CURRENT 12 Ampere
VOLTAGE RANG 650 Volts

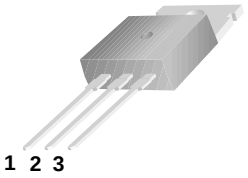
# ASE12N65S

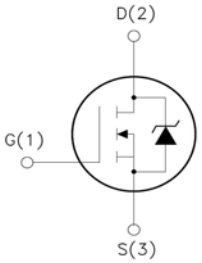
12N65S

**Features:**

- ☐ Low Intrinsic Capacitances
- ☐ Excellent Switching Characteristics
- ☐ Extended Safe Operating Area
- ☐ Unrivalled Gate Charge :Qg= 44nC (Typ.)
- ☐ BVDSS=650V,ID=12A
- ☐ $R_{DS(on)}$ :0.68 Ω (Max) @VG=10V
- ☐ 100% Avalanche Tested

TO-220




1.Gate (G)
2.Drain (D)
3.Source (S)

## Absolute Maximum Ratings (Ta=25℃ unless otherwise noted)

| Symbol | Parameter | | Value | Unit |
|---|---|---|---|---|
| $V_{DSS}$ | Drain-Source Voltage | | 650 | V |
| $I_D$ | Drain Current | $T_j$=25℃ | 12 | A |
| | | $T_j$=100℃ | 7.9 | |
| $V_{GS(TH)}$ | Gate Threshold Voltage | | ±30 | V |
| $E_{AS}$ | Single Pulse Avalanche Energy (note1) | | 660 | mJ |
| $I_{AR}$ | Avalanche Current (note2) | | 12 | A |
| $P_D$ | Power Dissipation (Tj=25℃) | | 140 | W |
| $T_j$ | Junction Temperature(Max) | | 150 | ℃ |
| $T_{stg}$ | Storage Temperature | | -55~+150 | ℃ |
| TL | Maximum lead temperature for soldering purpose,1/8" from case for 5 seconds | | 300 | ℃ |

## Thermal Characteristics

| Symbol | Parameter | Typ. | Max. | Unit |
|---|---|---|---|---|
| $R_{\theta JC}$ | Thermal Resistance,Junction to Case | - | 0.89 | ℃/W |
| $R_{\theta JA}$ | Thermal Resistance,Junction to Ambient | - | 62.5 | ℃/W |

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## Electrical Characteristics (Ta=25℃ unless otherwise noted)

| Symbol | Parameter | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $I_D$=250μA，$V_{GS}$=0 | 650 | - | - | V |
| △BVDSS/△TJ | Breakdown Voltage Temperature Coefficient | $I_D$=250μA ,Reference to 25℃ | - | 0.71 | - | V/℃ |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$=650V, $V_{GS}$=0V | - | - | 10 | μA |
| | | $V_{DS}$=520V, Tj=125℃ | | | 100 | |
| $I_{GSSF}$ | Gate-body leakage Current, Forward | $V_{GS}$=+30V, $V_{DS}$=0V | - | - | 100 | nA |
| $I_{GSSR}$ | Gate-body leakage Current, Reverse | $V_{GS}$=-30V, $V_{DS}$=0V | - | - | -100 | |
| **On Characteristics** | | | | | | |
| $V_{GS(TH)}$ | Date Threshold Voltage | $I_D$=250μA,$V_{DS}$=$V_{GS}$ | 2 | - | 4 | V |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $I_D$=6.0A,$V_{GS}$=10V | - | - | 0.68 | Ω |
| **Dynamic Characteristics** | | | | | | |
| Ciss | Input Capacitance | $V_{DS}$=25V，$V_{GS}$=0，f=1.0MHz | - | 1890 | - | pF |
| Coss | Output Capacitance | | - | 150 | - | |
| Crss | Reverse Transfer Capacitance | | - | 18 | - | |
| **Switching Characteristics** | | | | | | |
| Td(on) | Turn-On Delay Time | $V_{DD}$=300V，$I_D$=12A $R_G$=25Ω (Note 3,4) | - | 30 | 70 | ns |
| Tr | Turn-On Rise Time | | - | 80 | 165 | |
| Td(off) | Turn-Off Delay Time | | - | 144 | 300 | |
| Tf | Turn-Off Rise Time | | - | 77 | 165 | |
| Qg | Total Gate Charge | $V_{DS}$=520V,$V_{GS}$=10V，$I_D$=12A (Note 3,4) | - | 44 | 47 | nC |
| Qgs | Gate-Source Charge | | - | 6.7 | - | |
| Qgd | Gate-Drain Charge | | - | 18.5 | - | |
| **Drain-Source Diode Characteristics and Maximum Ratings** | | | | | | |
| Is | Max. Diode Forward Current | - | - | - | 12 | A |
| $I_{SM}$ | Max. Pulsed Forward Current | - | - | - | 48 | |
| $V_{SD}$ | Diode Forward Voltage | $I_D$=12A | - | - | 1.4 | V |
| Trr | Reverse Recovery Time | $I_S$=12A,$V_{GS}$ =0V diF/dt=100A/μs (Note3) | - | 380 | - | nS |
| Qrr | Reverse Recovery Charge | | - | 3.5 | - | μC |

Notes : 1, L=0.5mH, IAS=12A, VDD=50V, RG=25Ω, Starting TJ =25°C
2, Repetitive Rating : Pulse width limited by maximum junction temperature
3, Pulse Test : Pulse Width ≤ 300μs, Duty Cycle ≤ 2%
4, Essentially Independent of Operating Temperature

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## Typical Characteristics

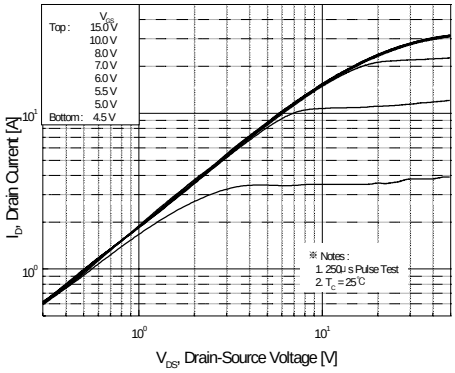


**Figure 1. On-Region Characteristics**

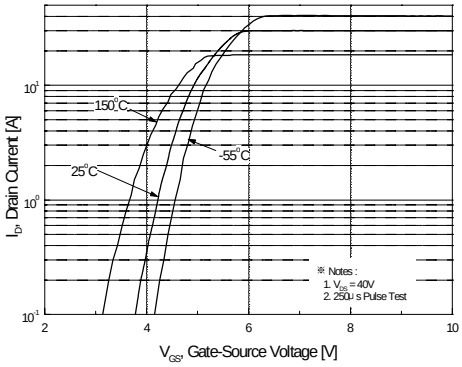


**Figure 2. Transfer Characteristics**

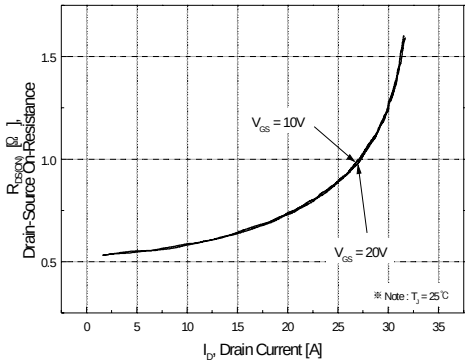


**Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage**

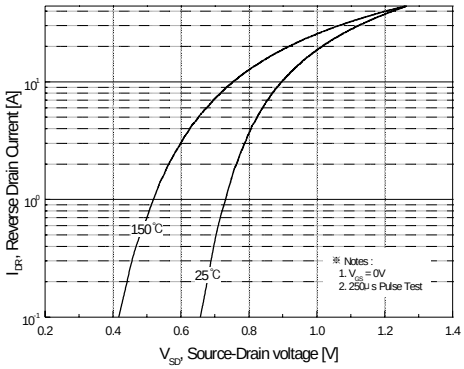


**Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature**

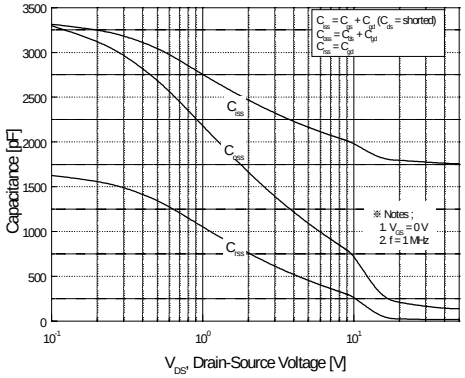


**Figure 5. Capacitance Characteristics**

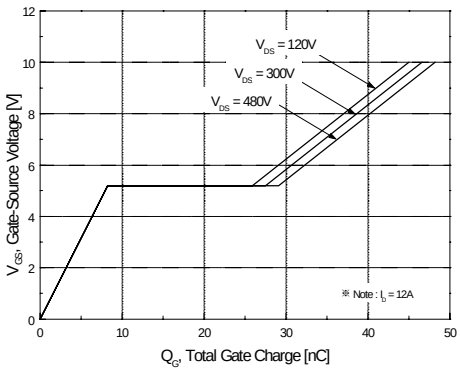


**Figure 6. Gate Charge Characteristics**

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**Typical Characteristics** (Continued)

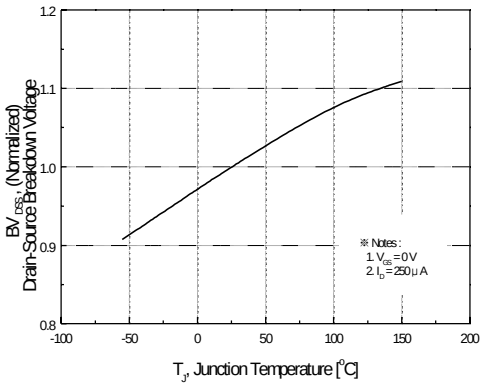


**Figure 7. Breakdown Voltage Variation vs Temperature**

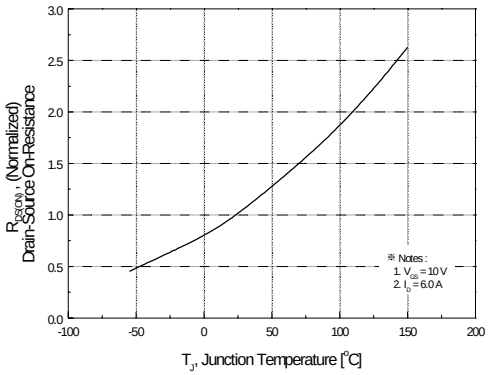


**Figure 8. On-Resistance Variation vs Temperature**

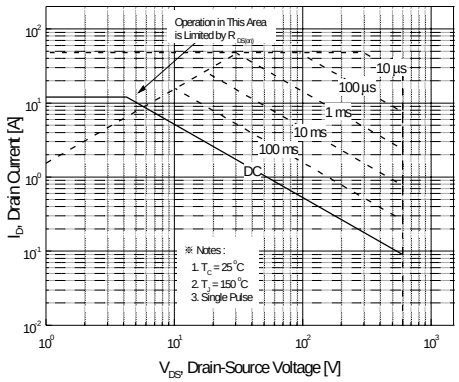


**Figure 9-2. Maximum Safe Operating Area**

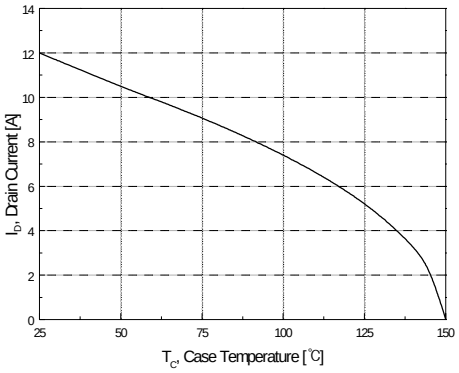


**Figure 10. Maximum Drain Current vs Case Temperature**

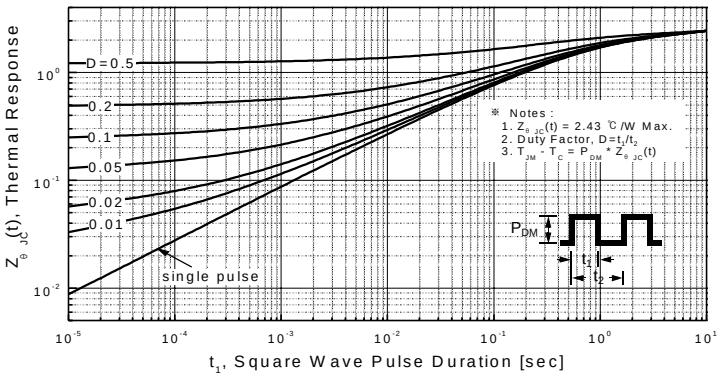


**Figure 11-2. Transient Thermal Response Curve**

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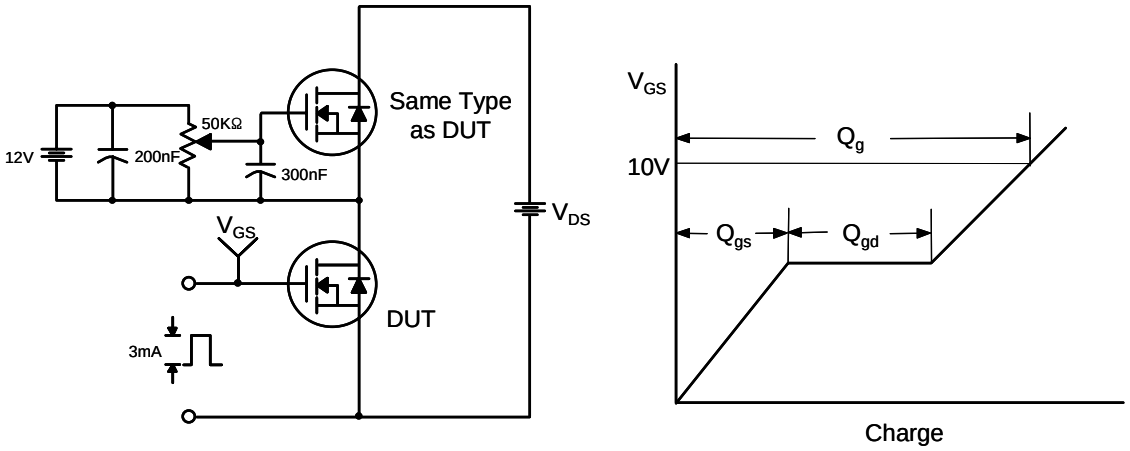
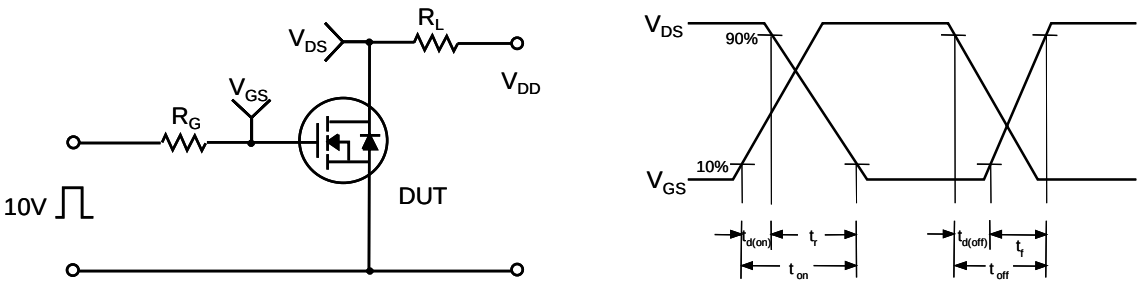
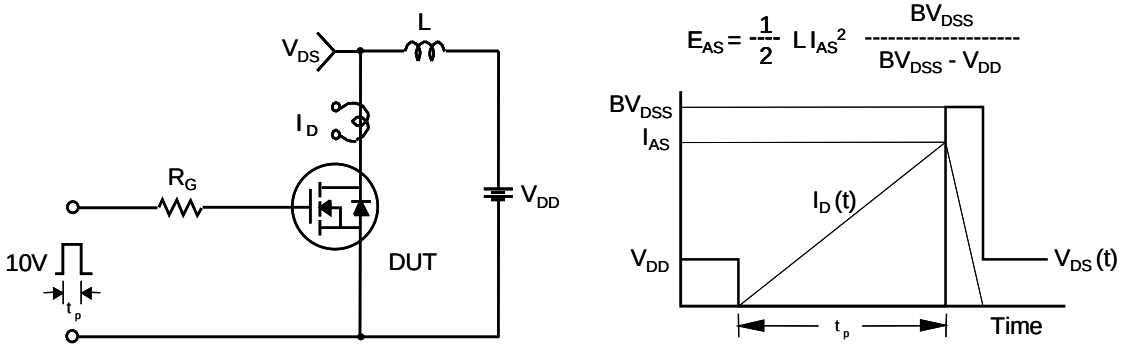
**Gate Charge Test Circuit & Waveform**




**Resistive Switching Test Circuit & Waveforms**




**Unclamped Inductive Switching Test Circuit & Waveforms**



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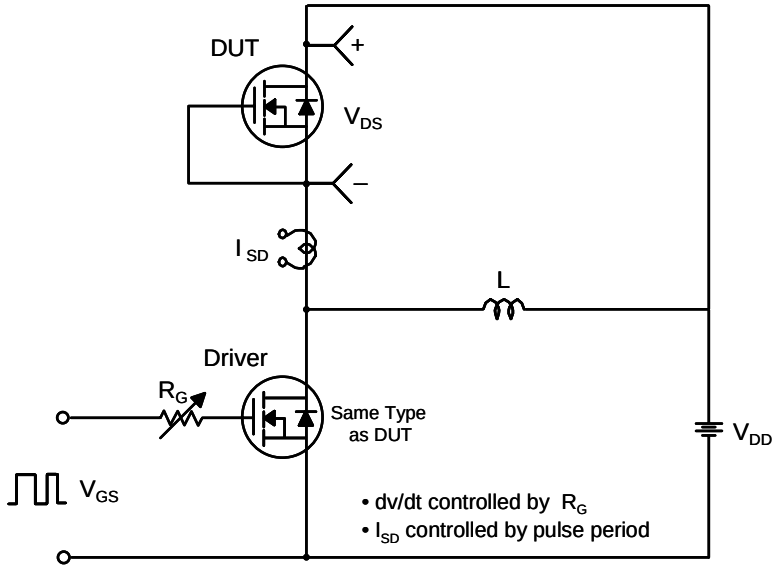
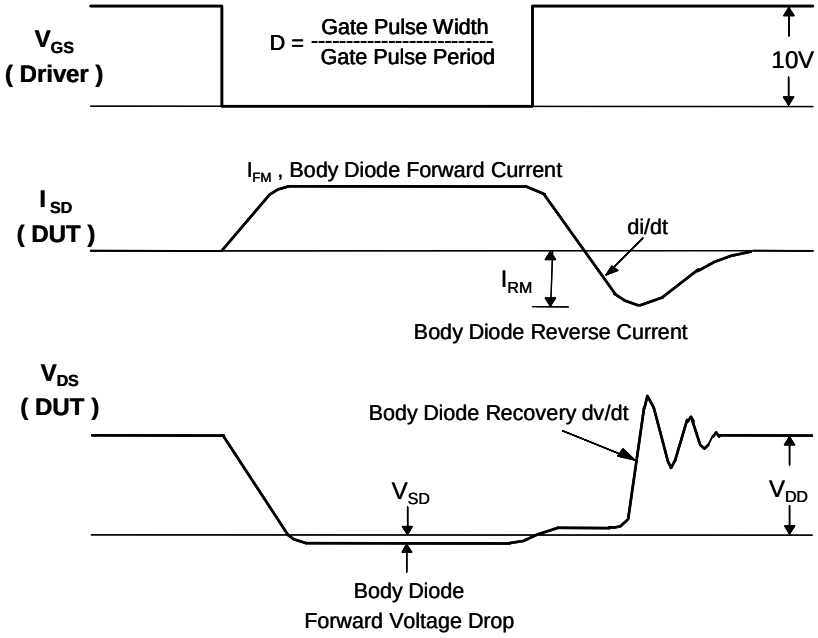
**Peak Diode Recovery dv/dt Test Circuit & Waveforms**



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## Package Dimension

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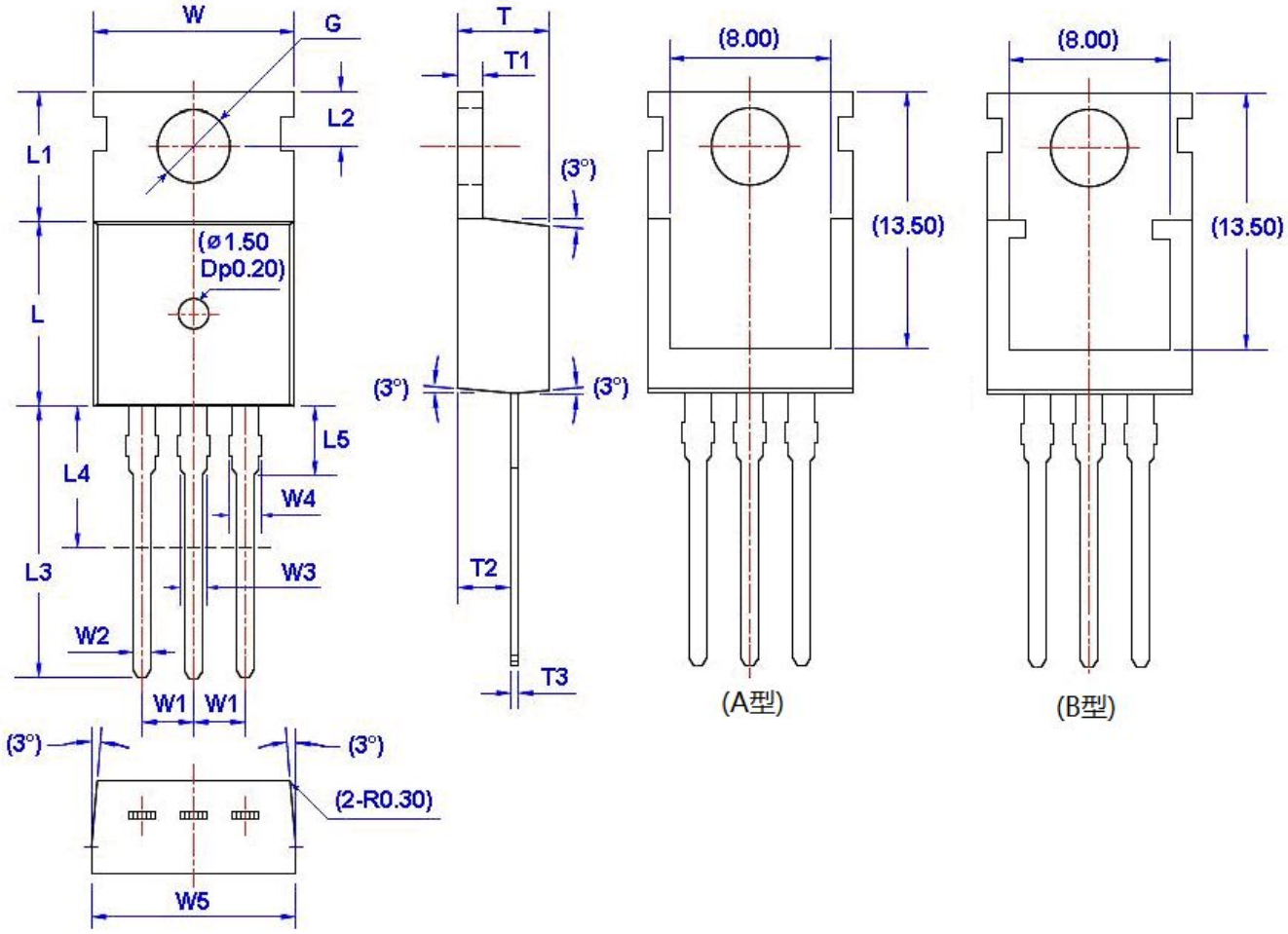
Unit: mm




| Symbol | Size | | Symbol | Size | | Symbol | Size | | Symbol | Size | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Min | Max | | Min | Max | | Min | Max | | Min | Max |
| W | 9.66 | 10.28 | W5 | 9.80 | 10.20 | L4** | 6.20 | 6.60 | T3 | 0.45 | 0.60 |
| W1 | 2.54（TYP） | | L | 9.00 | 9.40 | L5 | 2.79 | 3.30 | G(Φ) | 3.50 | 3.70 |
| W2 | 0.70 | 0.95 | L1 | 6.40 | 6.80 | T | 4.30 | 4.70 | | | |
| W3 | 1.17 | 1.37 | L2 | 2.70 | 2.90 | T1 | 1.15 | 1.40 | | | |
| W4* | 1.32 | 1.72 | L3 | 12.70 | 14.27 | T2 | 2.20 | 2.60 | | | |