

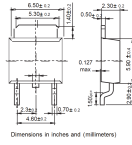
# FEATURE

- $h_{FE}$  (dc current gain)  $\geq 2.6$  @  $V_{GS} = 10V$ ,  $I_D = 2A$
- Low gate charge
- Low  $C_{iss}$
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability



# TO-252

Unit: mm



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

| PARAMETER                          | SYMBOL    | RATINGS    | UNIT |
|------------------------------------|-----------|------------|------|
| Drain-Source Voltage               | $V_{DS}$  | 650        | V    |
| Gate-Source Voltage                | $V_{GS}$  | $\pm 30$   | V    |
| Drain Current                      | $I_D$     | 4          | A    |
| Avalanche Energy                   | $E_{AS}$  | 112        | mJ   |
| Peak Diode Recovery dv/dt (Note 4) | $dv/dt$   | 2.63       | V/ns |
| Power Dissipation                  | $P_D$     | 33         | W    |
| Junction Temperature               | $T_J$     | +150       | °C   |
| Storage Temperature                | $T_{STG}$ | -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 maximum junction temperature.  
3.  $L = 30mH$ ,  $I_{AS} = 4A$ ,  $V_{GS} = 50V$ ,  $R_{DS(on)} = 25\Omega$  Starting  $T_J = 25^\circ C$   
4.  $I_{AS} = 4.0A$ ,  $dI/dt = 250A/\mu s$ ,  $V_{GS} = 10V$ , Starting  $T_J = 25^\circ C$

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

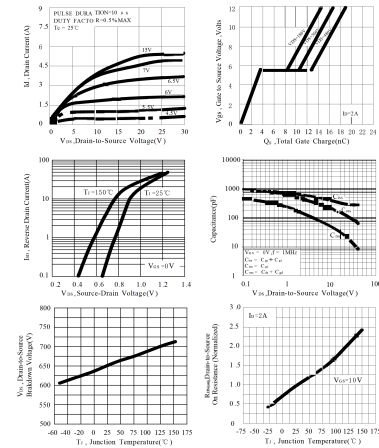
| PARAMETER                                             | SYMBOL                    | TEST CONDITIONS                                      | MIN | TYP  | MAX | UNIT     |
|-------------------------------------------------------|---------------------------|------------------------------------------------------|-----|------|-----|----------|
| <b>OFF CHARACTERISTICS</b>                            |                           |                                                      |     |      |     |          |
| Drain-Source Breakdown Voltage                        | $BV_{DSS}$                | $V_{GS} = 0V$ , $I_D = 250\mu A$                     | 650 |      |     | V        |
| Drain-Source Leakage Current                          | $I_{DSS}$                 | $V_{DS} = 650V$ , $V_{GS} = 0V$                      |     | 10   |     | $\mu A$  |
| Gate-Source Leakage Current                           | $I_{GSS}$                 | Forward<br>Reverse<br>$V_{GS} = 30V$ , $V_{DS} = 0V$ |     | 100  |     | nA       |
| Breakdown Voltage Temperature Coefficient             | $\pm BV_{DSS}/\Delta T_J$ | $I_D = 250\mu A$ , Referenced to 25°C                | 0.6 |      |     | V/°C     |
| <b>ON CHARACTERISTICS</b>                             |                           |                                                      |     |      |     |          |
| Gate Threshold Voltage                                | $V_{GS(th)}$              | $V_{DS} = V_{DS}$ , $I_D = 250\mu A$                 | 2.0 | 4.0  |     | V        |
| Static Drain-Source On-State Resistance               | $R_{DS(on)}$              | $V_{GS} = 10V$ , $I_D = 2A$                          | 2.0 | 2.4  |     | $\Omega$ |
| <b>DYNAMIC CHARACTERISTICS</b>                        |                           |                                                      |     |      |     |          |
| Input Capacitance                                     | $C_{iss}$                 | $V_{DS} = 25V$ , $V_{GS} = 0V$ ,<br>$f = 1MHz$       |     | 520  | 670 | pF       |
| Output Capacitance                                    | $C_{oss}$                 |                                                      |     | 70   | 80  | pF       |
| Reverse Transfer Capacitance                          | $C_{rss}$                 |                                                      |     | 8    | 11  | pF       |
| <b>SWITCHING CHARACTERISTICS</b>                      |                           |                                                      |     |      |     |          |
| Turn-On Delay Time                                    | $t_{d(on)}$               | $V_{DS} = 320V$ , $I_D = 4.0A$                       |     | 13   | 35  | ns       |
| Turn-On Rise Time                                     | $t_r$                     | $R_{DS(on)} = 25\Omega$ (Note 1, 2)                  |     | 45   | 100 | ns       |
| Turn-Off Delay Time                                   | $t_{d(off)}$              |                                                      |     | 25   | 60  | ns       |
| Turn-Off Fall Time                                    | $t_f$                     |                                                      |     | 35   | 80  | ns       |
| Total Gate Charge                                     | $Q_g$                     | $V_{DS} = 520V$ , $I_D = 4A$                         |     | 15   | 20  | nC       |
| Gate-Source Charge                                    | $Q_{gs}$                  | $V_{GS} = 10V$ (Note 1, 2)                           |     | 3.4  |     | nC       |
| Gate-Drain Charge                                     | $Q_{gd}$                  |                                                      |     | 7.1  |     | nC       |
| <b>SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS</b> |                           |                                                      |     |      |     |          |
| Drain-Source Diode Forward Voltage                    | $V_{SD}$                  | $V_{GS} = 0V$ , $I_S = 4.0A$                         |     | 1.4  |     | V        |
| Maximum Continuous Drain-Source Diode Forward Current | $I_S$                     |                                                      |     | 4.4  |     | A        |
| Maximum Pulsed Drain-Source Diode Forward Current     | $I_{SM}$                  |                                                      |     | 17.6 |     | A        |
| Reverse Recovery Time                                 | $t_{rr}$                  | $V_{GS} = 0V$ , $I_D = 4.0A$                         |     | 250  |     | ns       |
| Reverse Recovery Charge                               | $Q_{rr}$                  | $I_{RR} = 100A/\mu s$ (Note 1)                       |     | 1.5  |     | $\mu C$  |

- Note: 1. Pulse Test: Pulse width  $\leq 300\mu s$ , Duty cycle  $\leq 2\%$   
2. Essentially independent of operating temperature

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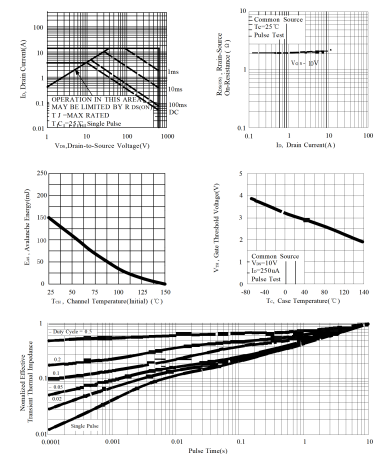
# RATING AND CHARACTERISTIC CURVES (4N65)



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