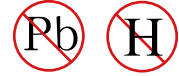




YEA SHIN TECHNOLOGY CO., LTD

YS7N65

# N-Channel Enhancement MOSFET



V<sub>DS</sub>= 650V, I<sub>D</sub>= 7A

## Feature

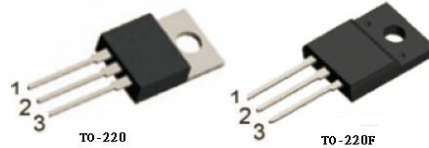
- R<sub>DS(ON)</sub><1.5Ω @ V<sub>GS</sub>=10V
- Fast switching capability
- Low gate charge
- Lead free in compliance with EU RoHS directive.
- Green molding compound

## PRODUCT SUMMARY

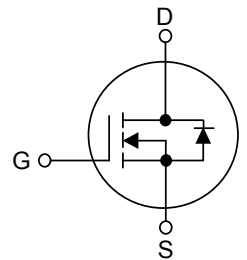
| V <sub>DS</sub> (V) | R <sub>DS(on)</sub> (Ω)    | I <sub>D</sub> (A) |
|---------------------|----------------------------|--------------------|
| 650                 | 1.5 @ V <sub>GS</sub> =10V | 7                  |

Pin Definition:

1. Gate
2. Drain
3. Source



## Block Diagram



## Mechanical Data

- Case : TO-220, TO-220F, TO-262, TO-263

## Ordering Information

| Part No.   | Package | Packing           |
|------------|---------|-------------------|
| YS7N65P-TU | TO-220  | 50pcs / Tube      |
| YS7N65F-TU | TO-220F | 50pcs / Tube      |
| YS7N65J-TU | TO-262  | 50pcs / Tube      |
| YS7N65H-TU | TO-263  | 50pcs / Tube      |
| YS7N65H-TR | TO-263  | 800pcs / 13" Reel |



## ABSOLUTE MAXIMUM RATINGS (T<sub>C</sub>=25°C, unless otherwise specified)

| PARAMETER                     |                          | SYMBOL           | RATINGS    | UNIT |
|-------------------------------|--------------------------|------------------|------------|------|
| Drain-Source Voltage          |                          | V <sub>DSS</sub> | 650        | V    |
| Gate-Source Voltage           |                          | V <sub>GSS</sub> | ±30        | V    |
| Continuous Drain Current      |                          | I <sub>D</sub>   | 7          | A    |
| Pulsed Drain Current (Note 2) |                          | I <sub>DM</sub>  | 28         | A    |
| Avalanche Energy              | Single Pulsed (Note 3)   | E <sub>AS</sub>  | 435        | mJ   |
| Power Dissipation             | TO-220 / TO-262 / TO-263 | P <sub>D</sub>   | 142        | W    |
|                               | TO-220F                  |                  | 48         |      |
| Junction Temperature          |                          | T <sub>J</sub>   | +150       | °C   |
| Operating Temperature         |                          | T <sub>OPR</sub> | -55 ~ +150 | °C   |
| Storage Temperature           |                          | T <sub>STG</sub> | -55 ~ +150 | °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 T<sub>J</sub>
3. L = 30mH, I<sub>AS</sub> = 5.25A, V<sub>DD</sub> = 50V, R<sub>G</sub> = 25 Ω, Starting T<sub>J</sub> = 25°C

# DEVICE CHARACTERISTICS

## YS7N65

### THERMAL DATA

| PARAMETER           |                                 | SYMBOL        | RATING | UNIT |
|---------------------|---------------------------------|---------------|--------|------|
| Junction to Ambient | TO-220/TO-220F<br>TO-262/TO-263 | $\theta_{JA}$ | 62.5   | °C/W |
| Junction to Case    | TO-220/TO-262/TO-263            | $\theta_{JC}$ | 0.90   | °C/W |
|                     | TO-220F                         |               | 2.6    |      |

### ELECTRICAL CHARACTERISTICS (T<sub>C</sub>=25°C, unless otherwise specified)

| PARAMETER   |         | SYMBOL                       | TEST CONDITIONS  | MIN | TYP  | MAX  | UNIT |    |
|---|---------|------------------------------|--|-----|------|------|------|----|
| <b>OFF CHARACTERISTICS</b>                                    |         |                              |  |     |      |      |      |    |
| 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>G</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                     |         | $\Delta BV_{DSS}/\Delta T_J$ | I <sub>D</sub> =250μA, Referenced to 25°C                                      |     | 0.67 |      | V/°C |    |
| <b>ON CHARACTERISTICS</b>                                     |         |                              |  |     |      |      |      |    |
| 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                                   |     | 1.35 | 1.5  | Ω    |    |
| <b>DYNAMIC CHARACTERISTICS</b>                                |         |                              |  |     |      |      |      |    |
| Input Capacitance   |         | C <sub>ISS</sub>             | V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1.0 MHz                           |     | 1210 | 1400 | pF   |    |
| Output Capacitance  |         | C <sub>OSS</sub>             |  |     |      | 140  | 180  | pF |
| Reverse Transfer Capacitance                                  |         | C <sub>RSS</sub>             |  |     |      | 40   | 50   | pF |
| <b>SWITCHING CHARACTERISTICS</b>                              |         |                              |  |     |      |      |      |    |
| Turn-On Delay Time  |         | t <sub>D(ON)</sub>           | V <sub>DD</sub> =300V, I <sub>D</sub> =7A,<br>R <sub>G</sub> =25Ω (Note 1, 2)  |     | 50   | 70   | ns   |    |
| Turn-On Rise Time   |         | t <sub>R</sub>               |  |     |      | 150  | 180  | ns |
| Turn-Off Delay Time   |         | t <sub>D(OFF)</sub>          |  |     |      | 380  | 410  | ns |
| Turn-Off Fall Time  |         | t <sub>F</sub>               |  |     |      | 180  | 220  | ns |
| Total Gate Charge   |         | Q <sub>G</sub>               | V <sub>DS</sub> =520V, I <sub>D</sub> =7A,<br>V <sub>GS</sub> =10V (Note 1, 2) |     | 29   | 38   | nC   |    |
| Gate-Source Charge  |         | Q <sub>GS</sub>              |  |     |      | 9    |      | nC |
| Gate-Drain Charge   |         | Q <sub>GD</sub>              |  |     |      | 19   |      | nC |
| <b>DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS</b> |         |                              |  |     |      |      |      |    |
| 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>              |  |     |      | 28   | A    |    |
| Reverse Recovery Time   |         | t <sub>rr</sub>              | V <sub>GS</sub> =0V, I <sub>S</sub> =7.0A,                                     |     | 490  |      | ns   |    |
| Reverse Recovery Charge                                       |         | Q <sub>RR</sub>              | di <sub>F</sub> /dt =100 A/μs (Note 1)   |     | 3.2  |      | μC   |    |

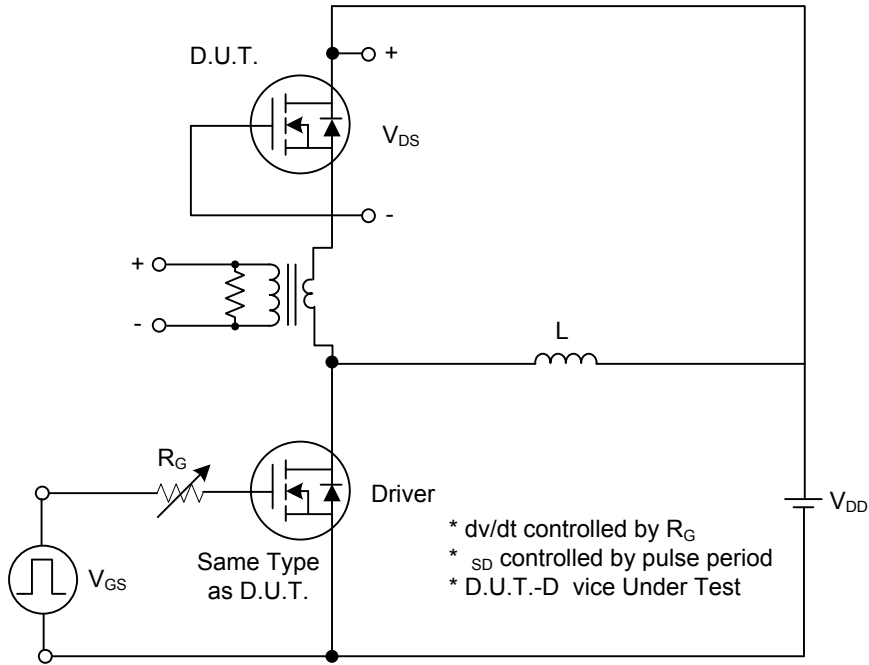
Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%.

2. Essentially independent of operating temperature.

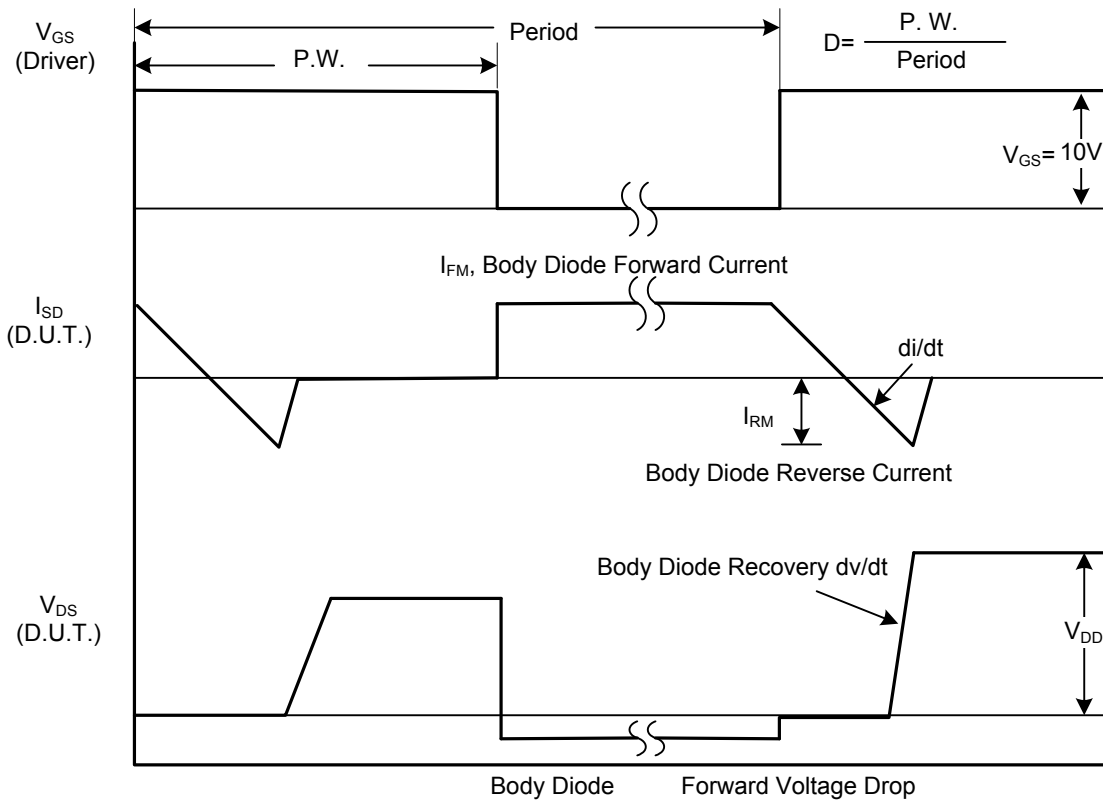
# DEVICE CHARACTERISTICS

## YS7N65

### TEST CIRCUITS AND WAVEFORMS



**Peak Diode Recovery  $dv/dt$  Test Circuit**

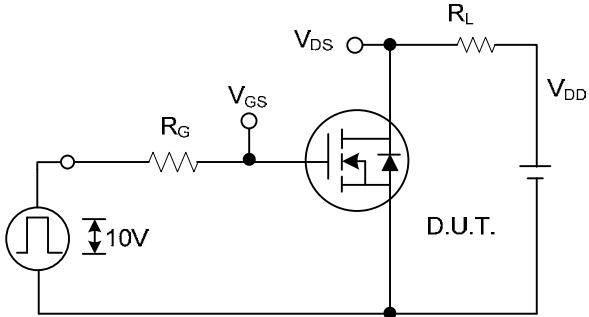


**Peak Diode Recovery  $dv/dt$  Waveforms**

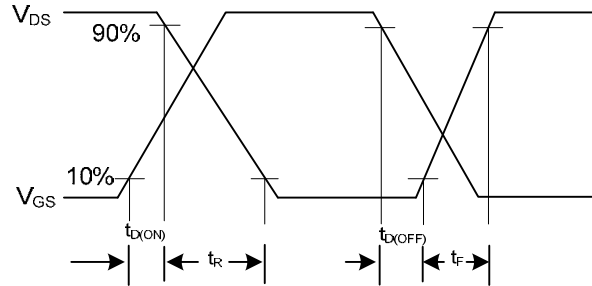
# DEVICE CHARACTERISTICS

## YS7N65

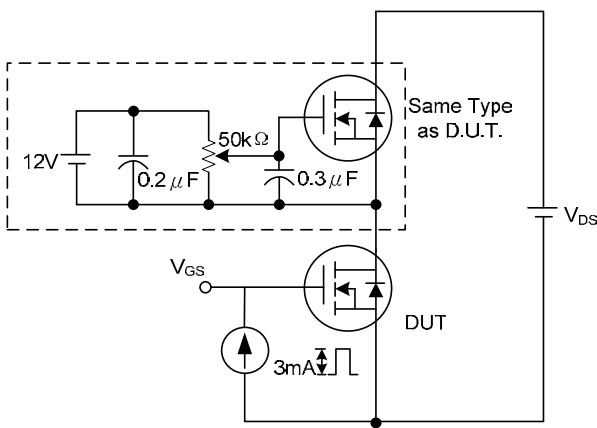
### TEST CIRCUITS AND WAVEFORMS(Cont.)



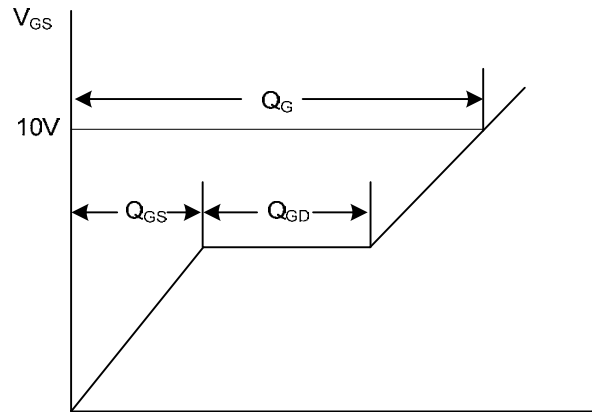
Switching Test Circuit



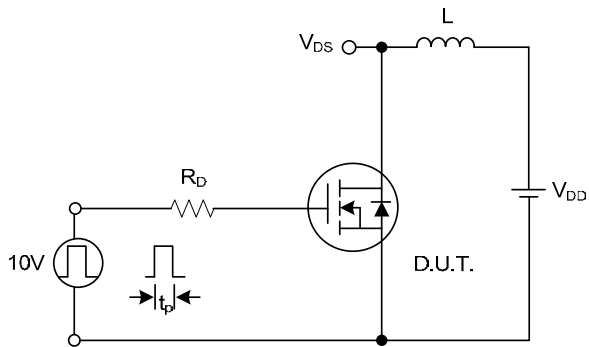
Switching Waveforms



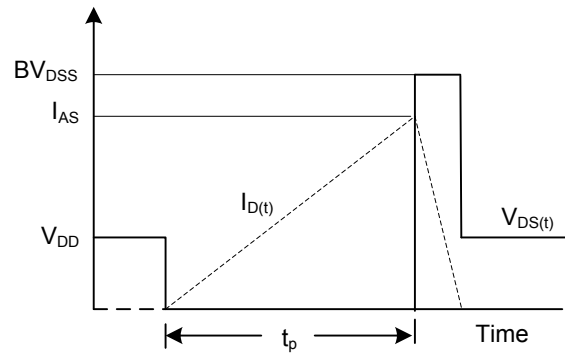
Gate Charge Test Circuit



Gate Charge Waveform



Unclamped Inductive Switching Test Circuit



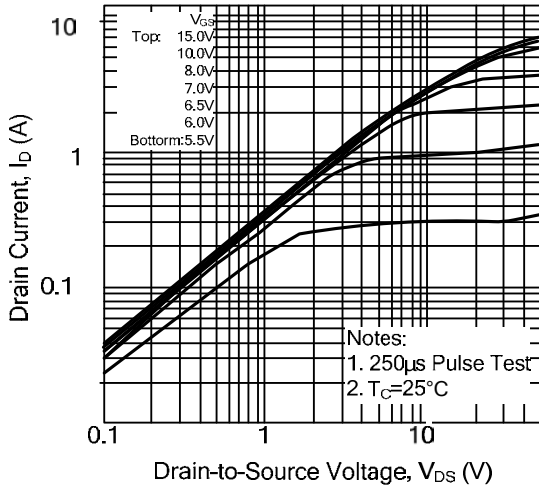
Unclamped Inductive Switching Waveforms

# DEVICE CHARACTERISTICS

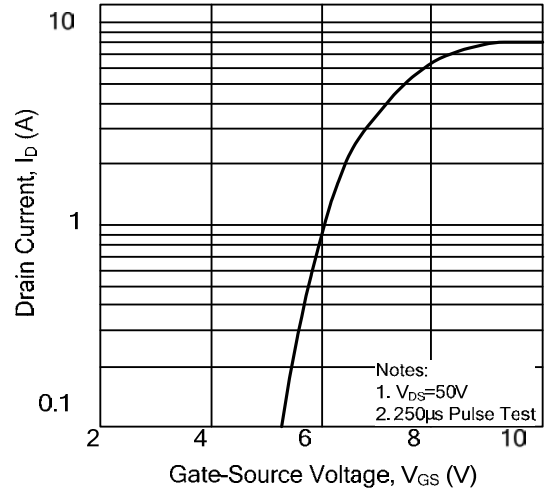
## YS7N65

### TYPICAL CHARACTERISTICS

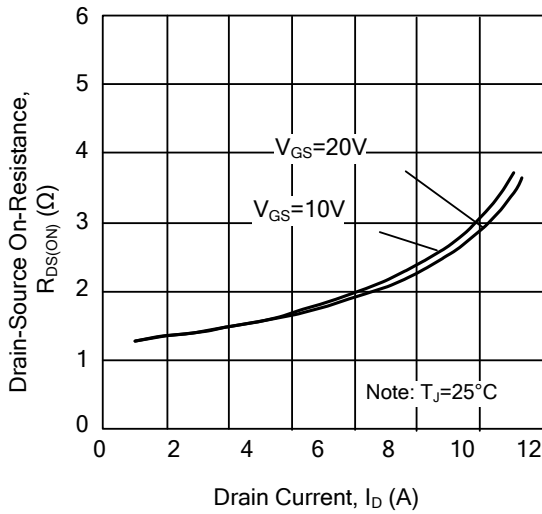
On-State Characteristics



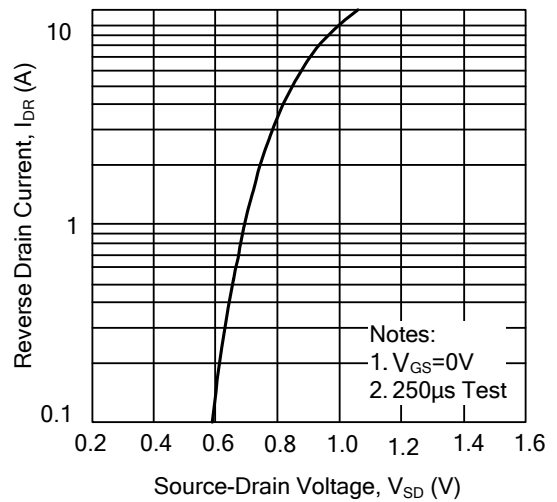
Transfer Characteristics



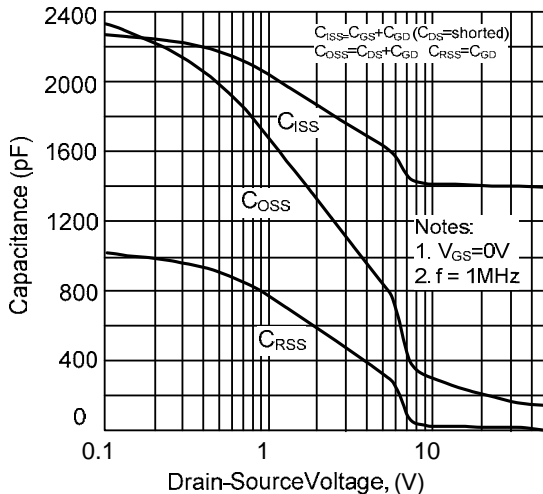
On-Resistance Variation vs. Drain Current and Gate Voltage



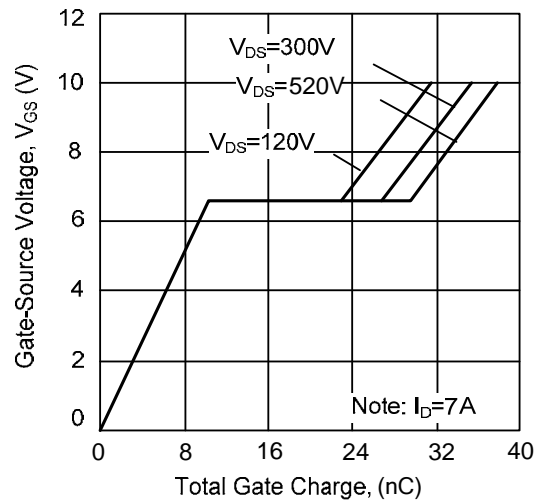
On State Current vs. Allowable Case Temperature



Capacitance Characteristics (Non-Repetitive)



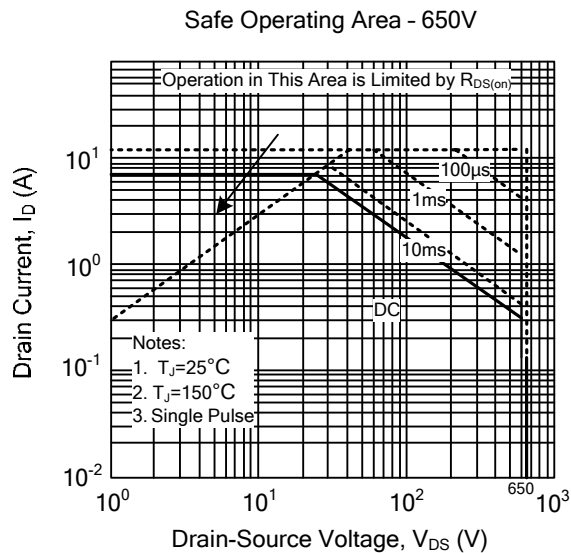
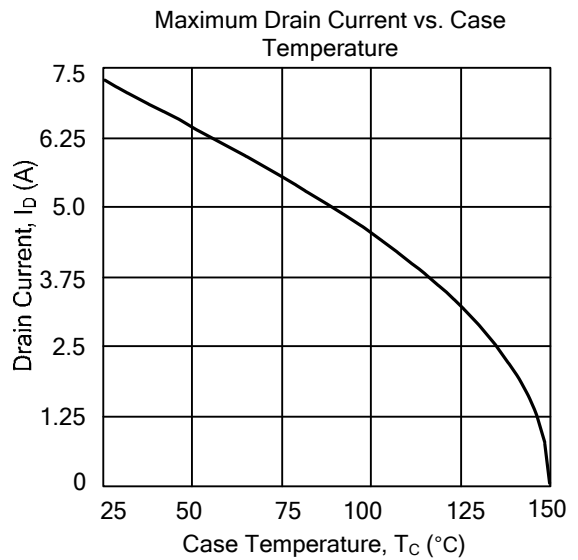
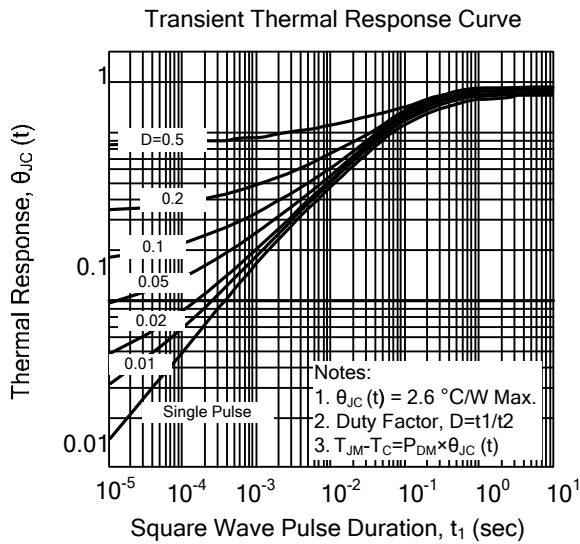
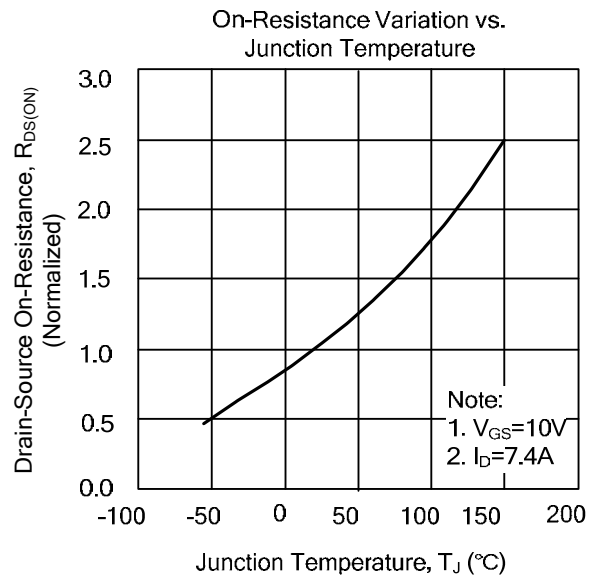
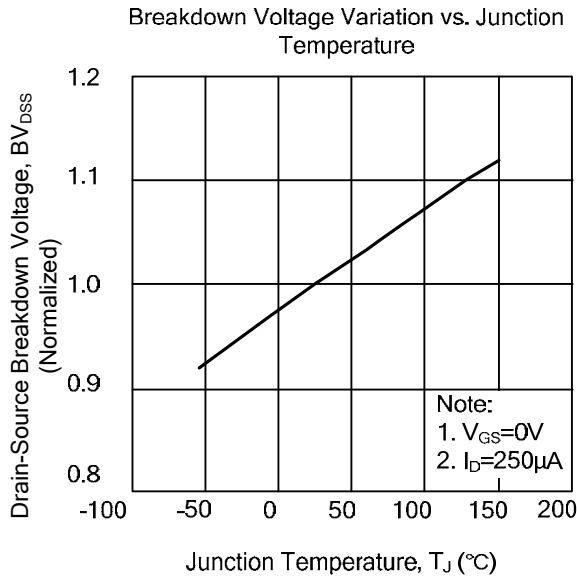
Gate Charge Characteristics



# DEVICE CHARACTERISTICS

## YS7N65

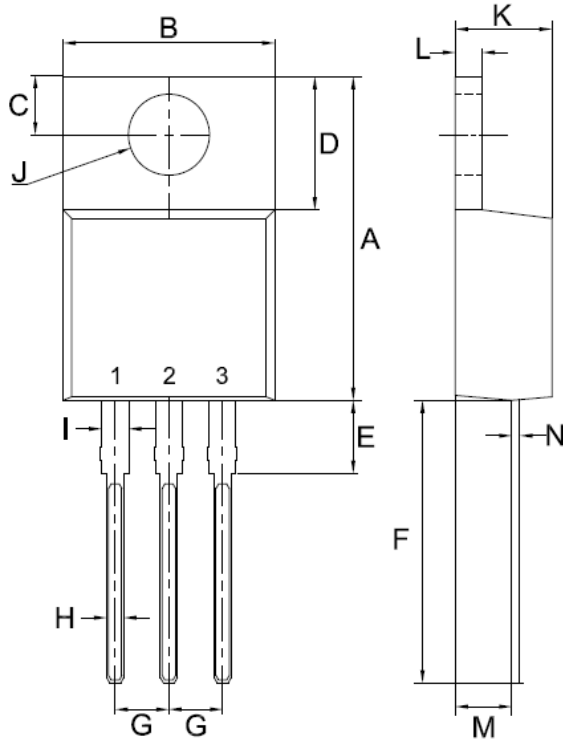
### TYPICAL CHARACTERISTICS



# PACKAGE OUTLINE & DIMENSIONS

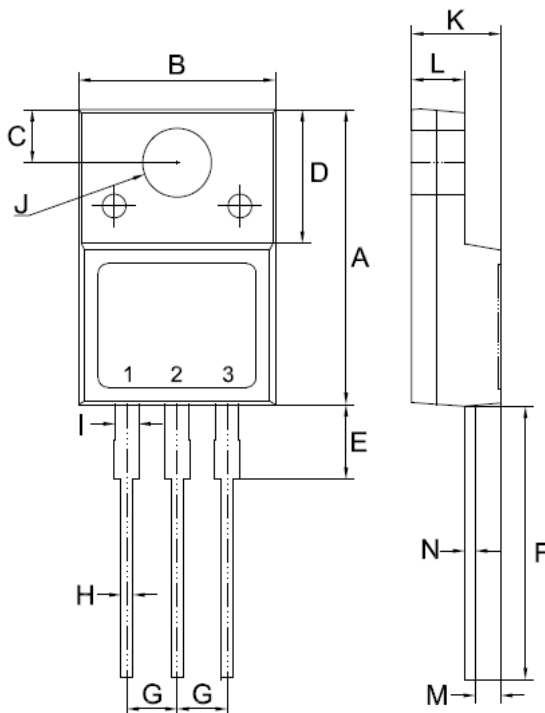
YS7N65

## TO-220 Mechanical Drawing



| TO-220  |             |             |
|---------|-------------|-------------|
| Unit:mm |             |             |
| DIM     | MIN         | MAX         |
| A       | 14.80       | 15.80       |
| B       | 9.57        | 10.57       |
| C       | 2.54        | 2.94        |
| D       | 5.80        | 6.80        |
| E       | 2.95        | 3.95        |
| F       | 12.70       | 13.40       |
| G       | 2.34        | 2.74        |
| H       | 0.51        | 1.11        |
| I       | 0.97        | 1.57        |
| J       | 3.54 $\phi$ | 4.14 $\phi$ |
| K       | 4.27        | 4.87        |
| L       | 1.07        | 1.47        |
| M       | 2.03        | 2.92        |
| N       | 0.30        | 0.64        |

## TO-220F Mechanical Drawing

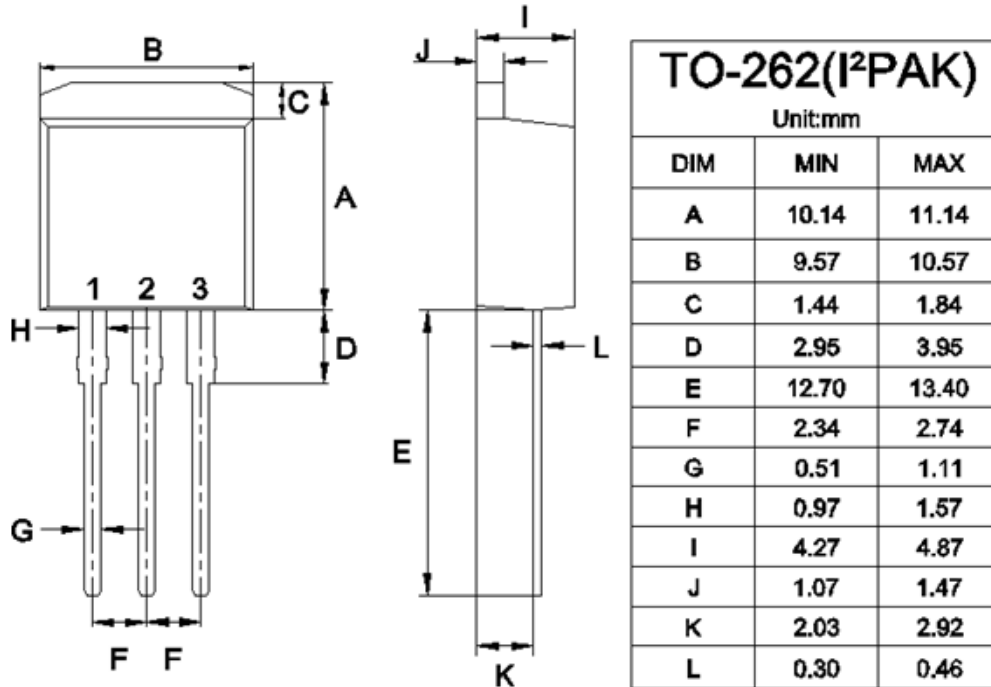


| TO-220F |       |       |
|---------|-------|-------|
| Unit:mm |       |       |
| DIM     | MIN   | MAX   |
| A       | 14.50 | 15.50 |
| B       | 9.50  | 10.50 |
| C       | 2.50  | 2.90  |
| D       | 6.30  | 7.30  |
| E       | 3.30  | 4.30  |
| F       | 13.00 | 14.00 |
| G       | 2.35  | 2.75  |
| H       | 0.30  | 0.90  |
| I       | 0.90  | 1.50  |
| J       | 3.20  | 3.80  |
| K       | 4.24  | 4.84  |
| L       | 2.52  | 2.92  |
| M       | 1.09  | 1.49  |
| N       | 0.47  | 0.64  |

# PACKAGE OUTLINE & DIMENSIONS

YS7N65

## TO-262 Mechanical Drawing



## TO-263 Mechanical Drawing

