

MDQ14N049TH

Single N-channel Trench MOSFET 135V, 160A, 4.9mΩ

MDQ14N049TH – Single N-Channel Trench MOSFET 135V

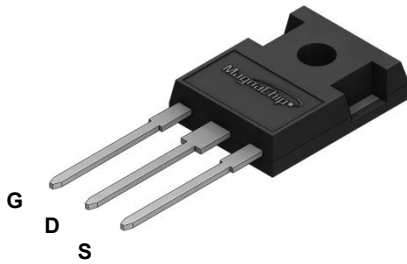
General Description

The MDQ14N049TH, Magnachip's latest generation of MV MOSFET Technology, which provides high performance in the lowest $R_{DS(on)}$, fast switching performance, and excellent quality.

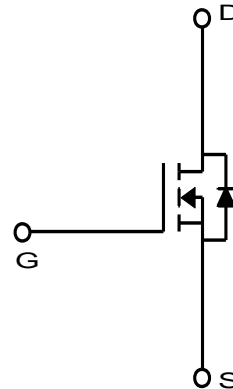
These devices can also be utilized in industrial applications such as Low Power Drives of E-bike, Light electric vehicles, DC/DC converter, and general purpose applications.

Features

- $V_{DS} = 135V$
- $I_D = 160A @ V_{GS} = 10V$
- Very low on-resistance $R_{DS(ON)} < 4.9 m\Omega @ V_{GS} = 10V$
- 175°C operating temperature
- 100% UIL Tested
- 100% Rg Tested
- 100% ΔV_{DS} Tested



TO-247



Absolute Maximum Ratings ($T_J = 25^\circ C$)

| Characteristics | | Symbol | Rating | Unit |
|--|-------------------------------------|----------------|----------|------------|
| Drain-Source Voltage | | V_{DSS} | 135 | V |
| Gate-Source Voltage | | V_{GSS} | ± 20 | V |
| Continuous Drain Current ⁽¹⁾ | $T_C=25^\circ C$ (Silicon Limited) | I_D | 195 | A |
| | $T_C=100^\circ C$ (Silicon Limited) | | 138 | |
| | $T_C=25^\circ C$ (Package Limited) | | 160 | |
| Pulsed Drain Current ⁽²⁾ | | I_{DM} | 640 | |
| Power Dissipation | $T_C=25^\circ C$ | P_D | 375 | W |
| | $T_C=100^\circ C$ | | 187 | |
| Single Pulse Avalanche Energy ⁽³⁾ | | E_{AS} | 450 | mJ |
| Junction and Storage Temperature Range | | T_J, T_{stg} | -55~175 | $^\circ C$ |

Thermal Characteristics

| Characteristics | Symbol | Rating | Unit |
|--|-----------------|--------|--------------|
| Thermal Resistance, Junction-to-Ambient ⁽¹⁾ | $R_{\theta JA}$ | 40 | $^\circ C/W$ |
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 0.4 | |

Ordering Information

| Part Number | Temp. Range | Package | Packing | RoHS Status |
|-------------|-------------|---------|---------|--------------|
| MDQ14N049TH | -55~175°C | TO-247 | 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 | 135 | - | - | V |
| Gate Threshold Voltage | V _{GS(th)} | V _{DS} = V _{GS} , I _D = 250μA | 2.5 | - | 3.9 | |
| Drain Cut-Off Current | I _{DSS} | V _{DS} = 135V, V _{GS} = 0V | - | - | 1.0 | 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 = 50A | - | 4.2 | 4.9 | mΩ |
| Forward Transconductance | g _{fs} | V _{DS} = 10V, I _D = 50A | - | 122 | - | S |
| Dynamic Characteristics | | | | | | |
| Total Gate Charge | Q _g | V _{DS} = 70V, I _D = 50A, V _{GS} = 10V | - | 123 | - | nC |
| Gate-Source Charge | Q _{gs} | | - | 41 | - | |
| Gate-Drain Charge | Q _{gd} | | - | 22 | - | |
| Input Capacitance | C _{iss} | V _{DS} = 70V, V _{GS} = 0V, f = 1.0MHz | - | 9,267 | - | pF |
| Reverse Transfer Capacitance | C _{rss} | | - | 27 | - | |
| Output Capacitance | C _{oss} | | - | 923 | - | |
| Turn-On Delay Time | t _{d(on)} | V _{GS} = 10V, V _{DS} = 70V, I _D = 50A, R _G = 3.0Ω | - | 36 | - | ns |
| Rise Time | t _r | | - | 21 | - | |
| Turn-Off Delay Time | t _{d(off)} | | - | 83 | - | |
| Fall Time | t _f | | - | 13 | - | |
| Gate Resistance | R _g | f=1 MHz | - | 3 | - | Ω |
| Drain-Source Body Diode Characteristics | | | | | | |
| Source-Drain Diode Forward Voltage | V _{SD} | I _S = 50A, V _{GS} = 0V | - | 0.9 | 1.2 | V |
| Body Diode Reverse Recovery Time | t _{rr} | I _F = 50A, di/dt = 125A/μs | - | 117 | - | ns |
| Body Diode Reverse Recovery Charge | Q _{rr} | | - | 538 | - | nC |

Note :

1. Surface mounted FR-4 board by JEDEC (jesd51-7). Continuous current at T_c=25°C is silicon limited
2. Pulse width limited by T_{Jmax}
3. E_{AS} is tested at starting T_j = 25°C, L = 1.0mH, I_{AS} = 30A, V_{GS} = 10V

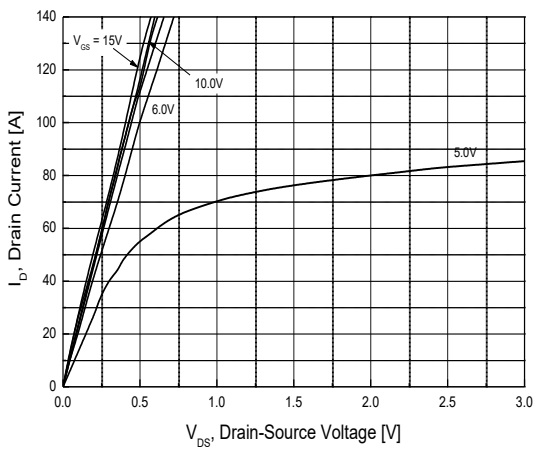


Fig.1 On-Region Characteristics

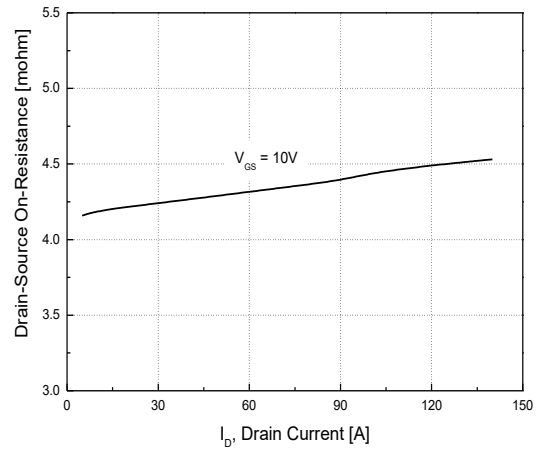


Fig.2 On-Resistance Variation with Drain Current and Gate Voltage

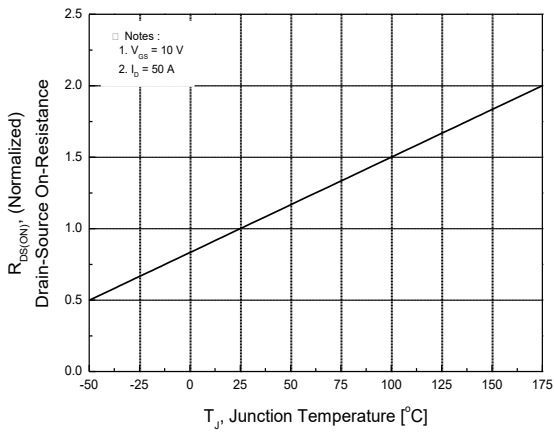


Fig.3 On-Resistance Variation with Temperature

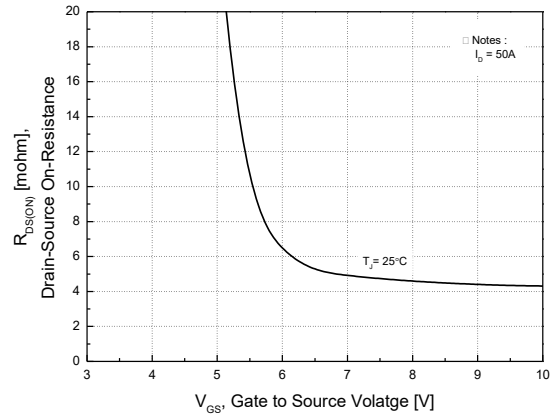


Fig.4 On-Resistance Variation with Gate to Source Voltage

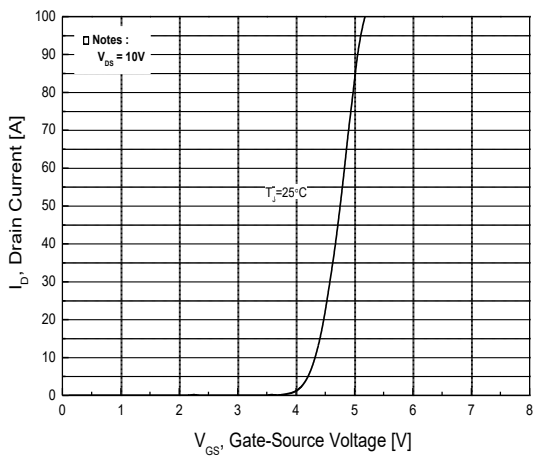


Fig.5 Transfer Characteristics

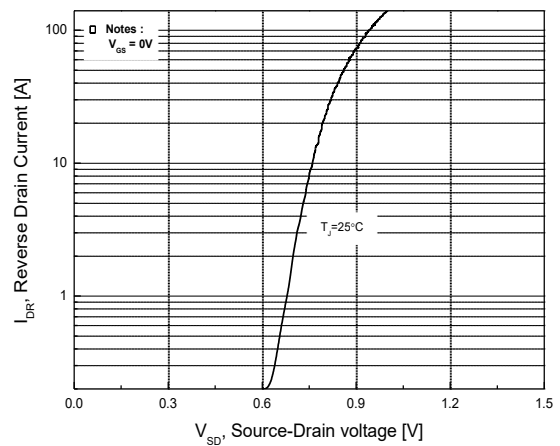


Fig.6 Body Diode Forward Voltage Variation with Source Current and Temperature

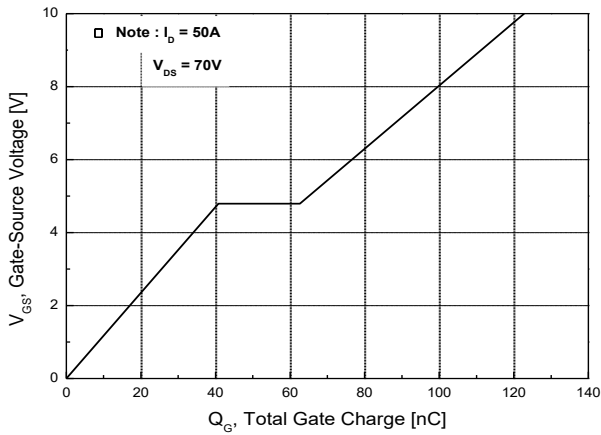


Fig.7 Gate Charge Characteristics

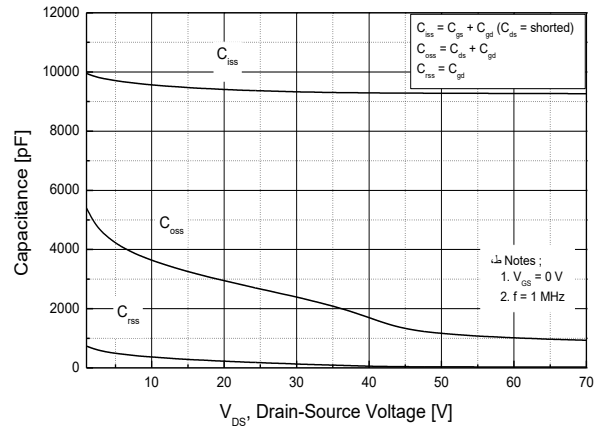


Fig.8 Capacitance Characteristics

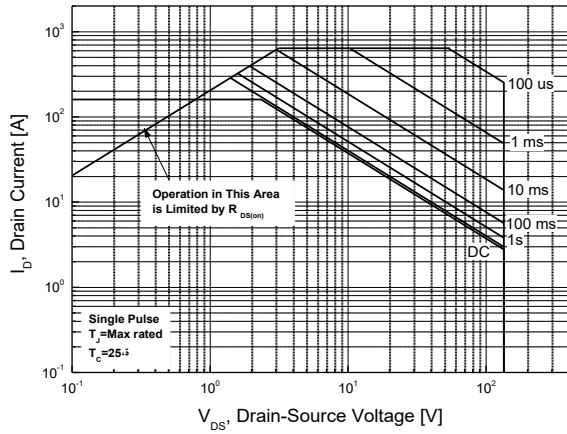


Fig.9 Maximum Safe Operating Area

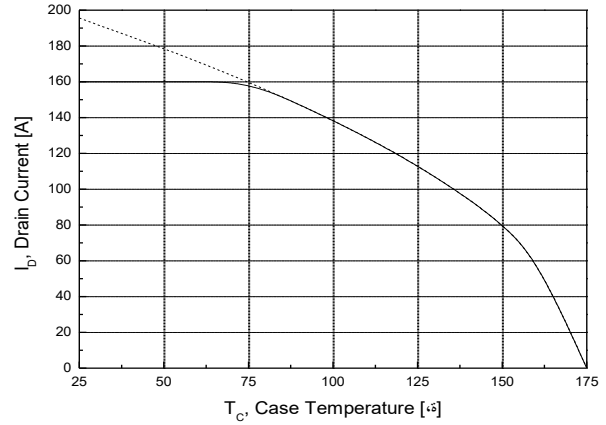


Fig.10 Maximum Drain Current vs. Case Temperature

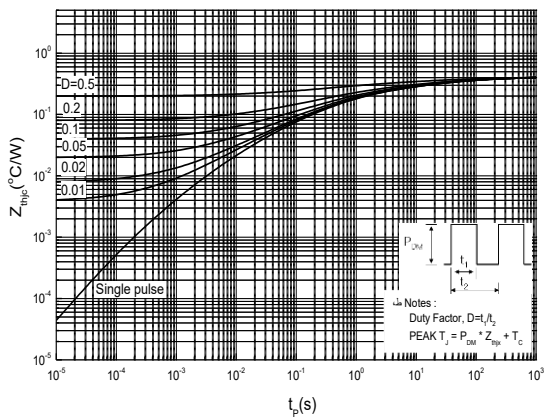
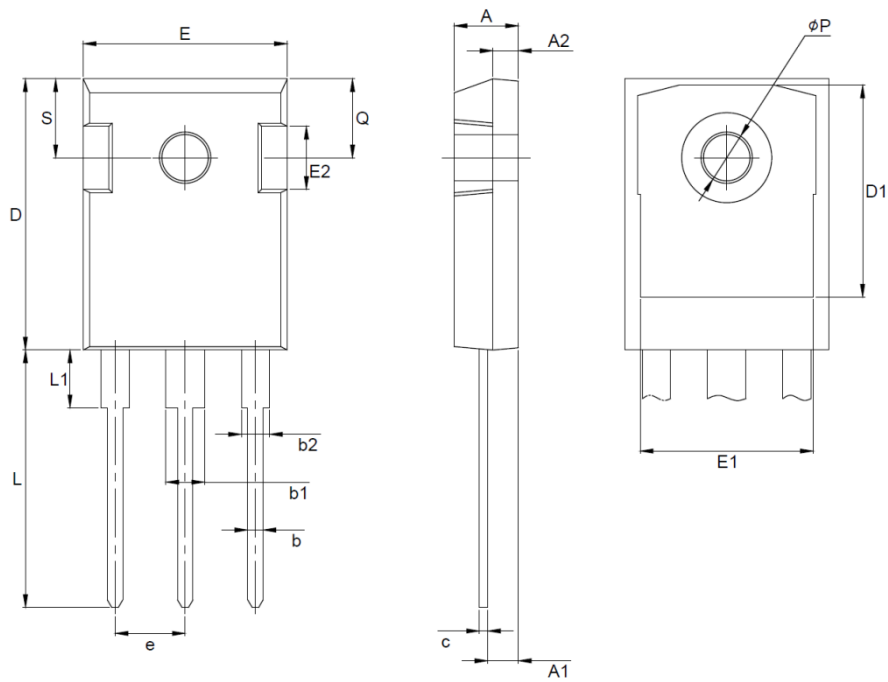


Fig.11 Transient Thermal Response Curve

Package Dimension

TO-247

Dimensions are in millimeters unless otherwise specified



| Symbol | Dimension (mm) | | |
|--------|----------------|-----|-------|
| | Min | Nom | Max |
| A | 4.70 | – | 5.31 |
| A1 | 2.20 | – | 2.60 |
| A2 | 1.50 | – | 2.49 |
| b | 0.99 | – | 1.40 |
| b1 | 2.59 | – | 3.43 |
| b2 | 1.65 | – | 2.39 |
| c | 0.38 | – | 0.89 |
| D | 20.30 | – | 21.46 |
| D1 | 13.08 | – | – |
| E | 15.45 | – | 16.26 |
| E1 | 13.06 | – | 14.15 |
| E2 | 4.32 | – | 5.49 |
| e | 5.45 BSC | | |
| L | 19.81 | – | 20.57 |
| L1 | – | – | 4.50 |
| φP | 3.50 | – | 3.70 |
| Q | 5.38 | – | 6.20 |
| S | 6.15 BSC | | |

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