## General Description

The WSR10N65F is the highest performance trench N-Ch MOSFET with extreme high cell density,which provide excellent RDSON and gate charge for most of the synchronous buck converter applications .

The WSR10N65F meet the RoHS and Green Product requirement , 100% EAS guaranteed with full function reliability approved.

## Features

- Advanced high cell density Trench technology
- Super Low Gate Charge
- Excellent Cdv/dt effect decline
- Green Device Available

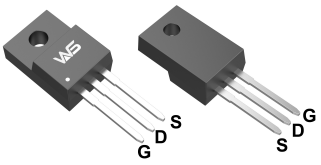
## Product Summery

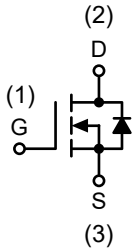
| $BV_{DSS}$ | $R_{DSON}$ | $I_D$ |
|---|---|---|
| 650V | 600mΩ | 10A |

## Applications

- AC/DC Power Conversion in Switched Mode Power Supplies (SMPS).
- Uninterruptible Power Supply(UPS)
- Adapter.

## TO-220F-3L Pin Configuration




## Absolute Maximum Ratings

| Symbol | Parameter | Rating | Units |
|---|---|---|---|
| $V_{DS}$ | Drain-Source Voltage | 650 | V |
| $V_{GS}$ | Gate-Source Voltage | ±30 | V |
| $I_D$@$T_C$=25℃ | Continuous Drain Current, $V_{GS}$ @ 10V[1.5] | 10 | A |
| $I_D$@$T_C$=100℃ | Continuous Drain Current, $V_{GS}$ @ 10V[1.5] | 6 | A |
| $I_{DM}$ | Pulsed Drain Current[1.2.5] | 40 | A |
| EAS | Single Pulse Avalanche Energy[1] | 900 | mJ |
| $P_D$ | Total Power Dissipation[1,5] | 39 | W |
| $T_{STG}$ | Storage Temperature Range | -55 to 150 | ℃ |
| $T_J$ | Operating Junction Temperature Range | -55 to 150 | ℃ |

## Thermal Data

| Symbol | Parameter | Typ. | Max. | Unit |
|---|---|---|---|---|
| $R_{\theta JA}$ | Thermal Resistance Junction-ambient [1] | --- | 62.5 | ℃/W |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case[1] | --- | 3.2 | ℃/W |

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

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$=0V , $I_D$=250uA | 650 | --- | --- | V |
| $\triangle BV_{DSS}/\triangle T_J$ | BVDSS Temperature Coefficient | Reference to 25℃ , $I_D$=250uA | --- | 0.6 | --- | V/℃ |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance[2] | $V_{GS}$=10V , $I_D$=3.5A | --- | 600 | 800 | mΩ |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS}$=$V_{DS}$ , $I_D$ =250uA | 2.0 | 3.0 | 4.0 | V |
| $\triangle V_{GS(th)}$ | $V_{GS(th)}$ Temperature Coefficient | | --- | -4.57 | --- | mV/℃ |
| $I_{DSS}$ | Drain-Source Leakage Current | $V_{DS}$=650V , $V_{GS}$=0V , $T_J$=25℃ | --- | --- | 1 | uA |
| | | $V_{DS}$=520V , $V_{GS}$=0V , $T_J$=55℃ | --- | --- | 10 | |
| $I_{GSS}$ | Gate-Source Leakage Current | $V_{GS}$=±30V , $V_{DS}$=0V | --- | --- | ±100 | nA |
| gfs | Forward Transconductance | $V_{DS}$=40V , $I_D$=3.5A | --- | 5 | --- | S |
| $Q_g$ | Total Gate Charge (10V) | VDD=520V , VGS=10V , ID=10A | --- | 21 | --- | nC |
| $Q_{gs}$ | Gate-Source Charge | | --- | 7.5 | --- | |
| $Q_{gd}$ | Gate-Drain Charge | | --- | 6 | --- | |
| $T_{d(on)}$ | Turn-On Delay Time | $V_{DD}$=300V , $V_{GS}$=10V , $I_D$=10A,RG=25Ω . | --- | 28 | --- | ns |
| $T_r$ | Rise Time | | --- | 70 | --- | |
| $T_{d(off)}$ | Turn-Off Delay Time | | --- | 35 | --- | |
| $T_f$ | Fall Time | | --- | 53 | --- | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$=25V , $V_{GS}$=0V , f=1MHz | --- | 1120 | --- | pF |
| $C_{oss}$ | Output Capacitance | | --- | 130 | --- | |
| $C_{rss}$ | Reverse Transfer Capacitance | | --- | 4.9 | --- | |

## Diode Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_S$ | Continuous Source Current[1,2,5] | $V_G$=$V_D$=0V , Force Current | --- | --- | 10 | A |
| $I_{SM}$ | Pulsed Source Current[1,2] | | --- | --- | 40 | A |
| $V_{SD}$ | Diode Forward Voltage[1] | $V_{GS}$=0V , $I_S$=10A , $T_J$=25℃ | --- | --- | 1.4 | V |
| $t_{rr}$ | Reverse Recovery Time | $I_F$=10A , dI/dt=40A/μs , $T_J$=25℃ | --- | 491 | --- | nS |
| $Q_{rr}$ | Reverse Recovery Charge | | --- | 2296 | --- | nC |

Notes:

Note 1：limited by maximum junction temperature.
Note 2：Bond wire current limit.
Note 3：$V_{DS}$=520V, $I_D$=10A.
Note 4：$I_D$=0.5A, $V_{DD}$=50V, $T_j$=25°C.
Note 5：Repetitive Rating : Pulse width limited by maximum junction temperature.

## Typical Characteristics

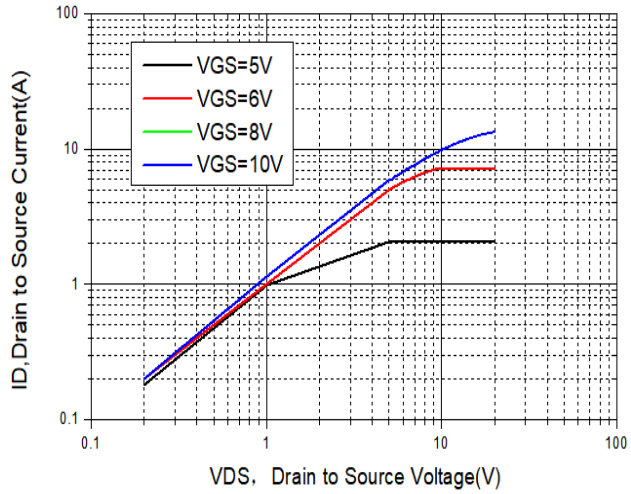



**Figure 1 Output Characteristics**

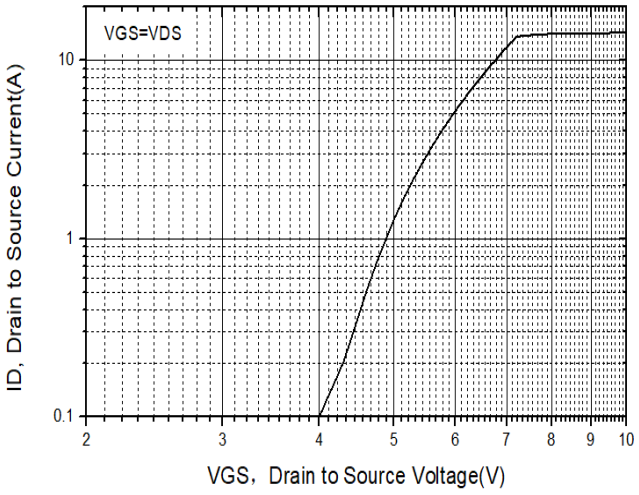



**Figure 3 Rdson-ID Characteristics**

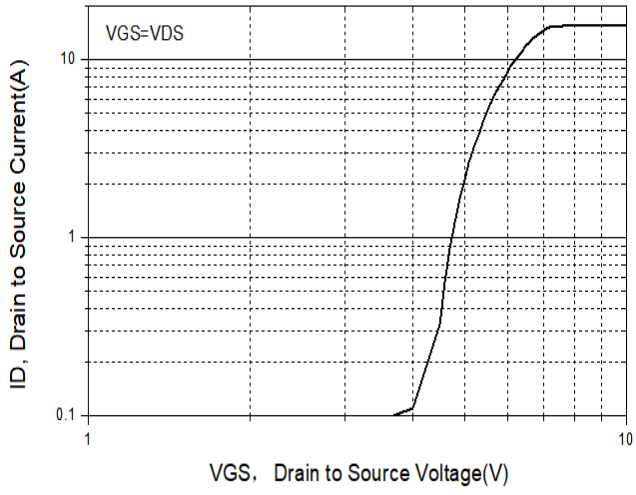



**Figure 2 Transfer Characteristics**

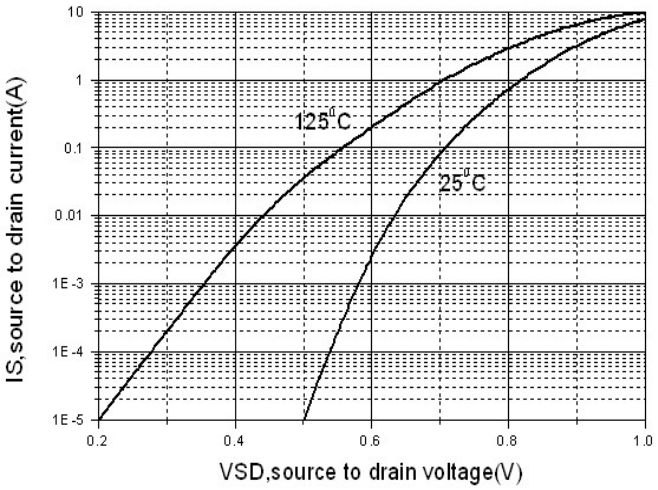



**Figure 4 Body diode Characteristics**

## Typical Characteristics

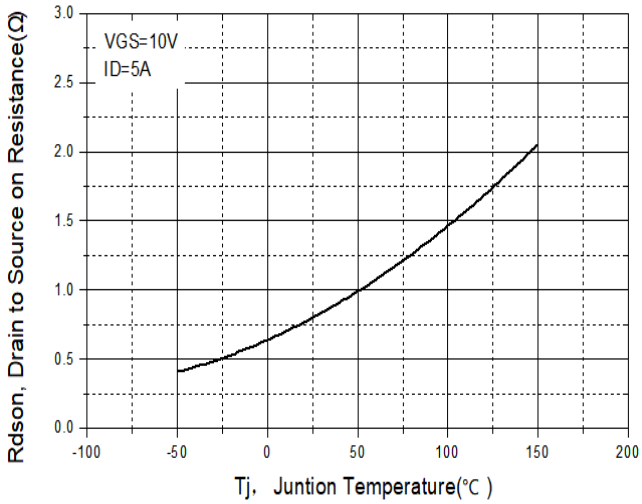



Figure 5 Rdson- Tj Relation

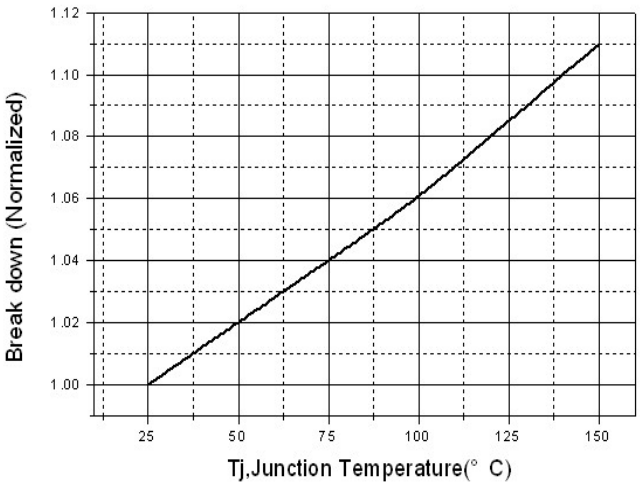



Figure 6 BVDSS vs Junction Temperature

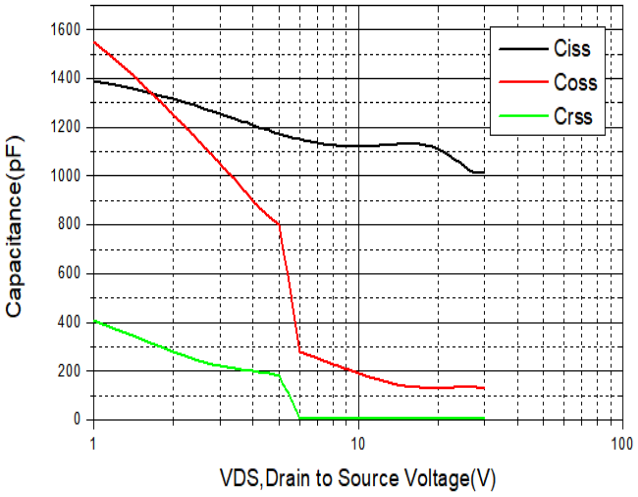



Figure 7 Capacitance vs Vds

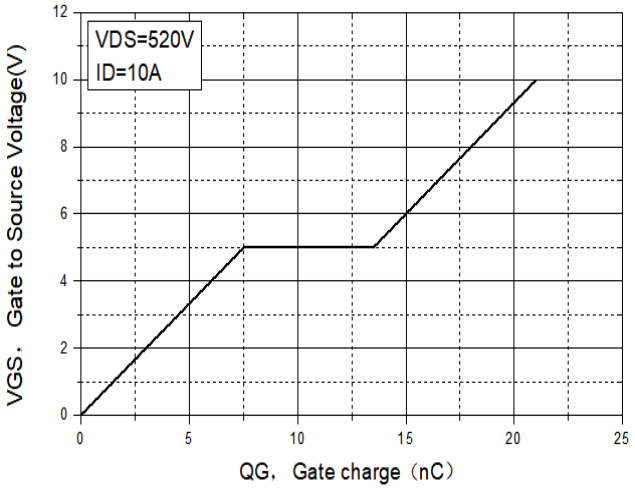



Figure 8 VGS vs QG Characteristics

## Typical Characteristics

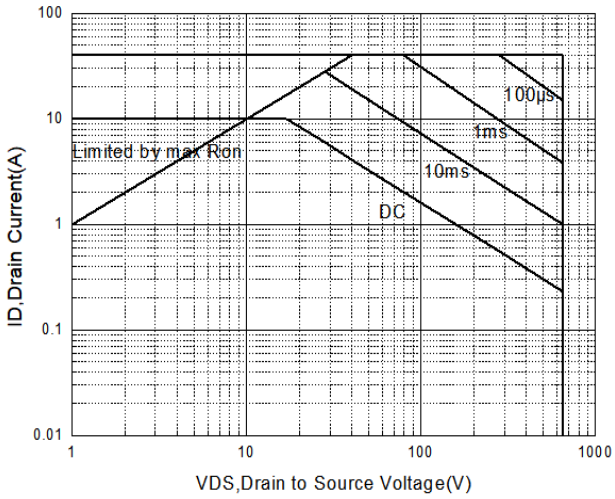



Figure 9 Safe Operation Area

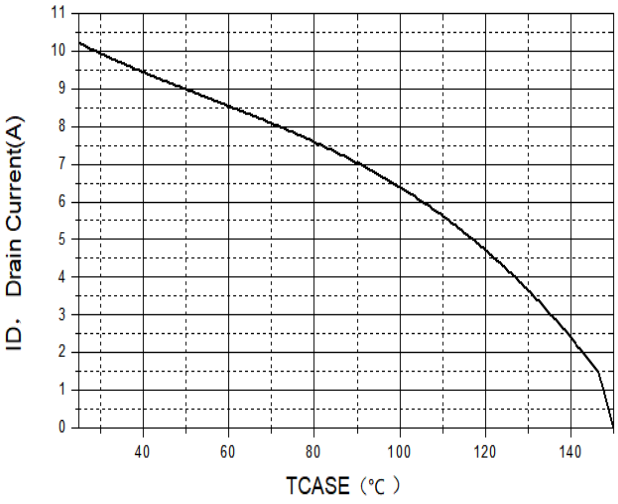



Figure 10 Maximum current attenuation

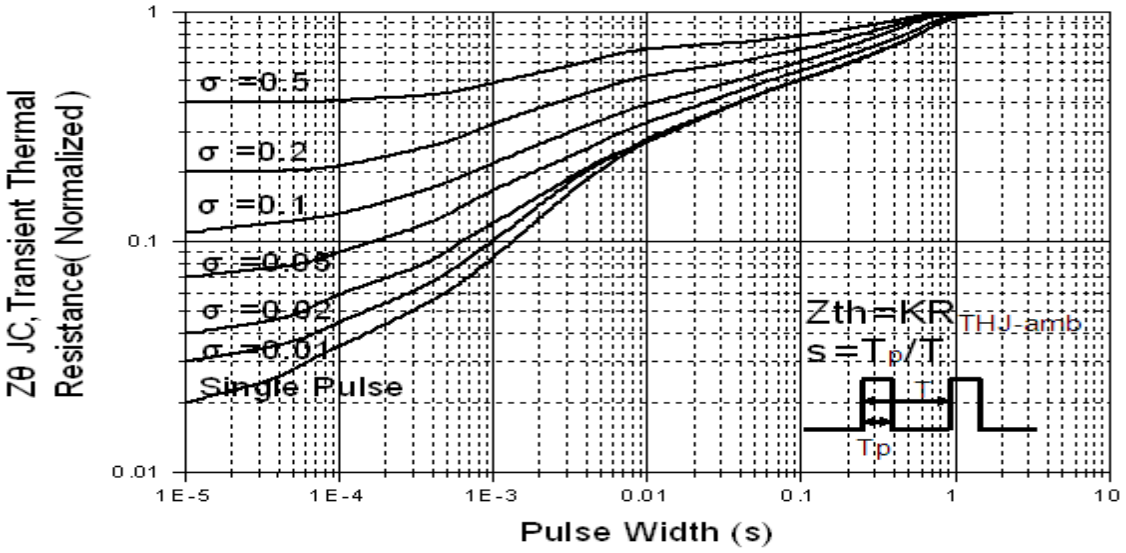
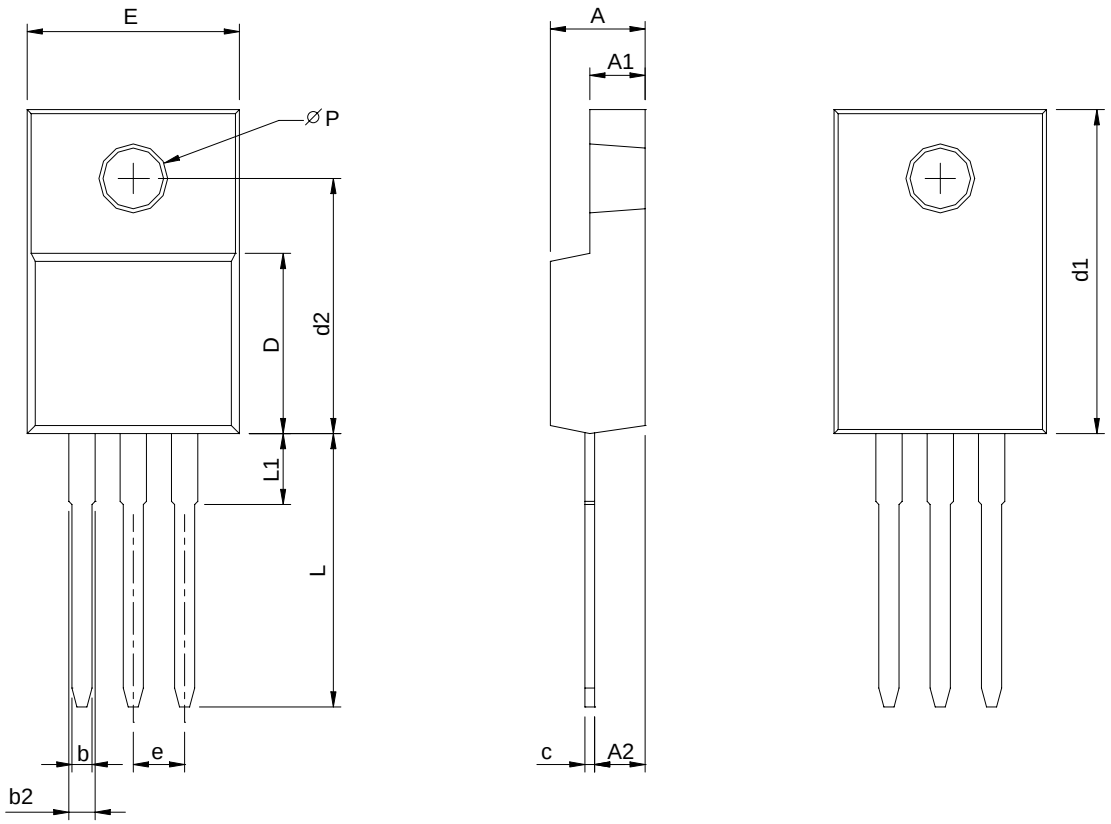


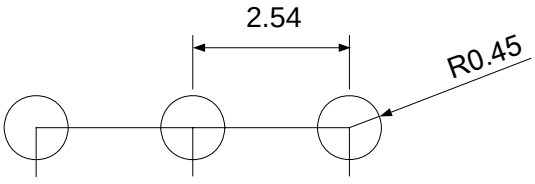

Figure 11 Normalized Maximum Transient Thermal Impedance

## Packaging information




| SYMBOL | TO-220F-3L | | | |
|---|---|---|---|---|
| | MILLIMETERS | | INCHES | |
| | MIN. | MAX. | MIN. | MAX. |
| A | 4.20 | 4.80 | 0.165 | 0.189 |
| A1 | 2.34 | 3.20 | 0.092 | 0.126 |
| A2 | 2.10 | 2.90 | 0.083 | 0.114 |
| b | 0.50 | 0.90 | 0.020 | 0.035 |
| b2 | 0.91 | 1.90 | 0.035 | 0.075 |
| c | 0.30 | 0.80 | 0.012 | 0.031 |
| D | 8.10 | 9.40 | 0.319 | 0.370 |
| d1 | 14.50 | 16.50 | 0.571 | 0.650 |
| d2 | 12.10 | 12.90 | 0.476 | 0.508 |
| E | 9.70 | 10.70 | 0.382 | 0.421 |
| e | 2.54 BSC | | 0.100 BSC | |
| L | 13.00 | 14.50 | 0.512 | 0.570 |
| L1 | 1.60 | 4.00 | 0.063 | 0.157 |
| P | 3.00 | 3.60 | 0.118 | 0.142 |

## RECOMMENDED LAND PATTERN




UNIT: mm

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