |
| N | 2.4 | 2.8 |
| O | 0.35 | 0.45 |
| All Dimensions in millimeter | | |

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## 650V N-Channel Enhancement Mode MOSFET

| Edition | Date | Change |
|---|---|---|
| Rve1.0 | 2020/1/31 | Initial release |