RoHS Compliant
HALOGEN-FREE

MagnaChip

# MDC0531E

## Common-Drain N-Channel Trench MOSFET 30V, 8.0 A, 20mΩ



## General Description

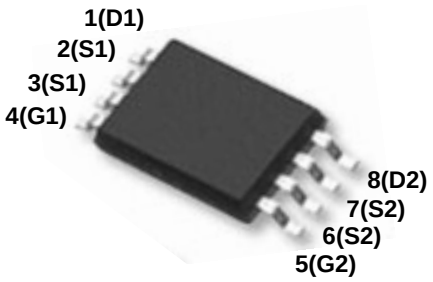
The MDC0531E uses advanced MagnaChip's MOSFET Technology, which provides low on-state resistance, high switching performance and excellent reliability. Low $R_{DS(ON)}$ and low gate charge operation with gate voltage as low as 2.5V

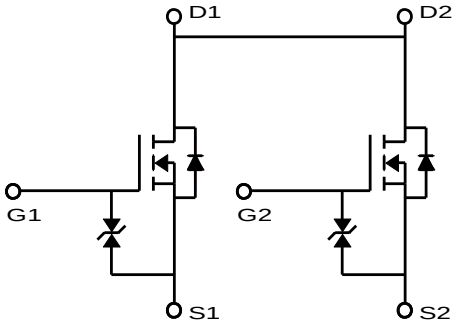
## Features

- $V_{DS}$ = 30V
- $I_D$ = 8.0A @$V_{GS}$ = 10V
- $R_{DS(ON)}$
  < 20mΩ @$V_{GS}$ = 10V
  < 23mΩ @$V_{GS}$ = 4.5V

## Applications

- Unidirectional or Bi-directional Load Switch
- Lithium-Ion Battery Packs
- Portable Battery Protection Module




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

| Characteristics | | Symbol | Rating | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DSS}$ | 30 | V |
| Gate-Source Voltage | | $V_{GSS}$ | ±12 | V |
| Continuous Drain Current | $T_C$=25°C | $I_D$ | 8 | A |
| | $T_C$=70°C | | 6.5 | A |
| Pulsed Drain Current | | $I_{DM}$ | 45 | A |
| Power Dissipation(1) | $T_A$=25°C | $P_D$ | 1.7 | W |
| | $T_A$=70°C | | 1.0 | |
| Junction and Storage Temperature Range | | $T_J$, $T_{stg}$ | -55~150 | °C |

## Thermal Characteristics

| Characteristics | Symbol | Rating | Unit |
|---|---|---|---|
| Thermal Resistance, Junction-to-Ambient(1) | $R_{\theta JA}$ | 75 | °C/W |
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 6 | |

## Ordering Information

| Part Number | Temp. Range | Package | Packing | RoHS Status |
|---|---|---|---|---|
| MDC0531ET | -55~150°C | TSSOP-8 | Tube | Halogen Free |
| MDC0531ER | -55~150°C | TSSOP-8 | Tape & Reel | Halogen Free |

## Electrical Characteristics (Ta =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 | 0.6 | 0.85 | 1.5 | |
| Drain Cut-Off Current | $I_{DSS}$ | $V_{DS}$ = 24V, $V_{GS}$ = 0V | - | - | 1 | μA |
| Gate Leakage Current | $I_{GSS}$ | $V_{GS}$ = ±10V, $V_{DS}$ = 0V | - | - | 10 | μA |
| Drain-Source ON Resistance | $R_{DS(ON)}$ | $V_{GS}$ = 10V, $I_D$ = 5.0A | | 17 | 20 | mΩ |
| | | $V_{GS}$ = 4.5V, $I_D$ = 5.0A | - | 19 | 23 | |
| | | $V_{GS}$ = 2.5V, $I_D$ = 3.0A | - | 24 | - | |
| Forward Transconductance | $g_{fs}$ | $V_{DS}$ = 5V, $I_D$ = 7A | - | 33 | - | S |
| **Dynamic Characteristics** | | | | | | |
| Total Gate Charge | $Q_g$ | $V_{DS}$ = 15V, $I_D$ = 5A, $V_{GS}$ = 4.5V | - | 10.7 | | nC |
| Gate-Source Charge | $Q_{gs}$ | | - | 2.1 | | |
| Gate-Drain Charge | $Q_{gd}$ | | - | 4.3 | | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$ = 15V, $V_{GS}$ = 0V, f = 1.0MHz | - | 870 | | pF |
| Reverse Transfer Capacitance | $C_{rss}$ | | - | 105 | | |
| Output Capacitance | $C_{oss}$ | | - | 115 | | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{GS}$ = 10V, $V_{DS}$ = 15V, $R_L$ = 1.25Ω, $R_G$ = 3Ω | - | 3.5 | | ns |
| Rise Time | $t_r$ | | - | 11 | | |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 27 | | |
| Fall Time | $t_f$ | | - | 6.5 | | |
| **Drain-Source Body Diode Characteristics** | | | | | | |
| Source-Drain Diode Forward Voltage | $V_{SD}$ | $I_S$ = 1A, $V_{GS}$ = 0V | 0.5 | 0.71 | 0.9 | V |
| Source-Drain Diode Forward Voltage | $V_{SD}$ | $I_S$ = 4.5A, $V_{GS}$ = 0V | - | | 1.0 | V |
| Body Diode Reverse Recovery Time | $t_{rr}$ | $I_F$ = 11.6A, dI/dt = 100A/μs | - | 24 | | ns |
| Body Diode Reverse Recovery Charge | $Q_{rr}$ | | - | 13 | | nC |

Note :

1. Surface mounted FR-4 board with 2oz. Copper.

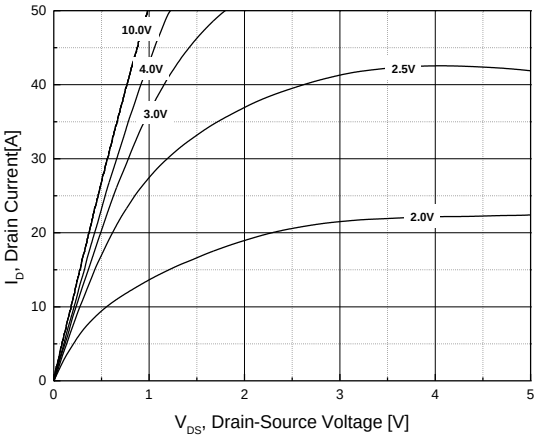



**Fig.1 On-Region Characteristics**

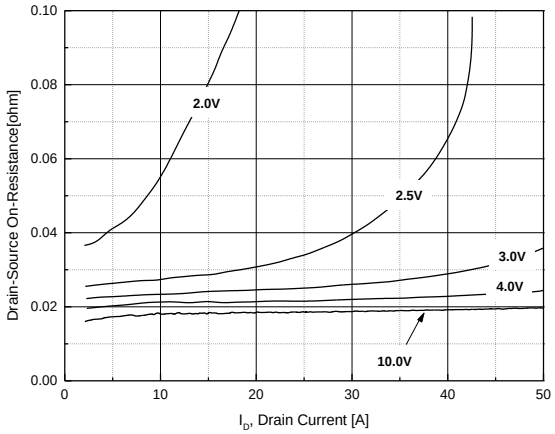



**Fig.2 On-Resistance Variation with Drain Current and Gate Voltage**

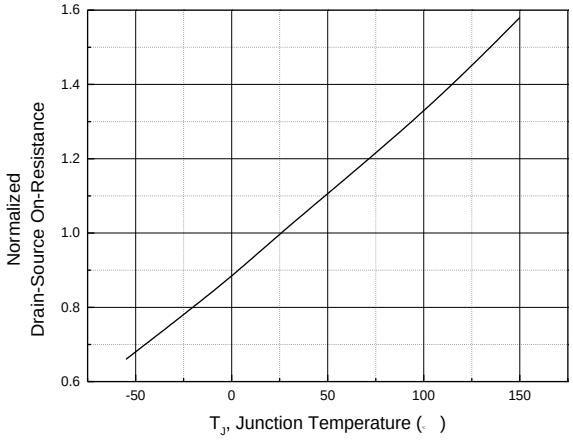



**Fig.3 On-Resistance Variation with Temperature**

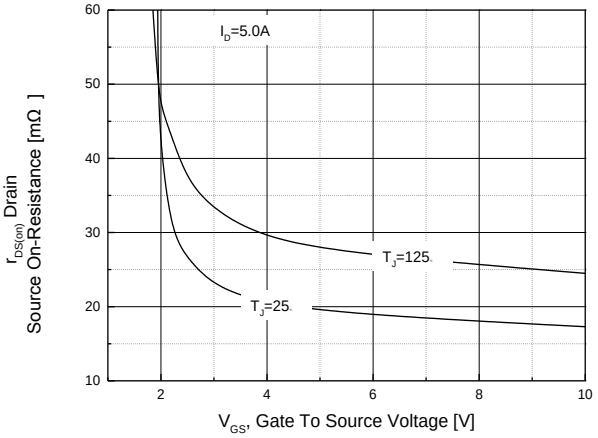



**Fig.4 On-Resistance Variation with Gate to Source Voltage**

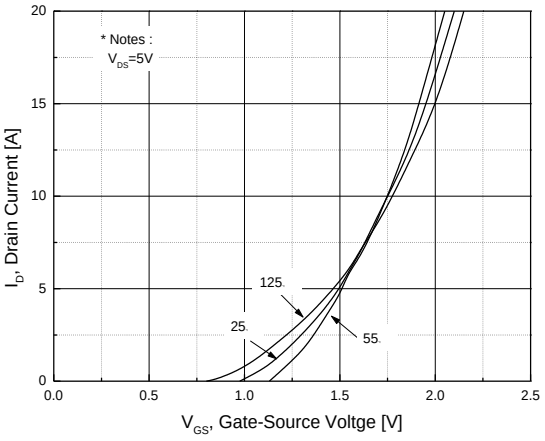



**Fig.5 Transfer Characteristics**

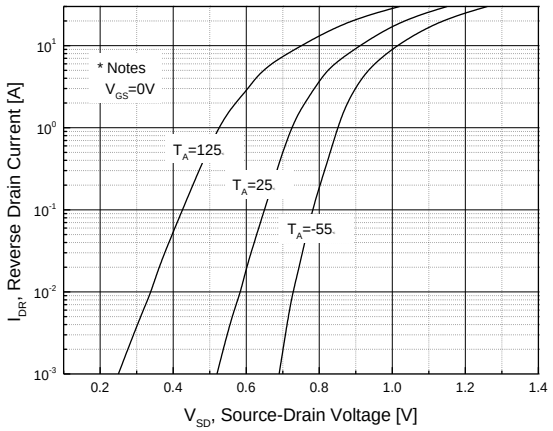



**Fig.6 Body Diode Forward Voltage Variation with Source Current and Temperature**

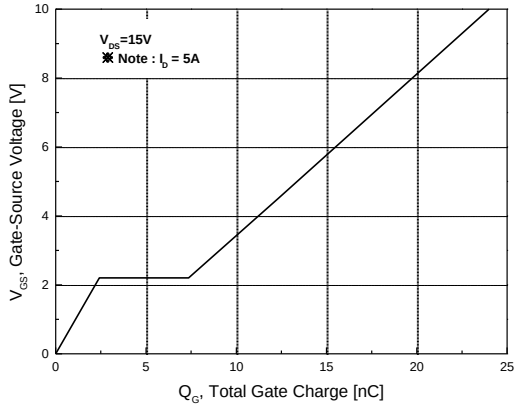



**Fig.7 Gate Charge Characteristics**

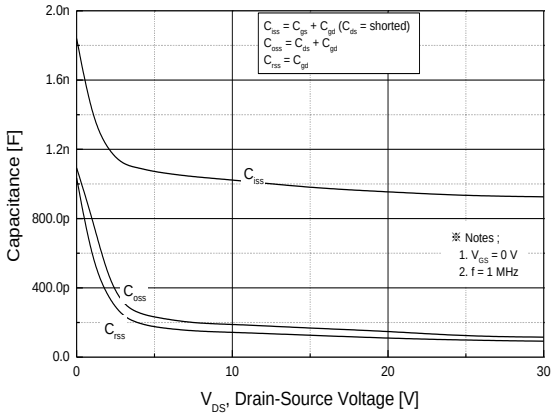



**Fig.8 Capacitance Characteristics**

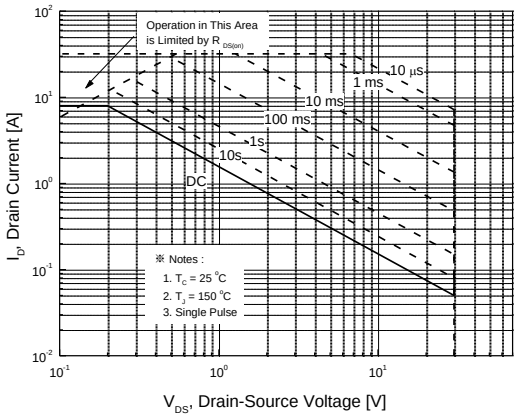



**Fig.9 Maximum Safe Operating Area**

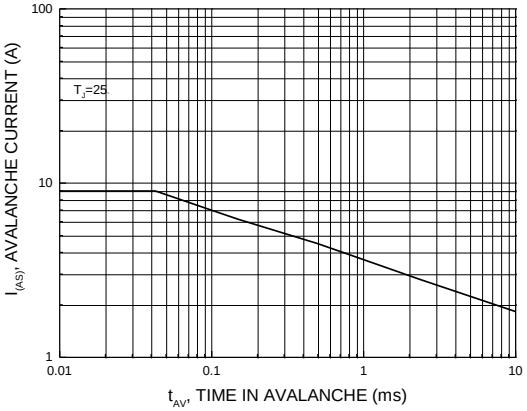



**Fig.10 Unclamped Inductive Switching Capability**

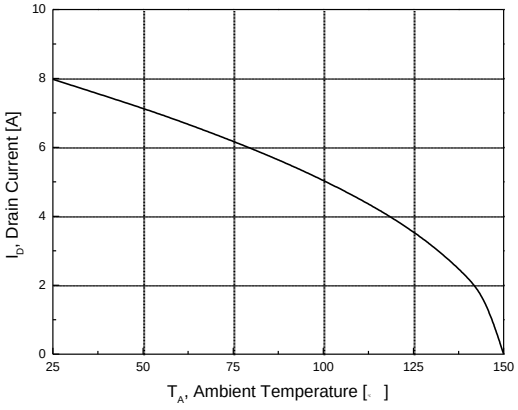



**Fig.11 Maximum Drain Current vs. Case Temperature**

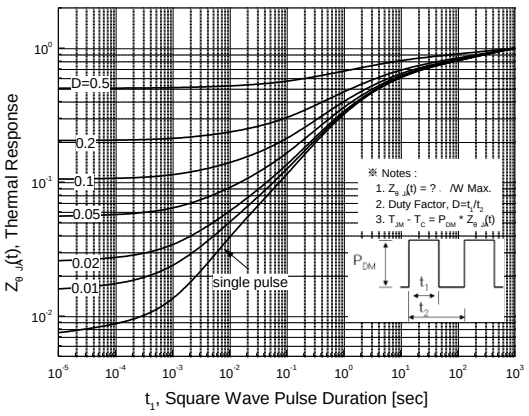



**Fig.12 Transient Thermal Response Curve**

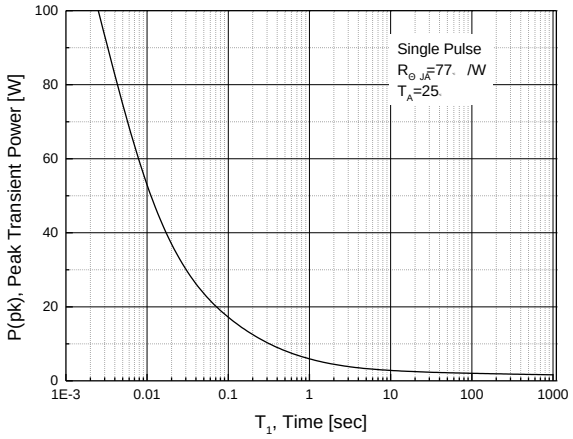



**Fig13. Single Pulse Maximum Power Dissipation**

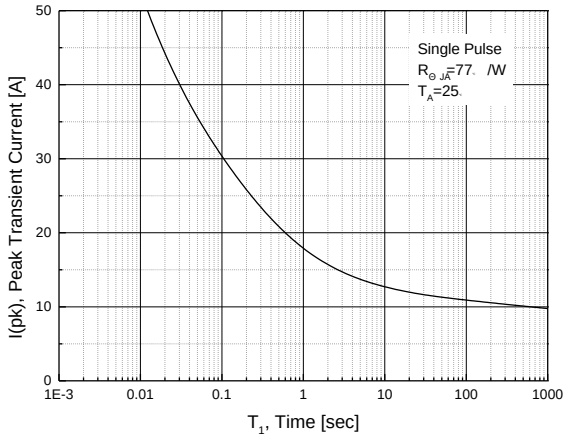
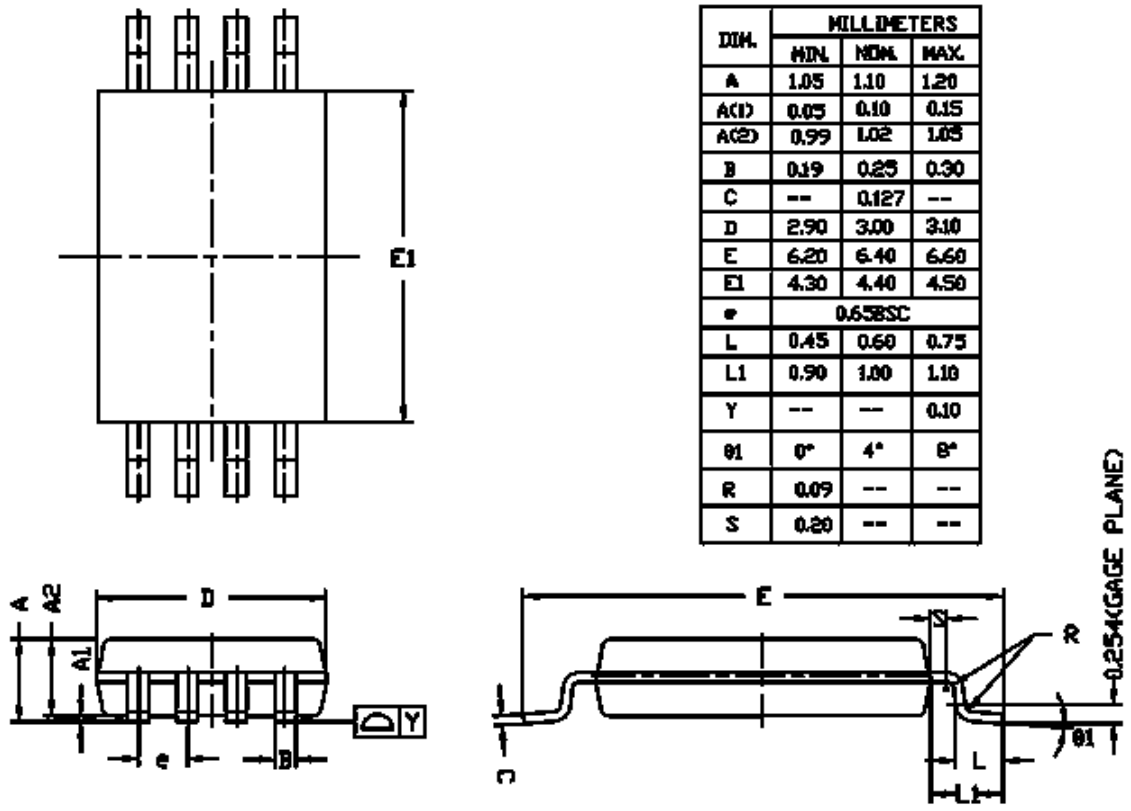



**Fig14. Single Pulse Maximum Peak Current**

## Physical Dimension

### TSSOP, 8 Leads

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




| DIM. | MILLIMETERS | | |
|---|---|---|---|
| | MIN. | NOM. | MAX. |
| A | 1.05 | 1.10 | 1.20 |
| A(1) | 0.05 | 0.10 | 0.15 |
| A(2) | 0.99 | 1.02 | 1.05 |
| B | 0.19 | 0.25 | 0.30 |
| C | -- | 0.127 | -- |
| D | 2.90 | 3.00 | 3.10 |
| E | 6.20 | 6.40 | 6.60 |
| E1 | 4.30 | 4.40 | 4.50 |
| e | 0.65BSC | | |
| L | 0.45 | 0.60 | 0.75 |
| L1 | 0.90 | 1.00 | 1.10 |
| Y | -- | -- | 0.10 |
| θ1 | 0° | 4° | 8° |
| R | 0.09 | -- | -- |
| S | 0.20 | -- | -- |

## Worldwide Sales Support Locations

**U.S.A**
**Sunnyvale Office**
787 N. Mary Ave. Sunnyvale
CA 94085 U.S.A
Tel : 1-408-636-5200
Fax : 1-408-213-2450
E-Mail : usasales@magnachip.com

**U.K**
Knyvett House The Causeway,
Staines Middx, TW18 3BA,U.K.
Tel : +44 (0) 1784-895-000
Fax : +44 (0) 1784-895-115
E-Mail : uksales@magnachip.com

**Japan**
**Osaka Office**
3F, Shin-Osaka MT-2 Bldg 3-5-36
Miyahara Yodogawa-Ku
Osaka, 532-0003 Japan
Tel : 81-6-6394-9160
Fax : 81-6-6394-9150
E-Mail : osakasales@magnachip.com

**Taiwan R.O.C**
2F, No.61, Chowize Street, Nei Hu
Taipei,114 Taiwan R.O.C
Tel : 886-2-2657-7898
Fax : 886-2-2657-8751
E-Mail : taiwansales@magnachip.com

**China**
**Hong Kong Office**
Suite 1024, Ocean Centre 5 Canton Road,
Tsim Sha Tsui Kowloon, Hong Kong
Tel : 852-2828-9700
Fax : 852-2802-8183
E-Mail : chinasales@magnachip.com

**Shenzhen Office**
Room 1803, 18/F
International Chamber of Commerce Tower
Fuhua Road3 CBD, Futian District, China
Tel : 86-755-8831-5561
Fax : 86-755-8831-5565
E-Mail : chinasales@magnachip.com

**Shanghai Office**
Room E, 8/F, Liaoshen International Building 1068
Wuzhong Road, (C) 201103
Shanghai, China
Tel : 86-21-6405-1521
Fax : 86-21-6505-1523
E-Mail : chinasales@magnachip.com

**Korea**
891, Daechi-Dong, Kangnam-Gu
Seoul, 135-738 Korea
Tel : 82-2-6903-3451
Fax : 82-2-6903-3668 ~9
Email : koreasales@magnachip.com