RoHS Compliant

MagnaChip

# MDF1903

## Single N-channel Trench MOSFET 100V, 12A, 110mΩ



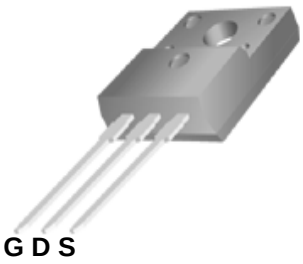
### General Description

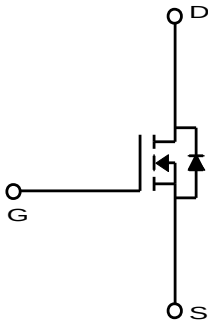
The MDF1903 uses advanced MagnaChip's MOSFET Technology, which provides high performance in on-state resistance, fast switching performance and excellent quality. MDF1903 is suitable device for DC to DC converter and general purpose applications.

### Features

- $V_{DS}$ = 100V
- $I_D$ = 12A @$V_{GS}$ = 10V
- $R_{DS(ON)\ (MAX)}$
  < 110mΩ @$V_{GS}$ = 10V
  < 115mΩ @$V_{GS}$ = 6.0V

**100% UIL Tested**




### Absolute Maximum Ratings (Tc = 25°C)

| Characteristics | | Symbol | Rating | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DSS}$ | 100 | V |
| Gate-Source Voltage | | $V_{GSS}$ | ±20 | V |
| Continuous Drain Current (1) | $T_C$=25°C | $I_D$ | 12 | A |
| | $T_C$=70°C | | 9.6 | |
| Pulsed Drain Current | | $I_{DM}$ | 40 | A |
| Power Dissipation | $T_C$=25°C | $P_D$ | 33.8 | W |
| | $T_C$=70°C | | 21.7 | |
| Single Pulse Avalanche Energy (2) | | $E_{AS}$ | 25.9 | mJ |
| Junction and Storage Temperature Range | | $T_J$, $T_{stg}$ | -55~150 | °C |

### Thermal Characteristics

| Characteristics | Symbol | Rating | Unit |
|---|---|---|---|
| Thermal Resistance, Junction-to-Ambient (1) | $R_{\theta JA}$ | 62.5 | °C/W |
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 3.7 | |

## Ordering Information

| Part Number | Temp. Range | Package | Packing | Rohs Status |
|---|---|---|---|---|
| MDF1903TH | -55~150°C | TO-220F | Tube | Halogen Free |

## Electrical Characteristics ($T_J$ =25°C)

| Characteristics | Symbol | Test Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Static Characteristics** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $I_D$ = 250μA, $V_{GS}$ = 0V | 100 | - | - | V |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA | 1.0 | 2.0 | 3.0 | |
| Drain Cut-Off Current | $I_{DSS}$ | $V_{DS}$ = 80V, $V_{GS}$ = 0V | - | - | 1 | μA |
| Gate Leakage Current | $I_{GSS}$ | $V_{GS}$ = ±20V, $V_{DS}$ = 0V | - | - | ±0.1 | |
| Drain-Source ON Resistance | $R_{DS(ON)}$ | $V_{GS}$ = 10V, $I_D$ = 9A | - | 90 | 110 | mΩ |
| | | $V_{GS}$ = 6.0V, $I_D$ = 9A | - | 95 | 115 | |
| Forward Transconductance | $g_{fs}$ | $V_{DS}$ = 10V, $I_D$ = 9A | - | 16 | - | S |
| **Dynamic Characteristics** | | | | | | |
| Total Gate Charge | $Q_{g(10V)}$ | $V_{DS}$ = 50.0V, $I_D$ = 9A, $V_{GS}$ = 10V | - | 8.8 | - | nC |
| Gate-Source Charge | $Q_{gs}$ | | - | 1.7 | - | |
| Gate-Drain Charge | $Q_{gd}$ | | - | 2.3 | - | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$ = 25.0V, $V_{GS}$ = 0V, f = 1.0MHz | - | 475 | 800 | pF |
| Reverse Transfer Capacitance | $C_{rss}$ | | - | 20 | - | |
| Output Capacitance | $C_{oss}$ | | - | 60 | - | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{GS}$ = 10V, $V_{DS}$ = 50V, $I_D$ = 9A , $R_G$ = 3.0Ω | - | 6.8 | - | ns |
| Rise Time | $t_r$ | | - | 10.6 | - | |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 16.2 | - | |
| Fall Time | $t_f$ | | - | 5.5 | - | |
| **Drain-Source Body Diode Characteristics** | | | | | | |
| Source-Drain Diode Forward Voltage | $V_{SD}$ | $I_S$ = 9A, $V_{GS}$ = 0V | - | 0.75 | 1.2 | V |
| Body Diode Reverse Recovery Time | $t_{rr}$ | $I_F$ = 9A, dI/dt = 100A/μs | - | 41 | - | ns |
| Body Diode Reverse Recovery Charge | $Q_{rr}$ | | - | 68 | - | nC |

Note :

1. Surface mounted FR-4 board by JEDEC (jesd51-7)
2. $E_{AS}$ is tested at starting Tj = 25℃, L = 1.0mH, $I_{AS}$ = 5.5A, $V_{DD}$ = 50V, $V_{GS}$ = 10V

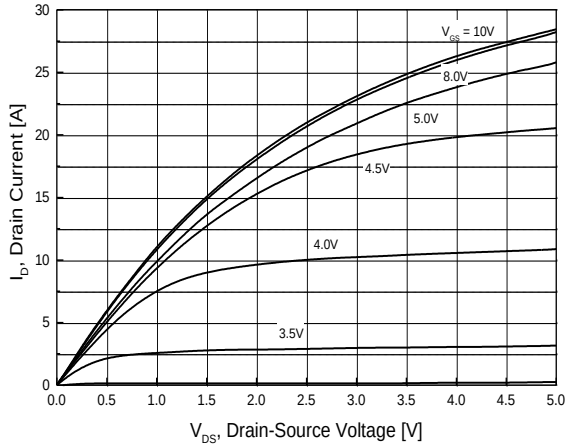



**Fig.1 On-Region Characteristics**

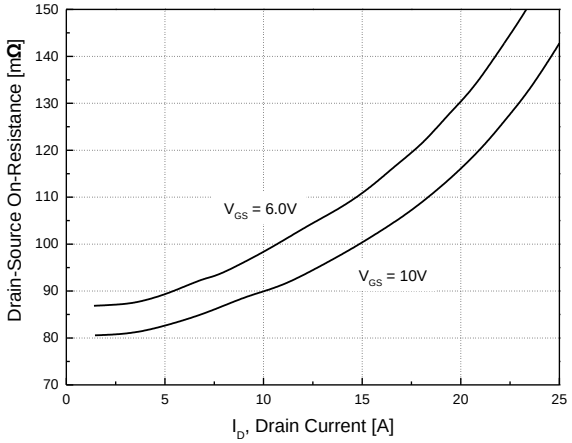



**Fig.2 On-Resistance Variation with Drain Current and Gate Voltage**

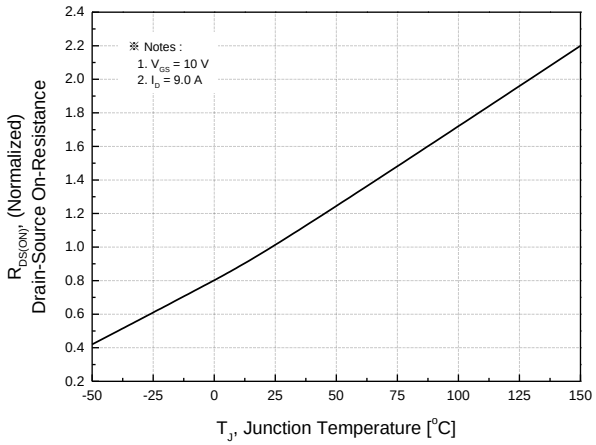



**Fig.3 On-Resistance Variation with Temperature**

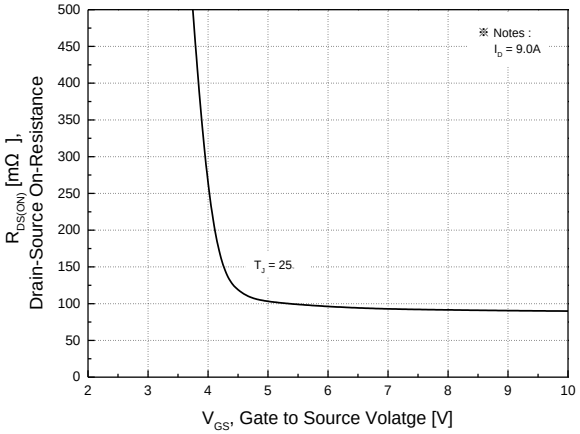



**Fig.4 On-Resistance Variation with Gate to Source Voltage**

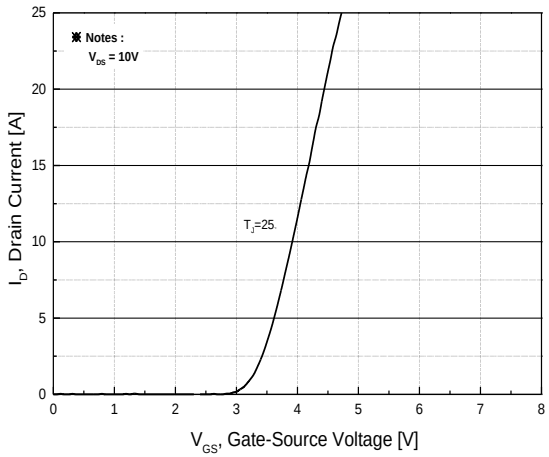



**Fig.5 Transfer Characteristics**

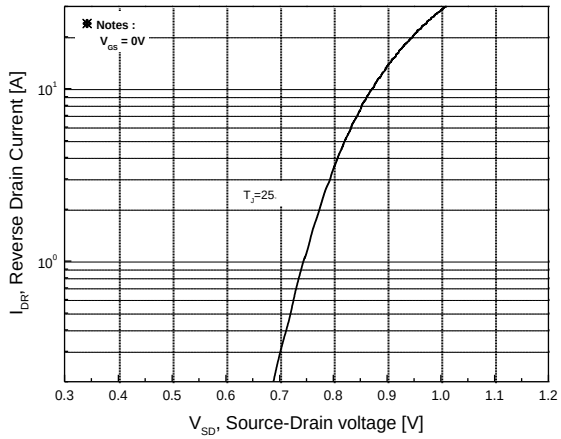



**Fig.6 Body Diode Forward Voltage Variation with Source Current and Temperature**

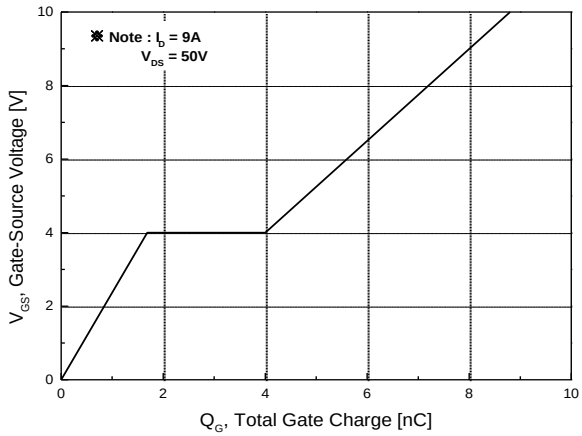



**Fig.7 Gate Charge Characteristics**

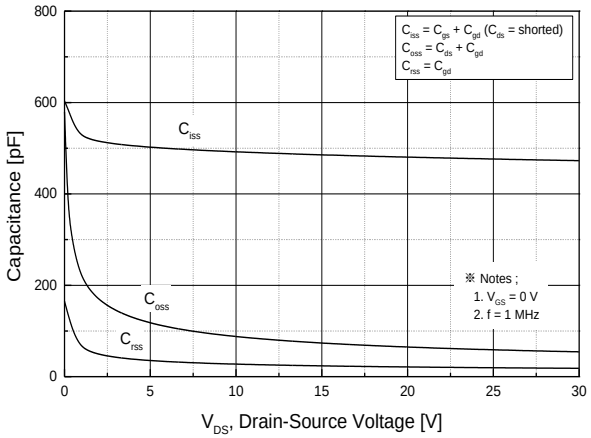



**Fig.8 Capacitance Characteristics**

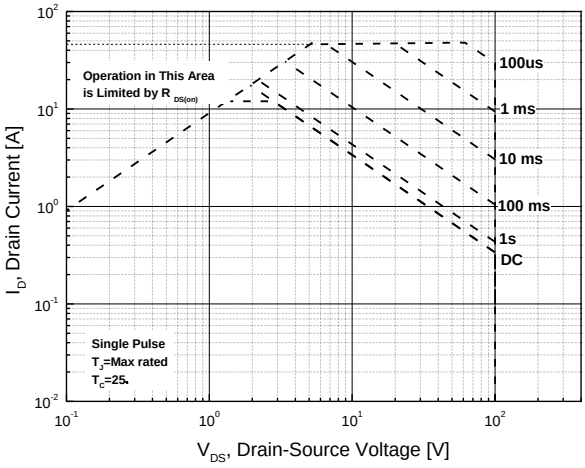



**Fig.9 Maximum Safe Operating Area**

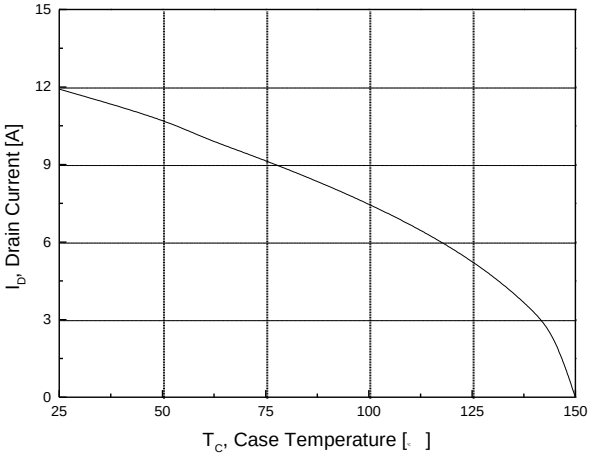



**Fig.10 Maximum Drain Current vs. Case Temperature**

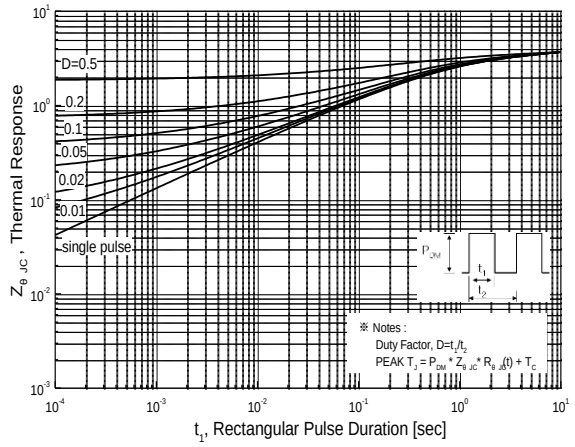
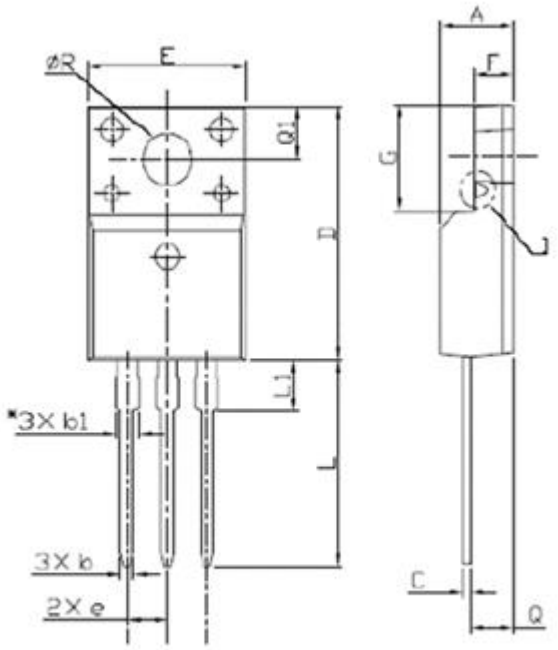



**Fig.11 Transient Thermal Response Curve**

## Package Dimension

### 3 Leads, TO-220F

**Dimensions are in millimeters, unless otherwise specified**




※Note1 : PKG Body Sizes exclude Mold Flash & Gate Burrs

| Symbol | Min | Nom | Max |
|---|---|---|---|
| A | 4.50 | - | 4.93 |
| b | 0.63 | - | 0.91 |
| b1 | 1.15 | - | 1.47 |
| C | 0.33 | - | 0.63 |
| D | 15.47 | - | 16.13 |
| E | 9.60 | - | 10.71 |
| e | 2.54 BSC | | |
| F | 2.34 | - | 2.84 |
| G | 6.48 | - | 6.90 |
| L | 12.24 | - | 13.72 |
| L1 | 2.79 | - | 3.67 |
| Q | 2.52 | - | 2.96 |
| Q1 | 3.10 | - | 3.50 |
| øR | 3.00 | - | 3.55 |

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