



## IXTH10N60, IXTM10N60

10 AMPS, 600 V, 0.55Ω/0.7Ω

T-39-15

## MAXIMUM RATINGS

| Parameter  | Sym.              | IXTH10N60<br>IXTM10N60            | Unit                |
|--|-------------------|-----------------------------------|---------------------|
| Drain-Source Voltage (1)                               | $V_{DSS}$         | 600                               | $V_{dc}$            |
| Drain-Gate Voltage ( $R_{GS}=1.0\text{ M}\Omega$ ) (1) | $V_{DGR}$         | 600                               | $V_{dc}$            |
| Gate-Source Voltage Continuous                         | $V_{GS}$          | $\pm 20$                          | $V_{dc}$            |
| Gate-Source Voltage Transient                          | $V_{GSM}$         | $\pm 30$                          | V                   |
| Drain Current Continuous ( $T_c=25^\circ\text{C}$ )    | $I_D$             | 10                                | $A_{dc}$            |
| Drain Current Pulsed (3)                               | $I_{DM}$          | 40                                | A                   |
| Total Power Dissipation                                | $P_D$ IXTH/IXTM   | 180/150                           | W                   |
| Power Dissipation Derating $>25^\circ\text{C}$         | IXTH/IXTM         | 1.4/1.2                           | W/ $^\circ\text{C}$ |
| Operating and Storage Temperature                      | $T_J$ & $T_{slg}$ | -65 to +150                       | $^\circ\text{C}$    |
| Max. Lead Temp. for Soldering                          | $T_L$             | 300 (1.6mm from case for 10 sec.) | $^\circ\text{C}$    |


ELECTRICAL CHARACTERISTICS  $T_c=25^\circ\text{C}$  unless otherwise specified

| Parameter  | Type         | Min. | Typ. | Max. | Units    | Test Conditions  |                                       |
|--|--------------|------|------|------|----------|--|---------------------------------------|
| $BV_{DSS}$ Drain-Source Breakdown Voltage                | 10N60, 60A   | 600  | -    | -    | V        | $V_{GS}=0V, I_D=250\mu A$  |                                       |
| $V_{GS(th)}$ Gate Threshold Voltage                      | ALL          | 2.0  | -    | 4.5  | V        | $V_{DS}=V_{GS}, I_D=250\mu A$  |                                       |
| $I_{GSS}$ Gate-Source Leakage Forward                    | ALL          | -    | -    | 100  | nA       | $V_{GS}=20V$   |                                       |
| $I_{GSS}$ Gate-Source Leakage Reverse                    | ALL          | -    | -    | 100  | nA       | $V_{GS}=-20V$  |                                       |
| $I_{DSS}$ Zero Gate Voltage Drain Current                | ALL          | -    | -    | 200  | $\mu A$  | $V_{DS}=\text{Max. Rating}\times 0.8, V_{GS}=0V$   |                                       |
|  |              | -    | -    | 1000 | $\mu A$  | $V_{DS}=\text{Max. Rating}\times 0.8, V_{GS}=0V, T_c=125^\circ\text{C}$  |                                       |
| $R_{DS(on)}$ Static Drain-Source On-State Resistance (2) | 10N60A       | -    | -    | 0.55 | $\Omega$ | $V_{GS}=10V, I_D=5.0A$   |                                       |
|  | 10N60        | -    | -    | 0.7  | $\Omega$ |  |                                       |
| $G_{fs}$ Forward Transconductance (2)                    | ALL          | 5.0  | 7.0  | -    | S        | $V_{DS}\geq 15V, I_D=5.0A$   |                                       |
| $C_{iss}$ Input Capacitance                              | ALL          | -    | 2700 | -    | pF       | $V_{GS}=0V, V_{DS}=25V, f=1.0\text{ MHz}$  |                                       |
| $C_{oss}$ Output Capacitance                             | ALL          | -    | 270  | -    | pF       |  |                                       |
| $C_{rss}$ Reverse Transfer Capacitance                   | ALL          | -    | 65   | -    | pF       |  |                                       |
| $t_{d(on)}$ Turn-On Delay Time                           | ALL          | -    | 20   | 35   | ns       | $V_{DS}=0.5 BV_{DSS}, I_D=5.0A, Z_o=5\Omega$   |                                       |
| $t_r$ Rise Time  | ALL          | -    | 25   | 45   | ns       | (MOSFET switching times are essentially independent of operating temperature. See Fig. 3, page 22 for test circuit.)   |                                       |
| $t_{d(off)}$ Turn-Off Delay Time                         | ALL          | -    | 70   | 100  | ns       |  |                                       |
| $t_f$ Fall Time  | ALL          | -    | 30   | 50   | ns       |  |                                       |
| $Q_g$ Total Gate Charge                                  | ALL          | -    | -    | 120  | nC       | $V_{GS}=10V, I_D=5.0A, V_{DS}=0.8\text{ Max. Rating.}$<br>(Gate charge is essentially independent of operating temperature. See Fig. 4, page 22 for test circuit.) |                                       |
| $Q_{gs}$ Gate-Source Charge                              | ALL          | -    | -    | 40   | nC       |  |                                       |
| $Q_{gd}$ Gate-Drain ("Miller") Charge                    | ALL          | -    | -    | 60   | nC       |  |                                       |
| $W_{DSR}$ Unclamped Drain-to-Source Avalanche Energy     | 10N60R, 60AR | 800  | -    | -    | -        | mJ   | See Fig. 5, page 22 for test circuit. |
|  | 3N90R, 90AR  |      |      |      |          |  |                                       |

## THERMAL RESISTANCE

|                                       |      |   |   |      |                    |                    |
|---------------------------------------|------|---|---|------|--------------------|--------------------|
| $R_{thJC}$ Junction-to-Case           | IXTM | - | - | 0.83 | $^\circ\text{C/W}$ |                    |
|                                       | IXTH | - | - | 0.7  | $^\circ\text{C/W}$ |                    |
| $R_{thJA}$ Junction-to-Ambient TO-204 | IXTM | - | - | 30.0 | $^\circ\text{C/W}$ | Free Air Operation |
| $R_{thJA}$ Junction-to-Ambient TO-247 | IXTH | - | - | 60.0 | $^\circ\text{C/W}$ | Free Air Operation |

## SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

|  |     |   |     |      |    |   |
|--|-----|---|-----|------|----|---|
| $I_S$ Continuous Source Current (Body Diode)   | ALL | - | -   | 10.0 | A  | Modified MOSFET symbol showing the integral reverse P-N junction rectifier.  |
| $I_{SM}$ Pulse Source Current (Body Diode) (1) | ALL | - | -   | 40.0 | A  |   |
| $V_{SD}$ Diode Forward Voltage (2)             | ALL | - | -   | 1.5  | V  | $T_c=25^\circ\text{C}, I_f=10.0A, V_{GS}=0V$  |
| $t_{rr}$ Reverse Recovery Time                 | ALL | - | 600 | -    | ns | $I_f=10.0A, di/dt=100A/\mu s$   |

(1)  $T_J=25^\circ\text{C}$  to  $150^\circ\text{C}$ (2) Pulse test: Pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ 

(3) Repetitive rating: Pulse width limited by max. junction temperature.