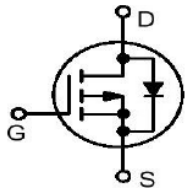
# P-Channel Enhancement Mode MOSFET

# BL3407E

## Features

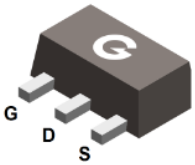
- $R_{DS(ON)} \leq 52m\Omega$@ $V_{GS}$ = -10V
- $R_{DS(ON)} \leq 87m\Omega$@ $V_{GS}$ = -4.5V
- High-speed switching
- Drive circuits can be simple
- Parallel use is easy
- JESD22-A114-B ESD rating of class 0 per human body model

HF




## Typical Applications

- Power Management in Note Book
- Switching Application
- Battery Powered System
- Load switch




## Mechanical Data

- Case: SOT-89
- Molding Compound, UL Flammability Classification Rating 94V-0
- Terminals: Matte Tin Plated Leads, Solderable Per MIL-STD-202, Method 208

SOT-89

## Ordering Information

| Part Number | Package | Shipping Quantity | Marking Code |
|---|---|---|---|
| BL3407E | SOT-89 | 1000 pcs / Tape & Reel | 3407 |

## Maximum Ratings (@ $T_A$ = 25°C unless otherwise specified)

| Parameter | | Symbol | Value | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DSS}$ | -30 | V |
| Gate -Source Voltage | | $V_{GSS}$ | ±20 | V |
| Continuous Drain Current | $T_A$ = 25°C | $I_D$ | -5.3 | A |
| | $T_A$ = 70°C | | -4.2 | A |
| Pulsed Drain Current ($t_p$ = 10μs, $T_A$ = 25°C) | | $I_{DM}$ | -20 | A |
| Single Pulse Avalanche Energy *3 | | $E_{AS}$ | 12 | mJ |
| Power Dissipation | $T_A$ = 25°C | $P_D$ | 2 | W |
| | $T_C$ = 25°C | | 4 | W |
| Operating Junction Temperature Range | | $T_J$ | -55 ~ +150 | °C |
| Storage Temperature Range | | $T_{STG}$ | -55 ~ +150 | °C |

## Thermal Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Thermal Resistance Junction-to-Case | $R_{\theta JC}$ | - | 20 | 30 | °C/W |
| Thermal Resistance Junction-to-Air *1 | $R_{\theta JA}$ | - | 45 | 60 | °C/W |

## Electrical Characteristics (@ $T_A$ = 25°C unless otherwise specified)

| Symbol | Parameter | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **Static Characteristics** | | | | | | |
| $V_{DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$ = 0V, $I_D$ = -250μA | -30 | - | - | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ = -24V, $V_{GS}$ = 0V | - | - | -1 | μA |
| $I_{GSS}$ | Gate-Body Leakage Current | $V_{GS}$ = ±20V, $V_{DS}$ = 0V | - | - | ±100 | nA |
| **On Characteristics** | | | | | | |
| $R_{DS(ON)}$ | Drain-Source On-resistance *2 | $V_{GS}$ = -10V,$I_D$ = -4.1A | - | - | 52 | mΩ |
| | | $V_{GS}$ = -4.5V,$I_D$ = -3A | - | - | 87 | mΩ |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$ = $V_{GS}$, $I_D$ = -250μA | -1 | -1.5 | -3 | V |
| $R_G$ | Gate Resistance | $V_{GS}$ = 0V, f = 1MHz | - | 12 | - | Ω |
| **Dynamic Characteristics** | | | | | | |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$ = -5V, $I_D$ = -4A | - | 7 | - | S |
| $C_{ISS}$ | Input Capacitance | $V_{GS}$ = 0V<br>$V_{DS}$ = -15V<br>f = 1.0MHz | - | 793 | - | pF |
| $C_{OSS}$ | Output Capacitance | | - | 78 | - | |
| $C_{RSS}$ | Reverse Transfer Capacitance | | - | 61 | - | |
| **Switching Characteristics** | | | | | | |
| $t_{d(ON)}$ | Turn-on Delay Time *4 | $V_{DD}$ =-15V, $V_{GS}$ = -10V<br>$R_G$ = 2.5Ω, $R_L$ = 15Ω<br>$I_D$ = -1A | - | 5 | - | ns |
| $t_r$ | Turn-on Rise Time *4 | | - | 6 | - | |
| $t_{d(OFF)}$ | Turn-Off Delay Time *4 | | - | 28 | - | |
| $t_f$ | Turn-Off Fall Time *4 | | - | 7 | - | |
| $Q_G$ | Total Gate-Charge | $V_{DD}$ = -20V<br>$V_{GS}$ = -4.5V<br>$I_D$ = -3A | - | 8 | - | nC |
| $Q_{GS}$ | Gate to Source Charge | | - | 2.6 | - | |
| $Q_{GD}$ | Gate to Drain (Miller) Charge | | - | 2.6 | - | |
| **Source-Drain Diode Characteristics** | | | | | | |
| $V_{SD}$ | Diode Forward Voltage *2 | $I_{SD}$ = -1A, $V_{GS}$ = 0V, $T_J$ = 25°C | - | -0.8 | -1.0 | V |
| trr | Reverse Recovery Time | $I_{SD}$ = -3A, $V_{GS}$ = 0V<br>$d_I/d_t$ = 100A/μs | - | 125 | - | ns |
| Qrr | Reverse Recovery Charge | | - | 110 | - | nC |

Notes:

1. The data tested by surface mounted on a 1 inch$^2$ FR-4 board with 2OZ copper
2. The data tested by pulsed, pulse width ≤ 300μs, duty cycle ≤ 2%
3. The $E_{AS}$ data shows Max. rating. The test condition is $V_{DD}$ = -15V, $V_{GS}$ = -10V, L = 0.1mH
4. Guaranteed by design, not subject to production

## Ratings and Characteristic Curves (@ $T_A$ = 25°C unless otherwise specified)

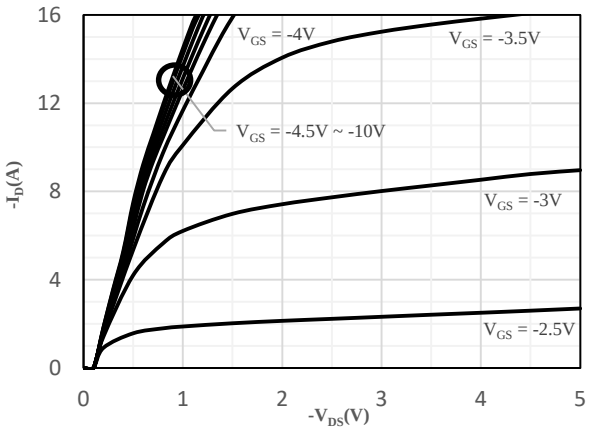



Fig 1 Typical Output Characteristics

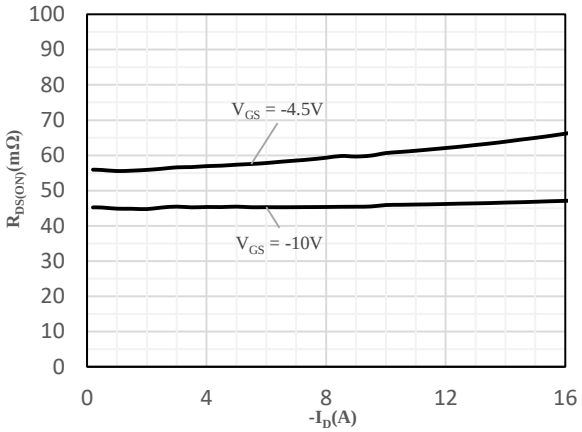



Fig 2 On-Resistance vs. Drain Current and Gate Voltage

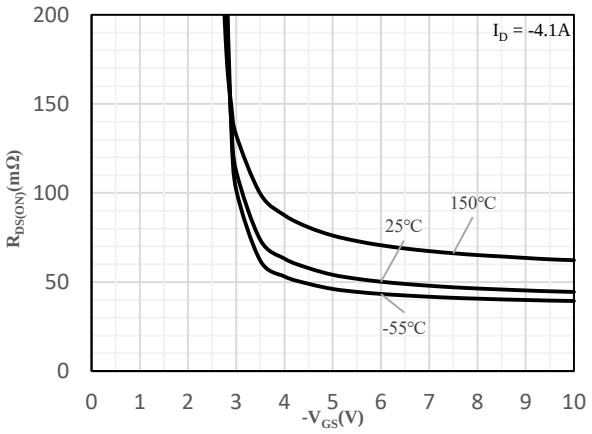



Fig 3 On-Resistance vs. Gate-Source Voltage

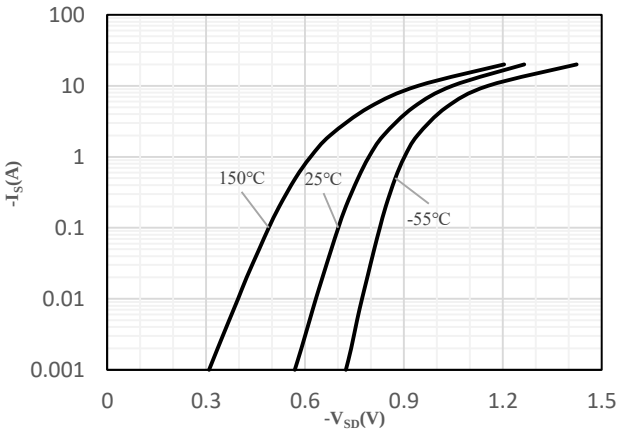



Fig 4 Body-Diode Characteristics

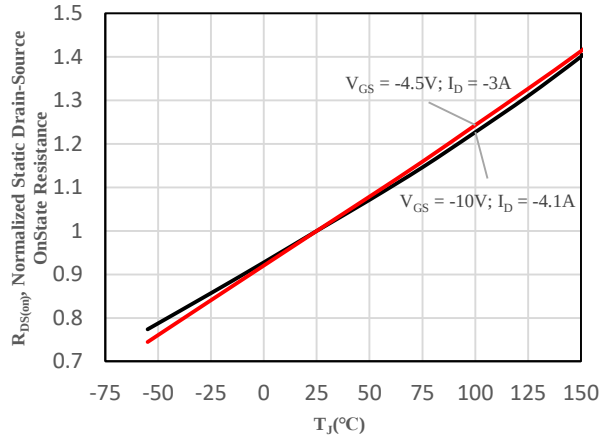



Fig 5 Normalized On-Resistance vs. Junction Temperature

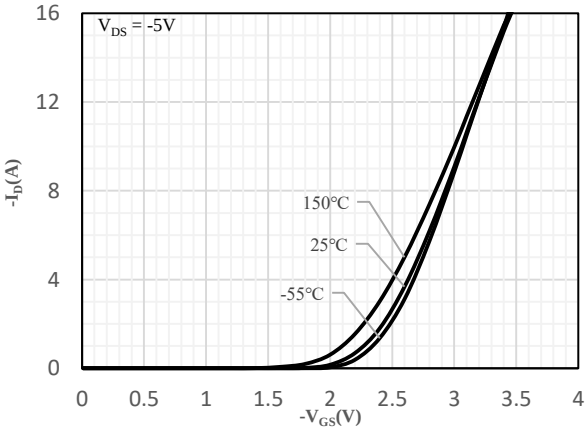



Fig 6 Transfer Characteristics

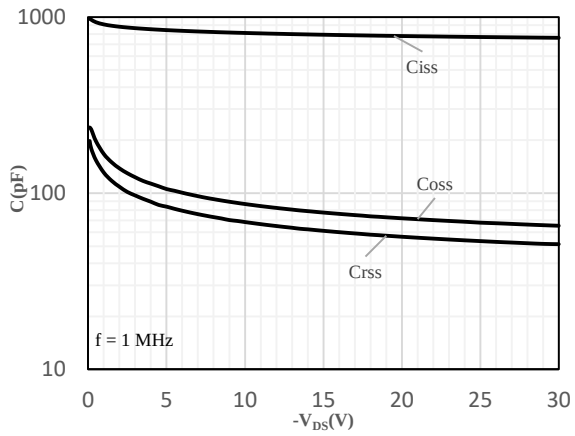



Fig 7 Capacitance Characteristics

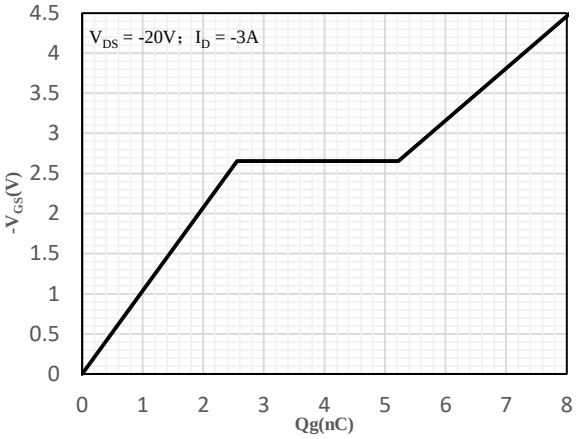



Fig 8 Gate-Charge Characteristics

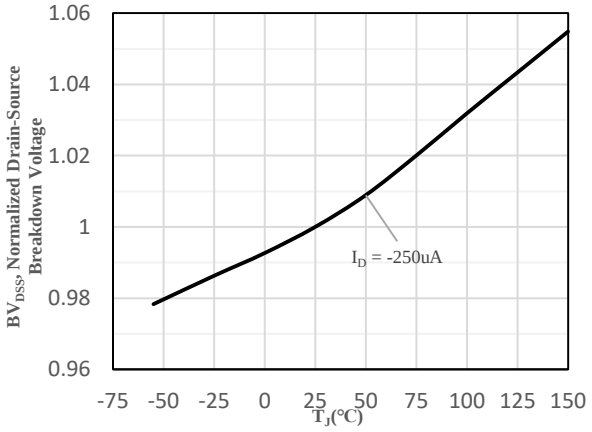



Fig 9 Normalized Breakdown Voltage vs. Junction Temperature

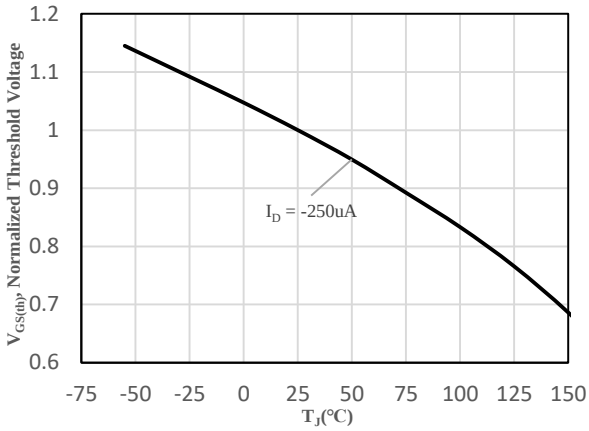



Fig 10 Normalized $V_{GS(th)}$ vs. Junction Temperature

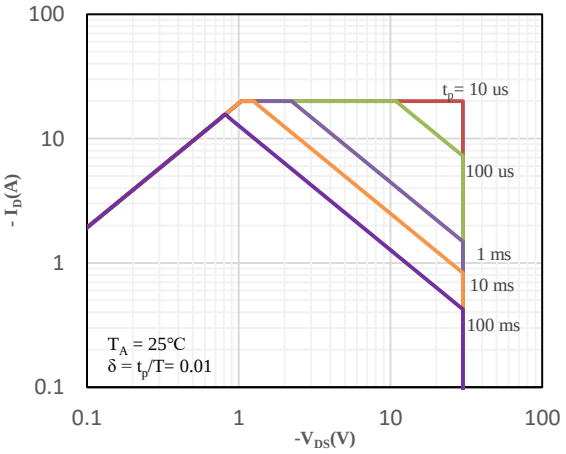



Fig 11 Safe Operation Area

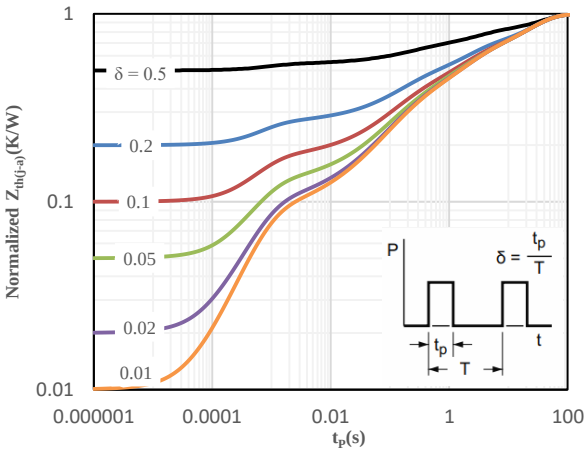
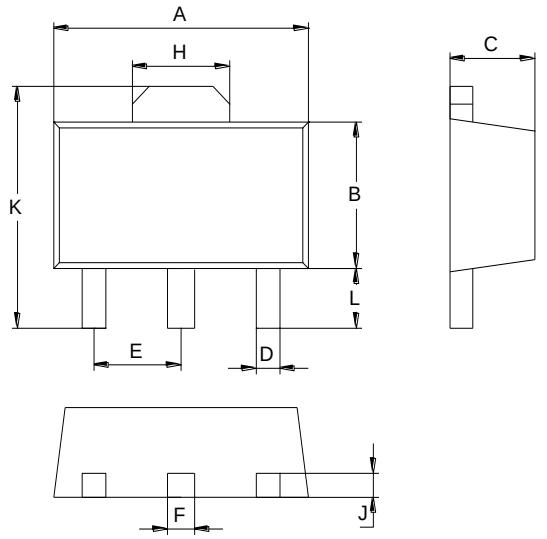



Fig 12 Normalized Maximum transient thermal impedance

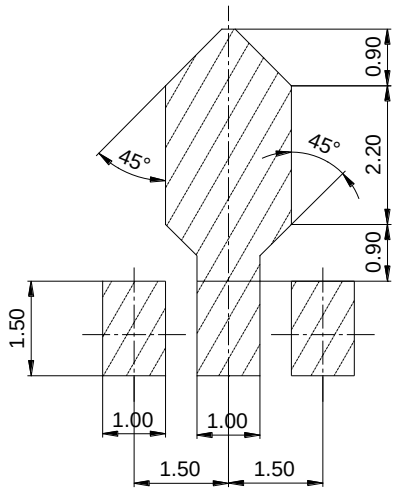
## Package Outline Dimensions (Unit: mm)




| SOT-89 | | |
|---|---|---|
| **Dimension** | **Min.** | **Max.** |
| A | 4.30 | 4.70 |
| B | 2.25 | 2.65 |
| C | 1.30 | 1.70 |
| D | 0.30 | 0.50 |
| E | 1.40 | 1.60 |
| F | 0.38 | 0.58 |
| H | 1.60 | 1.80 |
| J | 0.30 | 0.50 |
| L | 0.90 | 1.10 |
| K | 3.95 | 4.35 |

## Mounting Pad Layout (Unit: mm)

### SOT-89




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