Bulletin I27128 Rev.C 07/03

International
IOR Rectifier

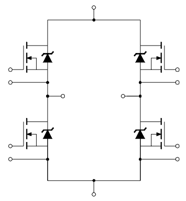
# 19MT050XF

## "FULL-BRIDGE" FREDFET MTP

## HEXFET® Power MOSFET

### Features

- Low On-Resistance
- High Performance Optimised Built-in Fast Recovery Diodes
- Fully Characterized Capacitance and Avalanche Voltage and Current
- Aluminum Nitride DBC
- Very Low Stray Inductance Design for High Speed Operation

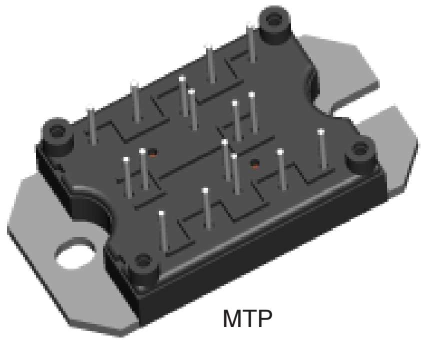


31 A

$V_{DSS}$ = 500V

### Benefits

- Low Gate Charge Qg results in Simple Drive Requirement
- Improved Gate, Avalanche and Dynamic dv/dt Ruggedness
- Low Trr and Soft Diode Reverse Recovery
- Optimized for Welding, UPS and SMPS Applications
- Outstanding ZVS and High Frequency Operation
- Direct Mounting to Heatsink
- PCB Solderable Terminals
- Very Low Junction-to-Case Thermal Resistance
- UL Approved E78996



MTP

### Absolute Maximum Ratings

| | Parameters | | Max | Units |
|---|---|---|---|---|
| $I_D$ | Continuos Drain Current @ $V_{GS}$ = 10V | @ $T_C$ = 25°C | 31 | A |
| | | @ $T_C$ = 100°C | 19 | |
| $I_{DM}$ | Pulsed Drain Current (1) | | 124 | |
| $P_D$ | Maximum Power Dissipation | @ $T_C$ = 25°C | 1140 | W |
| | | @ $T_C$ = 100°C | 456 | |
| $V_{GS}$ | Gate-to-Source Voltage | | ± 30 | V |
| $V_{ISOL}$ | RMS Isolation Voltage, Any Terminal to Case, t = 1 min | | 2500 | |
| dv/dt | Peak Diode Recovery dv/dt (3) | | 15 | V/ ns |

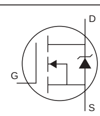
## Electrical Characteristics @ $T_J$ = 25°C (unless otherwise specified)

| | Parameters | Min | Typ | Max | Units | Test Conditions |
|---|---|---|---|---|---|---|
| $V_{(BR)DSS}$ | Drain-to-Source Breakdown Voltage | 500 | | | V | $V_{GS}$ = 0V, $I_D$ = 250μA |
| $\Delta V_{(BR)DSS}/\Delta T_J$ | Temperature Coeff. of Breakdown Voltage | | 0.48 | | V/°C | $I_D$ = 4mA, reference to $T_J$ = 25°C |
| $R_{DS(ON)}$ | Static Drain-to-Source On-Resistance | | 0.19 | 0.22 | Ω | $V_{GS}$ = 10V, $I_D$ = 19A (4) |
| | | | 0.21 | 0.25 | | $V_{GS}$ = 10V, $I_D$ = 31A |
| $V_{GS(th)}$ | Gate Threshold Voltage | 3.0 | | 6.0 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA |
| $I_{DSS}$ | Drain-to-Source Leakage Current (6) | | | 50 | μA | $V_{DS}$ = 500V, $V_{GS}$ = 0V |
| | | | | 2 | mA | $V_{DS}$ = 400V, $V_{GS}$ = 0V, $T_J$ = 125°C |
| $I_{GSS}$ | Gate-to-Source Forward Leakage | | | 150 | nA | $V_{GS}$ = 30V |
| | Gate-to-Source Reverse Leakage | | | - 150 | | $V_{GS}$ = - 30V |

## Dynamic Characteristics @ $T_J$ = 25°C (unless otherwise specified)

| | Parameters | Min | Typ | Max | Units | Test Conditions |
|---|---|---|---|---|---|---|
| $g_{fs}$ | Forward Transconductance | | 26 | | S | $V_{DS}$ = 50V, $I_D$ = 19A |
| $Q_g$ | Total Gate Charge | | 105 | 160 | nC | $I_D$ = 31A |
| $Q_{gs}$ | Gate-to-Source Charge | | 36 | 55 | | $V_{DS}$ = 400V |
| $Q_{gd}$ | Gate-to-Drain ("Miller") Charge | | 46 | 70 | | $V_{GS}$ = 10V (4) |
| $t_{d(on)}$ | Turn-on Delay Time | | 49 | 74 | ns | $I_D$ = 31A |
| $t_{d(off)}$ | Turn-off Delay Time | | 80 | 120 | | $V_{DS}$ = 250V |
| $t_r$ | Rise Time | | 165 | 250 | | $V_{GS}$ = 10V |
| $t_f$ | Fall Time | | 76 | 115 | | $R_G$ = 4.3Ω |
| $C_{iss}$ | Input Capacitance | | 4808 | 7210 | pF | $V_{GS}$ = 0V |
| $C_{oss}$ | Output Capacitance | | 1165 | 1750 | | $V_{DS}$ = 25V |
| $C_{rss}$ | Reverse Transfer Capacitance | | 40 | 60 | | f = 1.0 MHz |

## Diode Characteristics @ $T_J$ = 25°C (unless otherwise specified)

| | Parameters | Min | Typ | Max | Units | Test Conditions |
|---|---|---|---|---|---|---|
| $I_S$ | Continuous Source Current (Body Diode) | | | 31 | A | MOSFET symbol showing the integral reverse p-n junction diode  |
| $I_{SM}$ | Pulsed Source Current (Body Diode) (1) | | | 124 | | |
| $V_{SD}$ | Diode Forward Voltage | | 1.01 | 1.1 | V | $T_J$ = 25°C, $I_S$ = 31A, $V_{GS}$ = 0V (4) |
| $t_{rr}$ | Reverse Recovery Time | | 252 | 378 | ns | $T_J$ = 125°C, $I_F$ = 31A |
| $Q_{rr}$ | Reverse Recovery Charge | | 1619 | 2428 | nC | di/dt = 100A/μs (4) |

## Avalanche Characteristics

| | Parameters | | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| $E_{AS}$ | Single Pulse Avalanche Energy | (2) | | | 493 | mJ |
| $I_{AR}$ | Avalanche Current | (1) | | | 31 | A |
| $E_{AR}$ | Repetitive Avalanche Energy | (1) | | | 114 | mJ |

## Thermal- Mechanical Specifications

| | Parameters | Min | Typ | Max | Units |
|---|---|---|---|---|---|
| $T_J$ | Operating Junction Temperature Range | - 40 | | 150 | °C |
| $T_{STG}$ | Storage Temperature Range | - 40 | | 125 | |
| $R_{thJC}$ | Junction-to-Case (per MOSFET) | | | 0.44 | °C/ W |
| $R_{thCS}$ | Case-to-Sink (Heatsink Compound Thermal Conductivity = 1 W/mK) | | 0.06 | | |
| | Clearance (5) (external shortest distance in air between two terminals) | 5.5 | | | mm |
| | Creepage (5) (shortest distance along external surface of the insulating material between 2 terminals) | 8 | | | |
| | Weight | | 66 | | g |

**Notes:**

(1) Repetitive rating; pulse width limited by max. junction temperature

(2) Starting $T_J$ = 25°C, L = 1.0mH, $R_G$ = 25Ω $I_{AS}$ = 31A

(3) $I_{SD} \le$ 31A, di/dt ≤ 340 A/μs, $V_{DD} \le V_{(BR)DSS}$, $T_J \le$ 150°C

(4) Pulse width ≤ 400μs; duty cycle ≤ 2%

(5) Standard version only i.e. without optional thermistor

(6) $I_{CES}$ includes also opposite leg overall leakage

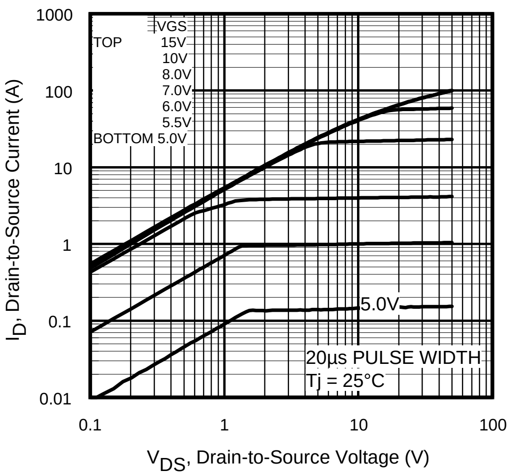



**Fig 1.** Typical Output Characteristics

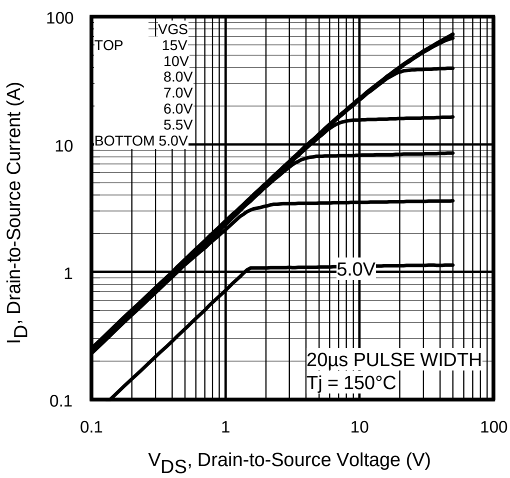



**Fig 2.** Typical Output Characteristics

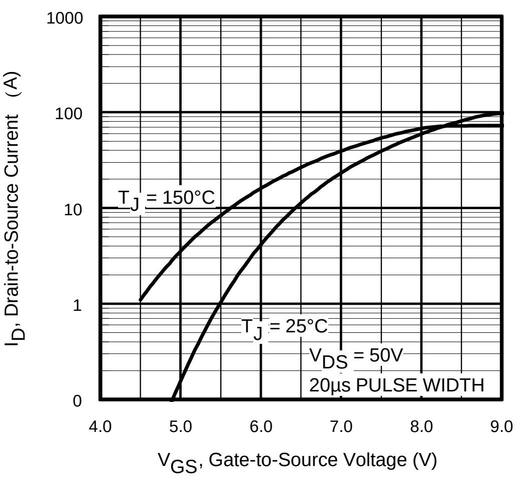



**Fig 3.** Typical Transfer Characteristics

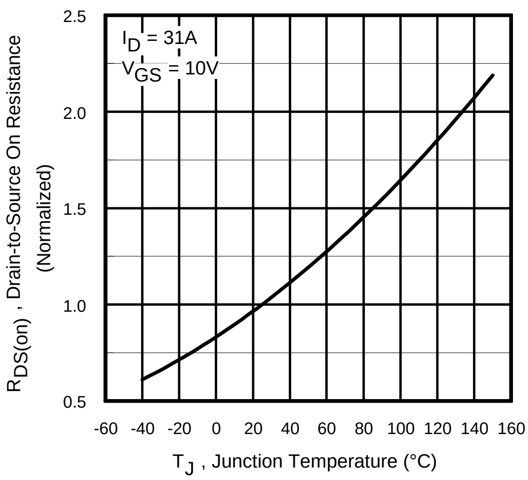



**Fig 4.** Normalized On-Resistance Vs. Temperature

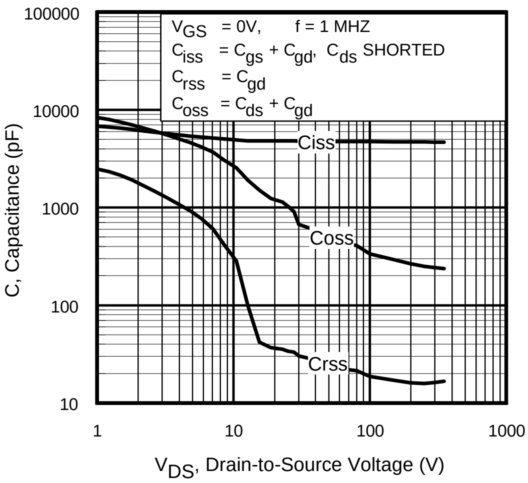



**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage

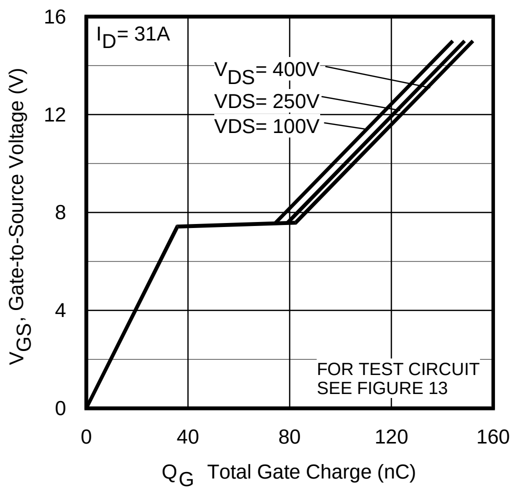



**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage

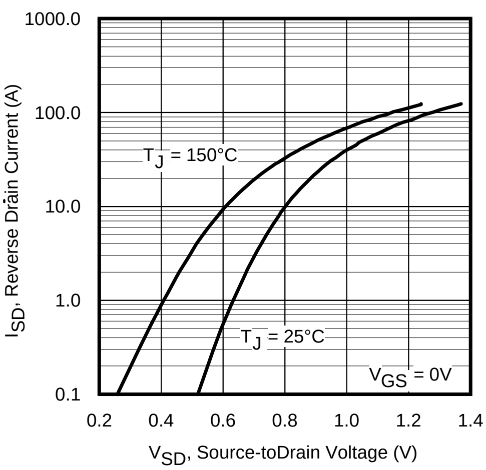



**Fig 7.** Typical Source-Drain Diode Forward Voltage

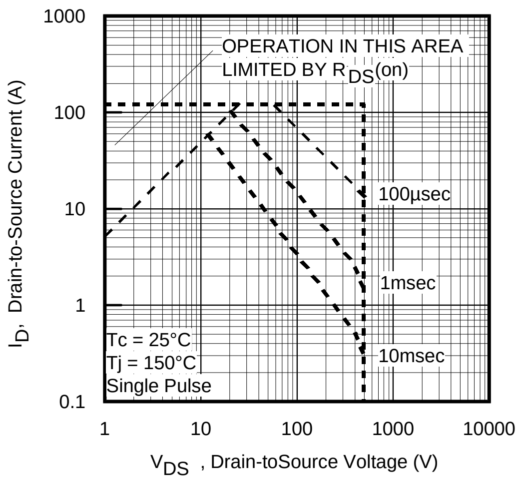



**Fig 8.** Maximum Safe Operating Area

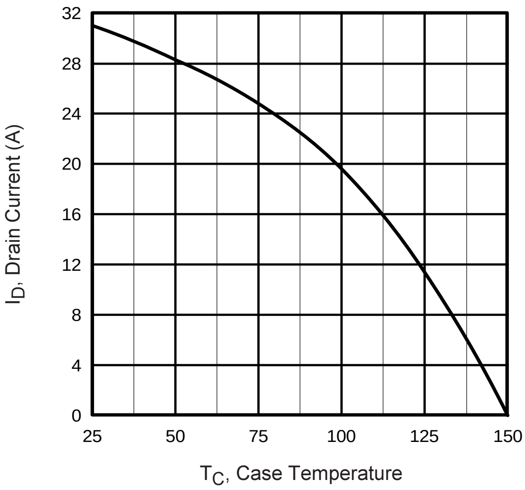



**Fig 9.** Maximum Drain Current Vs. Case Temperature

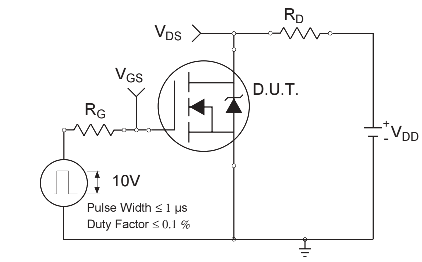



**Fig 10a.** Switching Time Test Circuit

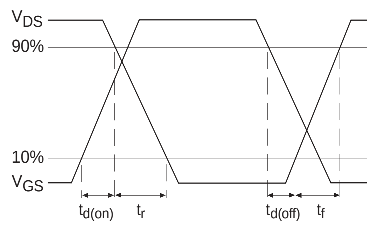



**Fig 10b.** Switching Time Waveforms

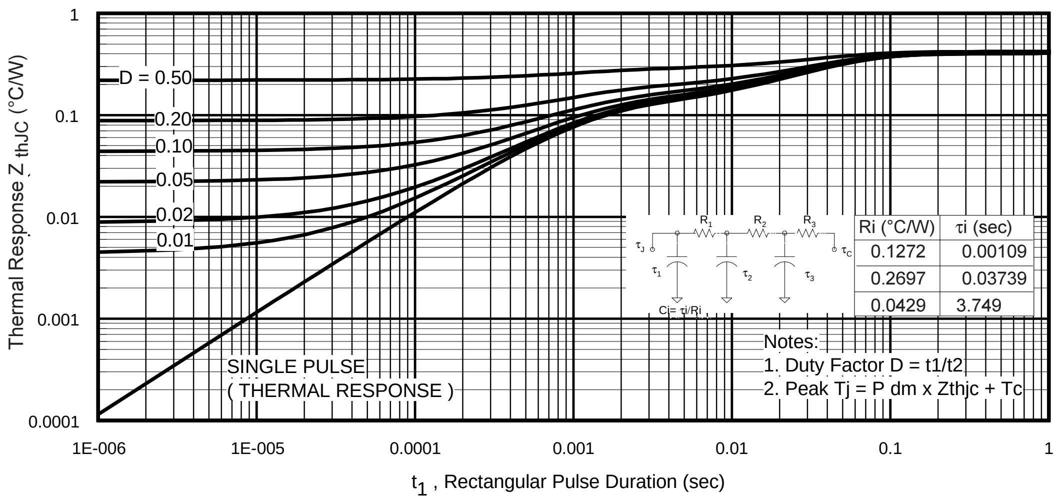



**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case

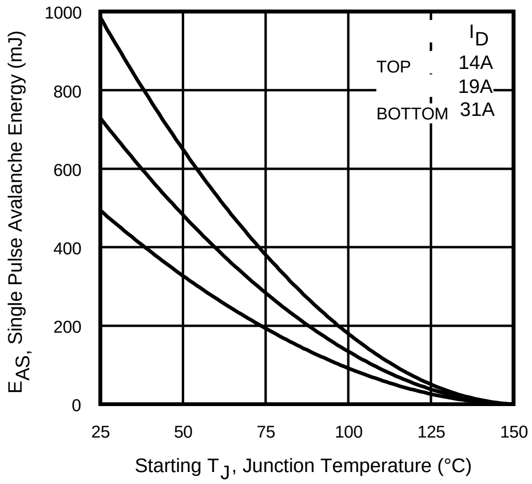



Fig 12a. Maximum Avalanche Energy Vs. Drain Current

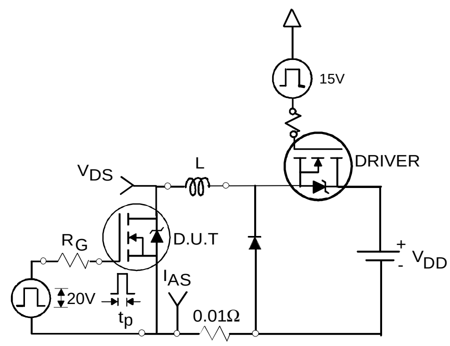



**Fig 12b.** Unclamped Inductive Test Circuit and vs Junction Temperature

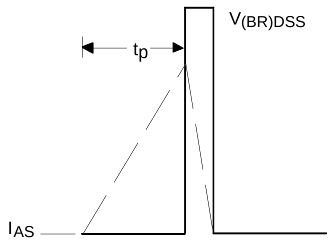



**Fig 12c.** Unclamped Inductive Waveforms

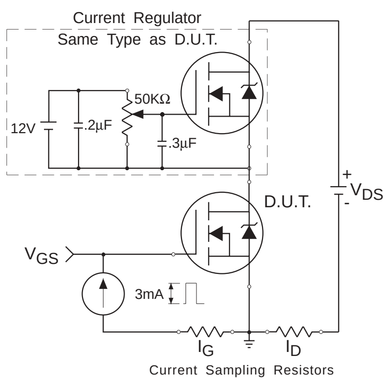



**Fig 13a.** Gate Charge Test Circuit

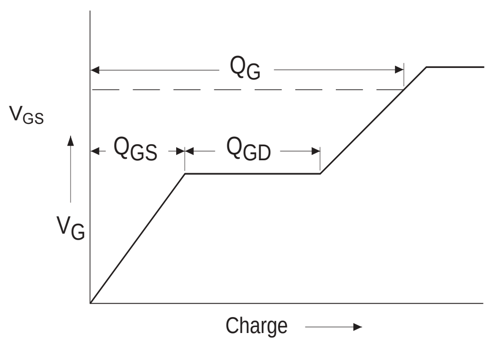
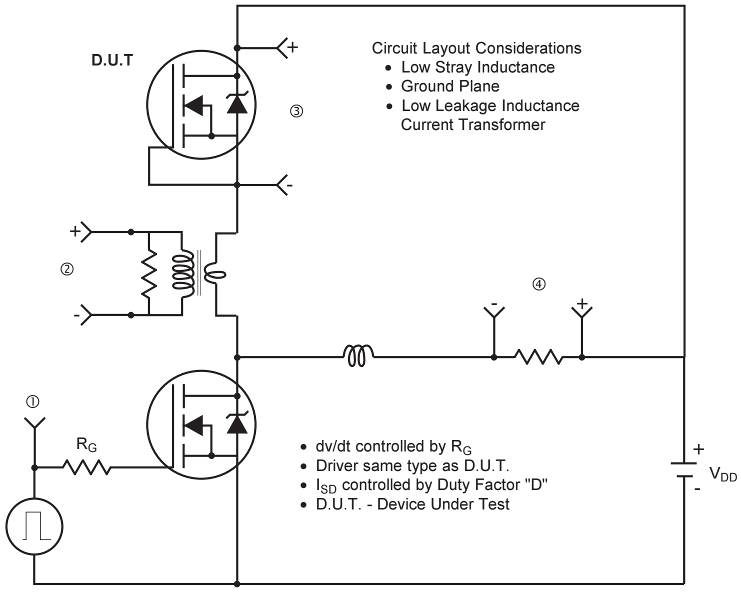
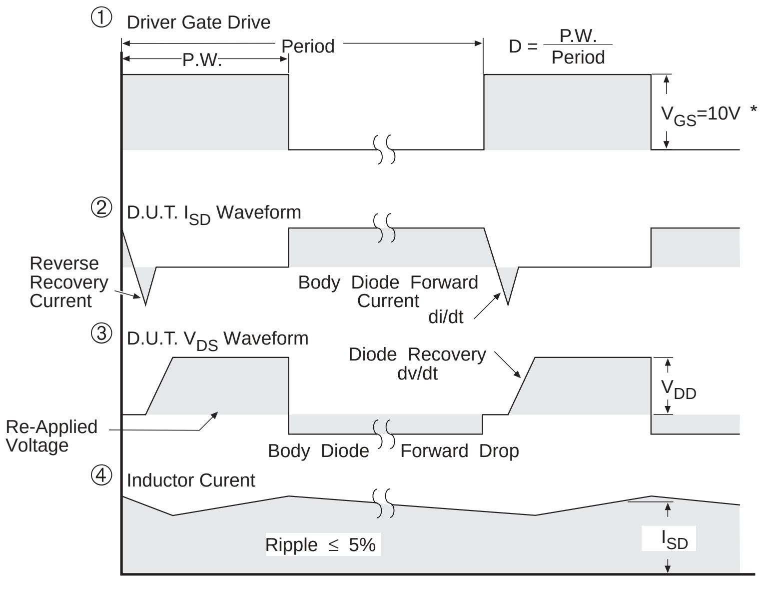



**Fig 13b.** Basic Gate Charge Waveform

## Peak Diode Recovery dv/dt Test Circuit

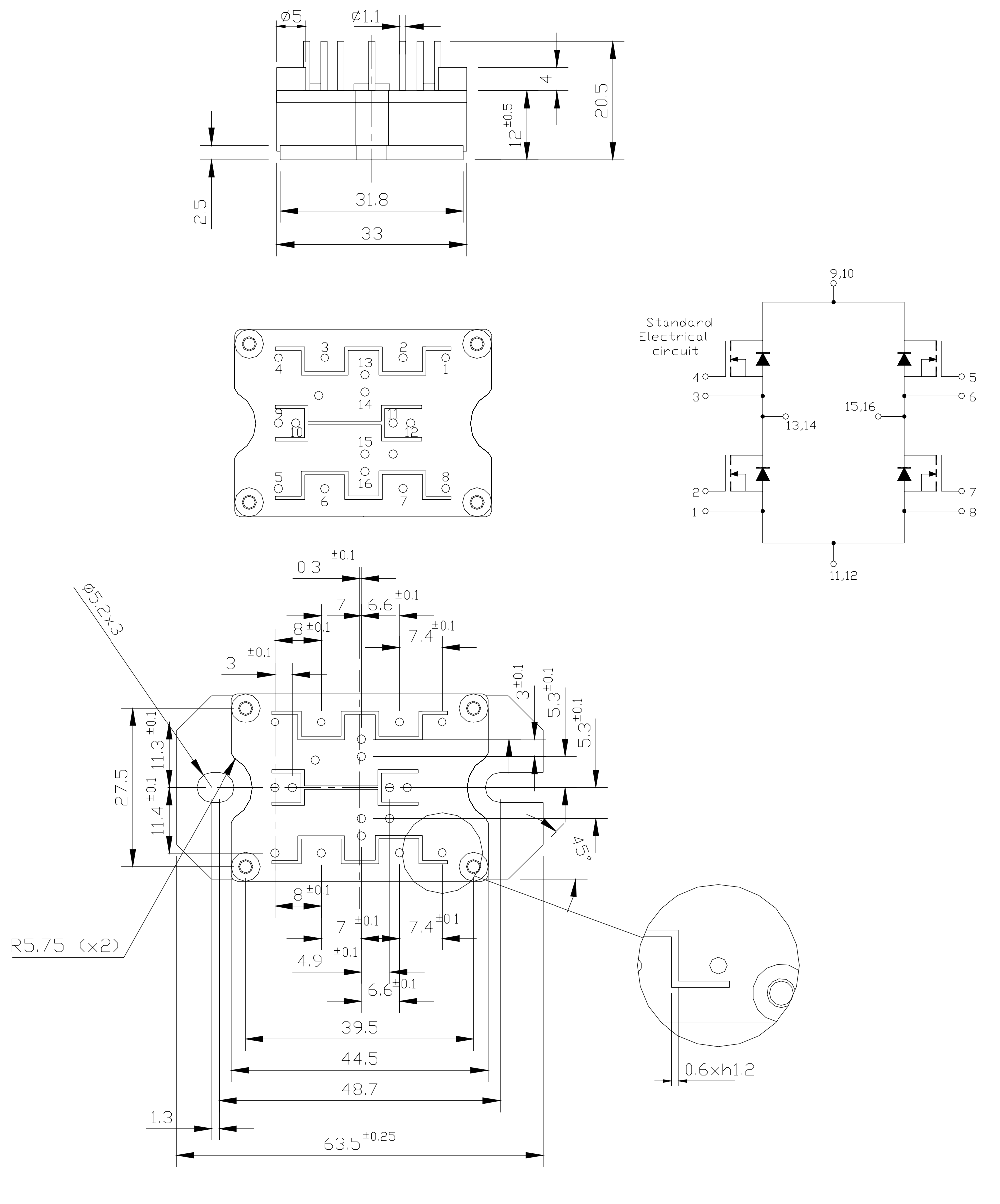



* $V_{GS}$ = 5V for Logic Level Devices

**Fig 14.** For N-Channel HEXFET® Power MOSFETs

## Outline Table




Dimensions in millimeters

## Ordering Information Table

**Device Code** 19 MT 050 X F

(1) (2) (3) (4) (5)

| | | | |
|---|---|---|---|
| 1 | - | Current rating | (19 = 19A) |
| 2 | - | Essential Part Number | |
| 3 | - | Voltage code | (050 = 500V) |
| 4 | - | Speed/ Type | (X = HexFet) |
| 5 | - | Circuit Configuration | (F = Full Bridge) |

Data and specifications subject to change without notice.
This product has been designed and qualified for Industrial Level.
Qualification Standards can be found on IR's Web site.

International IOR Rectifier

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