

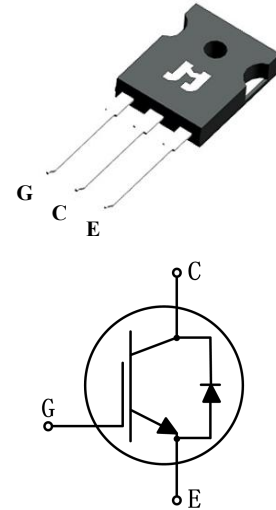
Key performance:

- $V_{CE}=1200V$
- $I_C=25A@T_C=100^{\circ}C$
- $V_{CE(sat)}=1.7V$

TO-247

Features:

- Trench and field-stop technology
- High speed switching
- Low collector to emitter saturation voltage
- Easy parallel switching capability
- Short circuit withstands time 10 μ s
- High ruggedness performance
- RoHS compliant


Applications:

- General inverter
- Motor drives

Package parameters

| Type | Marking | Package | Packaging Method |
|-------------|----------|---------|------------------|
| JJT25N120SE | T25120SE | TO-247 | Tube |

Maximum ratings

| Symbol | Parameter | Values | Unit |
|-----------|--|-------------|------------------|
| V_{CES} | Collector-emitter voltage | 1200 | V |
| V_{GES} | Gate-emitter voltage | ± 20 | V |
| I_C | Continuous collector current ($T_C=25^\circ\text{C}$) | 50 | A |
| | Continuous collector current ($T_C=100^\circ\text{C}$) | 25 | A |
| I_{CM} | Pulsed collector current, t_p limited by T_{vjmax} | 100 | A |
| I_F | Diode continuous forward current ($T_C=100^\circ\text{C}$) | 25 | A |
| I_{FM} | Diode maximum current, t_p limited by T_{vjmax} | 100 | A |
| t_{sc} | Short circuit withstand time | 10 | μs |
| P_{tot} | Power dissipation ($T_C=25^\circ\text{C}$) | 428 | W |
| | Power dissipation ($T_C=100^\circ\text{C}$) | 214 | W |
| T_{vj} | Operating junction temperature range | -40 to +175 | $^\circ\text{C}$ |
| T_{stg} | Storage temperature range | -55 to +150 | $^\circ\text{C}$ |

Thermal characteristics

| Symbol | Parameter | Values | | Unit |
|---------------|--|--------|------|------|
| | | Typ. | Max. | |
| $R_{th(j-c)}$ | Thermal resistance, junction to case for IGBT | - | 0.35 | K/ W |
| $R_{th(j-c)}$ | Thermal resistance, junction to case for Diode | - | 0.90 | K/ W |
| $R_{th(j-a)}$ | Thermal resistance, junction to ambient | - | 40 | K/ W |

Electrical characteristics of IGBT ($T_{vj}=25^{\circ}\text{C}$ unless otherwise specified)

Static characteristics

| Symbol | Parameter | Test condition | Values | | | Unit |
|---------------|--------------------------------------|---|--------|------|------|---------------|
| | | | Min. | Typ. | Max. | |
| BV_{CES} | Collector-emitter breakdown voltage | $V_{GE}=0\text{V}, I_C=250\mu\text{A}$ | 1200 | - | - | V |
| I_{CES} | Collector-emitter leakage current | $V_{CE}=1200\text{V}, V_{GE}=0\text{V}$ | - | - | 100 | μA |
| I_{GES} | Gate leakage current, forward | $V_{GE}=20\text{V}, V_{CE}=0\text{V}$ | - | - | 100 | nA |
| | Gate leakage current, reverse | $V_{GE}=-20\text{V}, V_{CE}=0\text{V}$ | - | - | -100 | nA |
| $V_{GE(th)}$ | Gate-emitter threshold voltage | $V_{GE}=V_{CE}, I_C=1\text{mA}$ | 5.8 | 6.1 | 6.3 | V |
| $V_{CE(sat)}$ | Collector-emitter saturation voltage | $V_{GE}=15\text{V}, I_C=25\text{A}$ | - | 1.7 | - | V |
| | | $V_{GE}=15\text{V}, I_C=25\text{A}, T_{vj}=175^{\circ}\text{C}$ | - | 2.3 | - | V |

Dynamic characteristics

| Symbol | Parameter | Test condition | Values | | | Unit |
|-----------|------------------------------|---|--------|------|------|------|
| | | | Min. | Typ. | Max. | |
| C_{ies} | Input capacitance | $V_{CE}=30\text{V}$ $V_{GE}=0\text{V}$ $f=1\text{MHz}$ | - | 2080 | - | pF |
| C_{oes} | Output capacitance | | - | 105 | - | pF |
| C_{res} | Reverse transfer capacitance | | - | 20 | - | pF |
| Q_g | Total gate charge | $V_{CC}=960\text{V}$ $V_{GE}=15\text{V}$ $I_C=25\text{A}$ | - | 133 | - | nC |

Switching characteristics

| Symbol | Parameter | Test condition | Values | | | Unit |
|--------------|------------------------|--|--------|------|------|------|
| | | | Min. | Typ. | Max. | |
| $t_{d(on)}$ | Turn-on delay time | $V_{CC}=600V$ $V_{GE}=0/15V$ $I_C=25A$ $R_G=10\Omega$ Inductive load | - | 31 | - | ns |
| t_r | Rise time | | - | 62 | - | ns |
| $t_{d(off)}$ | Turn-off delay time | | - | 184 | - | ns |
| t_f | Fall time | | - | 59 | - | ns |
| E_{on} | Turn-on energy | | - | 2.0 | - | mJ |
| E_{off} | Turn-off energy | | - | 0.9 | - | mJ |
| E_{ts} | Total switching energy | | - | 2.9 | - | mJ |
| $t_{d(on)}$ | Turn-on delay time | $V_{CC}=600V$ $V_{GE}=0/15V$ $I_C=25A$ $R_G=10\Omega$ Inductive load $T_{vj}=175^\circ C$ | - | 33 | - | ns |
| t_r | Rise time | | - | 67 | - | ns |
| $t_{d(off)}$ | Turn-off delay time | | - | 206 | - | ns |
| t_f | Fall time | | - | 87 | - | ns |
| E_{on} | Turn-on energy | | - | 3.1 | - | mJ |
| E_{off} | Turn-off energy | | - | 1.3 | - | mJ |
| E_{ts} | Total switching energy | | - | 4.4 | - | mJ |

Electrical characteristics of Diode ($T_{vj}=25^{\circ}\text{C}$ unless otherwise specified)

| Symbol | Parameter | Test condition | Values | | | Unit |
|-----------|-------------------------------------|---|--------|------|------|------|
| | | | Min. | Typ. | Max. | |
| V_F | Diode forward voltage | $I_F=25\text{A}$ | - | 2.0 | - | V |
| | | $I_F=25\text{A}, T_{vj}=175^{\circ}\text{C}$ | - | 1.6 | - | V |
| t_{rr} | Diode reverse recovery time | $V_R=600\text{V}$ $I_F=25\text{A}$ $di_F/dt=-250\text{A}/\mu\text{s}$ | - | 309 | - | ns |
| I_{rrm} | Diode peak reverse recovery current | | - | 7 | - | A |
| Q_{rr} | Diode reverse recovery charge | | - | 1038 | - | nC |
| t_{rr} | Diode reverse recovery time | $V_R=600\text{V}$ $I_F=25\text{A}$ $di_F/dt=-250\text{A}/\mu\text{s}$ $T_{vj}=175^{\circ}\text{C}$ | - | 480 | - | ns |
| I_{rrm} | Diode peak reverse recovery current | | - | 11 | - | A |
| Q_{rr} | Diode reverse recovery charge | | - | 3000 | - | nC |

Typical performance characteristics

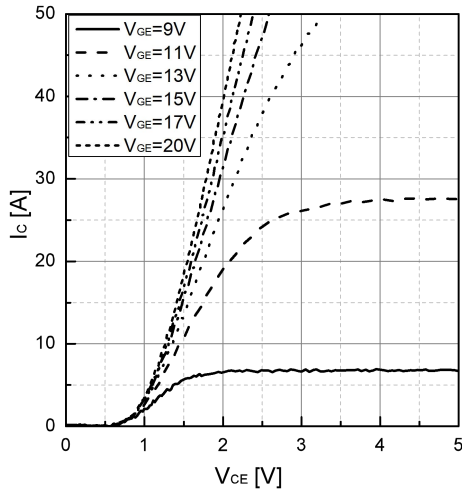


Fig 1. Typical output characteristic ($T_{vj}=25^{\circ}\text{C}$)

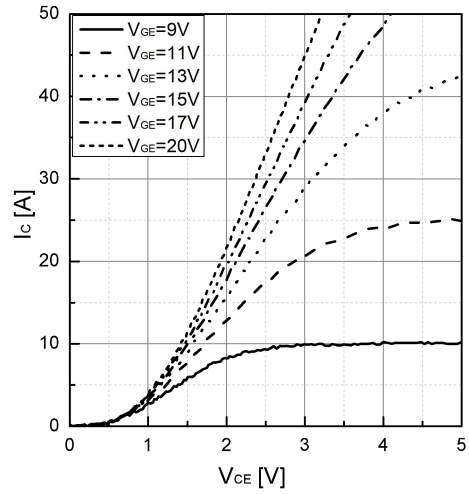


Fig 2. Typical output characteristic ($T_{vj}=175^{\circ}\text{C}$)

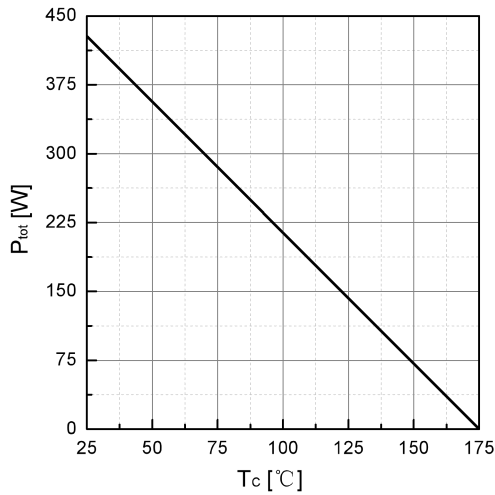


Fig 3. Power dissipation as a function of T_c

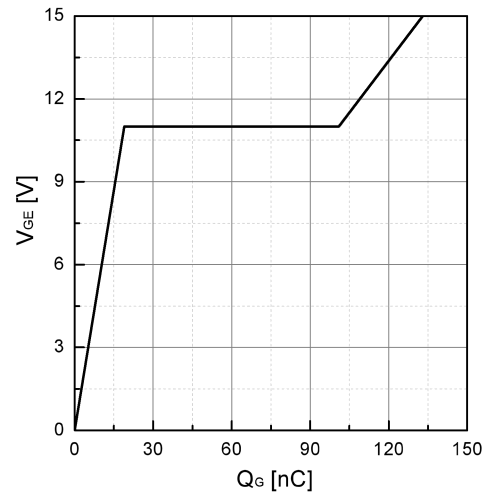


Fig 4. Typical Gate charge

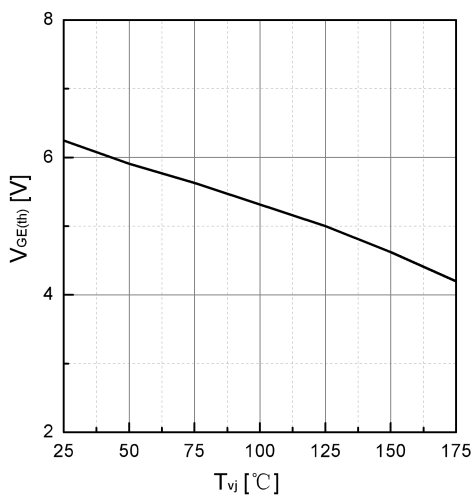


Fig 5. Typical $V_{GE(th)}$ as a function of T_{vj}
($I_C=1\text{mA}$)

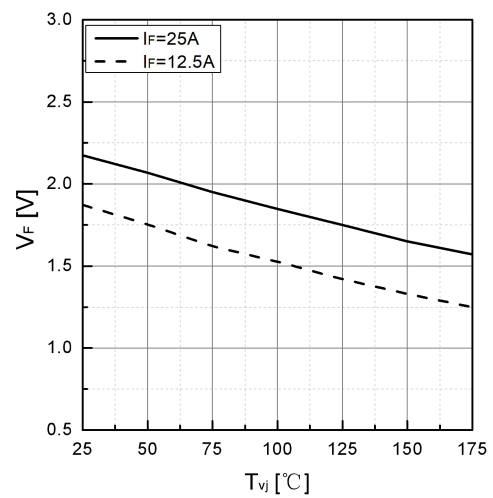


Fig 6. Typical V_F as a function of T_{vj}

Typical performance characteristics

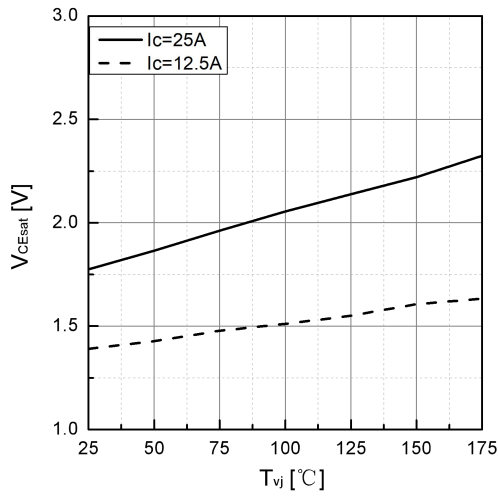


Fig 7. Typical V_{CEsat} as a function of T_{vj}

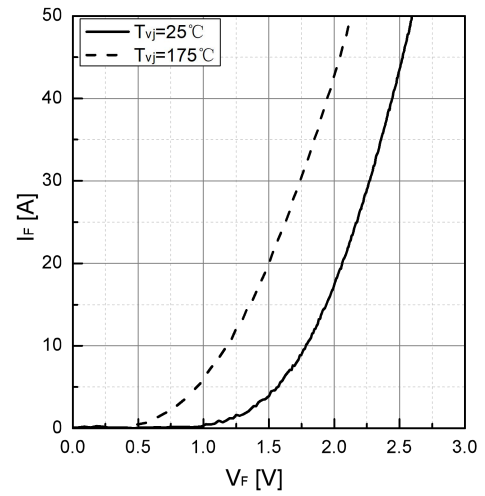


Fig 8. Typical I_F as a function of V_F

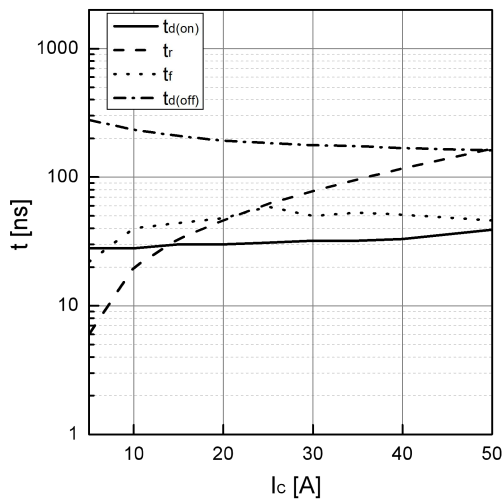


Fig 9. Typical switching time as a function of I_c

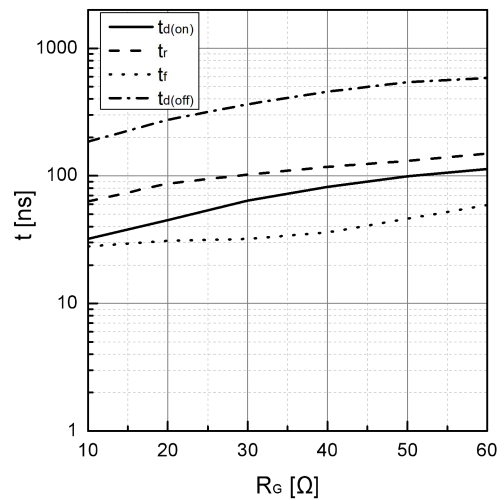


Fig 10. Typical switching times as a function of R_G

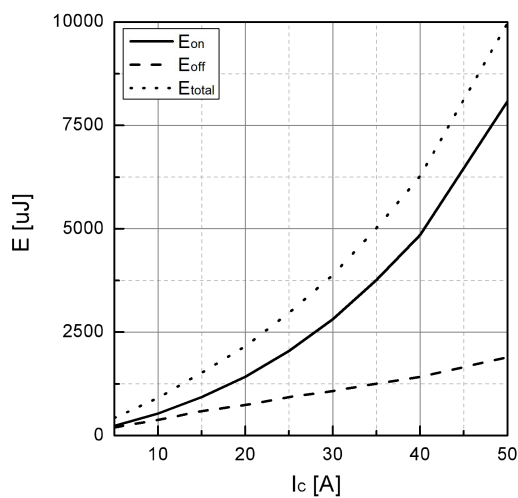


Fig 11. Typical switching energy losses as a function of I_c

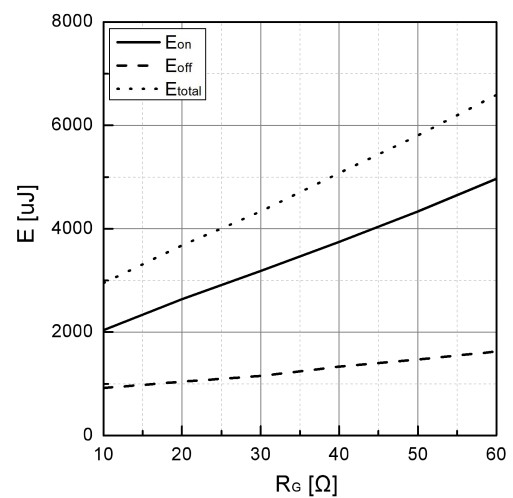


Fig 12. Typical switching energy losses as a function of R_G

Typical performance characteristics

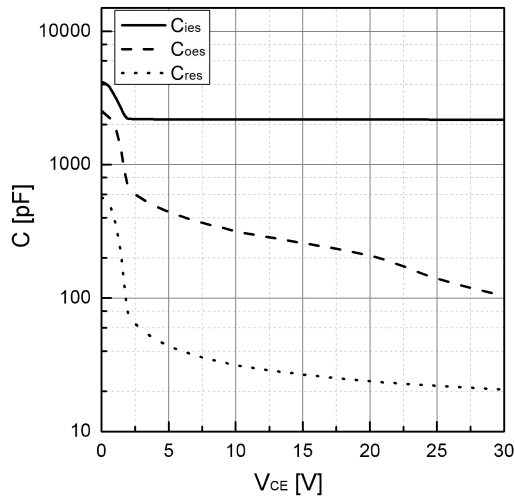


Fig 13. Typical capacitance as a function of V_{CE}
($f=1\text{MHz}$, $V_{GE}=0\text{V}$)

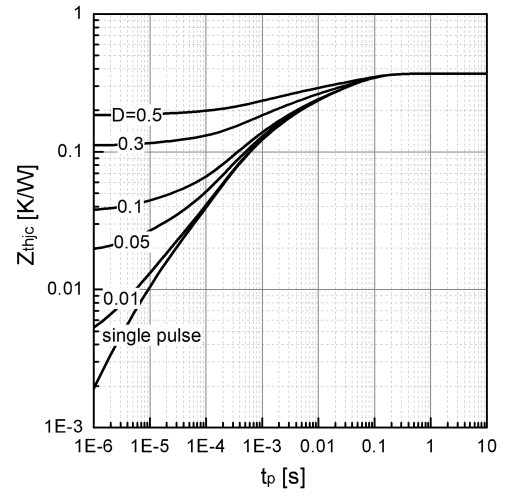
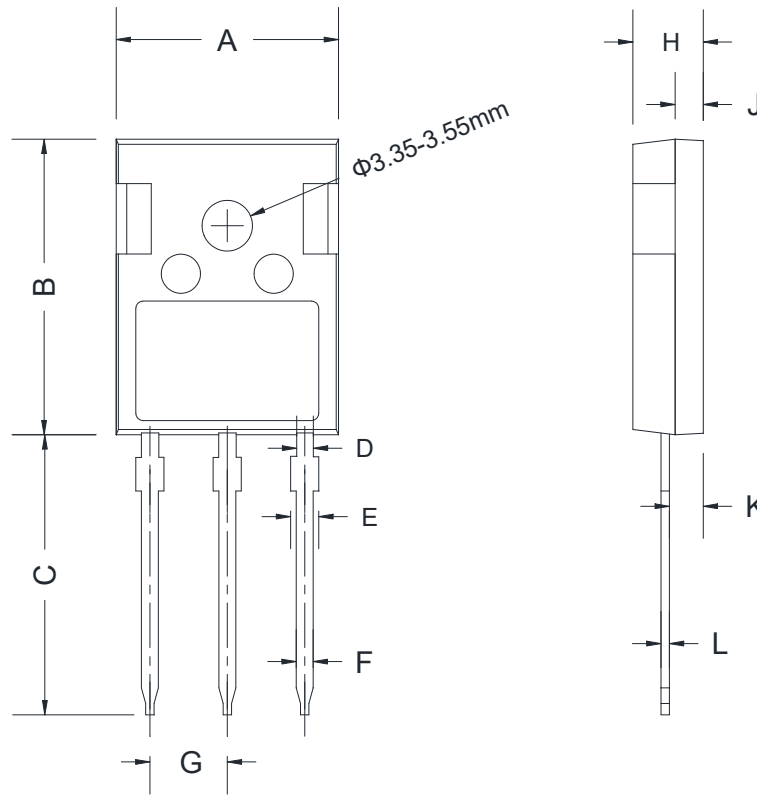


Fig 14. Transient thermal impedance of IGBT

Package dimension

TO-247



| Ref. | Dimensions | | | | | |
|------|-------------|-------|-------|--------|-------|-------|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 15.50 | 15.80 | 16.10 | 0.610 | 0.622 | 0.634 |
| B | 20.80 | 21.00 | 22.20 | 0.819 | 0.827 | 0.835 |
| C | 19.70 | 20.00 | 20.30 | 0.776 | 0.787 | 0.799 |
| D | 1.80 | 2.00 | 2.20 | 0.071 | 0.079 | 0.087 |
| E | 1.90 | 2.10 | 2.30 | 0.075 | 0.083 | 0.091 |
| F | 1.00 | 1.20 | 1.40 | 0.039 | 0.047 | 0.055 |
| G | - | 5.44 | - | - | 0.214 | - |
| H | 4.80 | 5.00 | 5.20 | 0.189 | 0.197 | 0.205 |
| J | 1.90 | 2.00 | 2.10 | 0.075 | 0.079 | 0.083 |
| K | 2.20 | 2.35 | 2.50 | 0.087 | 0.093 | 0.098 |
| L | 0.41 | 0.60 | 0.79 | 0.016 | 0.024 | 0.031 |

Revision history

| Date | Revision | Changes |
|------------|----------|--------------------------|
| 2023-11-12 | Rev 1.0 | Release of the datasheet |
| 2024-03-20 | Rev 1.1 | Update |
| | | |

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