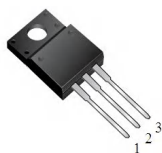


## FEATURES

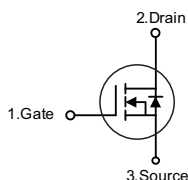
- 650V, 7A
- $R_{DS(ON)} = 1.18\Omega$  (Typ.) @  $V_{GS} = 10V$ ,  $I_D = 3.5A$
- Fast Switching
- Improved dv/dt Capability
- 100% Avalanche Tested

## APPLICATION

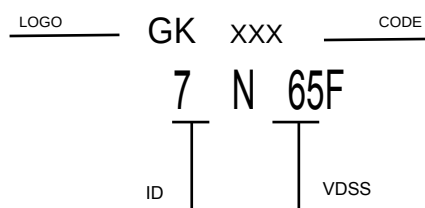
- Switch Mode Power Supply(SMPS)
- Uninterruptible Power Supply(UPS)
- Power Factor Correction (PFC)



ITO-220AB



$V_{DSS}$  650 V  
 $I_D$  7 A  
 $R_{DS(ON)}$  1.18  $\Omega$



## MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

ABSOLUTE MAXIMUM RATINGS ( $T_C = 25^\circ\text{C}$  unless otherwise specified)

| PARAMETER                          |                        | SYMBOL    | RATINGS    | UNIT             |
|------------------------------------|------------------------|-----------|------------|------------------|
| Drain-Source Voltage               |                        | $V_{DSS}$ | 650        | V                |
| Gate-Source Voltage                |                        | $V_{GSS}$ | $\pm 30$   | V                |
| Avalanche Current (Note 2)         |                        | $I_{AR}$  | 7          | A                |
| Drain Current                      | Continuous             | $I_D$     | 7          | A                |
|                                    | Pulsed (Note 2)        | $I_{DM}$  | 29.6       | A                |
| Avalanche Energy                   | Single Pulsed (Note 3) | $E_{AS}$  | 530        | mJ               |
|                                    | Repetitive (Note 2)    | $E_{AR}$  | 14.2       | mJ               |
| Peak Diode Recovery dv/dt (Note 4) |                        | dv/dt     | 4.5        | V/ns             |
| Power Dissipation                  |                        | $P_D$     | 48         | W                |
| Junction Temperature               |                        | $T_J$     | +150       | $^\circ\text{C}$ |
| Storage Temperature                |                        | $T_{STG}$ | -55 ~ +150 | $^\circ\text{C}$ |

Notes: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

2. Repetitive Rating : Pulse width limited by maximum junction temperature

3.  $L = 19.5\text{mH}$ ,  $I_{AS} = 7A$ ,  $V_{DD} = 50V$ ,  $R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$

4.  $I_{SD} \leq 7A$ ,  $di/dt \leq 200A/\mu s$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$

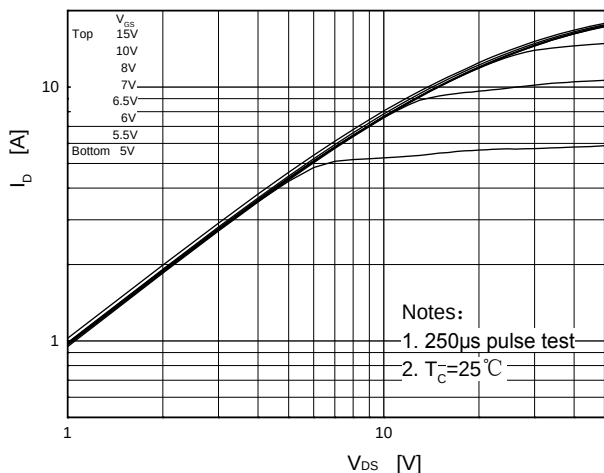
## Electrical Characteristics (T<sub>c</sub>=25°C unless otherwise specified)

| PARAMETER                                              |         | SYMBOL                              | TEST CONDITIONS                                                                  | MIN | TYP  | MAX  | UNIT |
|--------------------------------------------------------|---------|-------------------------------------|----------------------------------------------------------------------------------|-----|------|------|------|
| OFF CHARACTERISTICS                                    |         |                                     |                                                                                  |     |      |      |      |
| Drain-Source Breakdown Voltage                         |         | BV <sub>DSS</sub>                   | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA                                     | 650 |      |      | V    |
| Drain-Source Leakage Current                           |         | I <sub>DSS</sub>                    | V <sub>DS</sub> = 650V, V <sub>GS</sub> = 0V                                     |     |      | 1    | μA   |
| Gate- Source Leakage Current                           | Forward | I <sub>GSS</sub>                    | V <sub>GS</sub> = 30V, V <sub>DS</sub> = 0V                                      |     |      | 100  | nA   |
|                                                        | Reverse |                                     | V <sub>GS</sub> = -30V, V <sub>DS</sub> = 0V                                     |     |      | -100 | nA   |
| Breakdown Voltage Temperature Coefficient              |         | ΔBV <sub>DSS</sub> /ΔT <sub>J</sub> | I <sub>D</sub> =250μA,Referenced to 25°C                                         |     | 0.67 |      | V/°C |
| ON CHARACTERISTICS                                     |         |                                     |                                                                                  |     |      |      |      |
| Gate Threshold Voltage                                 |         | V <sub>GS(TH)</sub>                 | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                       | 2.0 |      | 4.0  | V    |
| Static Drain-Source On-State Resistance                |         | R <sub>DS(ON)</sub>                 | V <sub>GS</sub> = 10V, I <sub>D</sub> = 3.5A                                     |     | 1.18 | 1.67 | Ω    |
| DYNAMIC CHARACTERISTICS                                |         |                                     |                                                                                  |     |      |      |      |
| Input Capacitance                                      |         | C <sub>ISS</sub>                    | V <sub>DS</sub> =25V, V <sub>GS</sub> =0V,<br>f=1.0 MHz                          |     |      | 1400 | pF   |
| Output Capacitance                                     |         | C <sub>OSS</sub>                    |                                                                                  |     |      | 180  | pF   |
| Reverse Transfer Capacitance                           |         | C <sub>RSS</sub>                    |                                                                                  |     | 16   | 21   | pF   |
| SWITCHING CHARACTERISTICS                              |         |                                     |                                                                                  |     |      |      |      |
| Turn-On Delay Time                                     |         | t <sub>D(ON)</sub>                  | V <sub>DD</sub> =325V, I <sub>D</sub> =7.4A,<br>R <sub>G</sub> =25Ω (Note 1, 2)  |     |      | 70   | ns   |
| Turn-On Rise Time                                      |         | t <sub>R</sub>                      |                                                                                  |     |      | 170  | ns   |
| Turn-Off Delay Time                                    |         | t <sub>D(OFF)</sub>                 |                                                                                  |     |      | 140  | ns   |
| Turn-Off Fall Time                                     |         | t <sub>F</sub>                      |                                                                                  |     |      | 130  | ns   |
| SWITCHING CHARACTERISTICS                              |         |                                     |                                                                                  |     |      |      |      |
| Total Gate Charge                                      |         | Q <sub>G</sub>                      | V <sub>DS</sub> =520V, I <sub>D</sub> = 7A,<br>V <sub>GS</sub> =10 V (Note 1, 2) |     | 29   | 38   | nC   |
| Gate-Source Charge                                     |         | Q <sub>GS</sub>                     |                                                                                  |     | 7    |      | nC   |
| Gate-Drain Charge                                      |         | Q <sub>GD</sub>                     |                                                                                  |     | 14.5 |      | nC   |
| DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS |         |                                     |                                                                                  |     |      |      |      |
| Drain-Source Diode Forward Voltage                     |         | V <sub>SD</sub>                     | V <sub>GS</sub> = 0V, I <sub>S</sub> = 7A                                        |     |      | 1.4  | V    |
| Maximum Continuous Drain-Source Diode Forward Current  |         | I <sub>S</sub>                      |                                                                                  |     |      | 7    | A    |
| Maximum Pulsed Drain-Source Diode Forward Current      |         | I <sub>SM</sub>                     |                                                                                  |     |      | 29.6 | A    |
| Reverse Recovery Time                                  |         | t <sub>rr</sub>                     | V <sub>GS</sub> = 0V, I <sub>S</sub> = 7A,                                       |     | 320  |      | ns   |
| Reverse Recovery Charge                                |         | Q <sub>RR</sub>                     | dl <sub>F</sub> / dt = 100A/μs (Note 1)                                          |     | 2.4  |      | μC   |

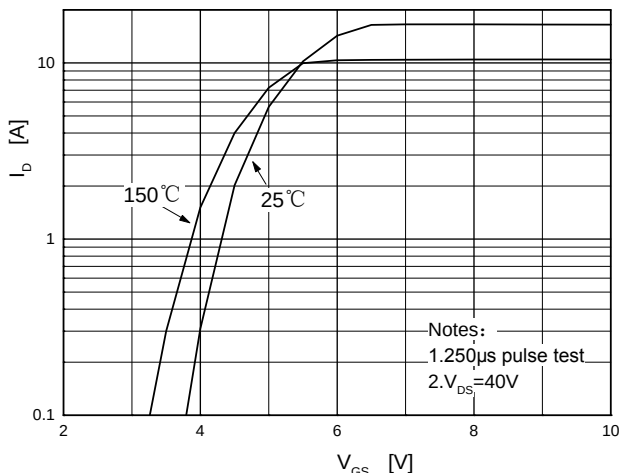
Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%  
2. Essentially independent of operating temperature

## RATING AND CHARACTERISTIC CURVES

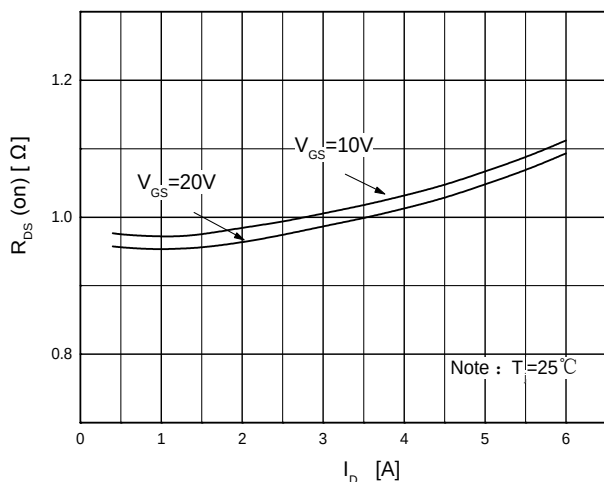
### On-Region Characteristics



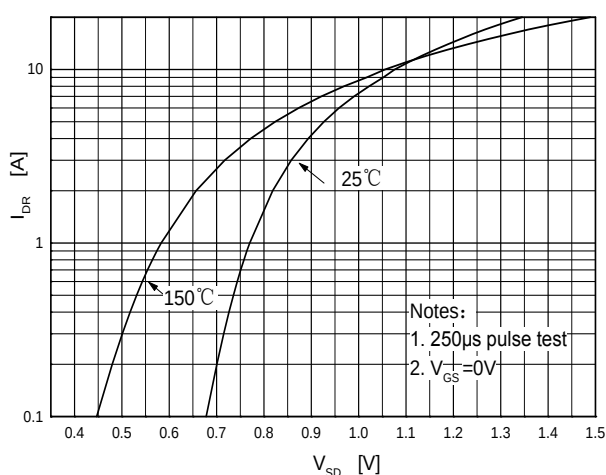
### Transfer Characteristics



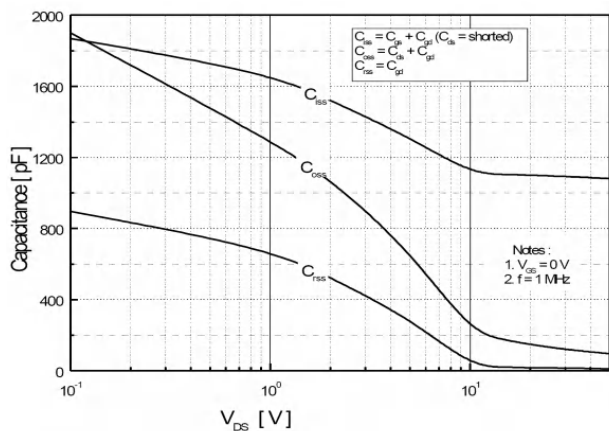
### On-Resistance Variation vs. Drain Current and Gate Voltage



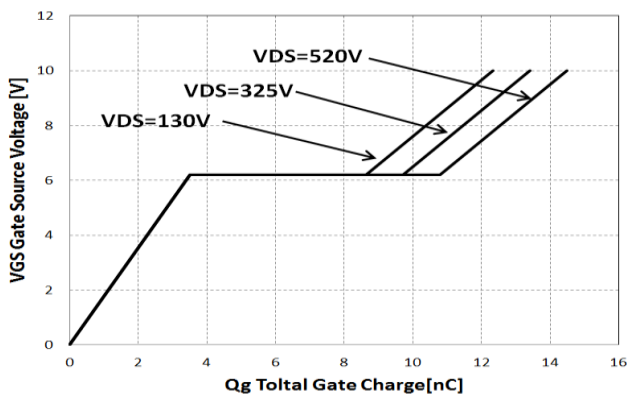
### Body Diode Forward Voltage Variation vs. Source Current and Temperature



### Capacitance Characteristics

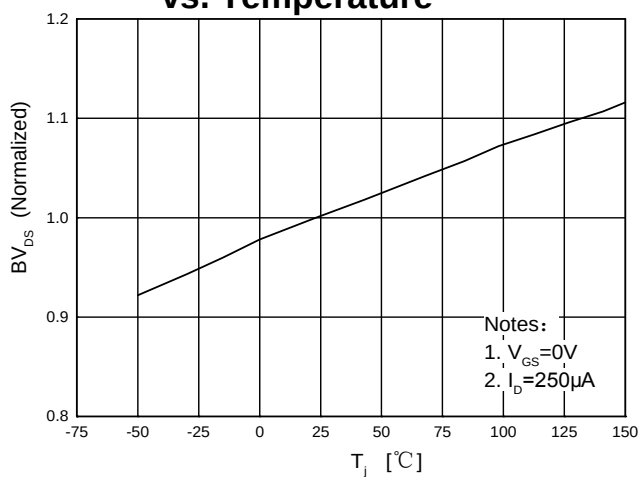


### Gate Charge Characteristics

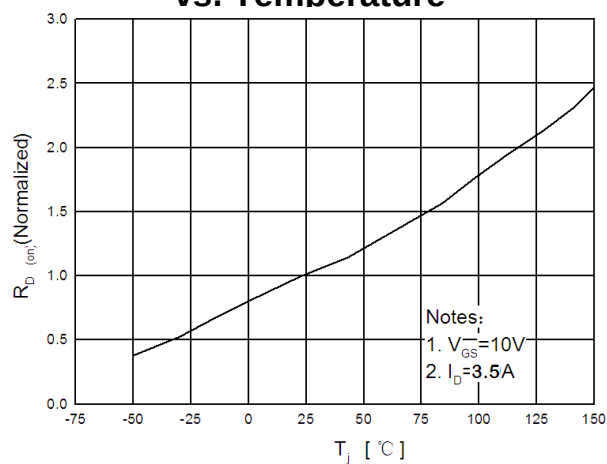


RATING AND CHARACTERISTIC CURVES

**Breakdown Voltage Variation  
vs. Temperature**

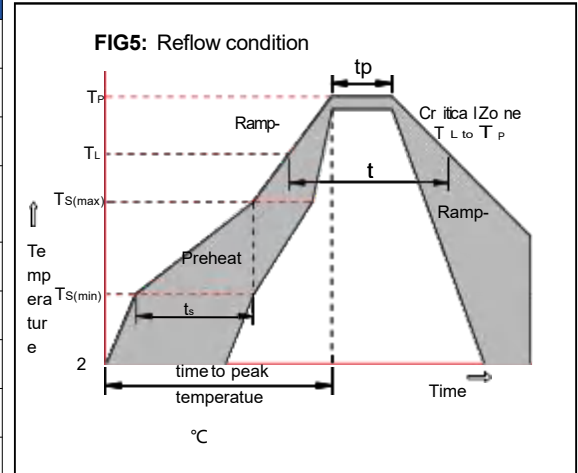


**On-Resistance Variation  
vs. Temperature**



## Soldering parameters

| Reflow Condition                                        |                                   | Pb-Free assembly<br>(see as below) |
|---------------------------------------------------------|-----------------------------------|------------------------------------|
| Pre Heat                                                | -Temperature Min ( $T_{s(min)}$ ) | +150 °C                            |
|                                                         | -Temperature Max( $T_{s(max)}$ )  | +200 °C                            |
|                                                         | -Time (Min to Max) (ts)           | 60-180 secs.                       |
| Average ramp up rate (Liquid us Temp ( $T_L$ ) to peak) |                                   | 3 °C/sec. Max                      |
| $T_{s(max)}$ to $T_L$ - Ramp-up Rate                    |                                   | 3 °C/sec. Max                      |
| Reflow                                                  | -Temperature( $T_L$ )(Liquid us)  | +217 °C                            |
|                                                         | -Temperature( $t_L$ )             | 60-150 secs.                       |
| Peak Temp ( $T_P$ )                                     |                                   | +260(+0/-5) °C                     |
| Time within 5 °C of actual Peak Temp ( $t_P$ )          |                                   | 30 secs. Max                       |
| Ramp-down Rate                                          |                                   | 6 °C/sec. Max                      |
| Time 25 °C to Peak Temp ( $T_P$ )                       |                                   | 8 min. Max                         |
| Do not exceed                                           |                                   | +260 °C                            |



## Package Dimensions & Suggested Pad Layout

