

### General Description

The MDD3754 uses advanced Magnachip's Trench MOSFET Technology to provided high performance in on-state resistance, switching performance and reliability.

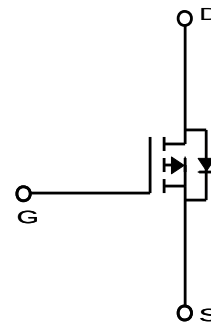
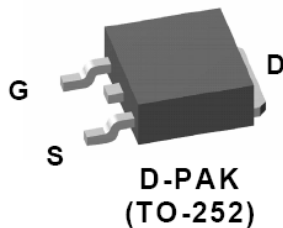
Low  $R_{DS(ON)}$ , Low Gate Charge can be offering superior benefit in the application.

### Features

- $V_{DS} = -40V$
- $I_D = -24.4A$  @  $V_{GS} = -10V$
- $R_{DS(ON)} < 43m\Omega$  @  $V_{GS} = -10V$
- $R_{DS(ON)} < 58m\Omega$  @  $V_{GS} = -4.5V$

### Applications

- Inverters
- General purpose applications



### Absolute Maximum Ratings ( $T_C = 25^\circ$ )

| Characteristics                        |                     | Symbol         | Rating   | Unit       |
|----------------------------------------|---------------------|----------------|----------|------------|
| Drain-Source Voltage                   |                     | $V_{DSS}$      | -40      | V          |
| Gate-Source Voltage                    |                     | $V_{GSS}$      | $\pm 20$ | V          |
| Continuous Drain Current (Note 2)      | $T_C = 25^\circ C$  | $I_D$          | -24.4    | A          |
|                                        | $T_C = 100^\circ C$ |                | -15.4    | A          |
| Pulsed Drain Current                   |                     | $I_{DM}$       | -50      | A          |
| Power Dissipation                      | $T_C = 25^\circ C$  | $P_D$          | 41.7     | W          |
|                                        | $T_C = 100^\circ C$ |                | 16.7     |            |
| Single Pulse Avalanche Energy (Note 3) |                     | $E_{AS}$       | 40.5     | mJ         |
| Junction and Storage Temperature Range |                     | $T_J, T_{stg}$ | -55~+150 | $^\circ C$ |

### Thermal Characteristics

| Characteristics                                  | Symbol          | Rating | Unit         |
|--------------------------------------------------|-----------------|--------|--------------|
| Thermal Resistance, Junction-to-Ambient (Note 1) | $R_{\theta JA}$ | 40     | $^\circ C/W$ |
| Thermal Resistance, Junction-to-Case             | $R_{\theta JC}$ | 3.0    |              |

## Ordering Information

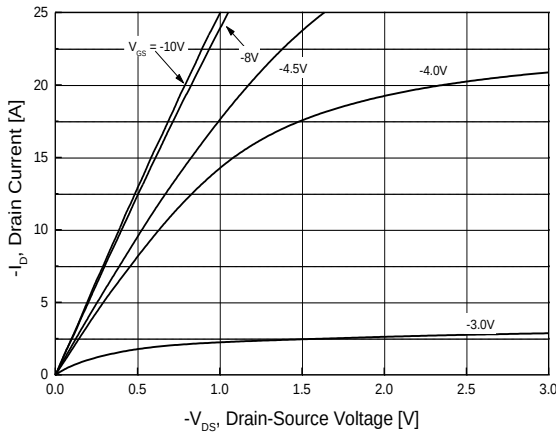
| Part Number | Temp. Range | Package | Packing     | RoHS Status  |
|-------------|-------------|---------|-------------|--------------|
| MDD3754RH   | -55~150°C   | TO-252  | Tape & Reel | Halogen Free |

## Electrical Characteristics (T<sub>J</sub> =25°C unless otherwise noted)

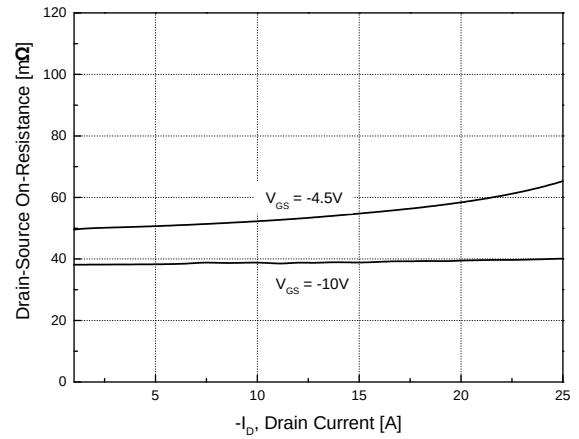
| Characteristics                         | Symbol              | Test Condition                                                                                  | Min  | Typ   | Max  | Unit |
|-----------------------------------------|---------------------|-------------------------------------------------------------------------------------------------|------|-------|------|------|
| Static Characteristics                  |                     |                                                                                                 |      |       |      |      |
| Drain-Source Breakdown Voltage          | BV <sub>DSS</sub>   | I <sub>D</sub> = -250μA, V <sub>GS</sub> = 0V                                                   | -40  | -     | -    | V    |
| Gate Threshold Voltage                  | V <sub>GS(th)</sub> | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA                                     | -1.0 | -2.0  | -3.0 |      |
| Zero Gate Voltage Drain Current         | I <sub>DSS</sub>    | V <sub>DS</sub> = -32V, V <sub>GS</sub> = 0V                                                    | -    |       | -1   | μA   |
| Gate Leakage Current                    | I <sub>GSS</sub>    | V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V                                                    | -    | -     | ±0.1 |      |
| Drain-Source ON Resistance              | R <sub>DS(ON)</sub> | V <sub>GS</sub> = -10V, I <sub>D</sub> = -6A                                                    | -    | 32    | 43   | mΩ   |
|                                         |                     | V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -4A                                                   |      | 43    | 58   |      |
| Forward Transconductance                | g <sub>FS</sub>     | V <sub>DS</sub> = -10V, I <sub>D</sub> = -6A                                                    |      | 12    | -    | S    |
| Dynamic Characteristics                 |                     |                                                                                                 |      |       |      |      |
| Total Gate Charge                       | Q <sub>g</sub>      | V <sub>DD</sub> = -28V, I <sub>D</sub> = -6A,<br>V <sub>GS</sub> = 10V                          | -    | 19.2  | -    | nC   |
| Gate-Source Charge                      | Q <sub>gs</sub>     |                                                                                                 | -    | 3.1   | -    |      |
| Gate-Drain Charge                       | Q <sub>gd</sub>     |                                                                                                 | -    | 4.4   | -    |      |
| Input Capacitance                       | C <sub>iSS</sub>    | V <sub>DS</sub> = -25V, V <sub>GS</sub> = 0V,<br>f = 1.0MHz                                     | -    | 868   | -    | pF   |
| Reverse Transfer Capacitance            | C <sub>rSS</sub>    |                                                                                                 | -    | 72    | -    |      |
| Output Capacitance                      | C <sub>oSS</sub>    |                                                                                                 | -    | 125   | -    |      |
| Turn-On Delay Time                      | t <sub>d(on)</sub>  | V <sub>GS</sub> = -10V ,V <sub>DD</sub> = -20V,<br>I <sub>D</sub> = -1A, R <sub>GEN</sub> =3.3Ω | -    | 11.0  | -    | ns   |
| Turn-On Rise Time                       | t <sub>r</sub>      |                                                                                                 | -    | 21.4  | -    |      |
| Turn-Off Delay Time                     | t <sub>d(off)</sub> |                                                                                                 | -    | 32.5  | -    |      |
| Turn-Off Fall Time                      | t <sub>f</sub>      |                                                                                                 | -    | 15.0  | -    |      |
| Drain-Source Body Diode Characteristics |                     |                                                                                                 |      |       |      |      |
| Source-Drain Diode Forward Voltage      | V <sub>SD</sub>     | I <sub>S</sub> = -6A, V <sub>GS</sub> = 0V                                                      | -    | -0.88 | 1.2  | V    |
| Reverse Recovery Time                   | trr                 | I <sub>S</sub> = -6A, di/dt=100A/us                                                             | -    | 37    | -    | ns   |
| Reverse Recovery Charge                 | Qrr                 |                                                                                                 | -    | 24    | -    | nC   |

Note :

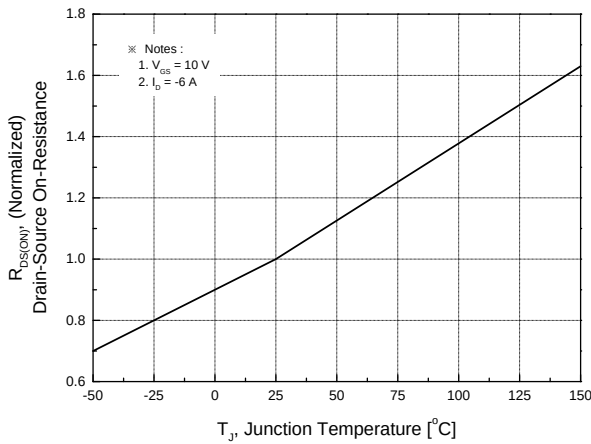
1. Surface mounted RF4 board with 2oz. Copper.
2. P<sub>D</sub> is based on T<sub>J(MAX)</sub> = 150°C, P<sub>D</sub>(T<sub>C</sub> = 25°C) is based on R<sub>θJC</sub>.
3. Starting T<sub>J</sub> = 25°C, L = 1mH, I<sub>AS</sub> = -9A, V<sub>DD</sub> = -20V, V<sub>GS</sub> = -10V



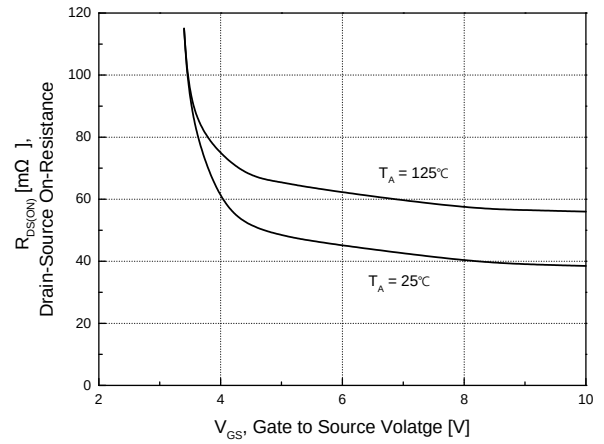
**Fig.1 On-Region Characteristics**



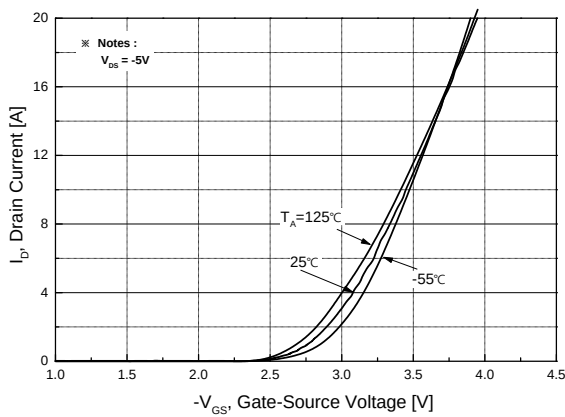
**Fig.2 On-Resistance Variation with Drain Current and Gate Voltage**



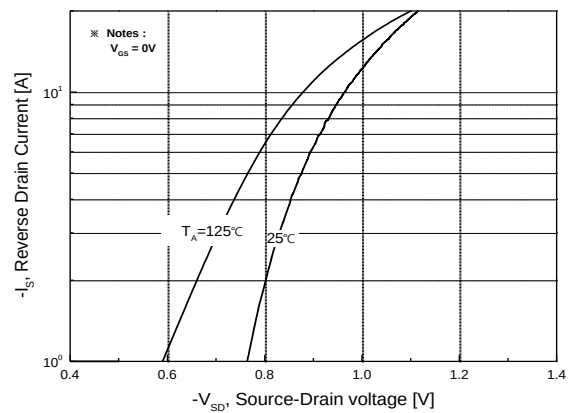
**Fig.3 On-Resistance Variation with Temperature**



**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**

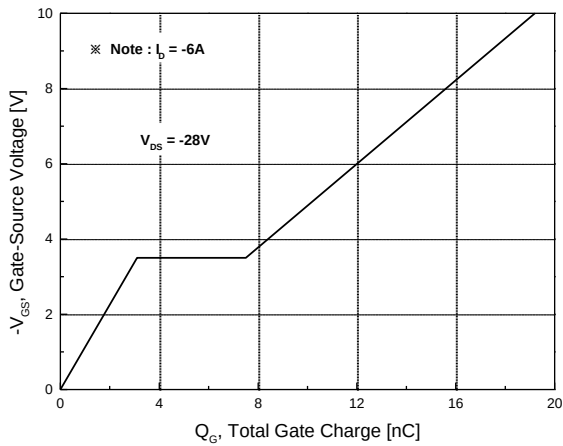


Fig.7 Gate Charge Characteristics

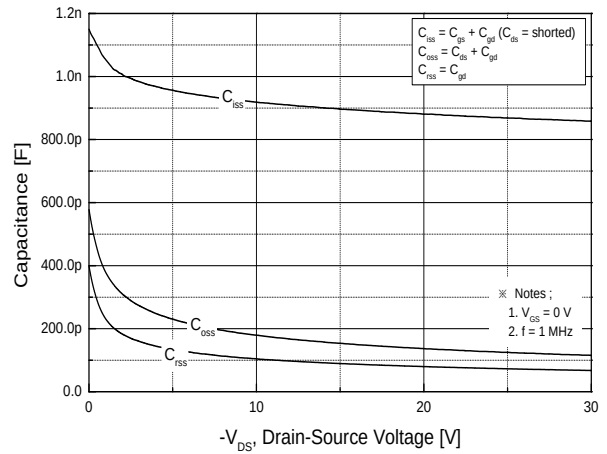


Fig.8 Capacitance Characteristics

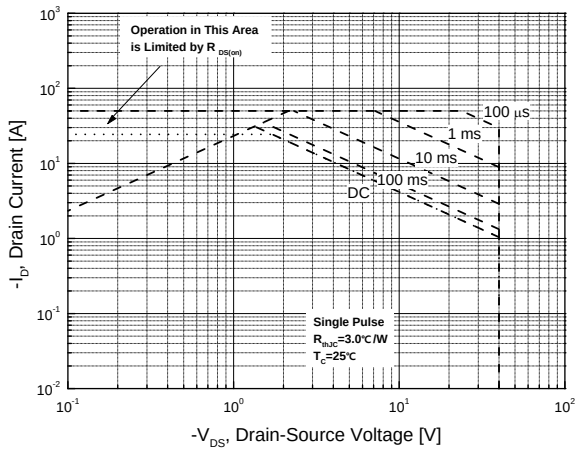


Fig.9 Maximum Safe Operating Area

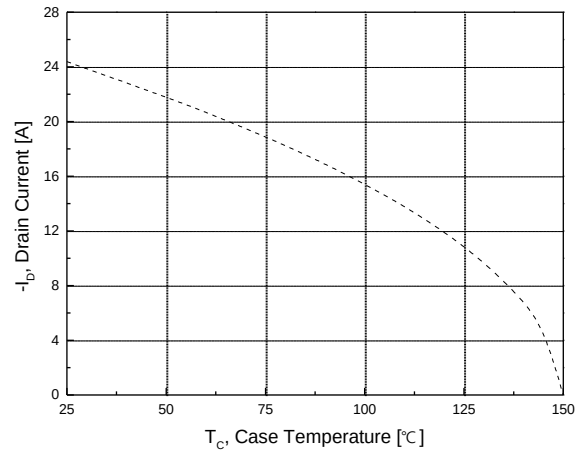


Fig.10 Maximum Drain Current vs. Case Temperature

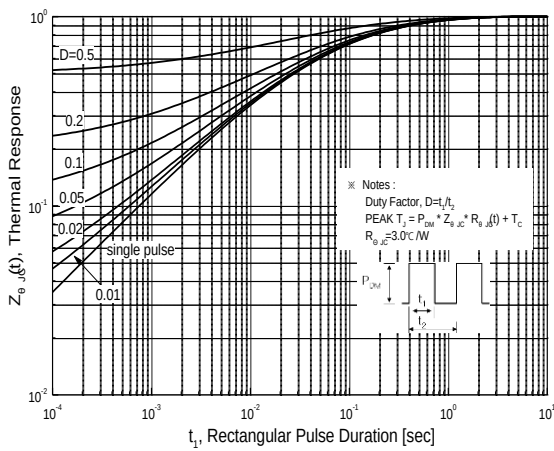
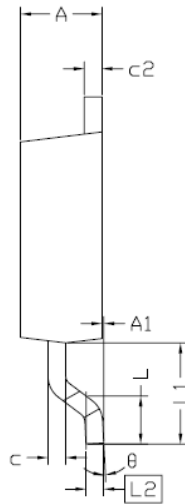
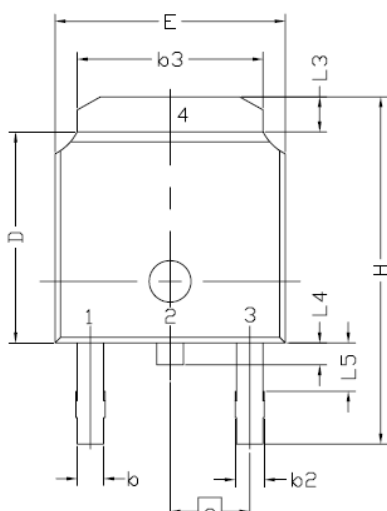


Fig.11 Transient Thermal Response Curve

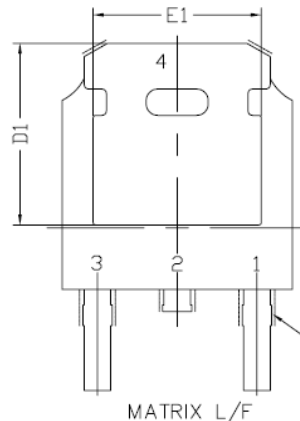
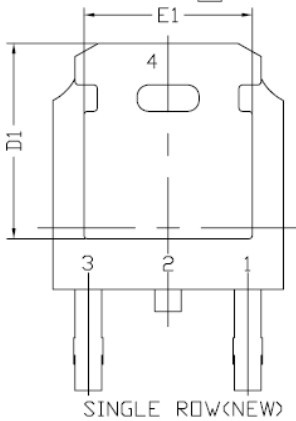
## Physical Dimensions

### 2 Leads, DPAK (TO252)

Dimensions are in millimeters unless otherwise specified



| SYMBOL | DIMENSIONAL REQMTS |       |       |
|--------|--------------------|-------|-------|
|        | MIN                | NOM   | MAX   |
| E      | 6.40               | 6.60  | 6.731 |
| L      | 1.40               | 1.52  | 1.77  |
| L1     | 2.743 REF          |       |       |
| L2     | 0.508 BSC          |       |       |
| L3     | 0.89               | --    | 1.27  |
| L4     | 0.64               | --    | 1.01  |
| L5     | --                 | --    | --    |
| D      | 6.00               | 6.10  | 6.223 |
| H      | 9.40               | 10.00 | 10.40 |
| b      | 0.64               | 0.76  | 0.88  |
| b2     | 0.77               | 0.84  | 1.14  |
| b3     | 5.21               | 5.34  | 5.46  |
| e      | 2.286 BSC          |       |       |
| A      | 2.20               | 2.30  | 2.38  |
| A1     | 0                  | --    | 0.127 |
| c      | 0.45               | 0.50  | 0.60  |
| c2     | 0.45               | 0.50  | 0.58  |
| D1     | 5.30               | --    | --    |
| E1     | 4.40               | --    | --    |
| theta  | 0°                 | --    | 10°   |



COPPER  
EXPOSITION  
AREA

#### Note:

1. All Dimension Are In mm.
2. Package Body Sizes Exclude Mold Flash, Protrusion Or Gate Burrs. Mold Flash, Protrusion Or Gate Burrs Shall Not Exceed 0.10 mm Per Side.
3. Package Body Sizes Determined At The Outermost Extremes Of The Plastic Body Exclusive Of Mold Flash, Gate Burrs And Interlead Flash, But Including Any Mismatch Between The Top And Bottom Of The Plastic Body.
4. The Package Top May Be Smaller Than The Package Bottom.
5. Dimension "b" Does Not Include Dambar Protrusion. Allowable Dambar Protrusion Shall Be 0.10 mm Total In Excess Of "b" Dimension At Maximum Material Condition. The Dambar Cannot Be Located On The Lower Radius Of The Foot.

Note : Package body size, length and width do not include mold flash, protrusions and gate burrs.

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