

# ICE47N65W

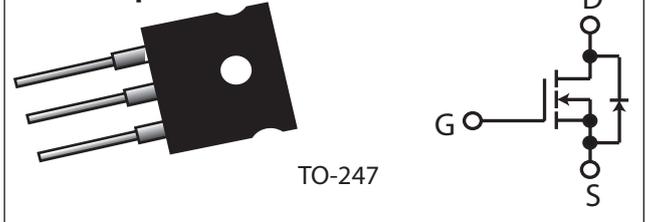
## N-Channel Enhancement Mode MOSFET

### Features:

- Low  $r_{DS(on)}$
- Ultra Low Gate Charge
- High dv/dt Capability
- High Unclamped Inductive Switching (UIS) Capability
- High Peak Current Capability
- Increased Transconductance Performance
- Optimized Design For High Performance Power Systems

| Product Summary |                          |                |     |
|-----------------|--------------------------|----------------|-----|
| $I_D$           | $T_A = 25^\circ\text{C}$ | 47A            | Max |
| $V_{(BR)DSS}$   | $I_D = 1\text{mA}$       | 650V           | Min |
| $r_{DS(ON)}$    | $V_{GS} = 10\text{V}$    | 0.063 $\Omega$ | Typ |
| $Q_g$           | $V_{DS} = 480\text{V}$   | 187nC          | Typ |

### Pin Description:



### Maximum Ratings @ $T_j = 25^\circ\text{C}$ , Unless Otherwise Specified

| Symbol                | Parameter                         | Value       | Unit             | Conditions  |
|-----------------------|-----------------------------------|-------------|------------------|---|
| $I_D$                 | Continuous Drain Current          | 47          | A                | $T_C = 25^\circ\text{C}$  |
| $I_{D, \text{pulse}}$ | Pulsed Drain Current              | 117         | A                | $T_C = 25^\circ\text{C}$  |
| $E_{AS}$              | Avalanche Energy, Single Pulse    | 1600        | mJ               | $I_D = 24\text{A}$  |
| $I_{AR}$              | Avalanche Current, Repetitive     | 24          | A                | Limited by $T_{j,max}$  |
| dv/dt                 | MOSFET dv/dt Ruggedness           | 50          | V/ns             | $V_{DS} = 480\text{V}$ , $I_D = 47\text{A}$ , $T_j = 125^\circ\text{C}$ |
| $V_{GS}$              | Gate Source Voltage               | $\pm 20$    | V                | Static  |
|                       |                                   | $\pm 30$    |                  | AC (f>Hz)   |
| $P_{tot}$             | Power Dissipation                 | 417         | W                | $T_C = 25^\circ\text{C}$  |
| $T_j, T_{stg}$        | Operating and Storage Temperature | -55 to +150 | $^\circ\text{C}$ |   |
|                       | Mounting Torque                   | 60          | Ncm              | M 3 & 3.5 screws  |

| Symbol | Parameter | Values |     |     | Unit | Conditions |
|--------|-----------|--------|-----|-----|------|------------|
|        |           | Min    | Typ | Max |      |            |

### Thermal Characteristics

|            |   |   |   |     |                    |                                    |
|------------|---|---|---|-----|--------------------|------------------------------------|
| $R_{thJC}$ | Thermal Resistance, Junction to Case                        | - | - | 0.3 | $^\circ\text{C/W}$ |                                    |
| $R_{thJA}$ | Thermal Resistance, Junction to Ambient                     | - | - | 62  |                    | Leaded                             |
| $T_{sold}$ | Soldering Temperature, Wave Soldering Only Allowed At Leads | - | - | 260 | $^\circ\text{C}$   | 1.6mm (0.063in.) from Case for 10s |

### Electrical Characteristics @ $T_j = 25^\circ\text{C}$ , Unless Otherwise Specified

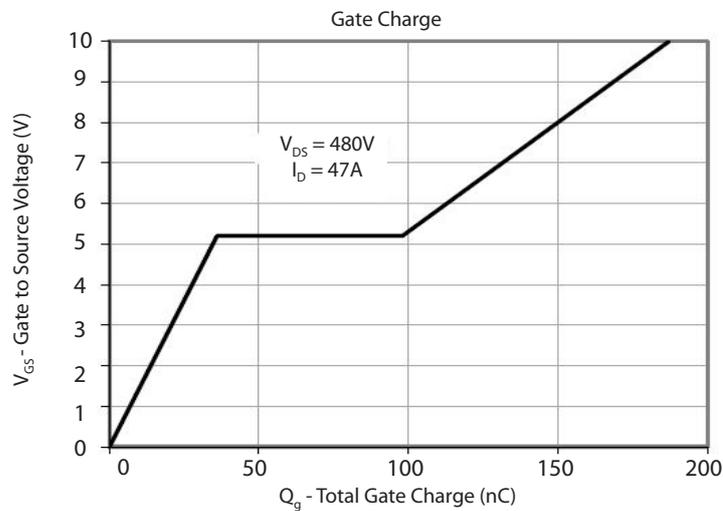
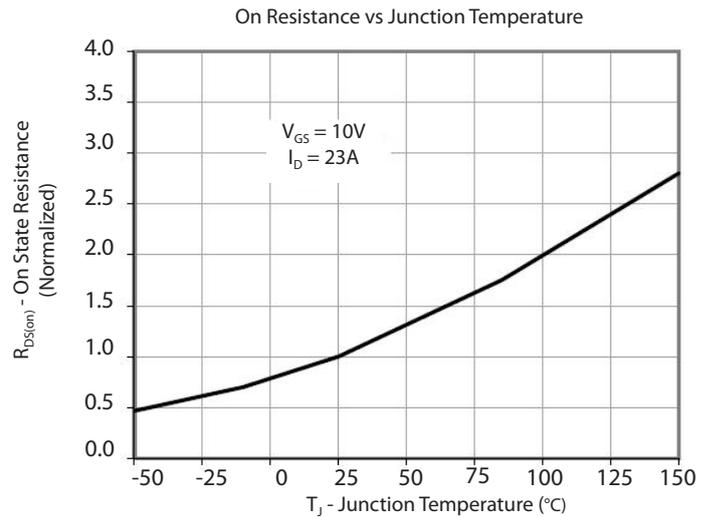
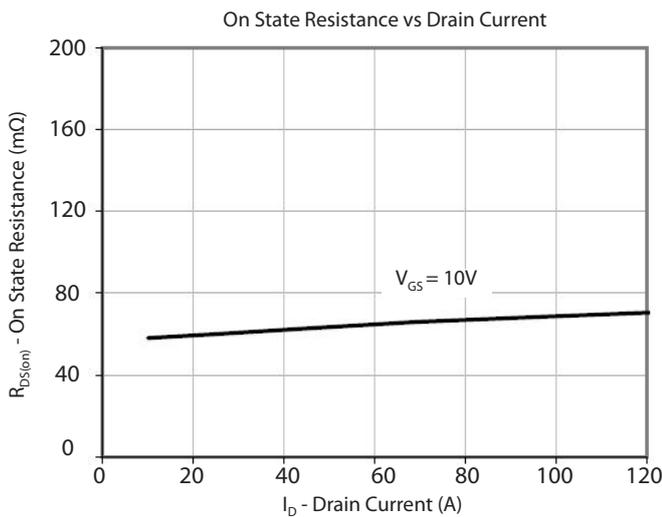
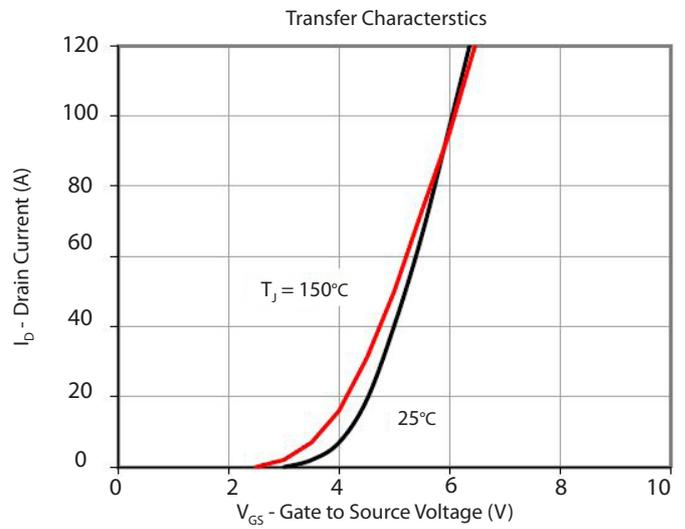
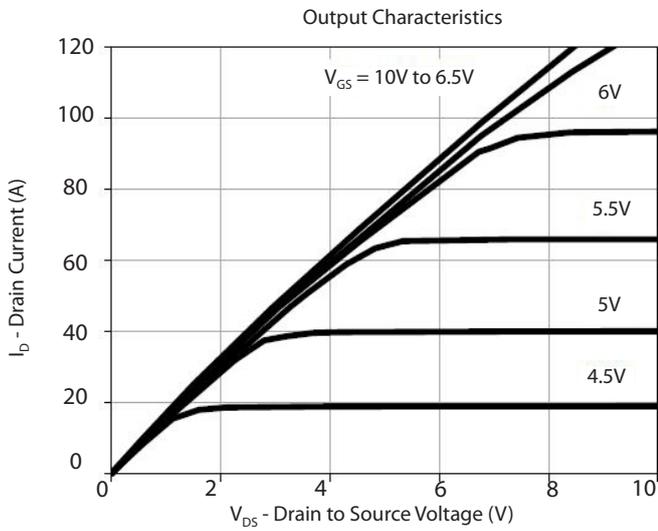
#### Static Characteristics

|               |                                     |     |       |      |               |   |
|---------------|-------------------------------------|-----|-------|------|---------------|---|
| $V_{(BR)DSS}$ | Drain to Source Breakdown Voltage   | 650 | 675   | -    | V             | $V_{GS} = 0\text{V}$ , $I_D = 1\text{mA}$                                 |
| $V_{GS(th)}$  | Gate Threshold Voltage              | 2.1 | 3     | 3.9  |               | $V_{DS} = V_{GS}$ , $I_D = 250\mu\text{A}$                                |
| $I_{DSS}$     | Zero Gate Voltage Drain Current     | -   | 0.1   | 1    | $\mu\text{A}$ | $V_{DS} = 650\text{V}$ , $V_{GS} = 0\text{V}$ , $T_j = 25^\circ\text{C}$  |
|               |                                     | -   | -     | 100  |               | $V_{DS} = 650\text{V}$ , $V_{GS} = 0\text{V}$ , $T_j = 150^\circ\text{C}$ |
| $I_{GSS}$     | Gate Source Leakage Current         | -   | -     | 100  | nA            | $V_{GS} = \pm 20\text{V}$ , $V_{DS} = 0\text{V}$                          |
| $R_{DS(on)}$  | Drain to Source On-State Resistance | -   | 0.063 | 0.07 | $\Omega$      | $V_{GS} = 10\text{V}$ , $I_D = 24\text{A}$ , $T_j = 25^\circ\text{C}$     |
|               |                                     | -   | 0.17  | -    |               | $V_{GS} = 10\text{V}$ , $I_D = 24\text{A}$ , $T_j = 150^\circ\text{C}$    |
| $R_{GS}$      | Gate Resistance                     | -   | 6     | -    | $\Omega$      | f = 1 MHz, open drain   |

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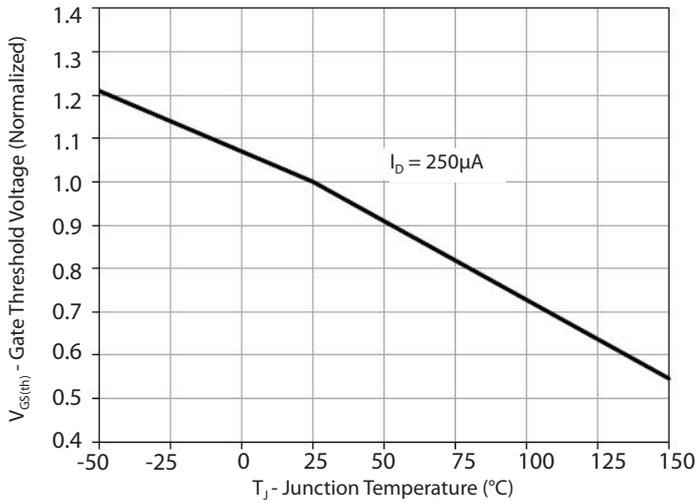
| Symbol                             | Parameter                     | Values |      |     | Unit          | Conditions  |
|------------------------------------|-------------------------------|--------|------|-----|---------------|---|
|                                    |                               | Min    | Typ  | Max |               |   |
| <b>Dynamic Characteristics</b>     |                               |        |      |     |               |   |
| $C_{iss}$                          | Input Capacitance             | -      | 5970 | -   | pF            | $V_{GS} = 0V, V_{DS} = 25V, f = 1 \text{ MHz}$                        |
| $C_{oss}$                          | Output Capacitance            | -      | 677  | -   |               |   |
| $C_{riss}$                         | Reverse Transfer Capacitance  | -      | 35   | -   |               |   |
| $g_{fs}$                           | Transconductance              | -      | 50   | -   | S             | $V_{DS} = >2 \cdot I_D \cdot R_{DS}, I_D = 24A$                       |
| $t_{d(on)}$                        | Turn-on Delay Time            | -      | 160  | -   | nS            | $V_{DS} = 380V, V_{GS} = 10V, I_D = 47A, R_G = 4\Omega$<br>(External) |
| $T_r$                              | Rise Time                     | -      | 25   | -   |               |   |
| $t_{d(off)}$                       | Turn-off Delay Time           | -      | 20   | -   |               |   |
| $t_f$                              | Fall Time                     | -      | 25   | -   |               |   |
| <b>Gate Charge Characteristics</b> |                               |        |      |     |               |   |
| $Q_{gs}$                           | Gate to Source Charge         | -      | 36   | -   | nC            | $V_{DS} = 480V, I_D = 47A, V_{GS} = 0 \text{ to } 10V$                |
| $Q_{gd}$                           | Gate to Drain Charge          | -      | 62   | -   |               |   |
| $Q_g$                              | Gate Charge Total             | -      | 187  | -   |               |   |
| $V_{plateau}$                      | Gate Plateau Voltage          | -      | 5.3  | -   | V             |   |
| <b>Reverse Diode</b>               |                               |        |      |     |               |   |
| $V_{SD}$                           | Diode Forward Voltage         | -      | 0.95 | 1.2 | V             | $V_{GS} = 0V, I_S = I_F$  |
| $t_{rr}$                           | Reverse Recovery Time         | -      | 547  | -   | ns            | $V_{RR} = 480V, I_S = I_F, d_{IF}/d_t = 100 \text{ A}/\mu\text{S}$    |
| $Q_{rr}$                           | Reverse Recovery Charge       | -      | 12   | -   | $\mu\text{C}$ |   |
| $I_{rm}$                           | Peak Reverse Recovery Current | -      | 43   | -   | A             |   |

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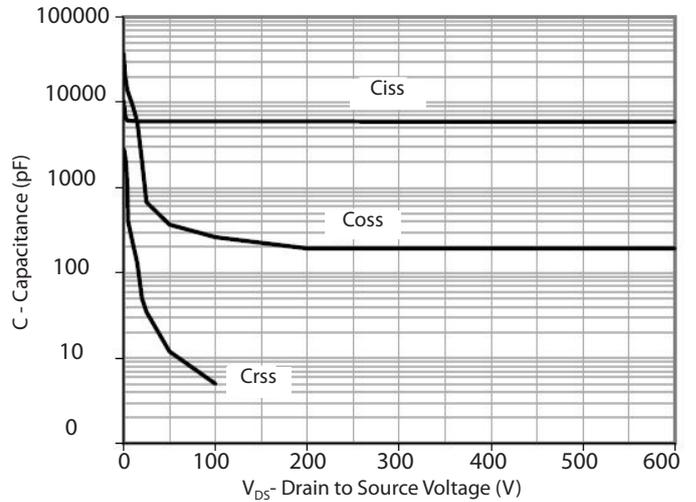


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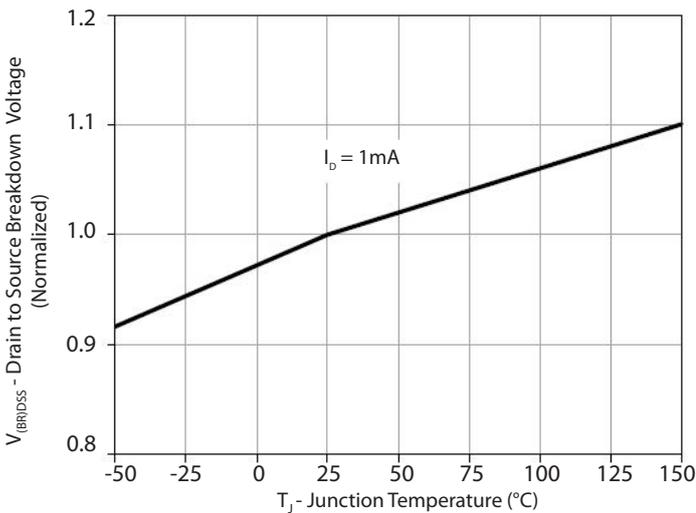
Gate Threshold Voltage vs. Junction Temperature



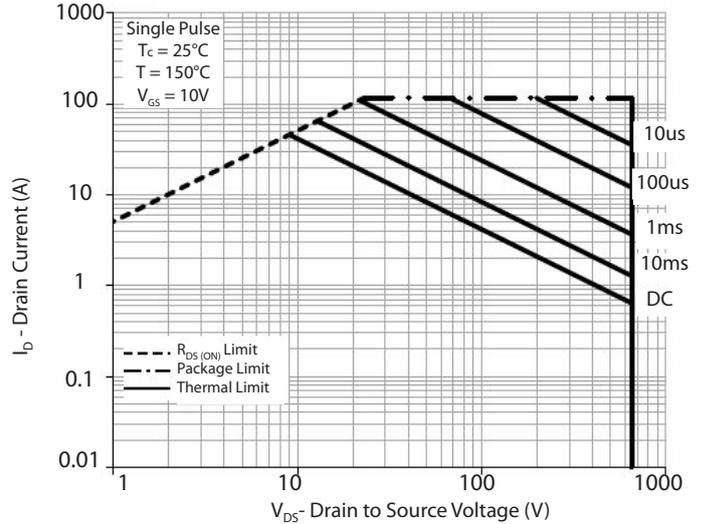
Capacitance



Drain to Source Breakdown Voltage vs. Junction Temperature



Maximum Rate Forward Biased Safe Operating Area



Transient Thermal Response - Junction to Case

