

## N-Channel 30V (D-S) MOSFET

| PRODUCT SUMMARY     |                                  |                    |
|---------------------|----------------------------------|--------------------|
| V <sub>DS</sub> (V) | R <sub>DS(on)</sub> (Ω)          | I <sub>D</sub> (A) |
| 30                  | 0.021 at V <sub>GS</sub> = 10 V  | 12 <sup>a</sup>    |
|                     | 0.033 at V <sub>GS</sub> = 4.5 V | 6                  |

### Features

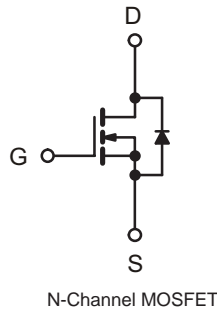
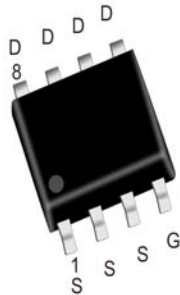
- Low Gate Charge
- RoHS Compliant

### Applications

- Notebook System Power
- Low Current DC/DC

### Pin Configuration

SOP-8L



### Packing Information

| Device | Marking     | Reel Size | Tape Width | Quantity |
|--------|-------------|-----------|------------|----------|
| EC4178 | 13D<br>.XXX | 12"       | 13mm       | 3000pcs  |

### Absolute Maximum Ratings (T<sub>J</sub>=25 °C Unless Otherwise Noted)

| Symbol                            | Parameter  | Value    | Unit |
|-----------------------------------|--|----------|------|
| <b>P-MOSFET</b>                   |  |          |      |
| V <sub>DS</sub>                   | Drain-Source Voltage   | 30       | V    |
| V <sub>GS</sub>                   | Gate-Source Voltage  | ±25      | V    |
| I <sub>D</sub>                    | Continuous Drain Current   | 12       | A    |
| I <sub>DM</sub>                   | Pulse Drain Current  | 40       | A    |
| P <sub>D</sub>                    | Maximum Power Dissipation  | 5        | W    |
| T <sub>j</sub>                    | Junction Temperature   | 150      | °C   |
| T <sub>stg</sub>                  | Storage Temperature  | -55~+150 | °C   |
| T <sub>L</sub>                    | Lead Temperature for Soldering Purposes(1/8" from case for 10 s) | 260      | °C   |
| <b>Thermal Resistance Ratings</b> |  |          |      |
| R <sub>thJA</sub>                 | Maximum Junction-to-Ambient t ≤ 10 s                             | 53       | °C/W |
| R <sub>thJF</sub>                 | Maximum Junction-to-Foot (Drain) Steady State                    | 25       | °C/W |

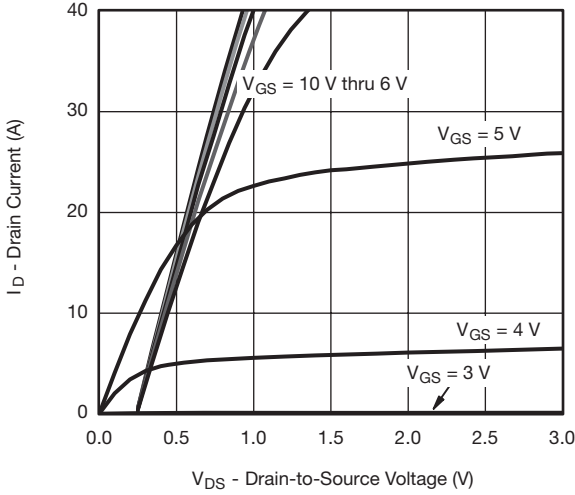
Notes:

- Package Limited.
- Surface Mounted on 1" x 1" FR4 board.
- t = 10 s.
- Maximum under Steady State conditions is 85 °C/W.

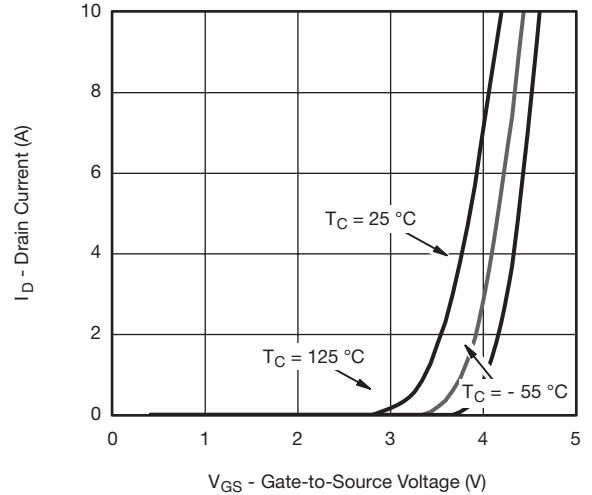
**Electrical Characteristics (T<sub>J</sub> = 25°C Unless Otherwise Specified)**

| Parameter                            | Symbol               | Test conditions   | Min | Typ  | Max  | Unit |
|--------------------------------------|----------------------|---|-----|------|------|------|
| <b>STATIC PARAMETERS</b>             |                      |   |     |      |      |      |
| Drain-source breakdown voltage       | V <sub>(BR)DSS</sub> | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250 μA   | 30  |      |      | V    |
| Zero gate voltage drain current      | I <sub>DSS</sub>     | V <sub>DS</sub> = 30V, V <sub>GS</sub> = 0V   |     |      | 1    | μA   |
| Gate-body leakage current            | I <sub>GSS</sub>     | V <sub>GS</sub> = ±25V, V <sub>DS</sub> = 0V  |     |      | ±100 | nA   |
| Gate threshold voltage               | V <sub>GS(th)</sub>  | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA   | 1.4 |      | 2.8  | V    |
| Drain-source on-resistance(note1)    | R <sub>DS(on)</sub>  | V <sub>GS</sub> = 10V, I <sub>D</sub> = -8.4A   |     | 17   | 21   | mΩ   |
|                                      |                      | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 2A   |     | 27   | 33   | mΩ   |
| Forward transconductance(note1)      | g <sub>FS</sub>      | V <sub>DS</sub> = 15V, I <sub>D</sub> = 8.4A  |     | 22   |      | S    |
| Diode forward voltage(note1)         | V <sub>SD</sub>      | I <sub>S</sub> = 6.7A, V <sub>GS</sub> = 0V   |     | 0.85 | 1.2  | V    |
| <b>DYNAMIC</b>                       |                      |   |     |      |      |      |
| Input capacitance                    | C <sub>ISS</sub>     | V <sub>DS</sub> = 15V, V <sub>GS</sub> = 0V, f = 1MHz   |     | 405  |      | pF   |
| Output capacitance                   | C <sub>OSS</sub>     |   |     | 110  |      | pF   |
| Reverse transfer capacitance         | C <sub>RSS</sub>     |   |     | 56   |      | pF   |
| <b>SWITCHING PARAMETERS (note 2)</b> |                      |   |     |      |      |      |
| Turn-on delay time                   | t <sub>d(on)</sub>   | V <sub>GS</sub> = 4.5V, V <sub>DD</sub> = 15V,<br>R <sub>L</sub> = 2.2Ω, R <sub>G</sub> = 1Ω, I <sub>D</sub> = 6.7A |     | 20   | 30   | ns   |
| Turn-on rise time                    | t <sub>r</sub>       |   |     | 15   | 25   | ns   |
| Turn-off delay time                  | t <sub>d(off)</sub>  |   |     | 11   | 20   | ns   |
| Turn-off fall time                   | t <sub>f</sub>       |   |     | 10   | 15   | ns   |
| Total Gate Charge                    | Q <sub>g</sub>       | V <sub>DS</sub> = 15V, V <sub>GS</sub> = 4.5V,<br>I <sub>D</sub> = 8.4A   |     | 3.7  | 5.6  | nC   |
| Gate-Source Charge                   | Q <sub>gs</sub>      |   |     | 1.6  |      | nC   |
| Gate-Drain Charge                    | Q <sub>gd</sub>      |   |     | 1.3  |      | nC   |

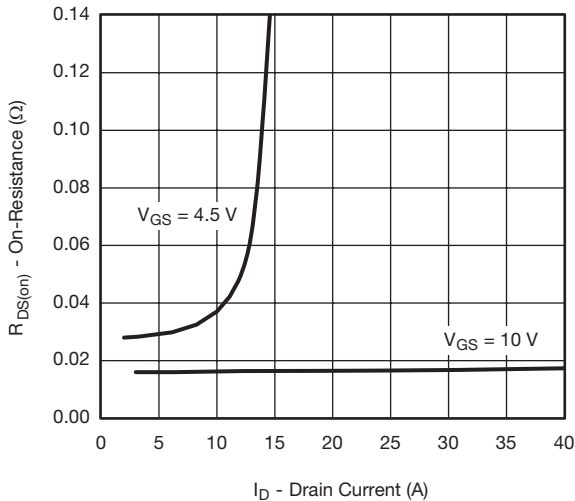
**MOSFET TYPICAL CHARACTERISTICS (25°C, unless otherwise noted)**



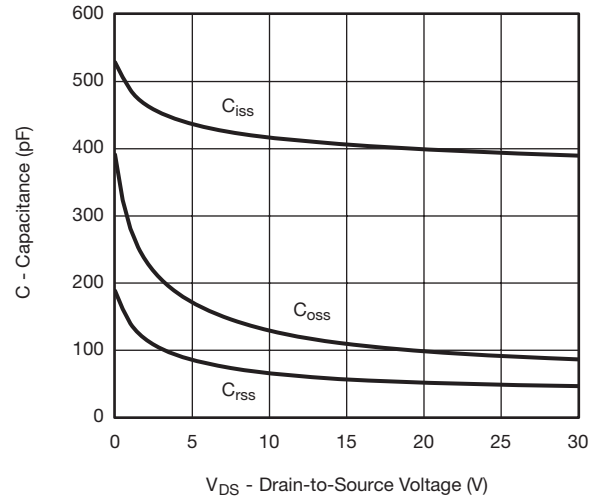
**Output Characteristics**



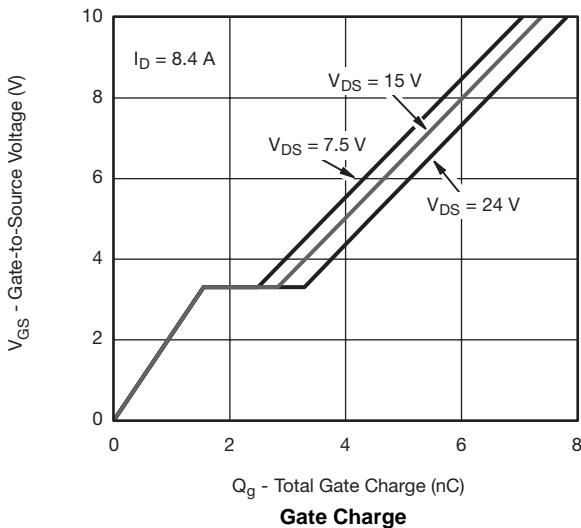
**Transfer Characteristics**



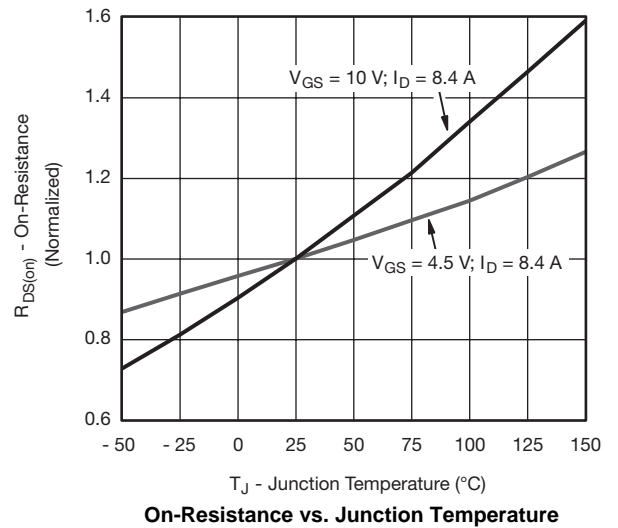
**On-Resistance vs. Drain Current**



**Capacitance**

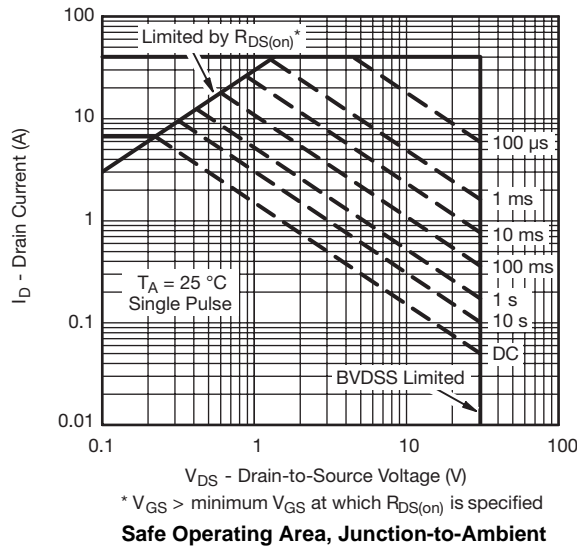
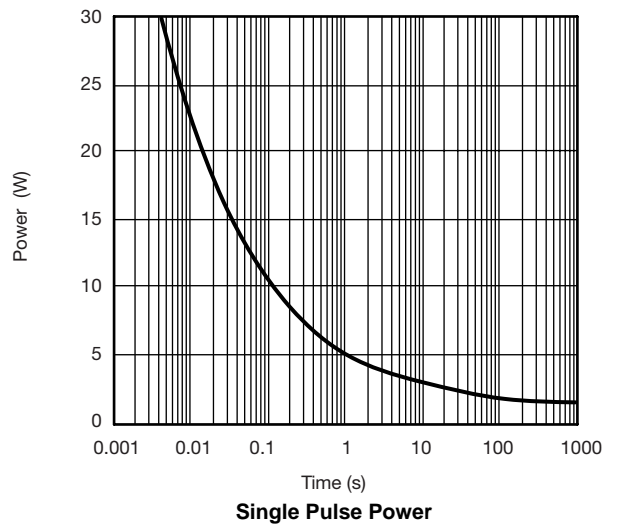
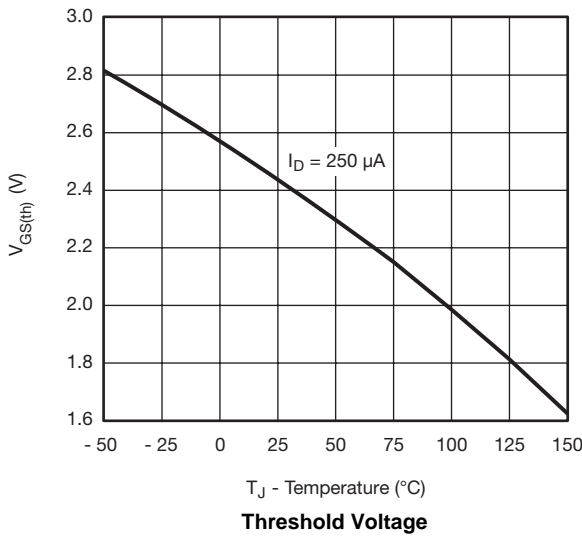
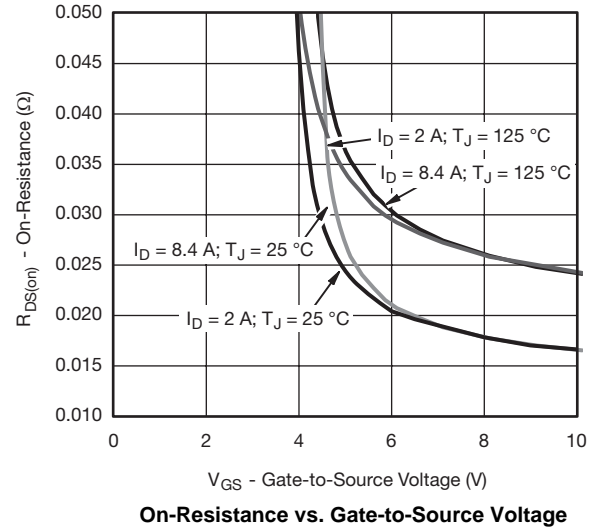
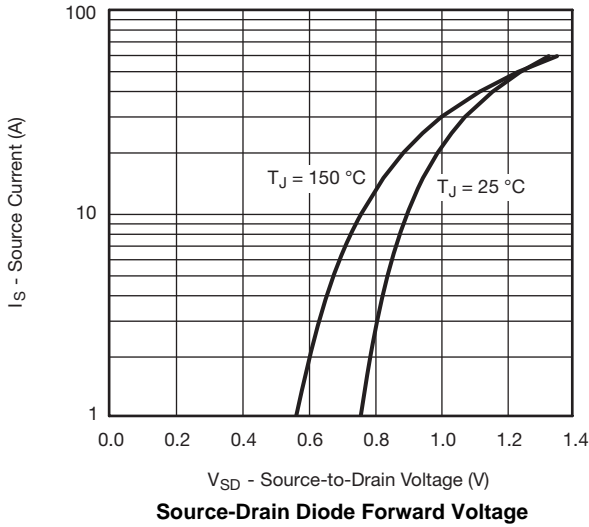


**Gate Charge**

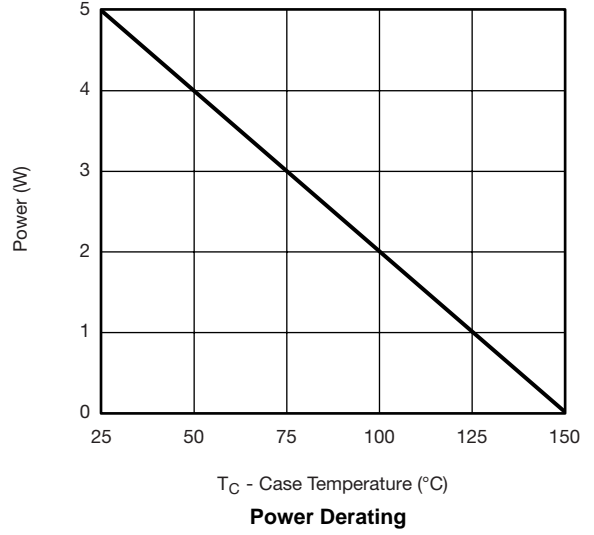
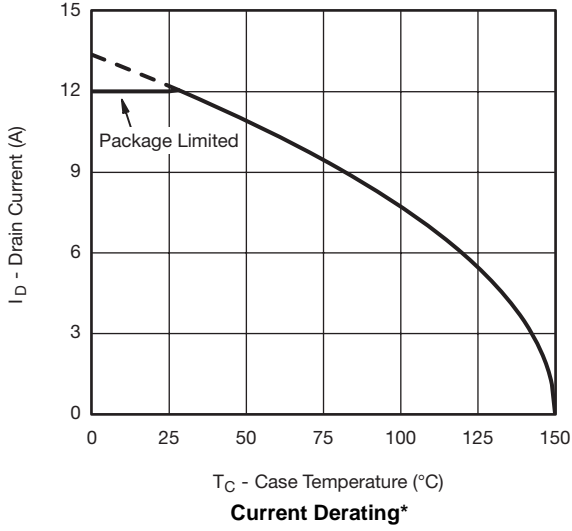


**On-Resistance vs. Junction Temperature**

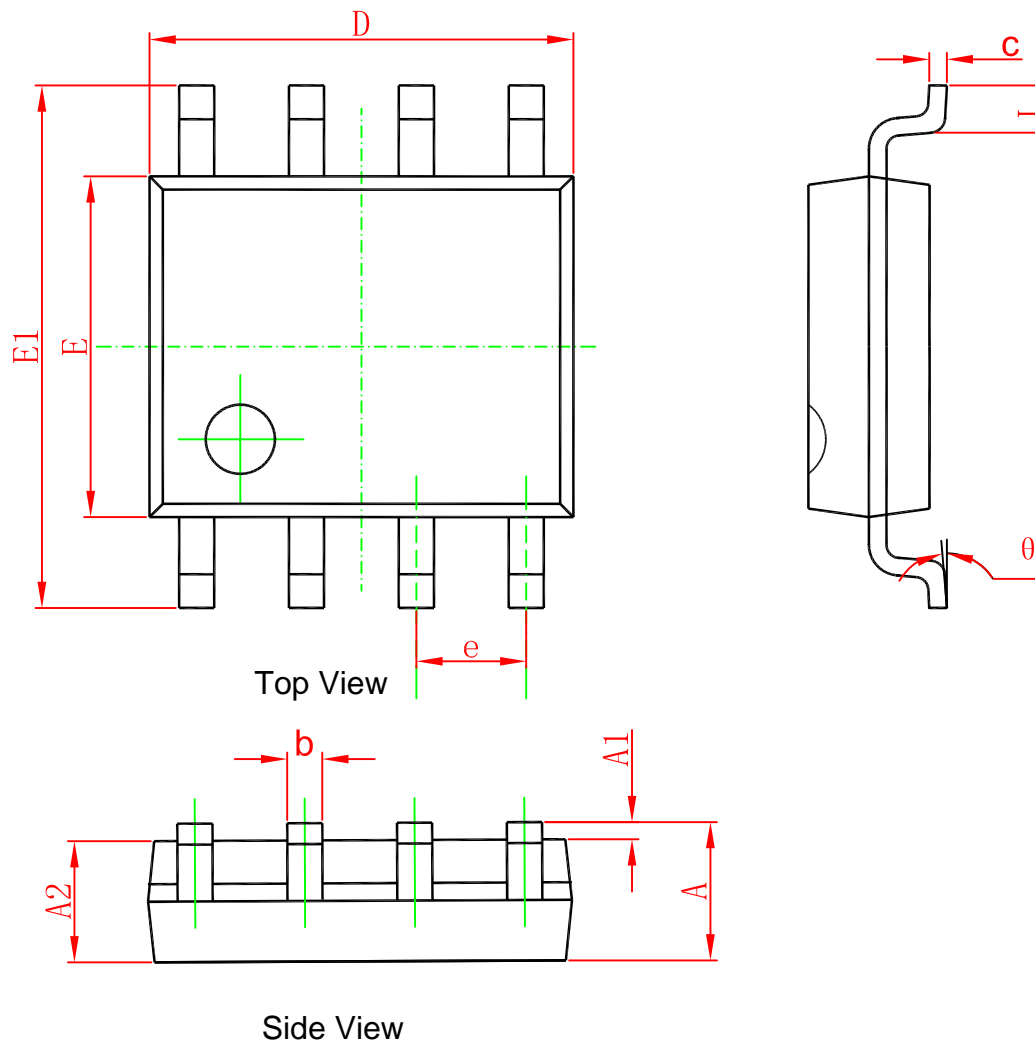
**MOSFET TYPICAL CHARACTERISTICS (25°C, unless otherwise noted)**



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## SOP-8L Package Information



| Symbol   | Dimensions In Millimeters |       | Dimensions In Inches |       |
|----------|---------------------------|-------|----------------------|-------|
|          | Min                       | Max   | Min                  | Max   |
| A        | 1.350                     | 1.750 | 0.053                | 0.069 |
| A1       | 0.100                     | 0.250 | 0.004                | 0.010 |
| A2       | 1.350                     | 1.550 | 0.053                | 0.061 |
| b        | 0.330                     | 0.510 | 0.013                | 0.020 |
| c        | 0.170                     | 0.250 | 0.006                | 0.010 |
| D        | 4.700                     | 5.100 | 0.185                | 0.200 |
| E        | 3.800                     | 4.000 | 0.150                | 0.157 |
| E1       | 5.800                     | 6.200 | 0.228                | 0.244 |
| e        | 1.270 (BSC)               |       | 0.050 (BSC)          |       |
| L        | 0.400                     | 1.270 | 0.016                | 0.050 |
| $\theta$ | 0°                        | 8°    | 0°                   | 8°    |