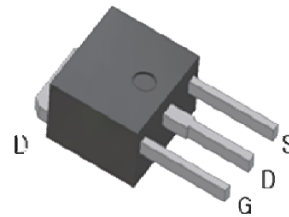
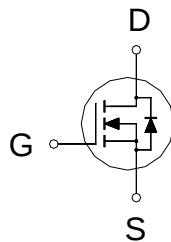


**N-Channel Logic Level Enhancement Mode Field Effect Transistor**

**Product Summary:**

|                     |              |
|---------------------|--------------|
| $BV_{DSS}$          | 600V         |
| $R_{DS(on)} (MAX.)$ | $3.3 \Omega$ |
| $I_D$               | 4A           |



UIS, 100% Tested

Pb-Free Lead Plating & Halogen Free



**ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$  Unless Otherwise Noted)**

| PARAMETERS/TEST CONDITIONS                     |                                                    | SYMBOL           | LIMITS     | UNIT             |
|------------------------------------------------|----------------------------------------------------|------------------|------------|------------------|
| Gate-Source Voltage                            |                                                    | $V_{GS}$         | $\pm 30$   | V                |
| Continuous Drain Current                       | $T_C = 25^\circ\text{C}$                           | $I_D$            | 4          | A                |
|                                                | $T_C = 100^\circ\text{C}$                          |                  | 3.2        |                  |
| Pulsed Drain Current <sup>1</sup>              |                                                    | $I_{DM}$         | 16         |                  |
| Avalanche Current                              |                                                    | $I_{AS}$         | 4          | mJ               |
| Avalanche Energy                               | $L = 3\text{mH}, I_D = 4\text{A}, R_G = 25 \Omega$ | $E_{AS}$         | 24         |                  |
| Repetitive Avalanche Energy <sup>2</sup>       | $L = 0.5\text{mH}$                                 | $E_{AR}$         | 4          |                  |
| Power Dissipation                              | $T_C = 25^\circ\text{C}$                           | $P_D$            | 30         | W                |
|                                                | $T_C = 100^\circ\text{C}$                          |                  | 12         |                  |
| Operating Junction & Storage Temperature Range |                                                    | $T_{j, T_{stg}}$ | -55 to 150 | $^\circ\text{C}$ |

**THERMAL RESISTANCE RATINGS**

| THERMAL RESISTANCE  | SYMBOL          | TYPICAL | MAXIMUM | UNIT                        |
|---------------------|-----------------|---------|---------|-----------------------------|
| Junction-to-Case    | $R_{\theta JC}$ |         | 4.2     | $^\circ\text{C} / \text{W}$ |
| Junction-to-Ambient | $R_{\theta JA}$ |         | 110     |                             |

<sup>1</sup>Pulse width limited by maximum junction temperature.

<sup>2</sup>Duty cycle  $\leq 1\%$

**ELECTRICAL CHARACTERISTICS (T<sub>j</sub> = 25 °C, Unless Otherwise Noted)**

| PARAMETER                                                               | SYMBOL               | TEST CONDITIONS                                                                             | LIMITS |      |      | UNIT |
|-------------------------------------------------------------------------|----------------------|---------------------------------------------------------------------------------------------|--------|------|------|------|
|                                                                         |                      |                                                                                             | MIN    | TYP  | MAX  |      |
| STATIC                                                                  |                      |                                                                                             |        |      |      |      |
| Drain-Source Breakdown Voltage                                          | V <sub>(BR)DSS</sub> | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA                                                | 600    |      |      | V    |
| Gate Threshold Voltage                                                  | V <sub>GS(th)</sub>  | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                                  | 2      | 3    | 4    |      |
| Gate-Body Leakage                                                       | I <sub>GSS</sub>     | V <sub>DS</sub> = 0V, V <sub>GS</sub> = ±30V                                                |        |      | ±100 | nA   |
| Zero Gate Voltage Drain Current                                         | I <sub>DSS</sub>     | V <sub>DS</sub> = 600V, V <sub>GS</sub> = 0V                                                |        |      | 10   | μA   |
|                                                                         |                      | V <sub>DS</sub> = 480V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 125 °C                       |        |      | 25   |      |
| Drain-Source On-State Resistance <sup>1</sup>                           | R <sub>DS(ON)</sub>  | V <sub>GS</sub> = 10V, I <sub>D</sub> = 2A                                                  |        | 3.0  | 3.3  | Ω    |
| Forward Transconductance <sup>1</sup>                                   | g <sub>fs</sub>      | V <sub>DS</sub> = 25V, I <sub>D</sub> = 2A                                                  |        | 2    |      | S    |
| DYNAMIC                                                                 |                      |                                                                                             |        |      |      |      |
| Input Capacitance                                                       | C <sub>iss</sub>     | V <sub>GS</sub> = 0V, V <sub>DS</sub> = 25V, f = 1MHz                                       |        | 539  |      | pF   |
| Output Capacitance                                                      | C <sub>oss</sub>     |                                                                                             |        | 44   |      |      |
| Reverse Transfer Capacitance                                            | C <sub>rss</sub>     |                                                                                             |        | 8.1  |      |      |
| Gate Resistance                                                         | R <sub>g</sub>       | V <sub>GS</sub> = 15mV, V <sub>DS</sub> = 0V, f = 1MHz                                      |        | 3.0  | 6.0  | Ω    |
| Total Gate Charge <sup>1,2</sup>                                        | Q <sub>g</sub>       | V <sub>DS</sub> = 300V, V <sub>GS</sub> = 10V,<br>I <sub>D</sub> = 2A                       |        | 10.6 |      | nC   |
| Gate-Source Charge <sup>1,2</sup>                                       | Q <sub>gs</sub>      |                                                                                             |        | 5.0  |      |      |
| Gate-Drain Charge <sup>1,2</sup>                                        | Q <sub>gd</sub>      |                                                                                             |        | 3.9  |      |      |
| Turn-On Delay Time <sup>1,2</sup>                                       | t <sub>d(on)</sub>   | V <sub>DS</sub> = 300V,<br>I <sub>D</sub> = 1A, V <sub>GS</sub> = 10V, R <sub>G</sub> = 20Ω |        | 20   |      | nS   |
| Rise Time <sup>1,2</sup>                                                | t <sub>r</sub>       |                                                                                             |        | 30   |      |      |
| Turn-Off Delay Time <sup>1,2</sup>                                      | t <sub>d(off)</sub>  |                                                                                             |        | 20   |      |      |
| Fall Time <sup>1,2</sup>                                                | t <sub>f</sub>       |                                                                                             |        | 30   |      |      |
| SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (T <sub>c</sub> = 25 °C) |                      |                                                                                             |        |      |      |      |
| Continuous Current                                                      | I <sub>S</sub>       |                                                                                             |        |      | 4    | A    |
| Pulsed Current <sup>3</sup>                                             | I <sub>SM</sub>      |                                                                                             |        |      | 16   |      |
| Forward Voltage <sup>1</sup>                                            | V <sub>SD</sub>      | I <sub>F</sub> = 2A, V <sub>GS</sub> = 0V                                                   |        |      | 1.4  | V    |
| Reverse Recovery Time                                                   | t <sub>rr</sub>      | I <sub>F</sub> = I <sub>S</sub> , dI <sub>F</sub> /dt = 100A / μS                           |        | 0.3  |      | μS   |
| Reverse Recovery Charge                                                 | Q <sub>rr</sub>      |                                                                                             |        | 1.0  |      | μC   |

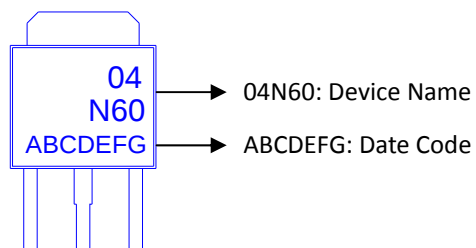
<sup>1</sup>Pulse test : Pulse Width ≤ 300 μsec, Duty Cycle ≤ 2%.

<sup>2</sup>Independent of operating temperature.

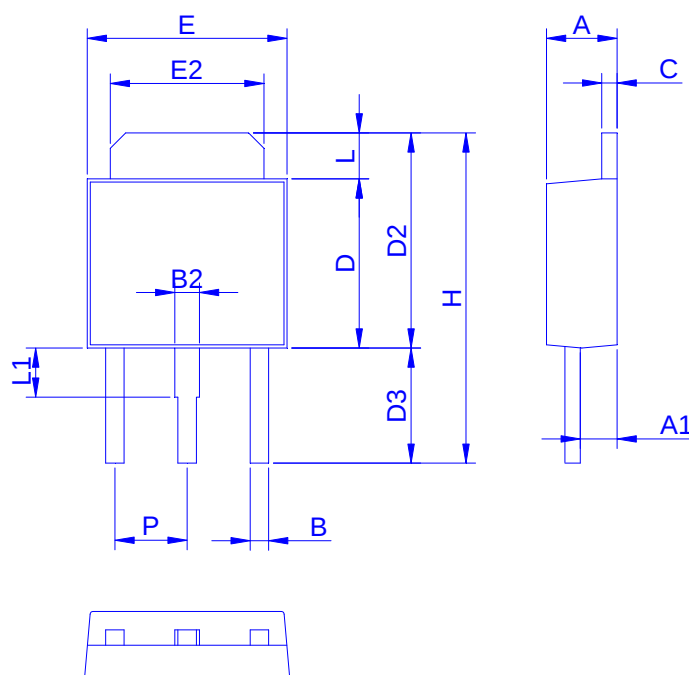
<sup>3</sup>Pulse width limited by maximum junction temperature.

## Ordering & Marking Information:

Device Name: LB04N60E for IPAK (TO-251)



## Outline Drawing



Dimension in mm

| Dimension | A    | A1   | B    | B2   | C    | D    | D2   | D3   | E    | E2   | H    | L    | L1   | P    |
|-----------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Min.      | 2.10 | 0.90 | 0.40 | 0.60 | 0.40 | 5.30 | 6.70 | 3.40 | 6.30 | 4.80 | 10.2 | 0.89 | 0.90 | 2.10 |
| Max.      | 2.50 | 1.50 | 0.90 | 1.15 | 0.60 | 6.25 | 7.30 | 4.30 | 6.80 | 5.50 | 11.5 | 1.40 | 1.80 | 2.50 |

## TYPICAL CHARACTERISTICS

