

Enhancement Mode N-Channel Power MOSFET

Features

- ◆ Low $R_{DS(on)}$ & FOM
- ◆ Extremely low switching loss
- ◆ Excellent stability and uniformity
- ◆ Fast switching and soft recovery

Applications

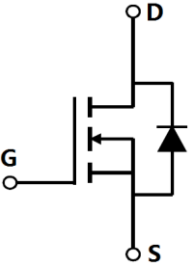
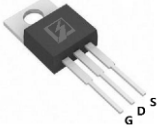
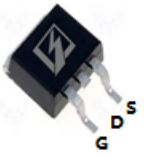
- ◆ Consumer electronic power supply
- ◆ Motor control
- ◆ Synchronous-rectification
- ◆ Isolated DC/DC convertor
- ◆ Invertors

■ General Description

SFG250N08xF use advanced SFGMOS™ technology to provide low $R_{DS(ON)}$, low gate charge, fast switching and excellent avalanche characteristics. This device is specially designed to get better ruggedness and suitable to use in motor control applications.

| | |
|-----------------------------------|----------|
| ◆ $V_{DS, min}$ | 80 V |
| ◆ $I_{D, pulse}$ | 750 A |
| ◆ $R_{DS(ON), max @ V_{GS}=10 V}$ | 3.2 mΩ |
| ◆ Q_g | 148.4 nC |

■ Schematic and Package Information

| SCHEMATIC DIAGRAM | PIN ASSIGNMENT TOP VIEW |
|--|--|
|  | <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  TO220 SFG250N08PF </div> <div style="text-align: center;">  TO263 SFG250N08KF </div> </div> |

■ Absolute Maximum Ratings at $T_j=25^\circ\text{C}$ unless otherwise noted

| Parameter | Symbol | Value | Unit |
|---|----------------|------------|------|
| Drain source voltage | V_{DS} | 80 | V |
| Gate source voltage | V_{GS} | ±20 | V |
| Continuous drain current ¹⁾ , $T_C=25^\circ\text{C}$ | I_D | 250 | A |
| Pulsed drain current ²⁾ , $T_C=25^\circ\text{C}$ | $I_{D, pulse}$ | 750 | A |
| Power dissipation ³⁾ , $T_C=25^\circ\text{C}$ | P_D | 300 | W |
| Single pulsed avalanche energy ⁵⁾ | E_{AS} | 1000 | mJ |
| Operation and storage temperature | T_{stg}, T_j | -55 to 150 | °C |

■ Thermal Characteristics

| Parameter | Symbol | Value | Unit |
|--|-----------------|-------|-----------------------------|
| Thermal resistance, junction-case | $R_{\theta JC}$ | 0.42 | $^{\circ}\text{C}/\text{W}$ |
| Thermal resistance, junction-ambient ⁴⁾ | $R_{\theta JA}$ | 62.5 | $^{\circ}\text{C}/\text{W}$ |

■ Electrical Characteristics at $T_j=25^{\circ}\text{C}$ unless otherwise specified

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Test condition |
|----------------------------------|--------------|------|------|------|------------------|---|
| Drain-source breakdown voltage | BV_{DSS} | 80 | | | V | $V_{GS}=0\text{ V}, I_D=250\ \mu\text{A}$ |
| Gate threshold voltage | $V_{GS(th)}$ | 2.0 | | 4.0 | V | $V_{DS}=V_{GS}, I_D=250\ \mu\text{A}$ |
| Drain-source on-state resistance | $R_{DS(on)}$ | | 2.9 | 3.2 | $\text{m}\Omega$ | $V_{GS}=10\text{ V}, I_D=30\text{ A}$ |
| Gate-source leakage current | I_{GSS} | | | 100 | nA | $V_{GS}=20\text{ V}$ |
| | | | | -100 | | $V_{GS}=-20\text{ V}$ |
| Drain-source leakage current | I_{DSS} | | | 1 | μA | $V_{DS}=80\text{ V}, V_{GS}=0\text{ V}$ |

■ Dynamic Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Test condition |
|------------------------------|--------------|------|-------|------|------|---|
| Input capacitance | C_{iss} | | 9322 | | pF | $V_{GS}=0\text{ V},$ $V_{DS}=40\text{ V},$ $f=100\text{ kHz}$ |
| Output capacitance | C_{oss} | | 2710 | | pF | |
| Reverse transfer capacitance | C_{rss} | | 91 | | pF | |
| Turn-on delay time | $t_{d(on)}$ | | 36.1 | | ns | $V_{GS}=10\text{ V},$ $V_{DS}=50\text{ V},$ $R_G=2\ \Omega,$ $I_D=25\text{ A}$ |
| Rise time | t_r | | 42.3 | | ns | |
| Turn-off delay time | $t_{d(off)}$ | | 102.3 | | ns | |
| Fall time | t_f | | 30.5 | | ns | |

■ Gate Charge Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Test condition |
|----------------------|----------------------|------|-------|------|------|---|
| Total gate charge | Q_g | | 148.4 | | nC | $I_D=25\text{ A}$, $V_{DS}=50\text{ V}$, $V_{GS}=10\text{ V}$ |
| Gate-source charge | Q_{gs} | | 34.5 | | nC | |
| Gate-drain charge | Q_{gd} | | 40.9 | | nC | |
| Gate plateau voltage | V_{plateau} | | 4.7 | | V | |

■ Body Diode Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Test condition |
|-------------------------------|-----------|------|-------|------|------|---|
| Diode forward current | I_S | | | 250 | A | $V_{GS} < V_{th}$ |
| Pulsed source current | I_{SP} | | | 750 | | |
| Diode forward voltage | V_{SD} | | | 1.3 | V | $I_S=25\text{ A}$, $V_{GS}=0\text{ V}$ |
| Reverse recovery time | t_{rr} | | 108.2 | | ns | $I_S=25\text{ A}$, $di/dt=100\text{ A}/\mu\text{s}$ |
| Reverse recovery charge | Q_{rr} | | 428.9 | | nC | |
| Peak reverse recovery current | I_{rrm} | | 6.5 | | A | |

■ Note

- 1) Calculated continuous current based on maximum allowable junction temperature.
- 2) Repetitive rating; pulse width limited by max. junction temperature.
- 3) P_d is based on max. junction temperature, using junction-case thermal resistance.
- 4) The value of $R_{\theta JA}$ is measured with the device mounted on 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with $T_a=25\text{ }^\circ\text{C}$.
- 5) $V_{DD}=50\text{ V}$, $R_G=50\text{ }\Omega$, $L=0.3\text{ mH}$, starting $T_j=25\text{ }^\circ\text{C}$.

■ **Electrical Characteristics Diagrams**

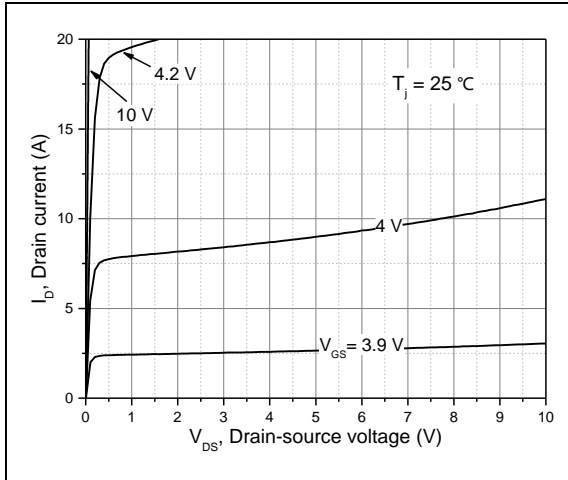


Figure 1, Typ. output characteristics

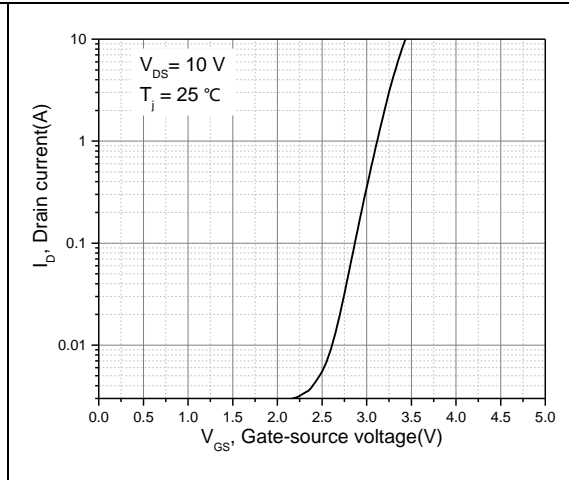


Figure 2, Typ. transfer characteristics

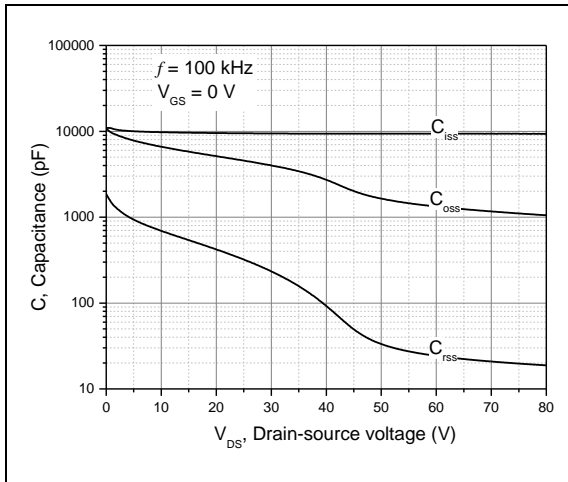


Figure 3, Typ. capacitances

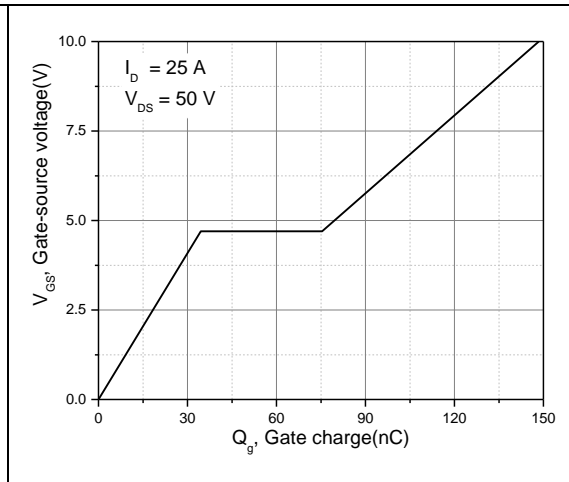


Figure 4, Typ. gate charge

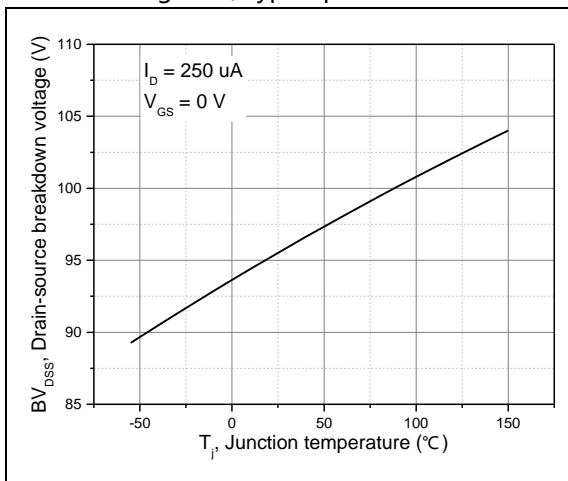


Figure 5, Drain-source breakdown voltage

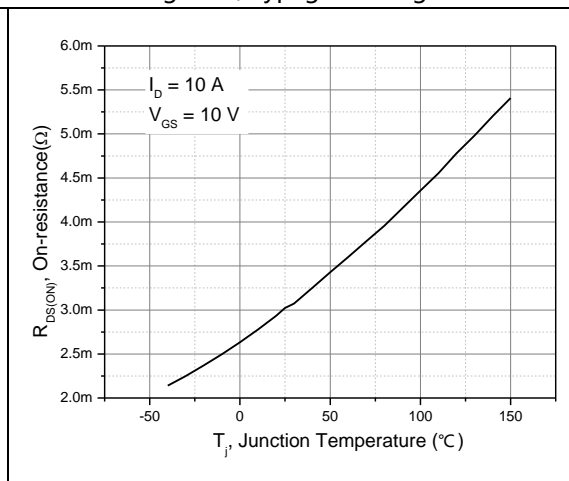


Figure 6, Drain-source on-state resistance

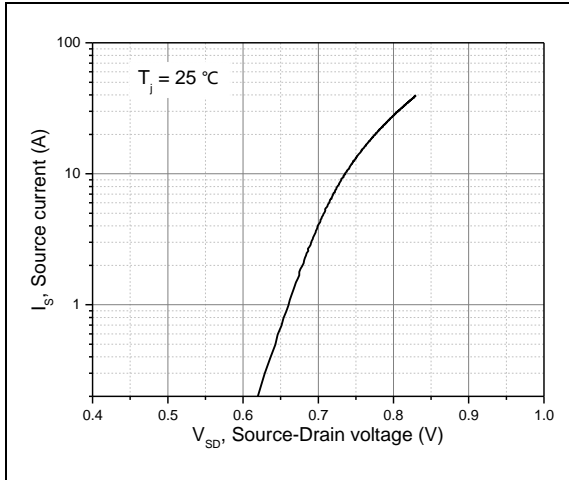


Figure 7, Forward characteristic of body diode

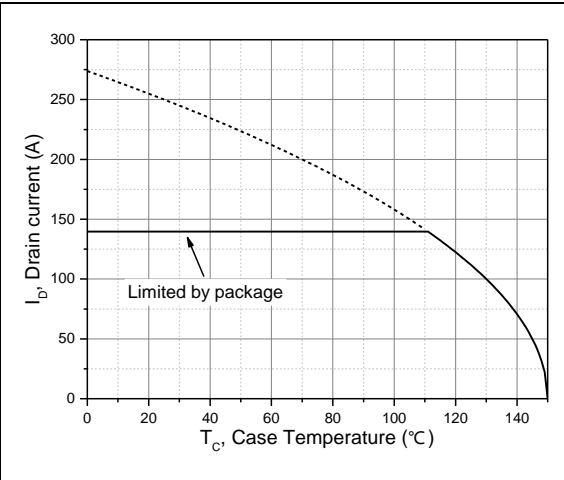


Figure 8, Drain current

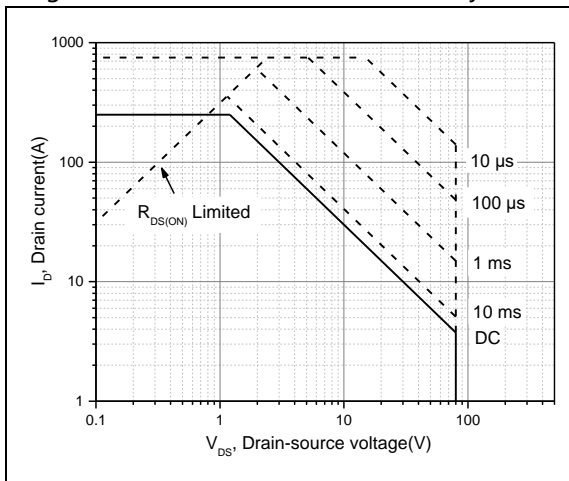
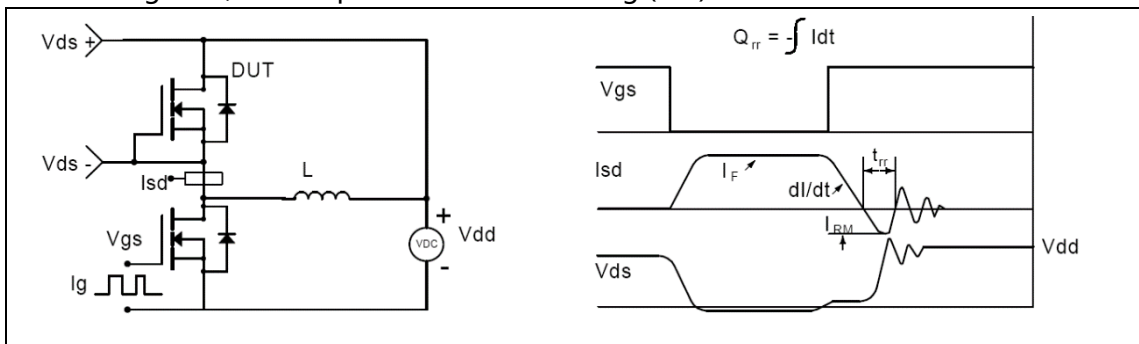
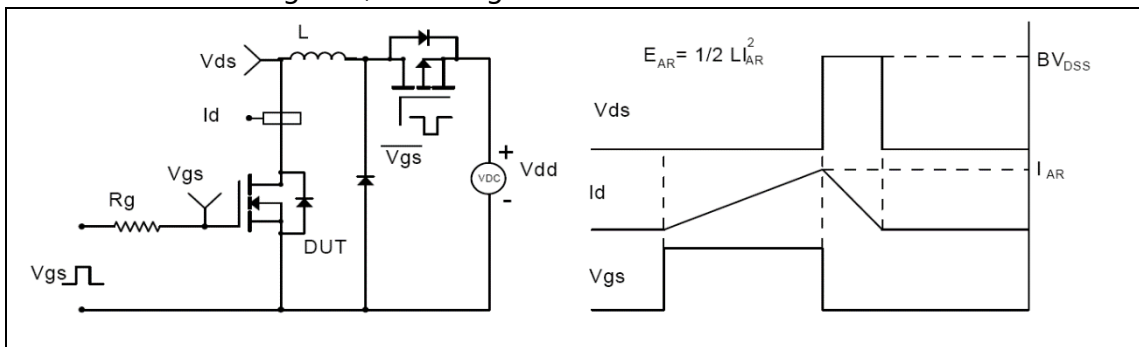
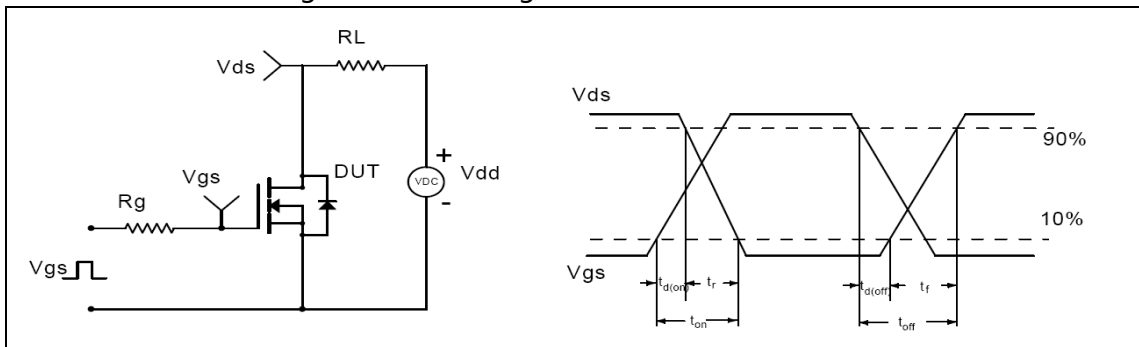
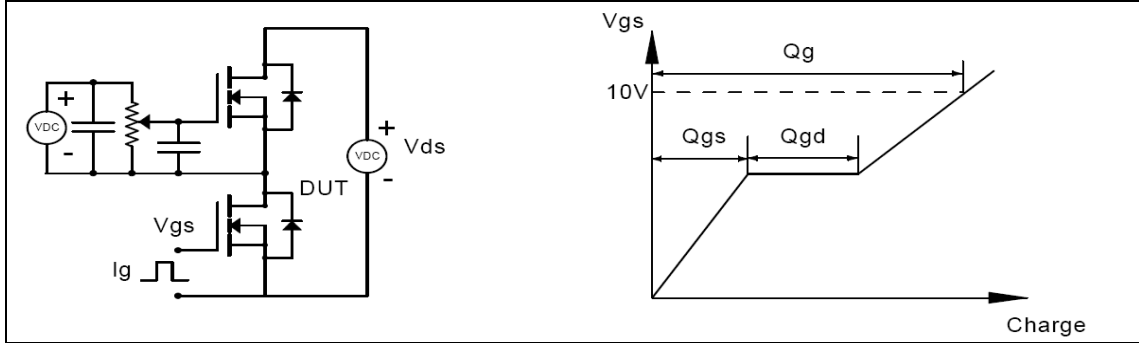


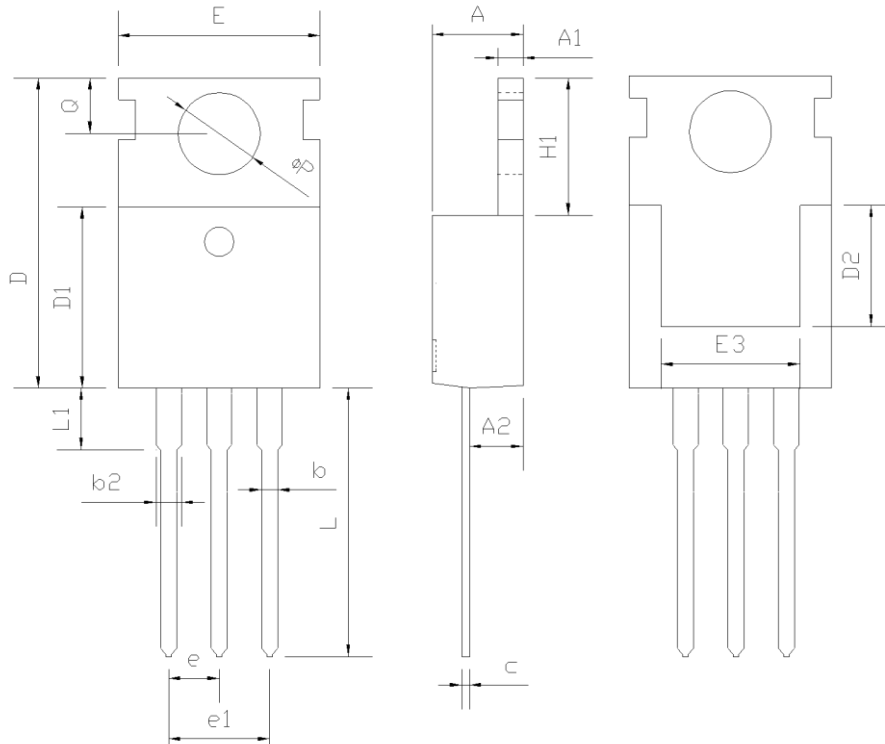
Figure 9, Safe operation area $T_C=25\text{ }^\circ\text{C}$

■ Test circuits and waveforms



■ Package Information

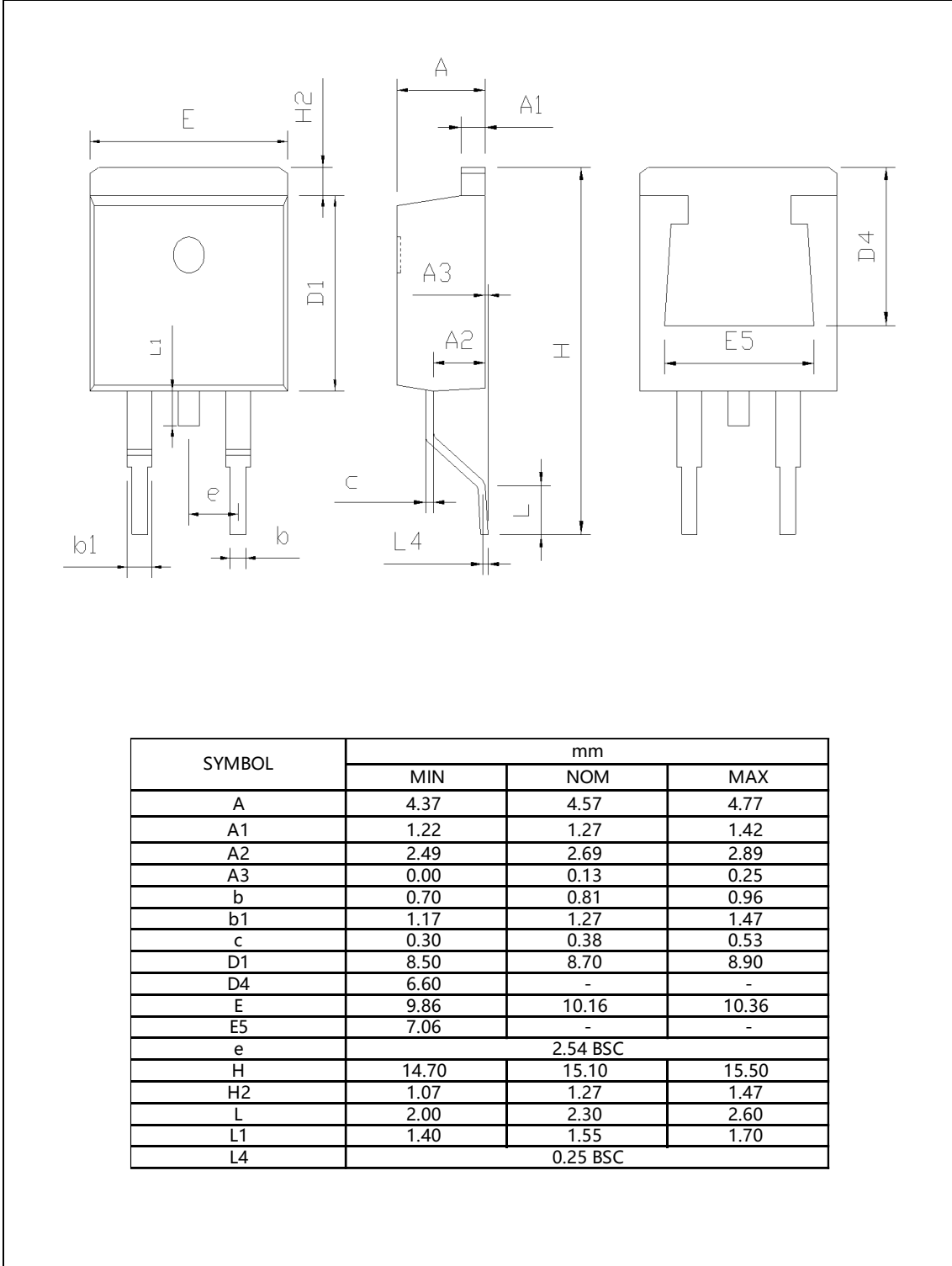
Figure1, TO220 package outline dimension



| SYMBOL | mm | | |
|--------|----------|-------|-------|
| | MIN | NOM | MAX |
| A | 4.37 | 4.57 | 4.70 |
| A1 | 1.25 | 1.30 | 1.40 |
| A2 | 2.20 | 2.40 | 2.60 |
| b | 0.70 | 0.80 | 0.95 |
| b2 | 1.17 | 1.27 | 1.47 |
| c | 0.45 | 0.50 | 0.60 |
| D | 15.10 | 15.60 | 16.10 |
| D1 | 8.80 | 9.10 | 9.40 |
| D2 | 5.50 | - | - |
| E | 9.70 | 10.00 | 10.30 |
| E3 | 7.00 | - | - |
| e | 2.54 BSC | | |
| e1 | 5.08 BSC | | |
| H1 | 6.25 | 6.50 | 6.85 |
| L | 12.75 | 13.50 | 13.80 |
| L1 | - | 3.10 | 3.40 |
| ΦP | 3.40 | 3.60 | 3.80 |
| Q | 2.60 | 2.80 | 3.00 |

■ Package Information

Figure2, TO263 package outline dimension



■ Ordering Information

| Package | Units/Tape | Tapes/Inner Box | Units/Inner Box | Inner Box/Carton Box | Units/Carton Box |
|---------|------------|-----------------|-----------------|----------------------|------------------|
| TO220 | 50 | 20 | 1000 | 6 | 6000 |
| TO263 | 50 | 20 | 1000 | 6 | 6000 |

■ Product Information

| Product | Package | Pb Free | RoHS | Halogen Free |
|-------------|---------|---------|------|--------------|
| SFG250N08PF | TO220 | yes | yes | yes |
| SFG250N08KF | TO263 | yes | yes | yes |