

SE120120G

**N-Channel Enhancement-Mode MOSFET**

Revision: A

**General Description**

This device used advanced semiconductor technology and design to provide excellent RDS(ON) with low gate charge and low operation voltage. It can be used in wide variety of application

- Excellent package for superior thermal resistance
- Optimized technology for DC/DC converters
- Easy to use and parallel

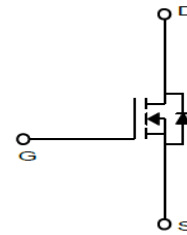
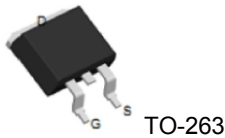
**Features**

For a single MOSFET

- $V_{DS} = 120V$
- $R_{DS(ON)} = 4.4m\Omega @ V_{GS}=10V$

**Pin configurations**

See Diagram below



Suffix "A" designates TO-220 package

**Absolute Maximum Ratings**

| Parameter                            |            | Symbol   | Rating     | Units |
|--------------------------------------|------------|----------|------------|-------|
| Drain-Source Voltage                 |            | $V_{DS}$ | 120        | V     |
| Gate-Source Voltage                  |            | $V_{GS}$ | $\pm 20$   | V     |
| Drain Current                        | Continuous | $I_D$    | 129        | A     |
|                                      | Pulsed     |          | 480        |       |
| Single Pulse Avalanche Energy        |            | $E_{AS}$ | 1000       | mJ    |
| Total Power Dissipation              | @TC=25°C   | $P_D$    | 185        | W     |
| Operating Junction Temperature Range |            | $T_J$    | -55 to 175 | °C    |

**Thermal Resistance**

| Symbol          | Parameter                                  | Typ | Max | Units |
|-----------------|--|-----|-----|-------|
| $R_{\theta JC}$ | Thermal Resistance Junction to Case(t≤10s) | -   | 0.8 | °C/W  |

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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                        | 120 |      |     | V     |
| I <sub>DSS</sub>   | Drain to Source Leakage Current   | V <sub>DS</sub> =120V, V <sub>GS</sub> =0V                         |     |      | 1   | 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          | 2.5 | 3.3  | 4.5 | V     |
| R <sub>DS(ON)</sub>  | Static Drain-Source On-Resistance | V <sub>GS</sub> =10V, I <sub>D</sub> =60A                          | -   | 4.4  | 6.1 | mΩ    |
| g <sub>FS</sub>  | Forward Transconductance          | V <sub>DS</sub> =10V, I <sub>D</sub> =60A                          | 60  |      |     | S     |
| <b>DYNAMIC PARAMETERS</b>  |                                   |  |     |      |     |       |
| C <sub>iss</sub>   | Input Capacitance                 | V <sub>GS</sub> =0V, V <sub>DS</sub> =50V,<br>f=1MHz               |     | 5600 |     | pF    |
| C <sub>oss</sub>   | Output Capacitance                |  |     | 641  |     | pF    |
| C <sub>rss</sub>   | Reverse Transfer Capacitance      |  |     | 28   |     | pF    |
| <b>SWITCHING PARAMETERS</b>  |                                   |  |     |      |     |       |
| Q <sub>g</sub>   | Total Gate Charge <sup>2</sup>    | V <sub>GS</sub> =10V, V <sub>DS</sub> =60V,<br>I <sub>D</sub> =60A |     | 84.7 |     | nC    |
| Q <sub>gs</sub>  | Gate Source Charge                |  |     | 30.6 |     | nC    |
| Q <sub>gd</sub>  | Gate Drain Charge                 |  |     | 18.3 |     | nC    |
| t <sub>d(on)</sub>   | Turn-On Delay Time                | V <sub>GS</sub> =10V, V <sub>DS</sub> =60,<br>I <sub>D</sub> =60A  |     | 16   |     | ns    |
| t <sub>d(off)</sub>  | Turn-Off Delay Time               |  |     | 45   |     | ns    |
| t <sub>d(r)</sub>  | Turn-On Rise Time                 |  |     | 67   |     | ns    |
| t <sub>d(f)</sub>  | Turn-Off Fall Time                |  |     | 14   |     | ns    |
| <b>Source-Drain Ratings and Characteristics</b>                          |                                   |  |     |      |     |       |
| I <sub>S</sub>   | Diode Forward Current             |  |     |      | 129 | A     |
| V <sub>SD</sub>  | Diode Forward Voltage             | V <sub>GS</sub> =0V, I <sub>S</sub> =129A                          |     |      | 1.2 | V     |
| t <sub>rr</sub>  | Reverse Recovery Time             | T <sub>J</sub> =25°C, I <sub>F</sub> =I <sub>S</sub>               |     | 60   |     | ns    |
| Q <sub>rr</sub>  | Reverse Recovery Charge           | Di/dt=100A/μs  |     | 140  |     | nC    |

Typical Characteristics

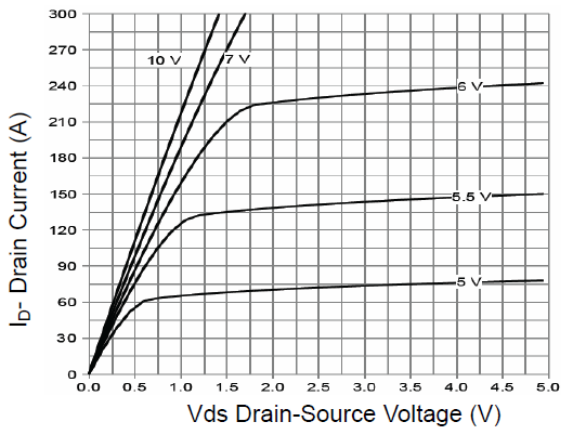


Figure 1 Output Characteristics

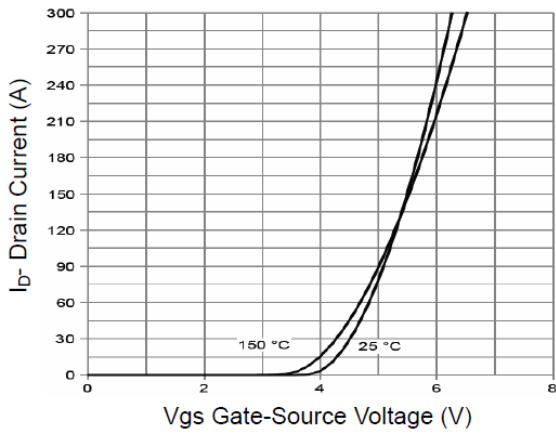


Figure 2 Transfer Characteristics

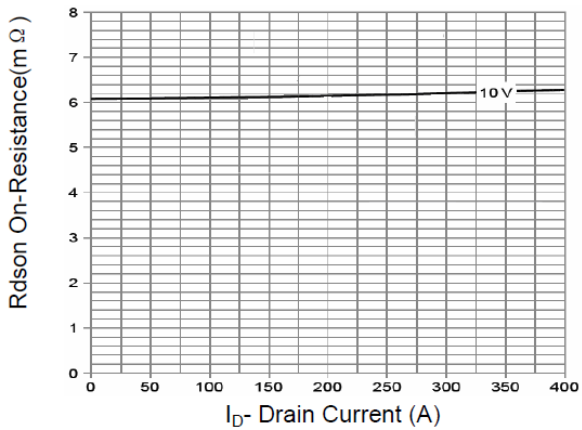


Figure 3 Rdson- Drain Current

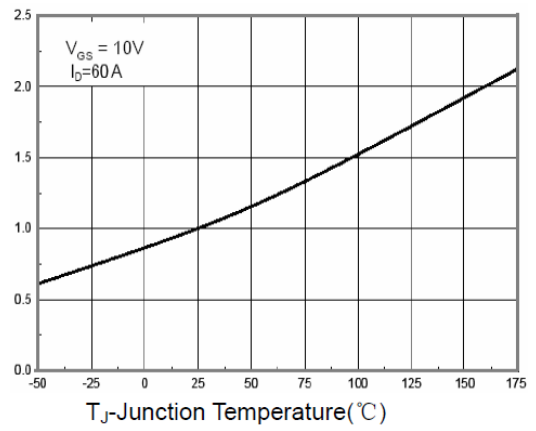


Figure 4 Rdson-Junction Temperature

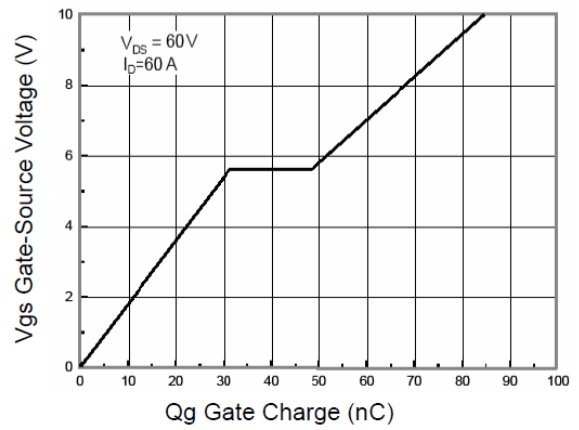


Figure 5 Gate Charge

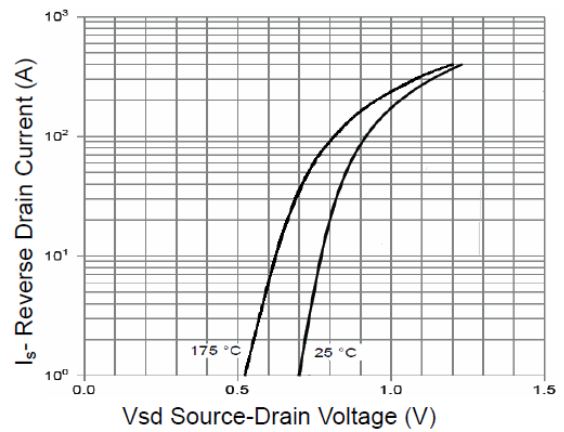


Figure 6 Source- Drain Diode Forward

Typical Characteristics

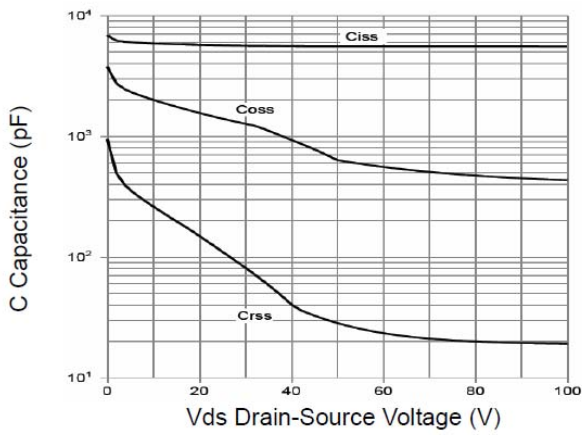


Figure 7 Capacitance vs Vds

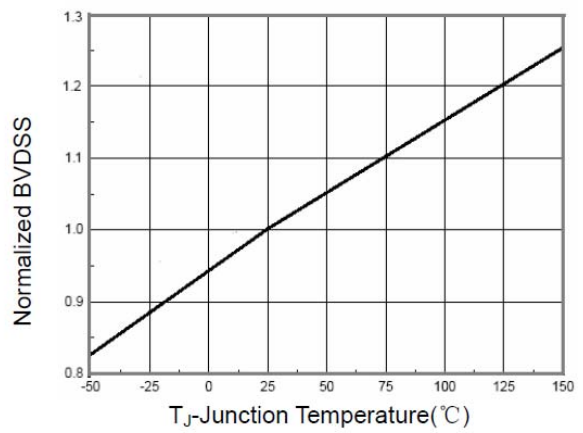


Figure 9  $BV_{DSS}$  vs Junction Temperature

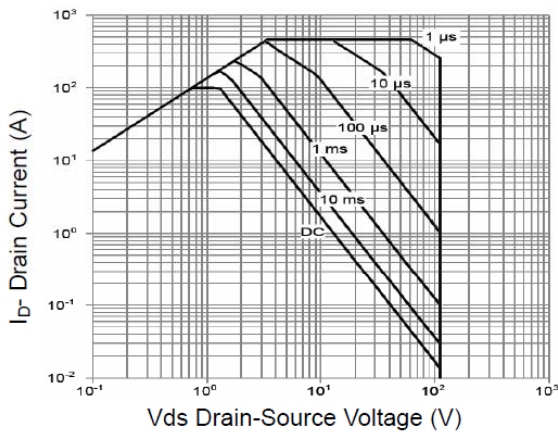


Figure 8 Safe Operation Area

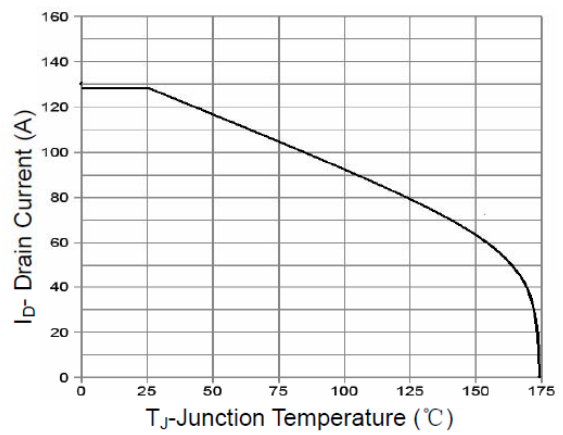


Figure 10 Current De-rating

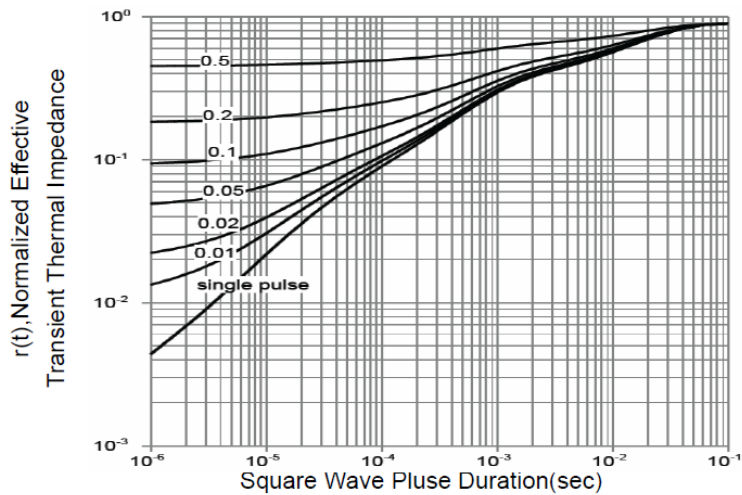
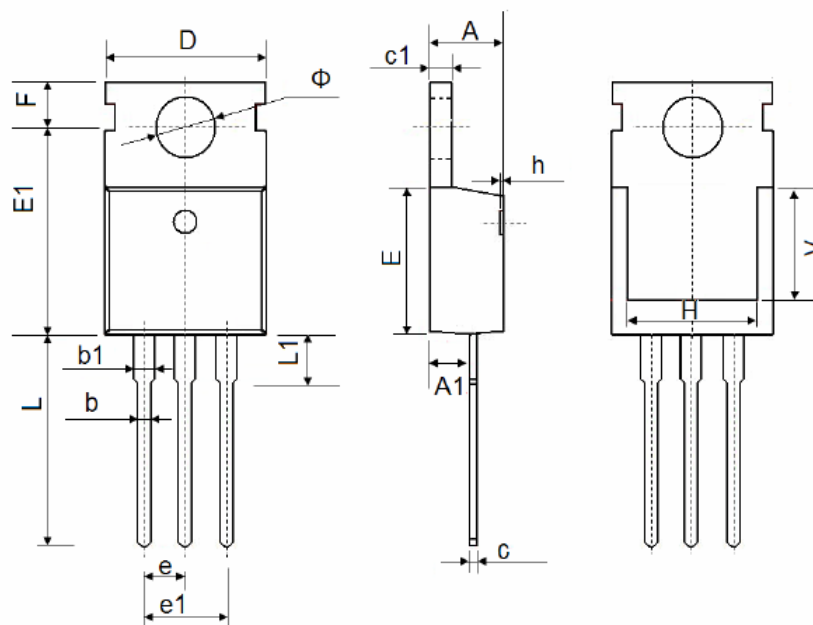


Figure 11 Normalized Maximum Transient Thermal Impedance

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## Package Outline Dimension

### TO-220

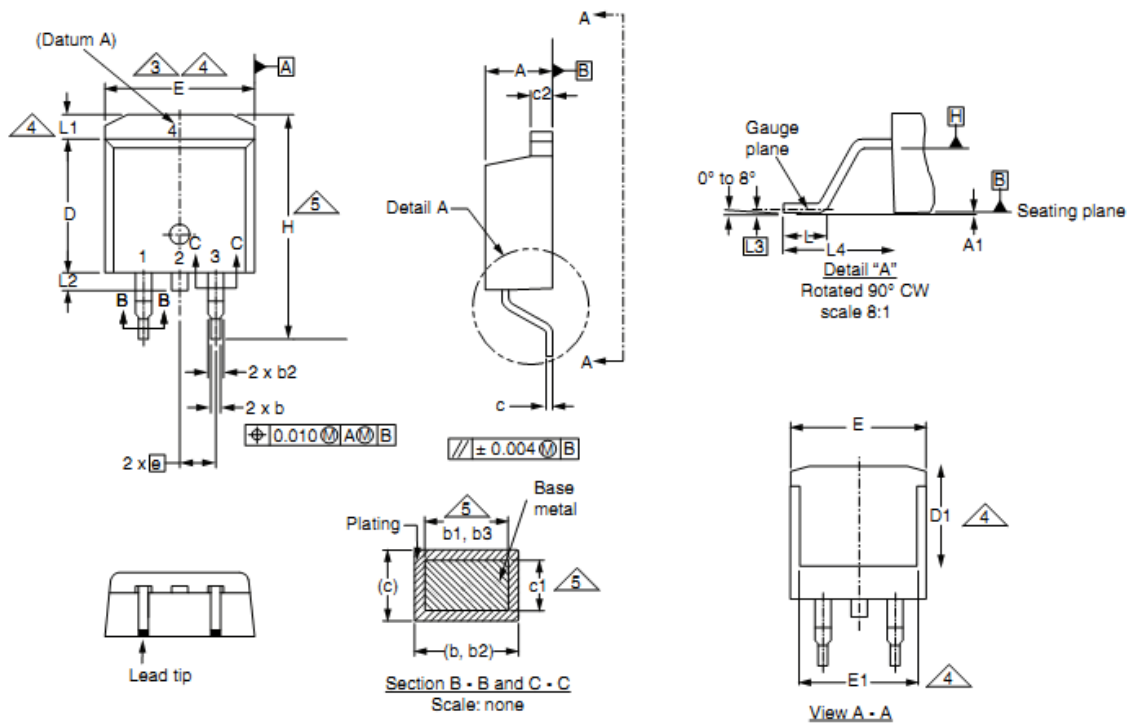


| Symbol | Dimensions In Millimeters |        | Dimensions In Inches |       |
|--------|---------------------------|--------|----------------------|-------|
|        | Min.                      | Max.   | Min.                 | Max.  |
| A      | 4.400                     | 4.600  | 0.173                | 0.181 |
| A1     | 2.250                     | 2.550  | 0.089                | 0.100 |
| b      | 0.710                     | 0.910  | 0.028                | 0.036 |
| b1     | 1.170                     | 1.370  | 0.046                | 0.054 |
| c      | 0.330                     | 0.650  | 0.013                | 0.026 |
| c1     | 1.200                     | 1.400  | 0.047                | 0.055 |
| D      | 9.910                     | 10.250 | 0.390                | 0.404 |
| E      | 8.9500                    | 9.750  | 0.352                | 0.384 |
| E1     | 12.650                    | 12.950 | 0.498                | 0.510 |
| e      | 2.540 TYP.                |        | 0.100 TYP.           |       |
| e1     | 4.980                     | 5.180  | 0.196                | 0.204 |
| F      | 2.650                     | 2.950  | 0.104                | 0.116 |
| H      | 7.900                     | 8.100  | 0.311                | 0.319 |
| h      | 0.000                     | 0.300  | 0.000                | 0.012 |
| L      | 12.900                    | 13.400 | 0.508                | 0.528 |
| L1     | 2.850                     | 3.250  | 0.112                | 0.128 |
| V      | 7.500 REF.                |        | 0.295 REF.           |       |
| Φ      | 3.400                     | 3.800  | 0.134                | 0.150 |

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## Package Outline Dimension

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| DIM. | MILLIMETERS |      | INCHES |       |
|------|-------------|------|--------|-------|
|      | MIN.        | MAX. | MIN.   | MAX.  |
| A    | 4.06        | 4.83 | 0.160  | 0.190 |
| A1   | 0.00        | 0.25 | 0.000  | 0.010 |
| b    | 0.51        | 0.99 | 0.020  | 0.039 |
| b1   | 0.51        | 0.89 | 0.020  | 0.035 |
| b2   | 1.14        | 1.78 | 0.045  | 0.070 |
| b3   | 1.14        | 1.73 | 0.045  | 0.068 |
| c    | 0.38        | 0.74 | 0.015  | 0.029 |
| c1   | 0.38        | 0.58 | 0.015  | 0.023 |
| c2   | 1.14        | 1.65 | 0.045  | 0.065 |
| D    | 8.38        | 9.65 | 0.330  | 0.380 |

| DIM. | MILLIMETERS |       | INCHES    |       |
|------|-------------|-------|-----------|-------|
|      | MIN.        | MAX.  | MIN.      | MAX.  |
| D1   | 6.86        | -     | 0.270     | -     |
| E    | 9.65        | 10.67 | 0.380     | 0.420 |
| E1   | 6.22        | -     | 0.245     | -     |
| e    | 2.54 BSC    |       | 0.100 BSC |       |
| H    | 14.61       | 15.88 | 0.575     | 0.625 |
| L    | 1.78        | 2.79  | 0.070     | 0.110 |
| L1   | -           | 1.65  | -         | 0.066 |
| L2   | -           | 1.78  | -         | 0.070 |
| L3   | 0.25 BSC    |       | 0.010 BSC |       |
| L4   | 4.78        | 5.28  | 0.188     | 0.208 |

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