

RoHS Compliant Product  
A suffix of "-C" specifies halogen free

## DESCRIPTION

The SSE60N06-C is the highest performance trench N-ch MOSFETs with extreme high cell density, which provide excellent  $R_{DS(ON)}$  and gate charge for most of the synchronous buck converter applications.

The SSE60N06-C meet the RoHS and Green Product requirement with full function reliability approved.

TO-220



## FEATURES

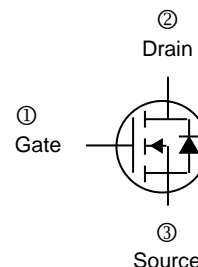
- Advanced high Cell Density Trench Technology
- Super Low Gate Charge
- Green Device Available

## MARKING



## ORDER INFORMATION

| Part Number | Type                            |
|-------------|---------------------------------|
| SSE60N06-C  | Lead (Pb)-free and Halogen-free |



## ABSOLUTE MAXIMUM RATINGS ( $T_A=25^\circ\text{C}$ unless otherwise specified)

| Parameter   | Symbol                  | Rating   | Unit               |
|---|-------------------------|----------|--------------------|
| Drain-Source Voltage  | $V_{DS}$                | 60       | V                  |
| Gate-Source Voltage   | $V_{GS}$                | $\pm 20$ | V                  |
| Continuous Drain Current <sup>1</sup> @ $V_{GS}=10\text{V}$ | $T_C=25^\circ\text{C}$  | 60       | A                  |
|   | $T_C=100^\circ\text{C}$ | 38       |                    |
|   | $T_A=25^\circ\text{C}$  | 9.2      |                    |
|   | $T_A=70^\circ\text{C}$  | 7.5      |                    |
| Pulsed Drain Current <sup>2</sup>                           | $I_{DM}$                | 165      | A                  |
| Power Dissipation <sup>3</sup>                              | $T_C=25^\circ\text{C}$  | 86.8     | W                  |
|   | $T_A=25^\circ\text{C}$  | 2        |                    |
| Operating Junction & Storage Temperature                    | $T_J, T_{STG}$          | -55~150  | $^\circ\text{C}$   |
| <b>Thermal Resistance Rating</b>                            |                         |          |                    |
| Thermal Resistance Junction-Ambient <sup>1</sup>            | $R_{\theta JA}$         | 62       | $^\circ\text{C/W}$ |
| Thermal Resistance Junction-Case <sup>1</sup>               | $R_{\theta JC}$         | 1.44     |                    |

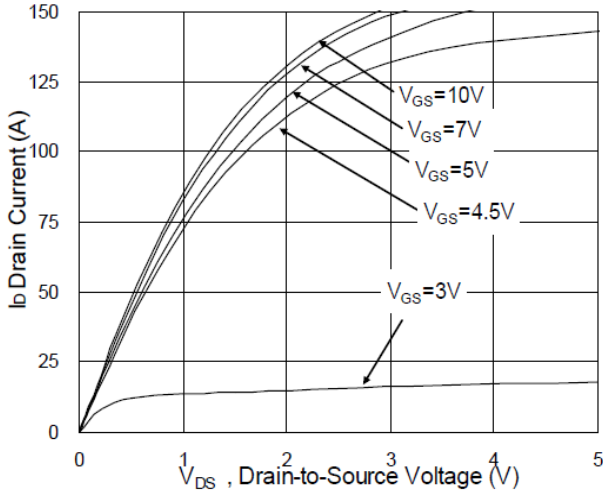
**ELECTRICAL CHARACTERISTICS** ( $T_J=25^\circ C$  unless otherwise specified)

| Parameter                                      | Symbol           | Min.      | Typ. | Max.      | Unit       | Test Conditions  |                         |
|--|------------------|-----------|------|-----------|------------|--|-------------------------|
| Drain-Source Breakdown Voltage                 | $V_{(BR)DSS}$    | 60        | -    | -         | V          | $V_{GS}=0V, I_D=250\mu A$                                    |                         |
| Gate-Threshold Voltage                         | $V_{GS(th)}$     | 1         | -    | 2.5       | V          | $V_{DS}=V_{GS}, I_D=250\mu A$                                |                         |
| Forward Transconductance                       | $g_{fs}$         | -         | 42   | -         | S          | $V_{DS}=5V, I_D=30A$   |                         |
| Gate-Source Leakage Current                    | $I_{GSS}$        | -         | -    | $\pm 100$ | nA         | $V_{GS}=\pm 20V, V_{DS}=0V$                                  |                         |
| Drain-Source Leakage Current                   | $T_J=25^\circ C$ | $I_{DSS}$ | -    | -         | 1          | $\mu A$  | $V_{DS}=48V, V_{GS}=0V$ |
|  | $T_J=55^\circ C$ |           | -    | -         | 5          |  |                         |
| Static Drain-Source On-Resistance <sup>2</sup> | $R_{DS(ON)}$     | -         | -    | 12        | m $\Omega$ | $V_{GS}=10V, I_D=30A$  |                         |
|  |                  | -         | -    | 15        |            | $V_{GS}=4.5V, I_D=15A$                                       |                         |
| Gate Resistance                                | $R_g$            | -         | 1.5  | -         | $\Omega$   | $V_{DS}=0V, V_{GS}=0V, f=1MHz$                               |                         |
| Total Gate Charge                              | $Q_g$            | -         | 28.7 | -         | nC         | $I_D=15A$<br>$V_{DS}=48V$<br>$V_{GS}=4.5V$                   |                         |
| Gate-Source Charge                             | $Q_{gs}$         | -         | 10.5 | -         |            |  |                         |
| Gate-Drain Change                              | $Q_{gd}$         | -         | 9.9  | -         |            |  |                         |
| Turn-on Delay Time                             | $T_{d(on)}$      | -         | 10.4 | -         | nS         | $V_{DD}=30V$<br>$I_D=15A$<br>$V_{GS}=10V$<br>$R_G=3.3\Omega$ |                         |
| Rise Time                                      | $T_r$            | -         | 9.2  | -         |            |  |                         |
| Turn-off Delay Time                            | $T_{d(off)}$     | -         | 63   | -         |            |  |                         |
| Fall Time                                      | $T_f$            | -         | 4.8  | -         |            |  |                         |
| Input Capacitance                              | $C_{iss}$        | -         | 3240 | -         | pF         | $V_{GS}=0V$<br>$V_{DS}=15V$<br>$f=1MHz$                      |                         |
| Output Capacitance                             | $C_{oss}$        | -         | 210  | -         |            |  |                         |
| Reverse Transfer Capacitance                   | $C_{rss}$        | -         | 146  | -         |            |  |                         |
| <b>Source-Drain Diode</b>                      |                  |           |      |           |            |  |                         |
| Diode Forward Voltage <sup>2</sup>             | $V_{SD}$         | -         | -    | 1.2       | V          | $I_S=1A, V_{GS}=0V, T_J=25^\circ C$                          |                         |
| Continuous Source Current <sup>1 4</sup>       | $I_S$            | -         | -    | 60        | A          | $V_{DS}=V_{GS}=0V, \text{Force Current}$                     |                         |
| Pulsed Source Current <sup>2 4</sup>           | $I_{SM}$         | -         | -    | 165       |            |  |                         |
| Reverse Recovery Time                          | $T_{rr}$         | -         | 18   | -         | ns         | $I_F=15A, di/dt=100A/\mu s,$                                 |                         |
| Reverse Recovery Charge                        | $Q_{rr}$         | -         | 14   | -         | nC         | $T_J=25^\circ C$   |                         |

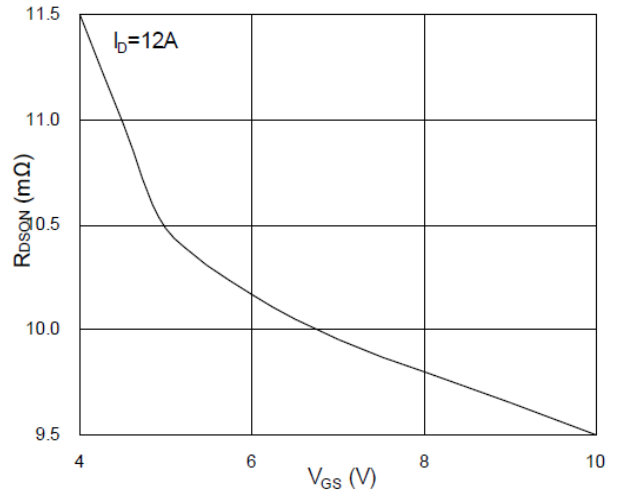
Notes:

- The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2oz copper.
- The data tested by pulsed, pulse width $\leq 300\mu s$ , Duty Cycle $\leq 2\%$ .
- The power dissipation is limited by 150 $^\circ C$  junction temperature.
- The data is theoretically the same as  $I_D$  and  $I_{DM}$ , in real applications, should be limited by total power dissipation.

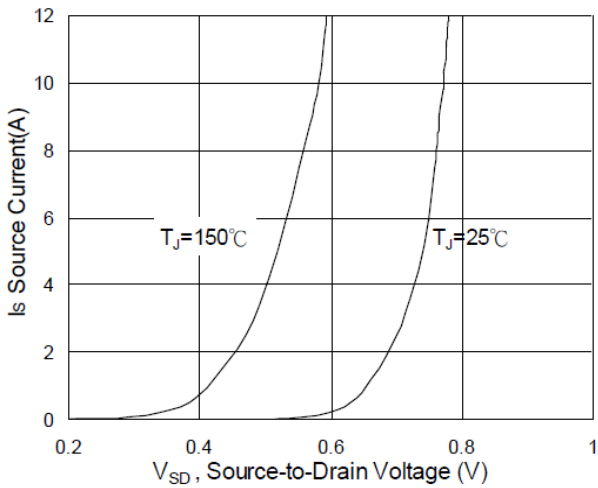
**CHARACTERISTIC CURVES**



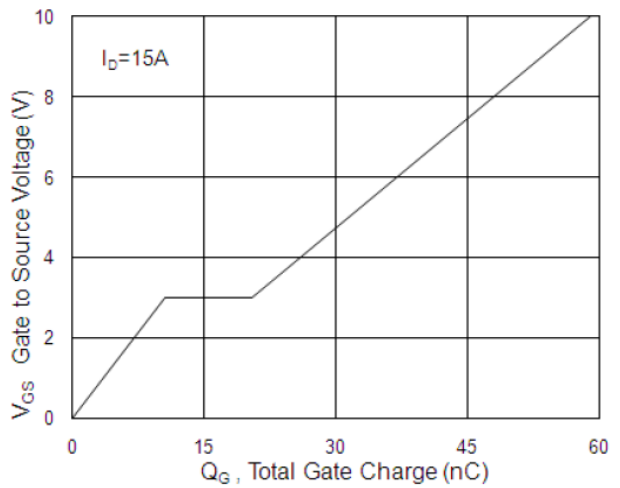
**Fig.1 Typical Output Characteristics**



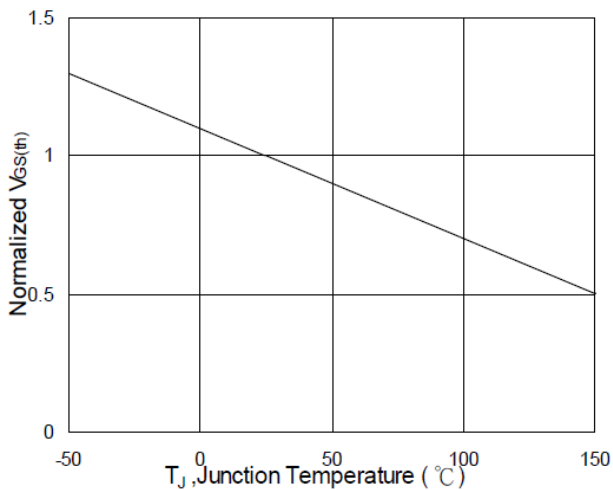
**Fig.2 On-Resistance v.s Gate-Source**



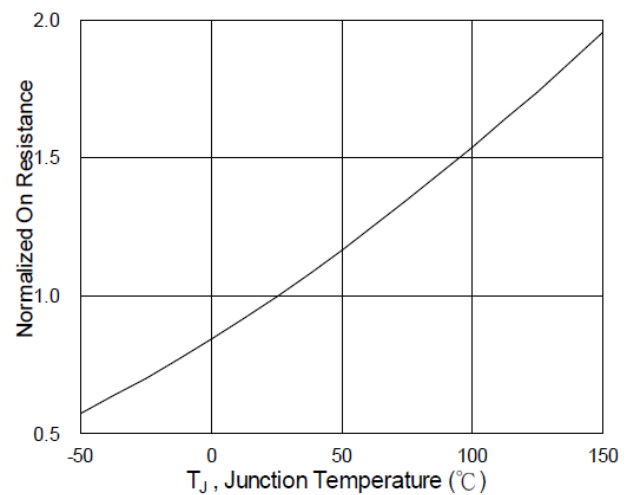
**Fig.3 Forward Characteristics of Reverse**



**Fig.4 Gate-Charge Characteristics**

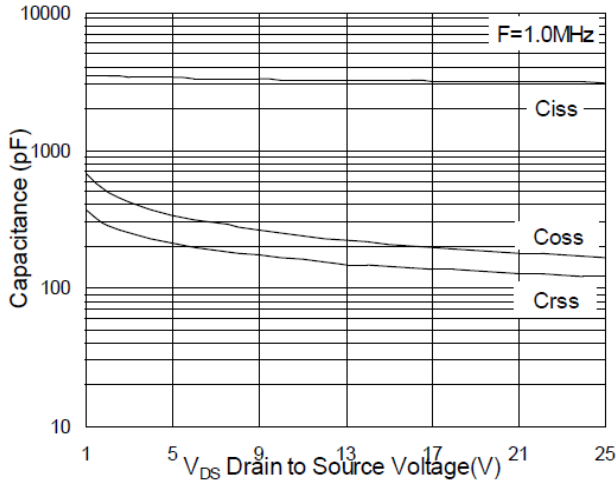


**Fig.5 Normalized  $V_{GS(th)}$  v.s  $T_J$**

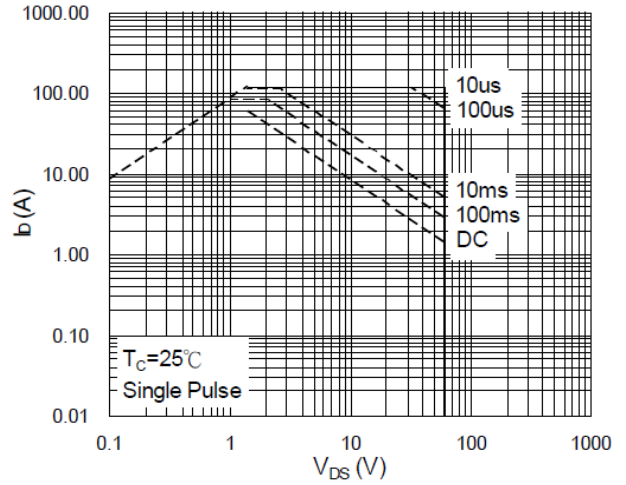


**Fig.6 Normalized  $R_{DS(ON)}$  v.s  $T_J$**

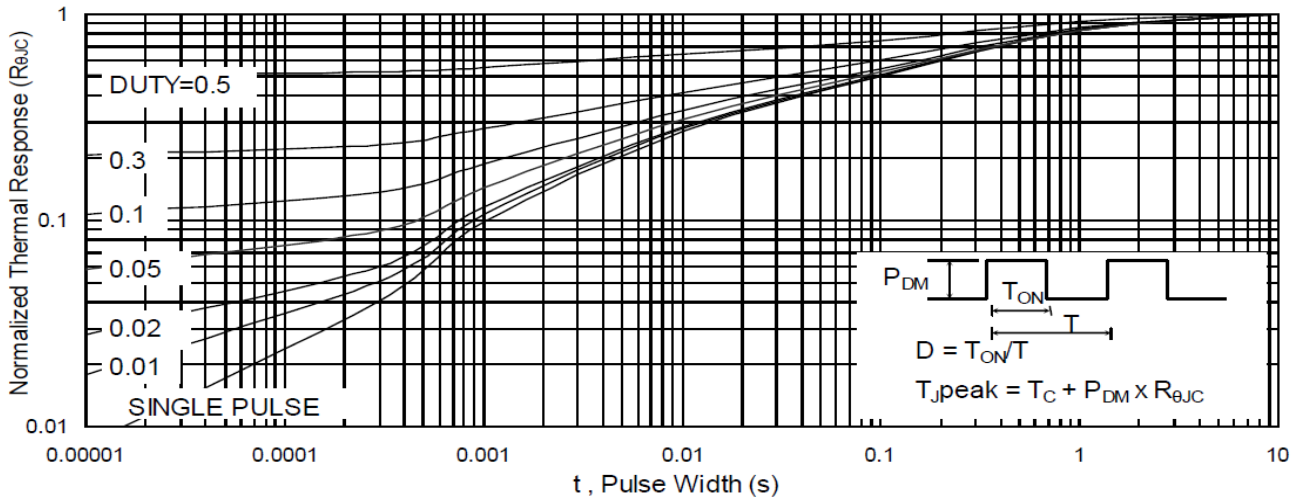
**CHARACTERISTIC CURVES**



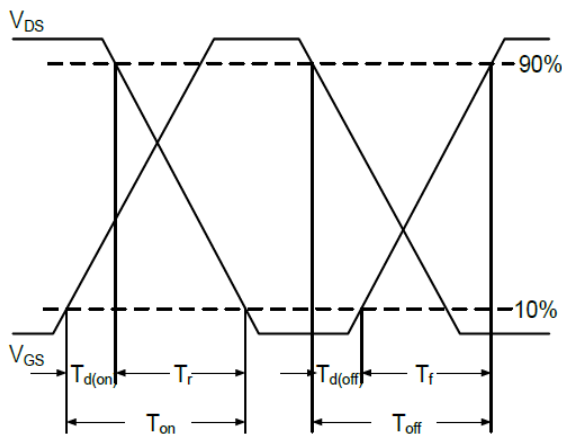
**Fig.7 Capacitance**



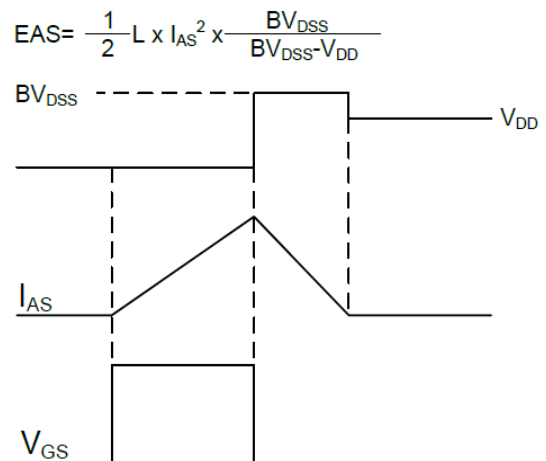
**Fig.8 Safe Operating Area**



**Fig.9 Normalized Maximum Transient Thermal Impedance**



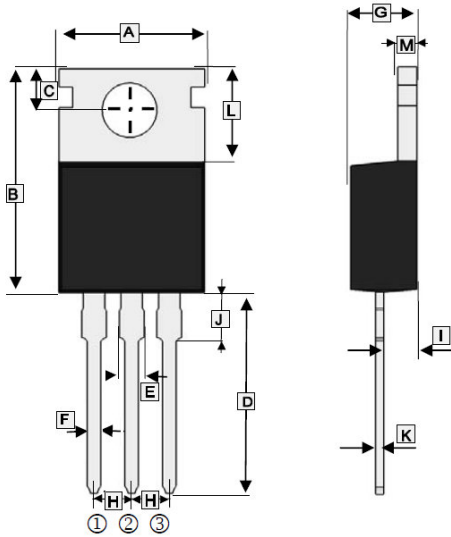
**Fig.10 Switching Time Waveform**



**Fig.11 Unclamped Inductive Switching Waveform**

**PACKAGE OUTLINE DIMENSIONS**

TO-220



| REF. | Millimeter |       |
|------|------------|-------|
|      | Min.       | Max.  |
| A    | 9.70       | 10.60 |
| B    | 14.22      | 16.50 |
| C    | 2.54       | 3.40  |
| D    | 12.70      | 14.70 |
| E    | 1.17       | 1.78  |
| F    | 0.40       | 1.00  |
| G    | 3.60       | 4.82  |
| H    | 2.54 TYP.  |       |
| I    | 2.03       | 2.92  |
| J    | 2.70       | 4.00  |
| K    | 0.33       | 0.65  |
| L    | 5.50       | 7.00  |
| M    | 1.15       | 1.40  |