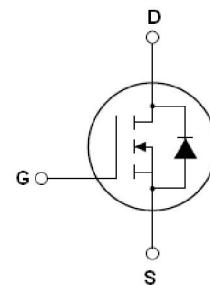


## FEATURES

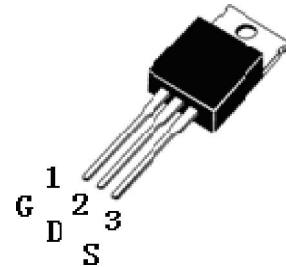
- Advanced trench process technology
- Ultra low  $R_{DS(on)}$ , typical 16mohm
- High avalanche energy, 100% test
- Fully characterized avalanche voltage and current
- Lead free product

**ID =60A**  
**BV=100V**  
 **$R_{DS(on)}=16\text{m}\Omega$  (Typ.)**



## DESCRIPTION

The SSF1020 is a new generation of middle voltage and high current N-Channel enhancement mode trench power MOSFET. This new technology increases the device reliability and electrical parameter repeatability. SSF1020 is assembled in high reliability and qualified assembly house.



## APPLICATIONS

- Power switching application

**SSF1020 Top View (TO-220)**

## Absolute Maximum Ratings

|                             | Parameter                                     | Max.        | Units |
|-----------------------------|---|-------------|-------|
| $I_D@T_c=25^\circ\text{C}$  | Continuous drain current, $V_{GS}=10\text{V}$ | 60          | A     |
| $I_D@T_c=100^\circ\text{C}$ | Continuous drain current, $V_{GS}=10\text{V}$ | 50          |       |
| $I_{DM}$                    | Pulsed drain current ①                        | 240         |       |
| $P_D@T_c=25^\circ\text{C}$  | Power dissipation                             | 180         | W     |
|                             | Linear derating factor                        | 2.0         | W/C   |
| $V_{GS}$                    | Gate-to-Source voltage                        | $\pm 20$    | V     |
| $E_{AS}$                    | Single pulse avalanche energy ②               | 240         | mJ    |
| $E_{AR}$                    | Repetitive avalanche energy                   | TBD         |       |
| $T_J$                       | Operating Junction and                        |             |       |
| $T_{STG}$                   | Storage Temperature Range                     | -55 to +175 | C     |

## Thermal Resistance

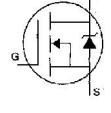
|                 | Parameter           | Min. | Typ. | Max. | Units |
|-----------------|---------------------|------|------|------|-------|
| $R_{\theta JC}$ | Junction-to-case    | —    | 0.83 | —    | C/W   |
| $R_{\theta JA}$ | Junction-to-ambient | —    | —    | 62   |       |

## Electrical Characteristics @ $T_J=25^\circ\text{C}$ (unless otherwise specified)

|              | Parameter                            | Min. | Typ. | Max. | Units            | Test Conditions   |
|--------------|--------------------------------------|------|------|------|------------------|---|
| $BV_{DSS}$   | Drain-to-Source breakdown voltage    | 100  | —    | —    | V                | $V_{GS}=0\text{V}, I_D=250\mu\text{A}$                        |
| $R_{DS(on)}$ | Static Drain-to-Source on-resistance | —    | 16   | 20   | $\text{m}\Omega$ | $V_{GS}=10\text{V}, I_D=30\text{A}$                           |
| $V_{GS(th)}$ | Gate threshold voltage               | 2.0  | 3.0  | 4.0  | V                | $V_{DS}=V_{GS}, I_D=250\mu\text{A}$                           |
| $g_{fs}$     | Forward transconductance             | —    | 58   | —    | S                | $V_{DS}=5\text{V}, I_D=30\text{A}$                            |
| $I_{DSS}$    | Drain-to-Source leakage current      | —    | —    | 1    | $\mu\text{A}$    | $V_{DS}=100\text{V}, V_{GS}=0\text{V}$                        |
|              |                                      | —    | —    | 10   |                  | $V_{DS}=100\text{V}, V_{GS}=0\text{V}, T_J=150^\circ\text{C}$ |

|                     |                                |   |      |      |    |   |
|---------------------|--------------------------------|---|------|------|----|---|
| I <sub>GSS</sub>    | Gate-to-Source forward leakage | — | —    | 100  | nA | V <sub>GS</sub> =20V                    |
|                     | Gate-to-Source reverse leakage | — | —    | -100 |    | V <sub>GS</sub> =-20V                   |
| Q <sub>g</sub>      | Total gate charge              | — | 90   | —    | nC | I <sub>D</sub> =30A                     |
| Q <sub>gs</sub>     | Gate-to-Source charge          | — | 14   | —    |    | V <sub>DD</sub> =30V                    |
| Q <sub>gd</sub>     | Gate-to-Drain("Miller") charge | — | 24   | —    |    | V <sub>GS</sub> =10V                    |
| t <sub>d(on)</sub>  | Turn-on delay time             | — | 18.2 | —    | nS | V <sub>DD</sub> =30V                    |
| t <sub>r</sub>      | Rise time                      | — | 15.6 | —    |    | I <sub>D</sub> =2A, R <sub>L</sub> =15Ω |
| t <sub>d(off)</sub> | Turn-Off delay time            | — | 70.5 | —    |    | R <sub>G</sub> =2.5Ω                    |
| t <sub>f</sub>      | Fall time                      | — | 13.8 | —    |    | V <sub>GS</sub> =10V                    |
| C <sub>iss</sub>    | Input capacitance              | — | 3150 | —    | pF | V <sub>GS</sub> =0V                     |
| C <sub>oss</sub>    | Output capacitance             | — | 300  | —    |    | V <sub>DS</sub> =25V                    |
| C <sub>rss</sub>    | Reverse transfer capacitance   | — | 240  | —    |    | f=1.0MHZ                                |

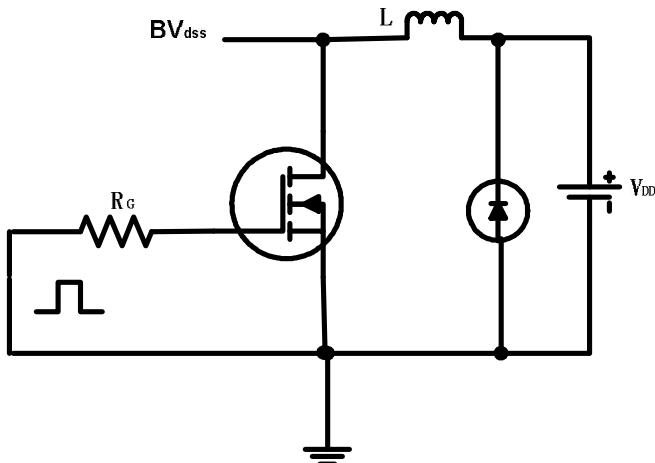
### Source-Drain Ratings and Characteristics

|                 | Parameter                                 | Min.   | Typ. | Max. | Units | Test Conditions   |
|-----------------|---|--|------|------|-------|---|
| I <sub>S</sub>  | Continuous Source Current<br>(Body Diode) | —  | —    | 60   | A     | MOSFET symbol showing the integral reverse p-n junction diode.                      |
| I <sub>SM</sub> | Pulsed Source Current<br>(Body Diode) ①   | —  | —    | 240  |       |  |
| V <sub>SD</sub> | Diode Forward Voltage                     | —  | —    | 1.3  | V     | T <sub>J</sub> =25°C, I <sub>S</sub> =30A, V <sub>GS</sub> =0V ③                    |
| t <sub>rr</sub> | Reverse Recovery Time                     | —  | 57   | —    | nS    | T <sub>J</sub> =25°C, I <sub>F</sub> =60A<br>di/dt=100A/μs ③                        |
| Q <sub>rr</sub> | Reverse Recovery Charge                   | —  | 107  | —    | nC    |   |
| t <sub>on</sub> | Forward Turn-on Time                      | Intrinsic turn-on time is negligible (turn-on is dominated by L <sub>s</sub> + LD) |      |      |       |   |

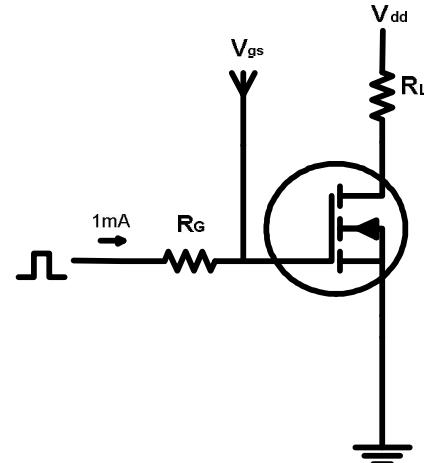
Notes:

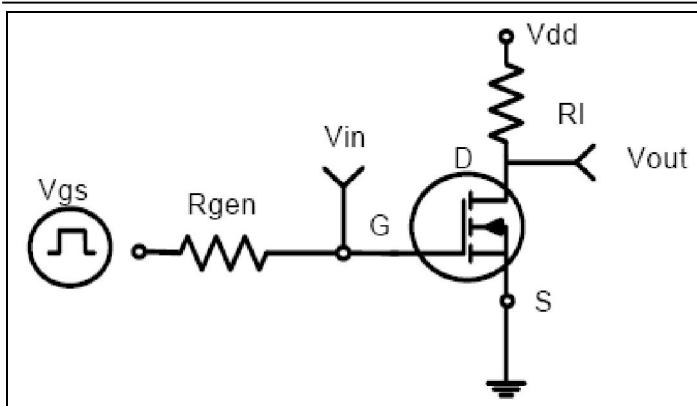
- ① Repetitive rating; pulse width limited by max junction temperature.
- ② Test condition: L = 0.3mH, ID = 40A, V<sub>DD</sub> = 50V
- ③ Pulse width≤300μS, duty cycle≤1.5% ; RG = 25Ω Starting TJ = 25°C

**EAS test circuit**

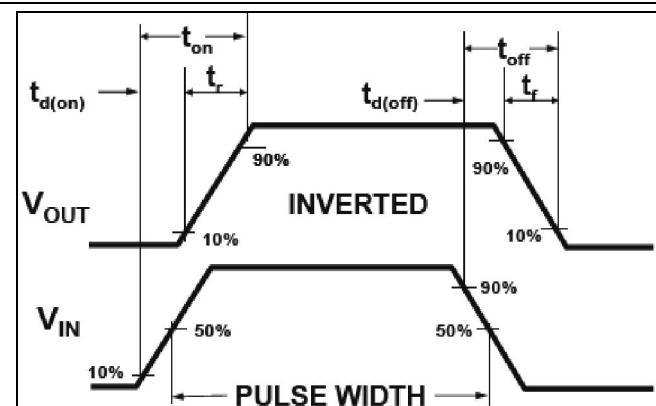


**Gate charge test circuit**

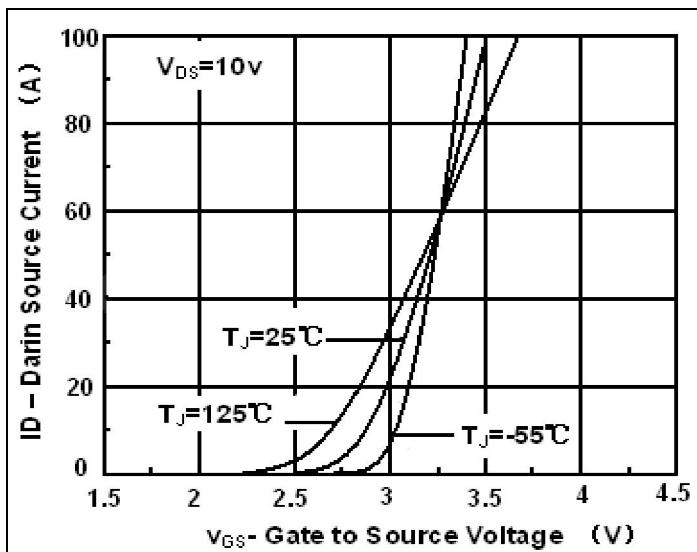




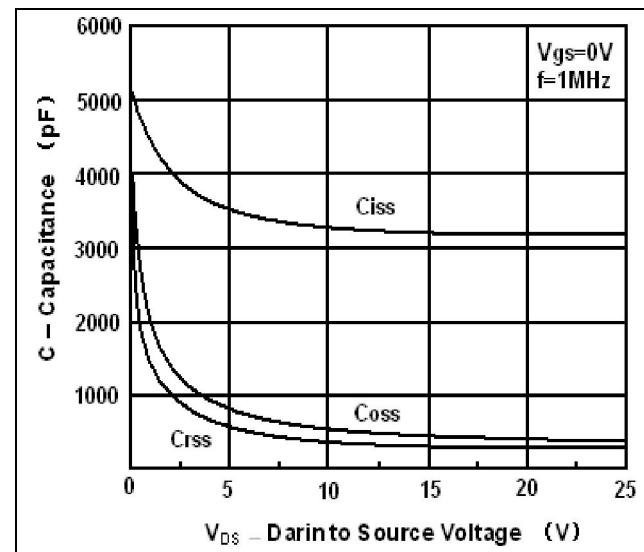
Switch Time Test Circuit:



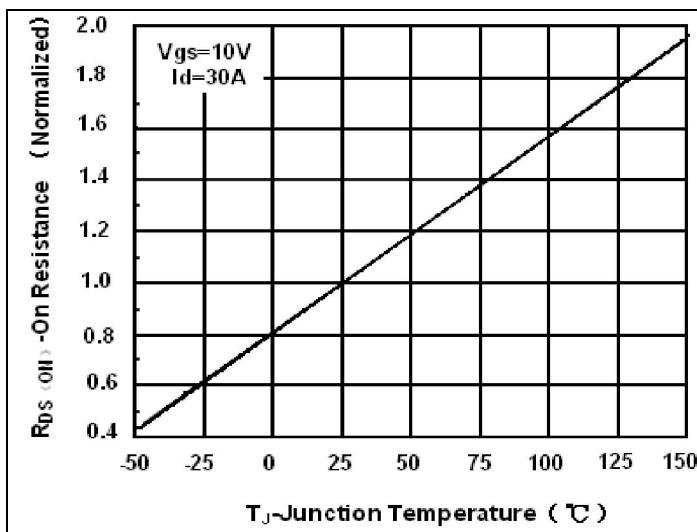
Switch Waveforms:



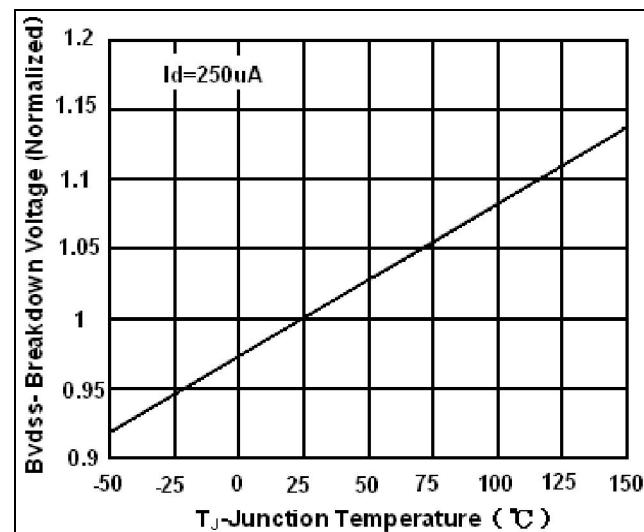
Transfer Characteristic



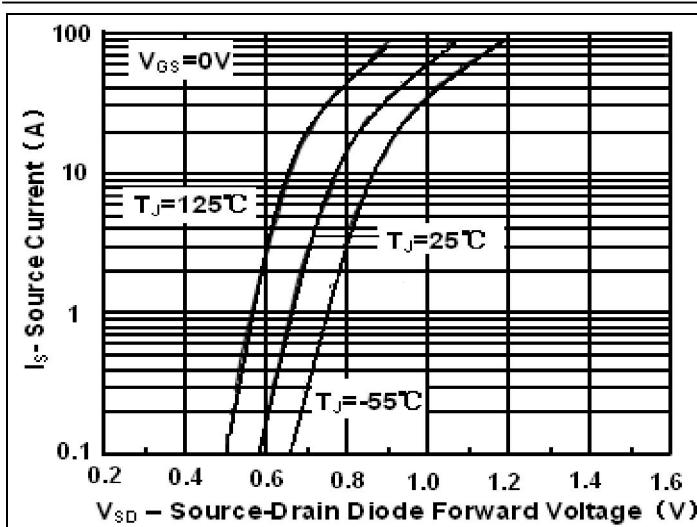
Capacitance



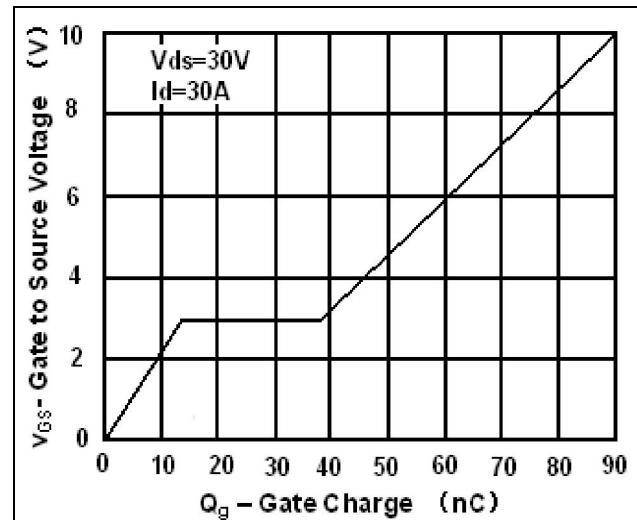
On Resistance vs. Junction Temperature



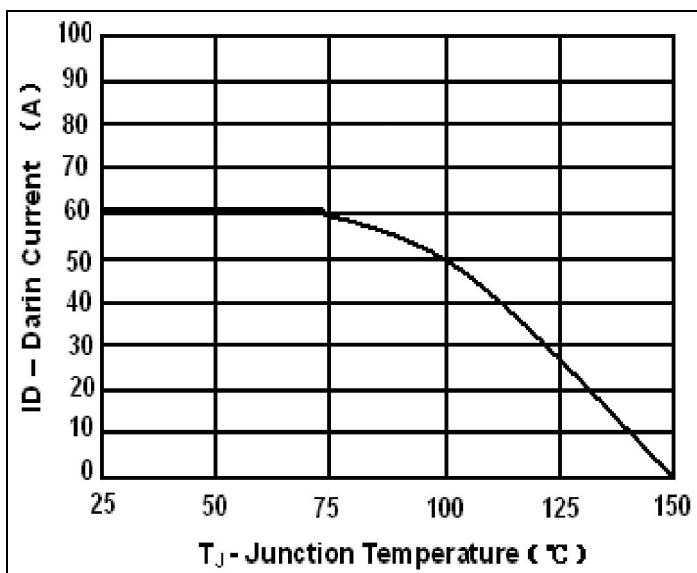
Breakdown Voltage vs. Junction Temperature



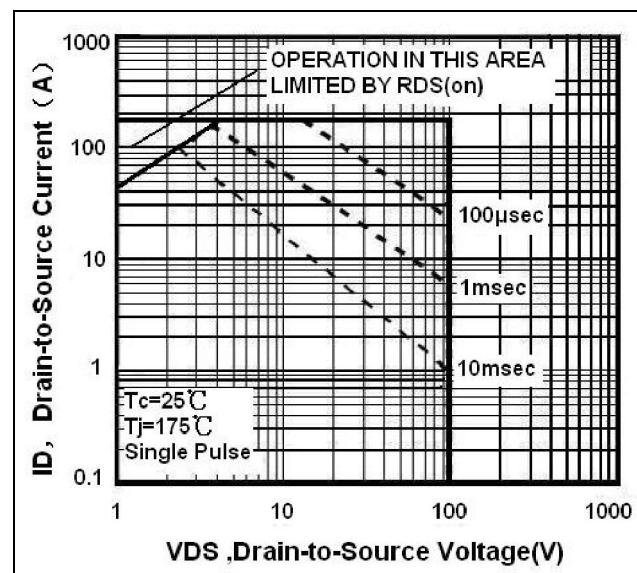
Source-Drain Diode Forward Voltage



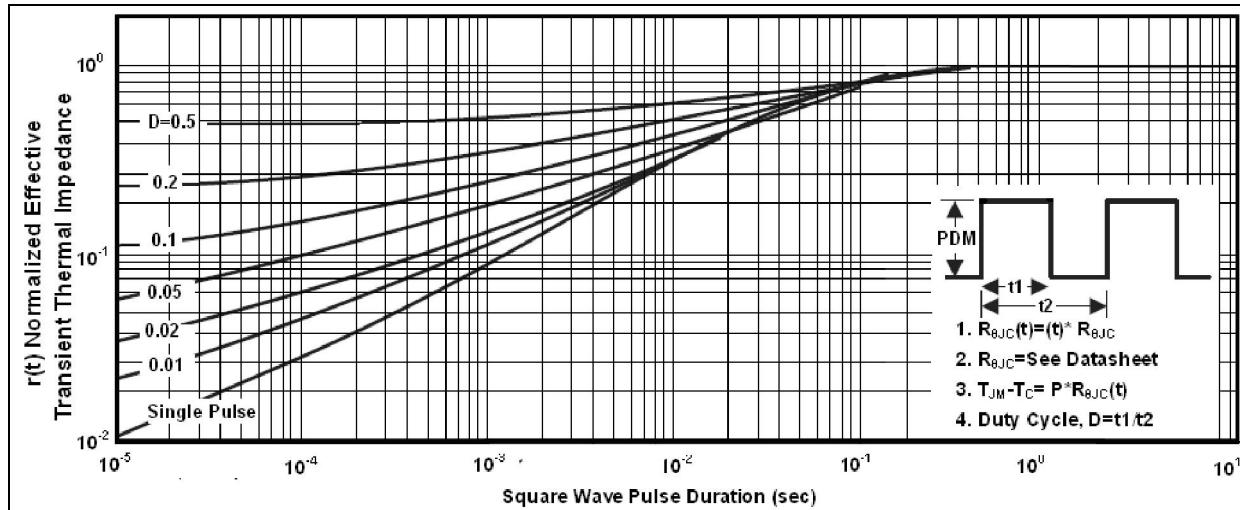
Gate Charge



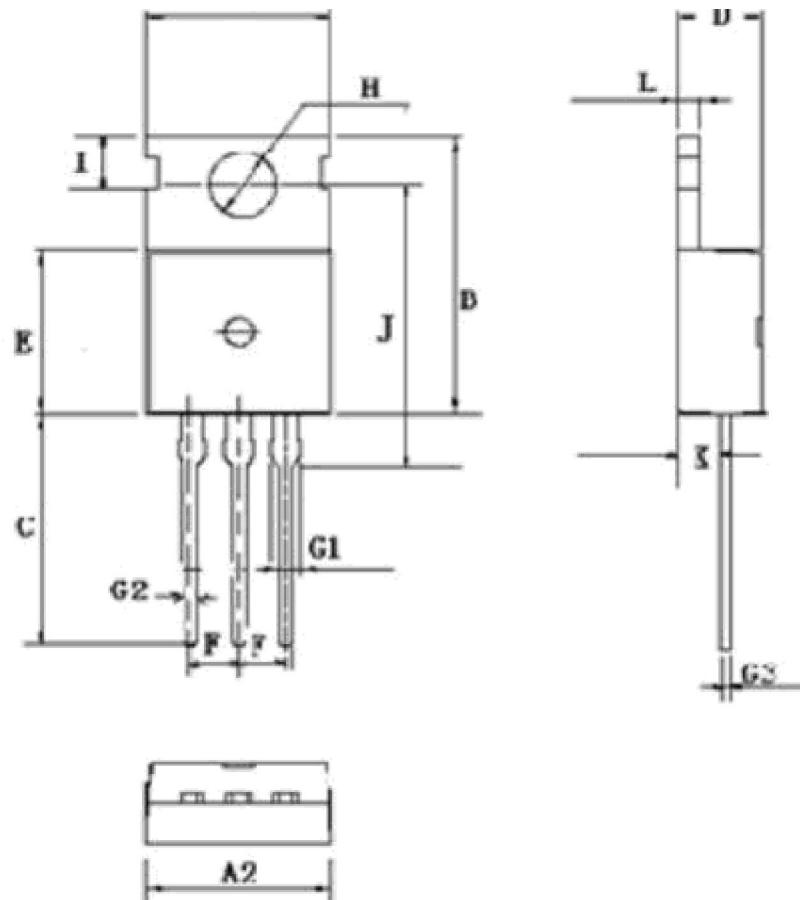
Max Drain Current vs. Junction Temperature



Safe Operation Area



Transient Thermal Impedance Curve

**TO220 MECHANICAL DATA**

**TO-220 3L**

| SYMBOL     | DIMENSIONS  |
|------------|-------------|
| A(mm)      | 9.66~10.28  |
| A2(mm)     | 9.80~10.20  |
| B(mm)      | 15.6~15.8   |
| C(mm)      | 12.70~14.27 |
| D(mm)      | 4.30~4.70   |
| E(mm)      | 8.59~9.40   |
| F(mm)      | 2.54 (nom)  |
| G1(mm)     | 1.42~1.62   |
| G2(mm)     | 0.70~0.95   |
| G3(mm)     | 0.45~0.60   |
| H(mm) dia. | 3.50~3.70   |
| I(mm)      | 2.7~2.9     |
| J(mm)      | 15.70~16.25 |
| K(mm)      | 2.20~2.90   |
| L(mm)      | 1.15~1.40   |
| M(mm)      | 0.5         |