MagnaChip

# MDS1652E

## Single N-channel Trench MOSFET 30V, 16A, 5.0mΩ

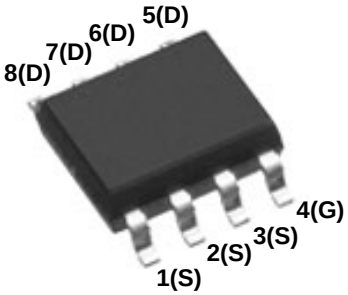


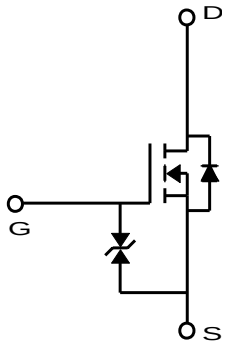
### General Description

The MDS1652E uses advanced MagnaChip's MOSFET Technology, which provides high performance in on-state resistance, fast switching performance and excellent quality. Excellent low $R_{DS(ON)}$, low gate charge and operation for Battery Applications.

### Features

- $V_{DS}$ = 30V
- $I_D$ = 16A @$V_{GS}$ = 10V
- $R_{DS(ON)\ (MAX)}$
  < 5.0mΩ @$V_{GS}$ = 10V
  < 8.5mΩ @$V_{GS}$ = 4.5V




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

| Characteristics | | Symbol | Rating | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DSS}$ | 30 | V |
| Gate-Source Voltage | | $V_{GSS}$ | ±20 | V |
| Continuous Drain Current (1) | $T_A$=25°C | $I_D$ | 16 | A |
| | $T_A$=100°C | | 10 | |
| Pulsed Drain Current | | $I_{DM}$ | 60 | A |
| Power Dissipation | $T_A$=25°C | $P_D$ | 2.5 | W |
| | $T_A$=100°C | | 1.0 | |
| Single Pulse Avalanche Energy(2) | | $E_{AS}$ | 112 | 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) | $R_{\theta JA}$ | 50 | °C/W |
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 25 | |

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## Ordering Information

| Part Number | Temp. Range | Package | Packing | Rohs Status |
|---|---|---|---|---|
| MDS1652EURH | -55~150°C | SOIC-8 | Tape & Reel | 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 | 30 | - | - | V |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA | 1.0 | 2.2 | 3.0 | |
| Drain Cut-Off Current | $I_{DSS}$ | $V_{DS}$ = 30V, $V_{GS}$ = 0V | - | - | 1 | μA |
| Gate Leakage Current | $I_{GSS}$ | $V_{GS}$ = ±16V, $V_{DS}$ = 0V | - | - | ±10 | |
| Drain-Source ON Resistance | $R_{DS(ON)}$ | $V_{GS}$ = 10V, $I_D$ = 10A | - | 4.2 | 5.0 | mΩ |
| | | $T_J$=125°C | - | 7.0 | 8.1 | |
| | | $V_{GS}$ = 4.5V, $I_D$ = 10A | - | 7.2 | 8.5 | |
| Forward Transconductance | $g_{fs}$ | $V_{DS}$ = 6.5V, $I_D$ = 10A | - | 38 | - | S |
| **Dynamic Characteristics** | | | | | | |
| Total Gate Charge | $Q_{g(10V)}$ | $V_{DS}$ = 15V, $I_D$ = 10A, $V_{GS}$ = 10V | 21.7 | 31.0 | 40.3 | nC |
| | $Q_{g(4.5V)}$ | | 10.3 | 14.8 | 19.2 | |
| Gate-Source Charge | $Q_{gs}$ | | - | 5.4 | - | |
| Gate-Drain Charge | $Q_{gd}$ | | - | 5.5 | - | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$ = 15V, $V_{GS}$ = 0V, f = 1.0MHz | 2642 | 1850 | 2405 | pF |
| Reverse Transfer Capacitance | $C_{rss}$ | | 108 | 155 | 201 | |
| Output Capacitance | $C_{oss}$ | | 294 | 420 | 546 | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{GS}$ = 10V, $V_{DS}$ = 15V, $I_D$ = 10A , $R_G$ = 4.7Ω | - | 7.1 | - | ns |
| Rise Time | $t_r$ | | - | 4.2 | - | |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 210.8 | - | |
| Fall Time | $t_f$ | | - | 134.7 | - | |
| **Drain-Source Body Diode Characteristics** | | | | | | |
| Source-Drain Diode Forward Voltage | $V_{SD}$ | $I_S$ = 10A, $V_{GS}$ = 0V | - | 0.7 | 1.2 | V |
| Body Diode Reverse Recovery Time | $t_{rr}$ | $I_F$ = 10A, dI/dt = 100A/μs | - | 29.5 | 44.2 | ns |
| Body Diode Reverse Recovery Charge | $Q_{rr}$ | | - | 21.5 | 32.2 | nC |

Note :

1. Surface mounted FR-4 board with 2oz. Copper. Continuous current at $T_C$=25℃ is silicon limited
2. Testing, $T_J$ = 25°C, L = 1mH, $V_{DD}$ = 15V, $V_{GS}$ = 10V

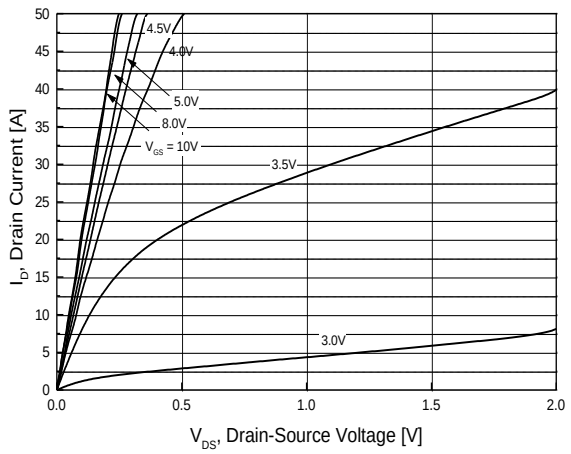


**Fig.1 On-Region Characteristics**

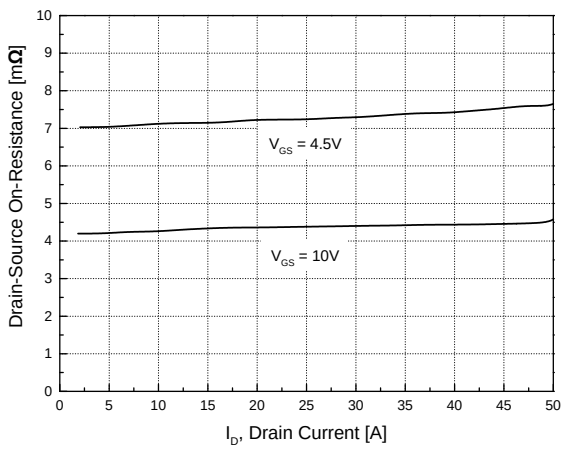


**Fig.2 On-Resistance Variation with Drain Current and Gate Voltage**

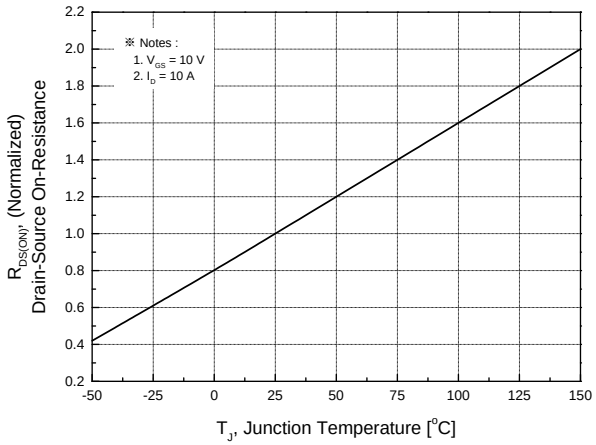


**Fig.3 On-Resistance Variation with Temperature**

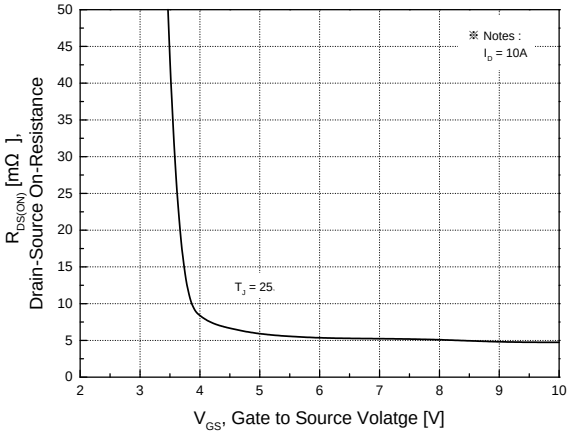


**Fig.4 On-Resistance Variation with Gate to Source Voltage**

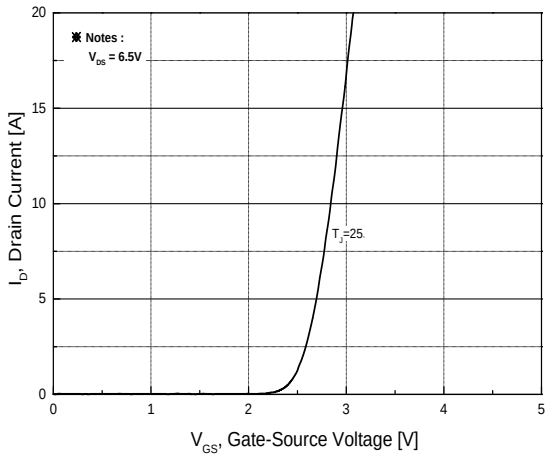


**Fig.5 Transfer Characteristics**

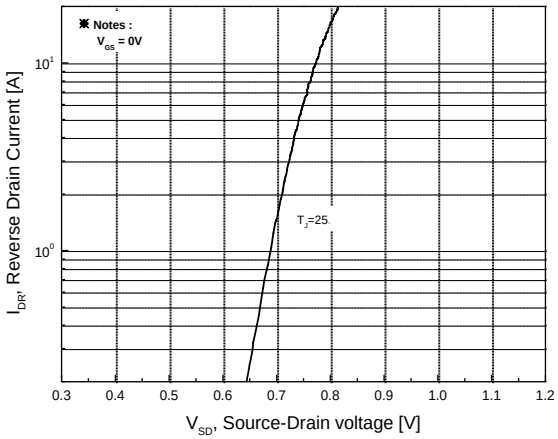


**Fig.6 Body Diode Forward Voltage Variation with Source Current and Temperature**

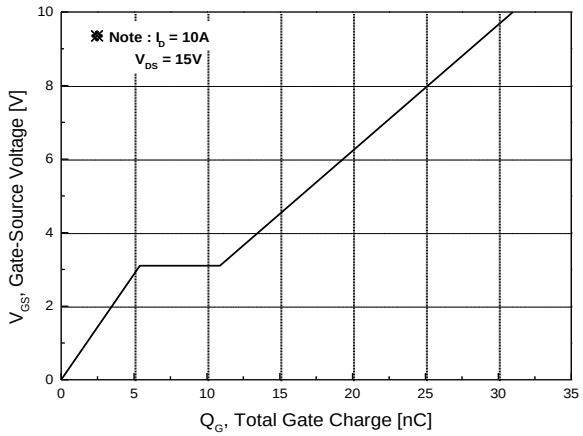


**Fig.7 Gate Charge Characteristics**

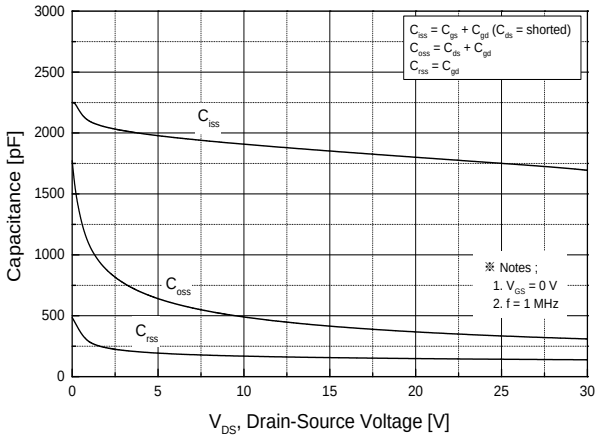


**Fig.8 Capacitance Characteristics**

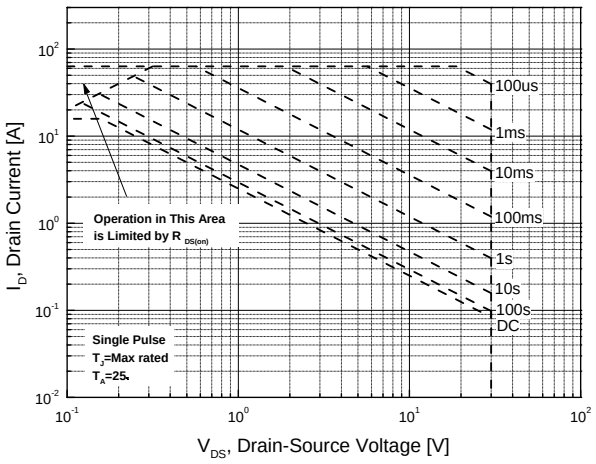


**Fig.9 Maximum Safe Operating Area**

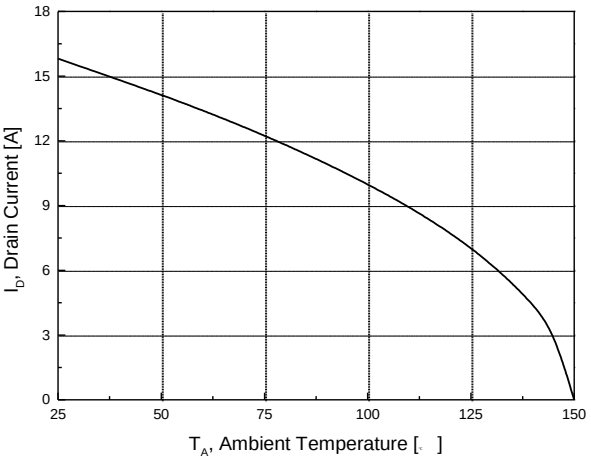


**Fig.10 Maximum Drain Current vs. Ambient Temperature**

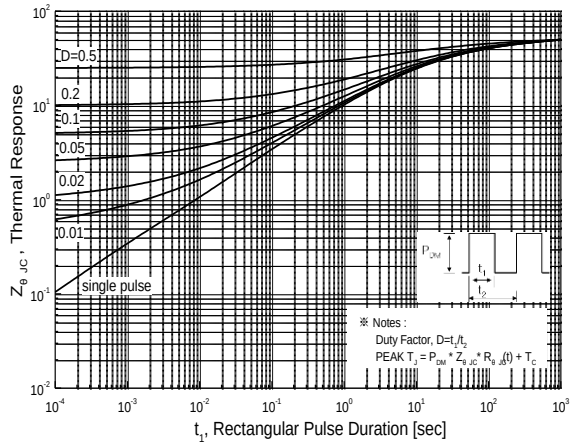


**Fig.11 Transient Thermal Response Curve**

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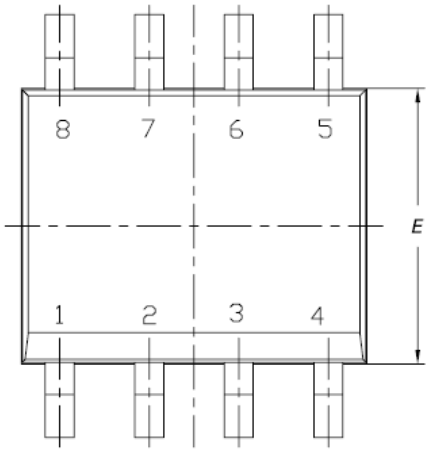
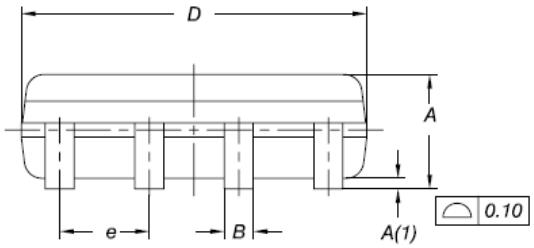
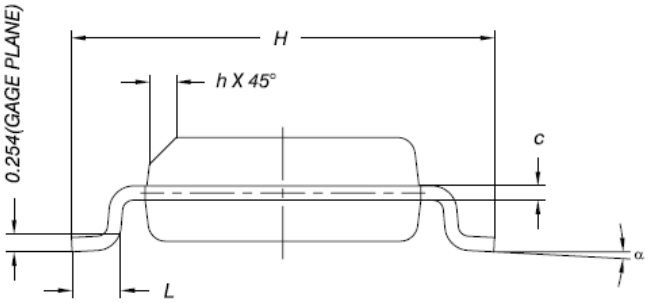
## Package Dimension

### 8 Leads, SOIC

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




| DIM. | MILLIMETERS | | |
|---|---|---|---|
| | MIN. | NOM. | MAX. |
| A | 1.35 | 1.55 | 1.75 |
| A(1) | 0.10 | 0.175 | 0.25 |
| B | 0.38 | 0.445 | 0.51 |
| C | 0.19 | 0.22 | 0.25 |
| D | 4.80 | 4.90 | 5.00 |
| E | 3.80 | 3.90 | 4.00 |
| e | 1.27 BSC | | |
| H | 5.80 | 6.00 | 6.20 |
| L | 0.50 | 0.715 | 0.93 |
| α | 0° | 4° | 8° |
| h | 0.25 | 0.375 | 0.50 |

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**DISCLAIMER:**

The Products are not designed for use in hostile environments, including, without limitation, aircraft, nuclear power generation, medical appliances, and devices or systems in which malfunction of any Product can reasonably be expected to result in a personal injury. Seller's customers using or selling Seller's products for use in such applications do so at their own risk and agree to fully defend and indemnify Seller.