

SE40160A

**N-Channel Enhancement-Mode MOSFET**

Revision: A

**General Description**

Thigh Density Cell Design For Ultra Low On-Resistance Fully Characterized Avalanche Voltage and Current Improved Shoot-Through FOM

- Simple Drive Requirement
- Small Package Outline
- Surface Mount Device

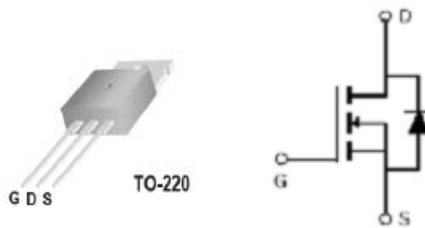
**Features**

For a single MOSFET

- $V_{DS} = 40V$
- $R_{DS(ON)} = 4m\Omega @ V_{GS}=10V$

**Pin configurations**

See Diagram below



**Absolute Maximum Ratings**

| Parameter                            |            | Symbol   | Rating     | Units |
|--------------------------------------|------------|----------|------------|-------|
| Drain-Source Voltage                 |            | $V_{DS}$ | 40         | V     |
| Gate-Source Voltage                  |            | $V_{GS}$ | $\pm 20$   | V     |
| Drain Current                        | Continuous | $I_D$    | 160        | A     |
|                                      | Pulsed     |          | 340        |       |
| Total Power Dissipation              | @TA=25°C   | $P_D$    | 100        | W     |
| Operating Junction Temperature Range |            | $T_J$    | -55 to 175 | °C    |

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| Electrical Characteristics (T <sub>J</sub> =25°C unless otherwise noted) |  |   |     |      |     |       |
|--|--|---|-----|------|-----|-------|
| Symbol   | Parameter                                  | Test Conditions   | Min | Typ  | Max | Units |
| <b>OFF CHARACTERISTICS (Note 2)</b>                                      |  |   |     |      |     |       |
| B <sub>V</sub> DSS   | Drain-Source Breakdown Voltage             | I <sub>D</sub> =250μA, V <sub>GS</sub> =0 V   | 40  |      |     | V     |
| I <sub>DSS</sub>   | Drain to Source Leakage Current            | V <sub>DS</sub> =40V, V <sub>GS</sub> =0V   |     |      | 20  | μA    |
| I <sub>GSS</sub>   | Gate-Body Leakage Current                  | V <sub>GS</sub> =20V  |     |      | 100 | nA    |
| V <sub>GS(th)</sub>  | Gate Threshold Voltage                     | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA                                  | 2   |      | 4   | V     |
| R <sub>DS(ON)</sub>  | Static Drain-Source On-Resistance          | V <sub>GS</sub> =10V, I <sub>D</sub> =16A   | -   | 4    | 5   | mΩ    |
| <b>DYNAMIC PARAMETERS</b>  |  |   |     |      |     |       |
| C <sub>iss</sub>   | Input Capacitance                          | V <sub>GS</sub> =0V, V <sub>DS</sub> =15V,<br>f=1MHz                                      |     | 7032 |     | pF    |
| C <sub>oss</sub>   | Output Capacitance                         |   |     | 898  |     | pF    |
| C <sub>rss</sub>   | Reverse Transfer Capacitance               |   |     | 743  |     | pF    |
| <b>SWITCHING PARAMETERS</b>  |  |   |     |      |     |       |
| Q <sub>g</sub>   | Total Gate Charge <sup>2</sup>             | V <sub>GS</sub> =10V, V <sub>DS</sub> =15V,<br>I <sub>D</sub> =30A                        |     | 80   |     | nC    |
| Q <sub>gs</sub>  | Gate Source Charge                         |   |     | 19   |     | nC    |
| Q <sub>gd</sub>  | Gate Drain Charge                          |   |     | 38   |     | nC    |
| t <sub>d(on)</sub>   | Turn-On Delay Time                         | V <sub>GS</sub> =10V, V <sub>DS</sub> =15V,<br>R <sub>GEN</sub> =1Ω<br>I <sub>D</sub> =1A |     | 20   |     | ns    |
| t <sub>d(off)</sub>  | Turn-Off Delay Time                        |   |     | 80   |     | ns    |
| t <sub>d(r)</sub>  | Turn-On Rise Time                          |   |     | 36   |     | ns    |
| t <sub>d(f)</sub>  | Turn-Off Fall Time                         |   |     | 33   |     | ns    |
| <b>Thermal Resistance</b>  |  |   |     |      |     |       |
| Symbol   | Parameter                                  |   | Typ | Max  |     | Units |
| R <sub>θJC</sub>   | Thermal Resistance Junction to Case(t≤10s) |   | -   | 1.5  |     | °C/W  |

Typical Characteristics

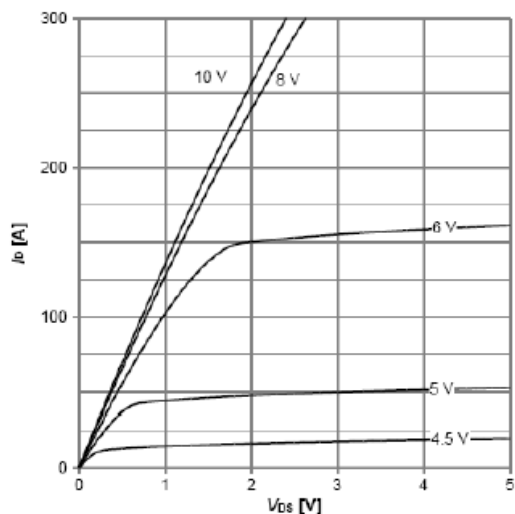


Figure 1: On-Region Characteristics

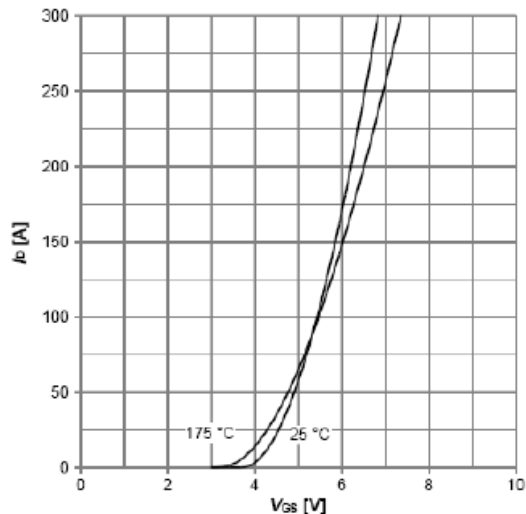


Figure 2: Transfer Characteristics

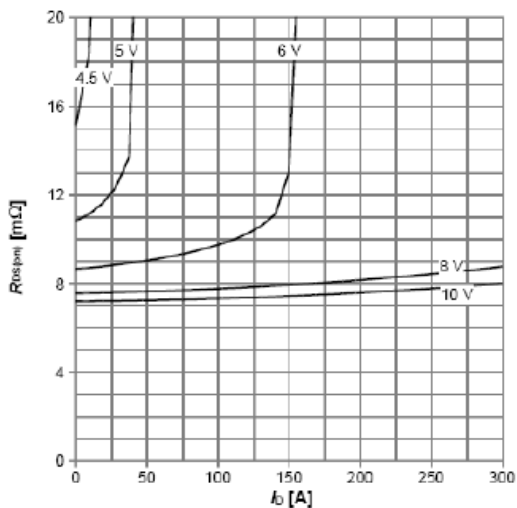


Figure 3: On-Resistance vs Drain current and Gate voltage

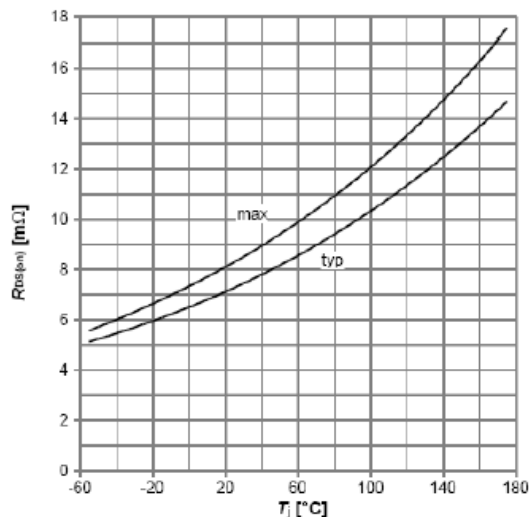


Figure 4: On-Resistance vs Junction Temperature

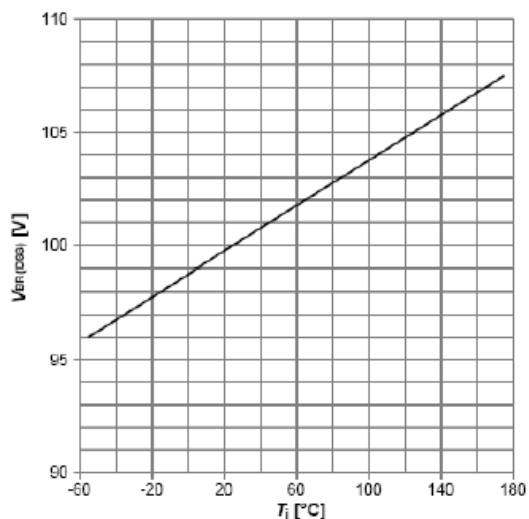


Figure 5: Drain-Source breakdown voltage

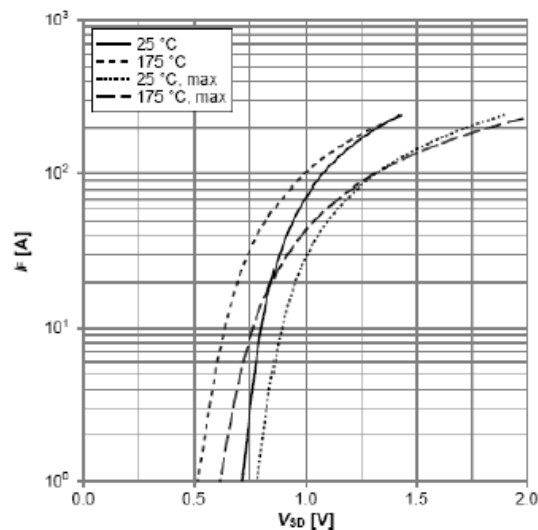


Figure 6: Body-Diode Characteristics

Typical Characteristics

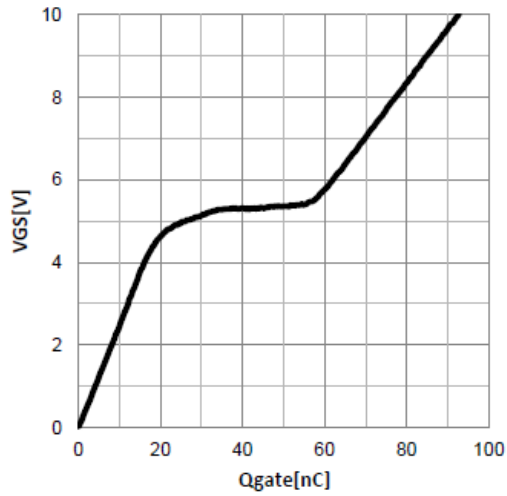


Figure 7: Gate-Charge Characteristics

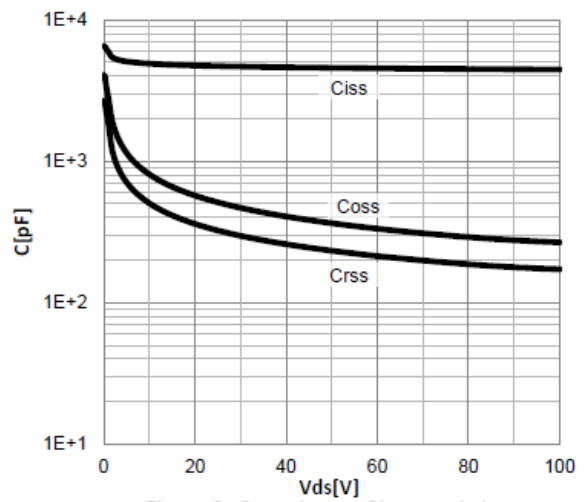


Figure 8: Capacitance Characteristics

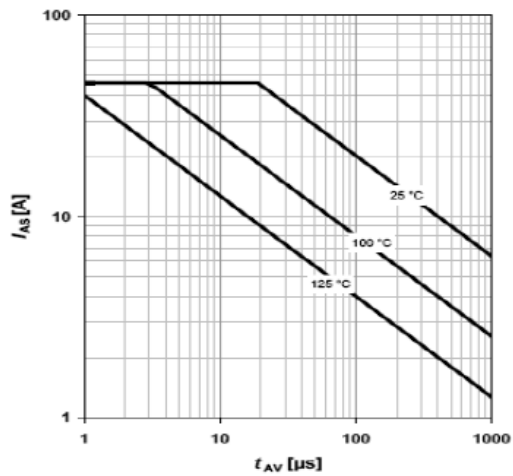


Figure 9: Avalanche Characteristics

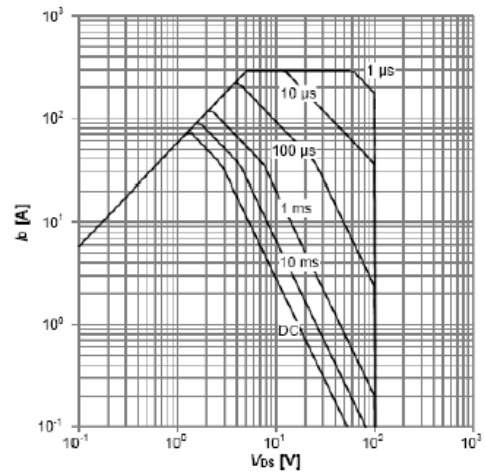


Figure 10: Maximum Forward Biased Safe Operating Area

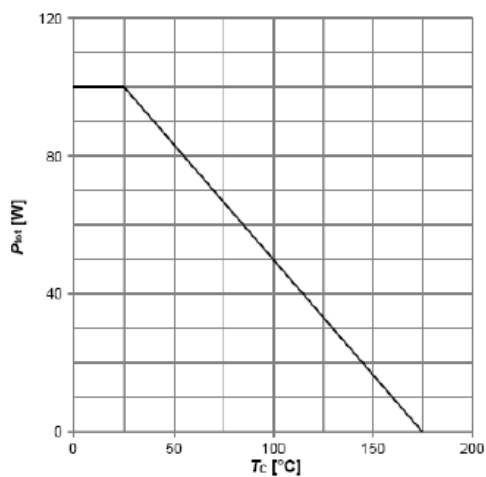


Figure 11: Power dissipation

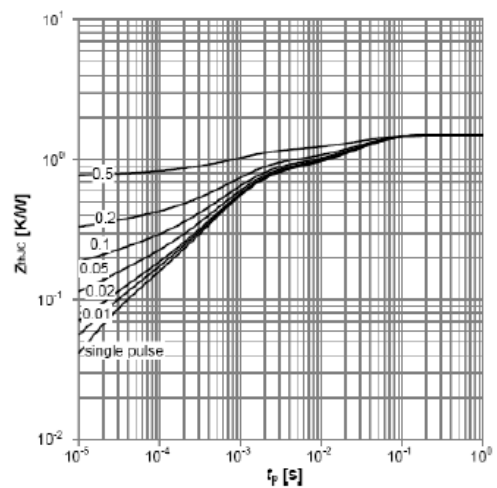
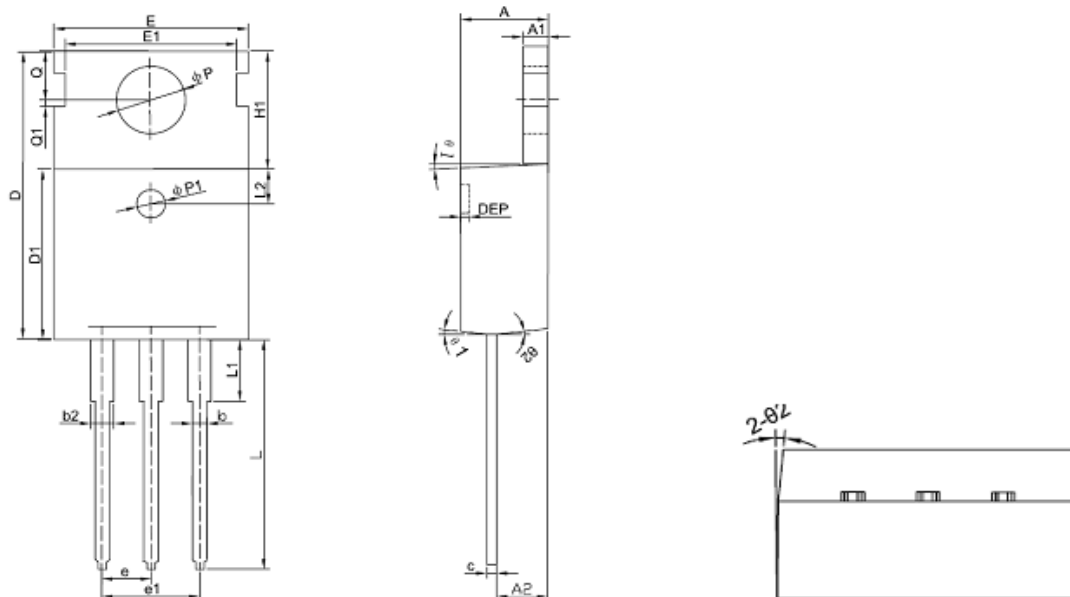


Figure 12: Maximum Transient Thermal Impedance

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## Package Outline Dimension

### TO-220



| Symbol     | Dimension In Millimeters |                |                | Dimension In Inches |                |                |
|------------|--------------------------|----------------|----------------|---------------------|----------------|----------------|
|            | Min                      | Nom            | Max            | Min                 | Nom            | Max            |
| A          | 4.400                    | 4.550          | 4.700          | 0.173               | 0.179          | 0.185          |
| A1         | 1.270                    | 1.300          | 1.330          | 0.050               | 0.051          | 0.052          |
| A2         | 2.590                    | 2.690          | 2.790          | 0.102               | 0.106          | 0.110          |
| b          | 0.770                    | -              | 0.900          | 0.030               | -              | 0.035          |
| b2         | 1.230                    | -              | 1.360          | 0.048               | -              | 0.054          |
| c          | 0.480                    | 0.500          | 0.520          | 0.019               | 0.020          | 0.020          |
| D          | 15.100                   | 15.400         | 15.700         | -                   | 0.606          | -              |
| D1         | 9.000                    | 9.100          | 9.200          | 0.354               | 0.358          | 0.362          |
| DEP        | 0.050                    | 0.285          | 0.520          | 0.002               | 0.011          | 0.020          |
| E          | 10.060                   | 10.160         | 10.260         | 0.396               | 0.400          | 0.404          |
| E1         | -                        | 8.700          | -              | -                   | 0.343          | -              |
| $\Phi P1$  | 1.400                    | 1.500          | 1.600          | 0.055               | 0.059          | 0.063          |
| e          | 2.54BSC                  |                |                | 0.1BSC              |                |                |
| e1         | 5.08BSC                  |                |                | 0.2BSC              |                |                |
| H1         | 6.100                    | 6.300          | 6.500          | 0.240               | 0.248          | 0.256          |
| L          | 12.750                   | 12.960         | 13.170         | 0.502               | 0.510          | 0.519          |
| L1         | -                        | -              | 3.950          | -                   | -              | 0.156          |
| L2         | 1.85REF                  |                |                | 0.073REF            |                |                |
| $\Phi P$   | 3.570                    | 3.600          | 3.630          | 0.141               | 0.142          | 0.143          |
| Q          | 2.730                    | 2.800          | 2.870          | 0.107               | 0.110          | 0.113          |
| Q1         | -                        | 0.200          | -              | -                   | 0.008          | -              |
| $\theta 1$ | 5 <sup>0</sup>           | 7 <sup>0</sup> | 9 <sup>0</sup> | 5 <sup>0</sup>      | 7 <sup>0</sup> | 9 <sup>0</sup> |
| $\theta 2$ | 1 <sup>0</sup>           | 3 <sup>0</sup> | 5 <sup>0</sup> | 1 <sup>0</sup>      | 3 <sup>0</sup> | 5 <sup>0</sup> |

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