

### General Description

The MDS1656 uses advanced Magnachip's trench MOSFET Technology to provide high performance in on-state resistance, switching performance and reliability

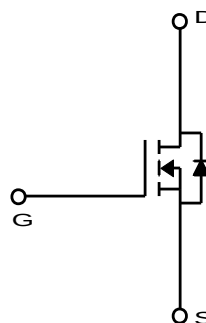
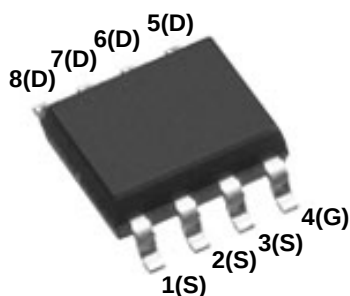
Low  $R_{DS(ON)}$ , low gate charge can be offering superior benefit in the application.

### Features

- $V_{DS} = 30V$
- $I_D = 7.2A$  @  $V_{GS} = 10V$
- $R_{DS(ON)}$   
 $< 28m\Omega$  @  $V_{GS} = 10V$   
 $< 42m\Omega$  @  $V_{GS} = 4.5V$

### Applications

- Inverters
- General purpose applications



### Absolute Maximum Ratings ( $T_a = 25^\circ C$ unless otherwise noted)

| Characteristics                              |                    | Symbol         | Rating   | Unit       |
|----------------------------------------------|--------------------|----------------|----------|------------|
| Drain-Source Voltage                         |                    | $V_{DSS}$      | 30       | V          |
| Gate-Source Voltage                          |                    | $V_{GSS}$      | $\pm 20$ | V          |
| Continuous Drain Current <sup>(1)</sup>      | $T_C = 25^\circ C$ | $I_D$          | 7.2      | A          |
|                                              | $T_C = 70^\circ C$ |                | 6.2      | A          |
| Pulsed Drain Current                         |                    | $I_{DM}$       | 30       | A          |
| Power Dissipation                            | $T_C = 25^\circ C$ | $P_D$          | 2        | W          |
|                                              | $T_C = 70^\circ C$ |                | 1.44     |            |
| Single Pulse Avalanche Energy <sup>(2)</sup> |                    | $E_{AS}$       | 20       | 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(Steady-State) <sup>(1)</sup> | $R_{\theta JA}$ | 100    | $^\circ C/W$ |
| Thermal Resistance, Junction-to-Case                                 | $R_{\theta JC}$ | 60     |              |

## Ordering Information

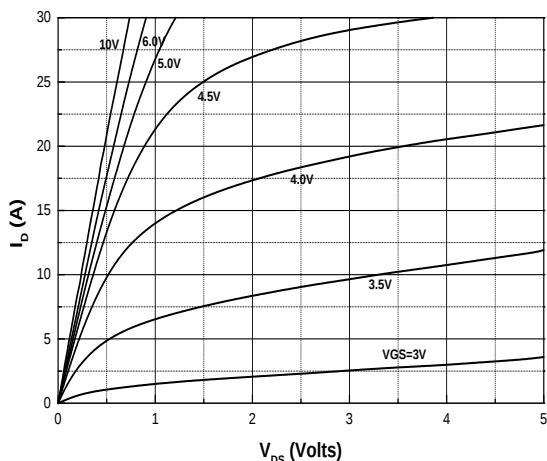
| Part Number | Temp. Range | Package | Packing     | RoHS Status  |
|-------------|-------------|---------|-------------|--------------|
| MDS1656R    | -55~150°C   | SO-8    | Tape & Reel | Halogen Free |

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

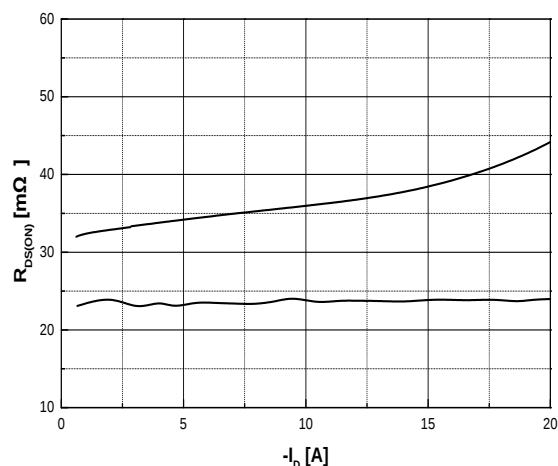
| Characteristics                         | Symbol              | Test Condition                                                                                | Min | Typ  | Max | Unit |
|-----------------------------------------|---------------------|-----------------------------------------------------------------------------------------------|-----|------|-----|------|
| Static Characteristics                  |                     |                                                                                               |     |      |     |      |
| Drain-Source Breakdown Voltage          | BV <sub>DSS</sub>   | I <sub>D</sub> = 250μA, V <sub>GS</sub> = 0V                                                  | 30  | -    | -   | V    |
| Gate Threshold Voltage                  | V <sub>GS(th)</sub> | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                                    | 1.0 | 1.9  | 3.0 |      |
| Drain Cut-Off Current                   | I <sub>DSS</sub>    | V <sub>DS</sub> = 24V, 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> = 6.9A                                                  | -   | 21.5 | 28  | mΩ   |
|                                         |                     | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 5.0A                                                 | -   | 31.5 | 42  |      |
| On-State Drain Current                  | I <sub>D(ON)</sub>  | V <sub>DS</sub> = 5V, V <sub>GS</sub> = 4.5V                                                  | 20  | -    | -   | A    |
| Forward Transconductance                | g <sub>FS</sub>     | V <sub>DS</sub> = 5V, I <sub>D</sub> = 6.9A                                                   | 10  | 15.4 | -   | S    |
| Maximum Body-Diode Continuous Current   |                     |                                                                                               | -   | -    |     |      |
| Dynamic Characteristics                 |                     |                                                                                               |     |      |     |      |
| Total Gate Charge                       | Q <sub>g</sub>      | V <sub>DS</sub> = 15V, I <sub>D</sub> = 6.9A,<br>V <sub>GS</sub> = 10V                        | -   | 6.94 | -   | nC   |
| Gate-Source Charge                      | Q <sub>gs</sub>     |                                                                                               | -   | 1.54 | -   |      |
| Gate-Drain Charge                       | Q <sub>gd</sub>     |                                                                                               | -   | 1.4  | -   |      |
| Input Capacitance                       | C <sub>iss</sub>    | V <sub>DS</sub> = 15V, V <sub>GS</sub> = 0V,<br>f = 1.0MHz                                    | -   | 334  | -   | pF   |
| Reverse Transfer Capacitance            | C <sub>rss</sub>    |                                                                                               | -   | 48   | -   |      |
| Output Capacitance                      | C <sub>oss</sub>    |                                                                                               | -   | 83   | -   |      |
| Turn-On Delay Time                      | t <sub>d(on)</sub>  | V <sub>GS</sub> = 10V, V <sub>DS</sub> = 15V,<br>R <sub>L</sub> = 2.2Ω, R <sub>GEN</sub> = 3Ω | -   | 3.5  | -   | ns   |
| Turn-On Rise Time                       | t <sub>r</sub>      |                                                                                               | -   | 25.4 | -   |      |
| Turn-Off Delay Time                     | t <sub>d(off)</sub> |                                                                                               | -   | 14.2 | -   |      |
| Turn-Off Fall Time                      | t <sub>f</sub>      |                                                                                               | -   | 10.5 | -   |      |
| Drain-Source Body Diode Characteristics |                     |                                                                                               |     |      |     |      |
| Source-Drain Diode Forward Voltage      | V <sub>SD</sub>     | I <sub>S</sub> = 1A, V <sub>GS</sub> = 0V                                                     | -   | 0.75 | 1.0 | V    |
| Body Diode Reverse Recovery Time        | t <sub>rr</sub>     | I <sub>F</sub> = 6.9A, di/dt = 100A/μs                                                        | -   | 16.5 | 20  | ns   |
| Body Diode Reverse Recovery Charge      | Q <sub>rr</sub>     |                                                                                               | -   | 7.8  | 10  | nC   |

Notes :

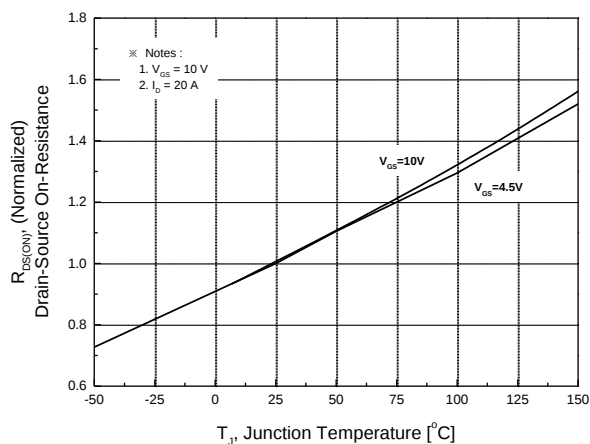
1. Surface mounted FR-4 board with 2oz. Copper..
2. Starting T<sub>J</sub> = 25°C, L = 1mH, I<sub>AS</sub> = 5A, V<sub>DD</sub> = 15V, V<sub>GS</sub> = 10V.



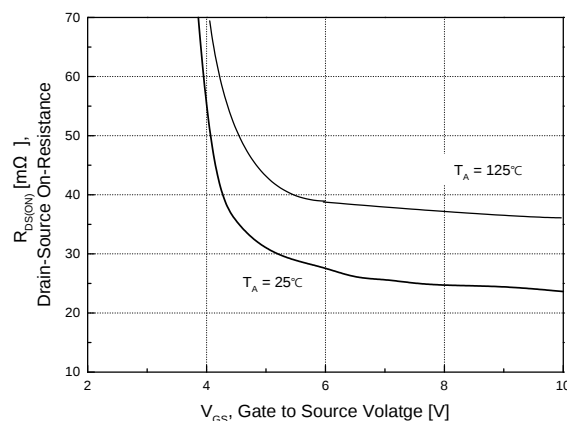
**Fig.1 On-Region Characteristics**



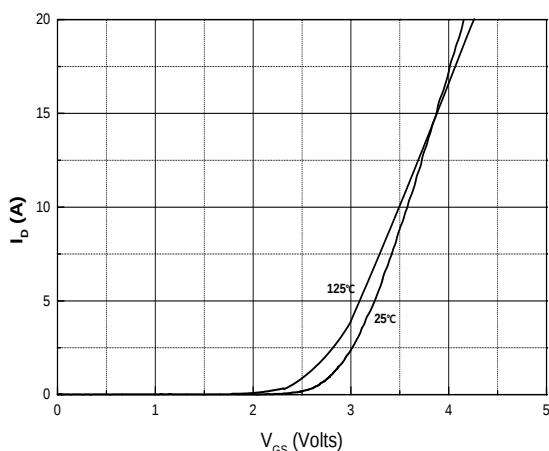
**Fig.2 On-Resistance Variation with Drain Current and Gate Voltage**



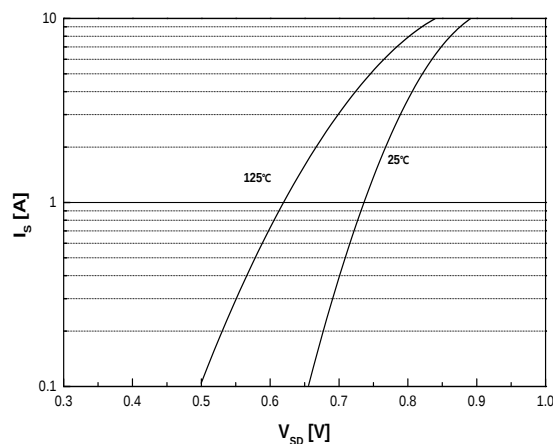
**Fig.3 On-Resistance Variation with Temperature**



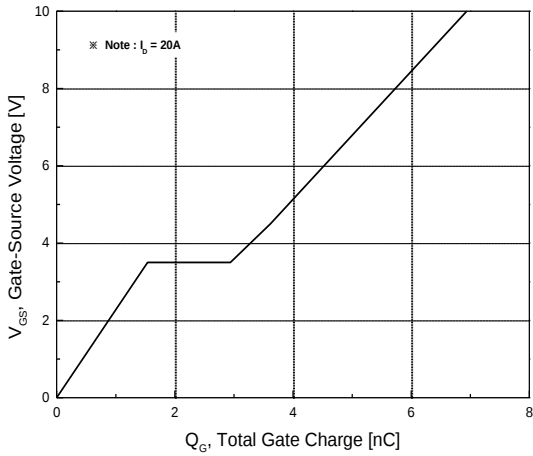
**Fig.4 On-Resistance Variation with Gate to Source Voltage**



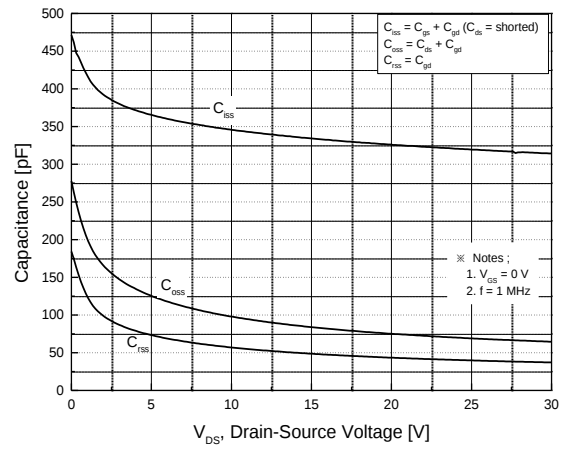
**Fig.5 Transfer Characteristics**



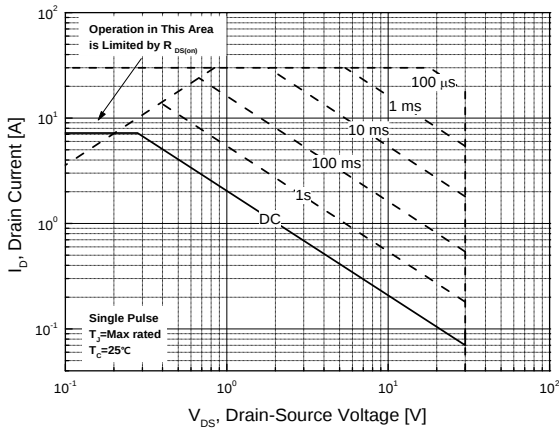
**Fig.6 Body Diode Forward Voltage Variation with Source Current and Temperature**



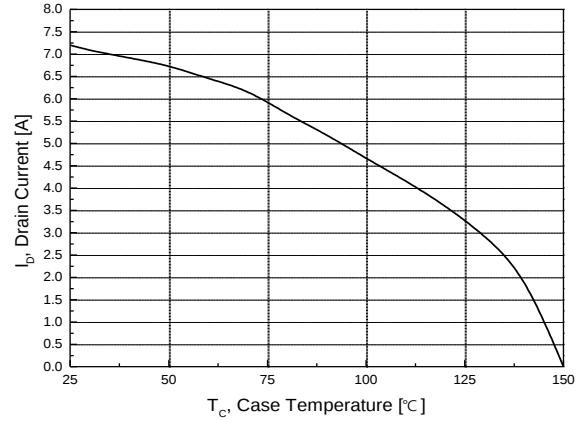
**Fig.7 Gate Charge Characteristics**



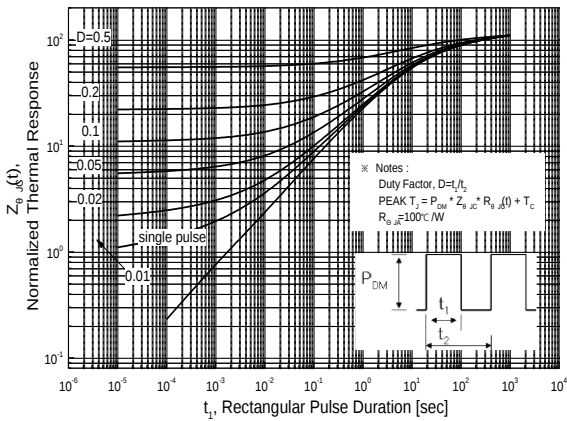
**Fig.8 Capacitance Characteristics**



**Fig.9 Maximum Safe Operating Area**



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

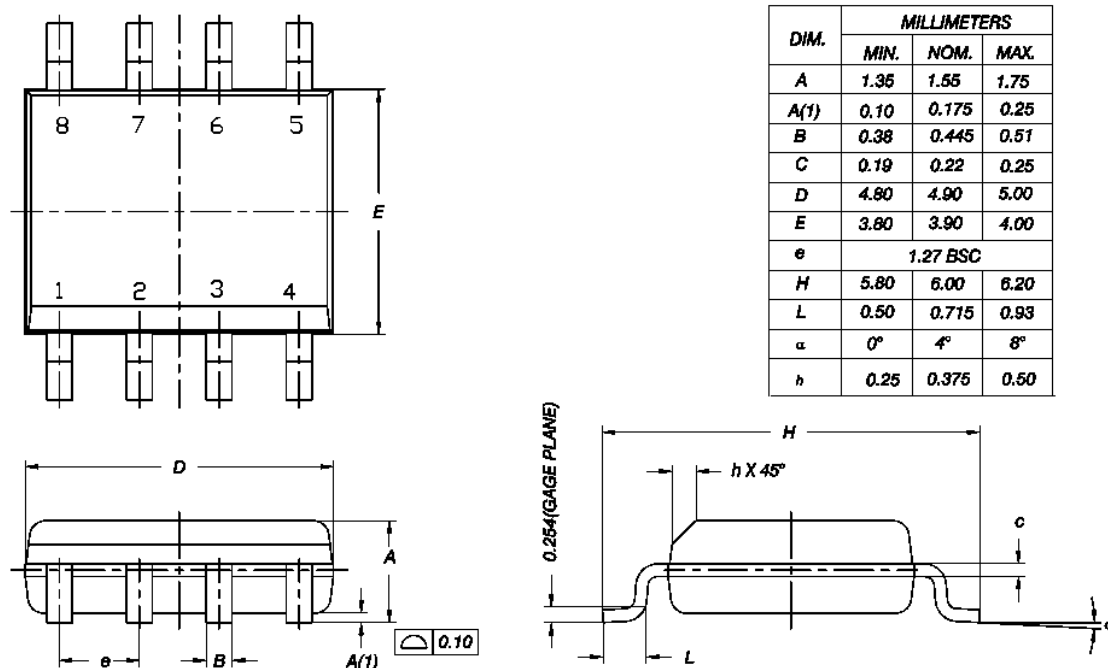


**Fig.11 Transient Thermal Response Curve**

## Physical Dimensions

### 8 Leads SOIC

Dimensions are in millimeters unless otherwise specified



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

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