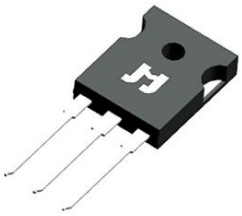
JJMICROELECTRONICS

# 650V 40A Trench and Field Stop IGBT

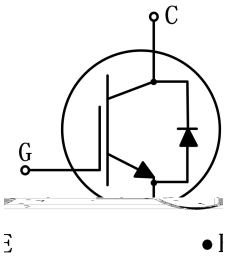
## JJT40N65HE

- $_{CE}$ =650V
- $_{C}$=40A@ $_{C}$=100
- $_{CE(sat)}$=1.7V

TO-247



- Trench and field-stop technology.
- Easy parallel switching capability.




- High efficiency for inverters.
- High ruggedness performance.
- RoHS compliant.

- PFC applications
- Uninterruptible power supplies
- Solar inverters

| Type | Marking | Package | Packaging Method |
|---|---|---|---|
| JJT40N65HE | T4065HE | TO-247 | Tube |

| | | | |
|---|---|---|---|
| CES | Collector-emitter voltage | 650 | V |
| GES | Gate-emitter voltage | ±20 | V |
| C | Continuous collector current ( C=25 ) | 80 | A |
| | Continuous collector current ( C=100 ) | 40 | A |
| CM | Pulsed collector current, p limited by vjmax | 160 | A |
| F | Diode continuous forward current ( C=100 ) | 40 | A |
| FM | Diode maximum current, p limited by vjmax | 160 | A |
| tot | Power dissipation ( C=25 ) | 300 | W |
| | Power dissipation ( C=100 ) | 150 | W |
| vj | Operating junction temperature range | -40 to +175 | |
| stg | Storage temperature range | -55 to +150 | |

| | | | |
|---|---|---|---|
| th(j-c) | Thermal resistance, junction to case for IGBT | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| $_{CES}$ | Collector-emitter breakdown voltage | $_{GE}$=0V, $I_C$=250 A | 650 | - | - | V |
| $_{CES}$ | Collector-emitter leakage current | $_{CE}$=650V, $_{GE}$=0V | - | - | 50 | A |
| $_{GES}$ | Gate | | | | | |

## Switching characteristics

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | |
| $t_{d(on)}$ | Turn-on delay time | $V_{CC}$=400V<br>$V_{GE}$=0/15V<br>$I_C$=40A<br>$R_G$=10Ω<br>Inductive load | - | 32 | - | ns |
| $t_r$ | Rise time | | - | 59 | - | ns |
| $t_{d(off)}$ | Turn-off delay time | | - | 110 | - | ns |
| $t_f$ | Fall time | | - | 52 | - | ns |
| $E_{on}$ | Turn-on energy | | - | 1.2 | - | mJ |
| $E_{off}$ | Turn-off energy | | - | 0.6 | - | mJ |
| $E_{ts}$ | Total switching energy | | - | 1.8 | - | mJ |
| $t_{d(on)}$ | Turn-on delay time | $V_{CC}$=400V<br>$V_{GE}$=0/15V<br>$I_C$=40A<br>$R_G$=10Ω<br>Inductive load<br>$T_{vj}$=175 | - | 28 | - | ns |
| $t_r$ | Rise time | | - | 51 | - | ns |
| $t_{d(off)}$ | Turn-off delay time | | - | 131 | - | ns |
| $t_f$ | Fall time | | - | 78 | - | ns |
| $E_{on}$ | Turn-on energy | | - | 1.6 | - | mJ |
| $E_{off}$ | Turn-off energy | | - | 1.0 | - | mJ |
| $E_{ts}$ | Total switching energy | | - | 2.6 | - | mJ |

( $_{vj}$=25 unless otherwise specified)

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | |
| $_{F}$ | Diode forward voltage | $_{F}$=40A | - | 1.5 | - | V |
| | | $_{F}$=40A, $_{vj}$=175 | - | 1.3 | - | V |
| $_{rr}$ | Diode reverse recovery time | $_{R}$=400V<br>$_{F}$=40A<br>d $_{F}$/d =-1200A/ s | - | 82 | - | ns |
| $_{rrm}$ | Diode peak reverse recovery current | | - | 15 | - | A |
| $_{rr}$ | Diode reverse recovery charge | | - | 1620 | - | nC |
| $_{rr}$ | Diode reverse recovery time | $_{R}$=400V<br>$_{F}$=40A<br>d $_{F}$/d =-1200A/ s<br>$_{vj}$=175 | - | 132 | - | ns |
| $_{rrm}$ | Diode peak reverse recovery current | | - | 43 | - | A |
| $_{rr}$ | Diode reverse recovery charge | | - | 3580 | - | nC |

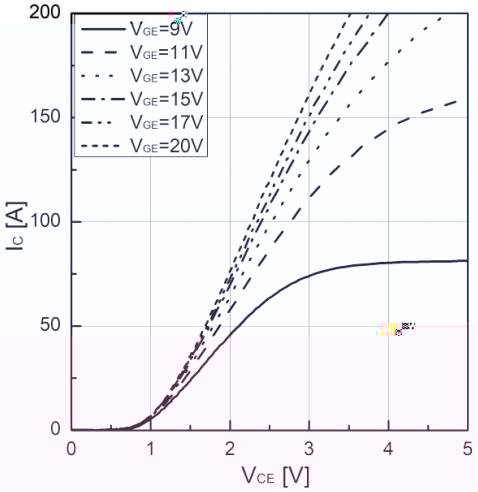



Fig 1. Typical output characteristic ( vj=25 )

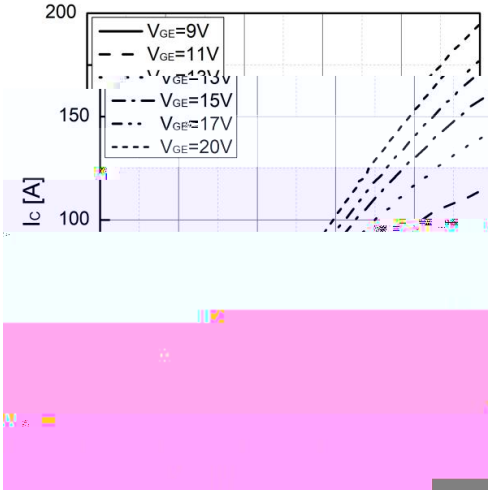



Fig 2. Typical output characteristic( vj=175 )

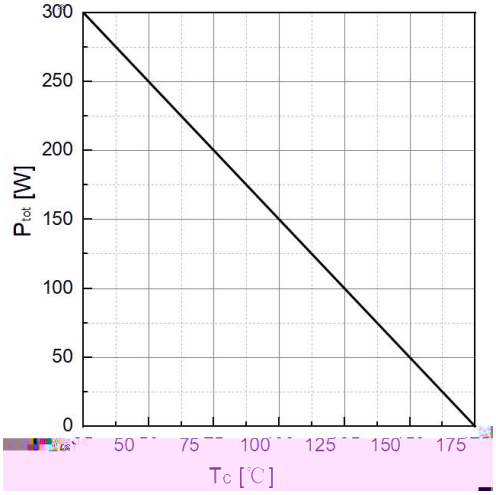



Fig 3. Power dissipation as a function of

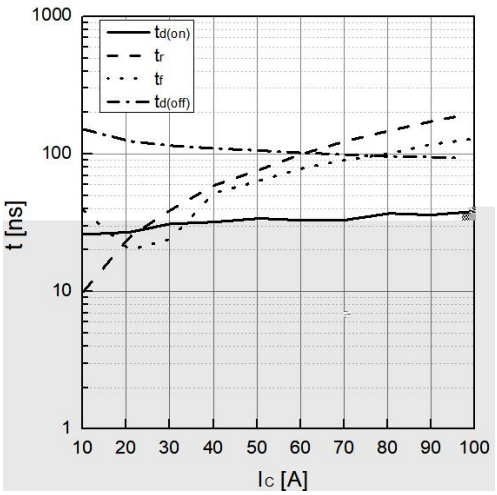



Fig 4. Typical switching time as a function of C

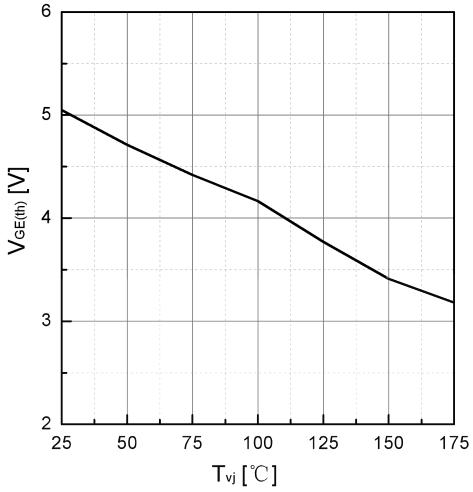



Fig 5. Typical GE(th) as a function of vj ( C=1mA)

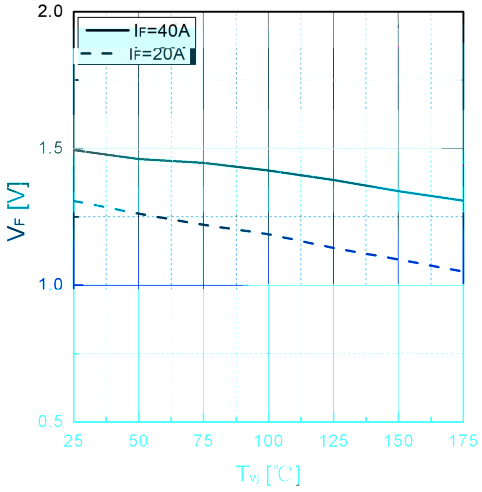



Fig 6. Typical F as a function of vj

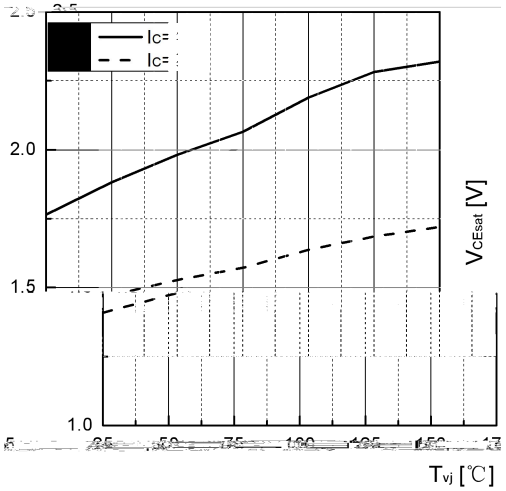



Fig 7. Typical $_{CEsat}$ as a function of $_{vj}$

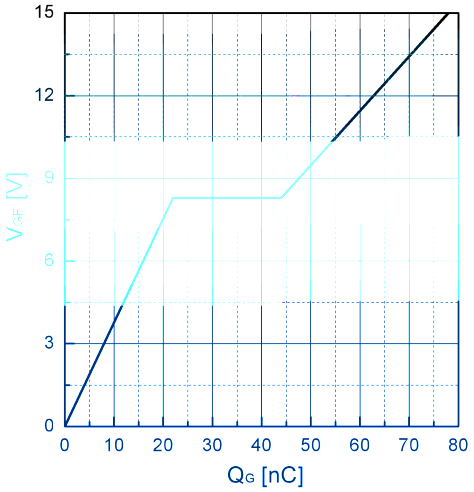



Fig 8. Typical Gate charge

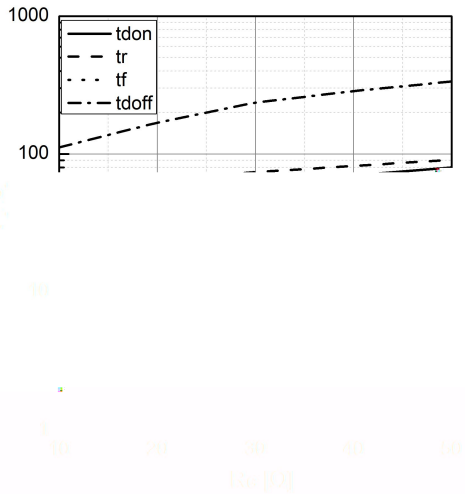



Fig 9. Typical switching times as a function of $_{G}$

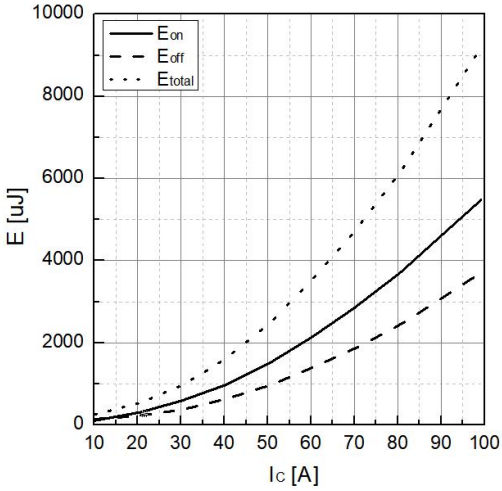



Fig 10. Typical switching energy losses as a function of $_{C}$

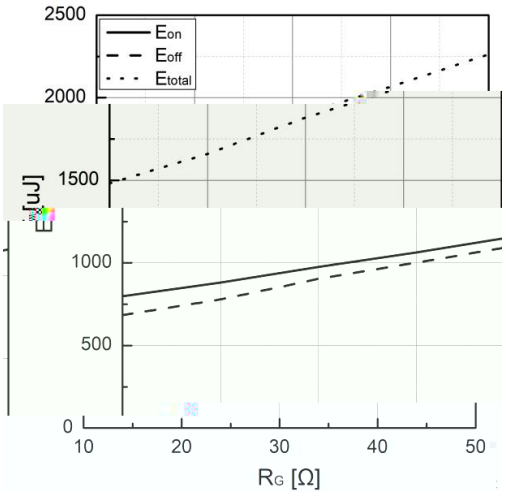



Fig 11. Typical switching energy losses as a function of $_{G}$

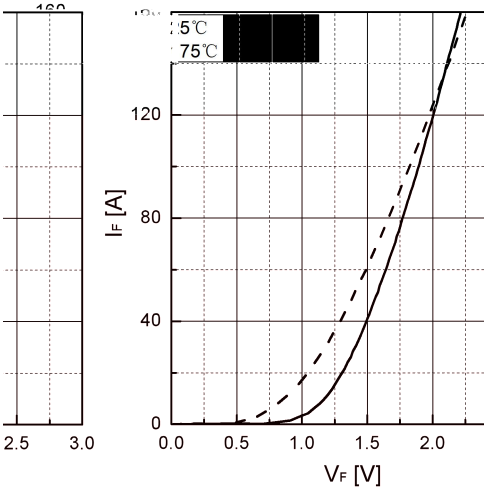



Fig 12. Typical $_{F}$ as a function of $_{F}$

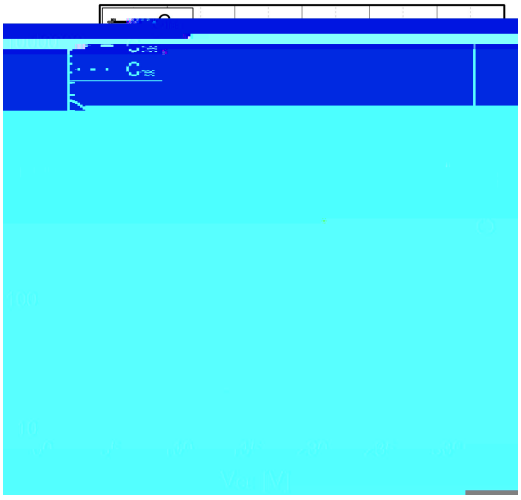


Fig 13. Typical capacitance as a function of $_{CE}$ ($f$=1Mhz, $_{GE}$=0V)

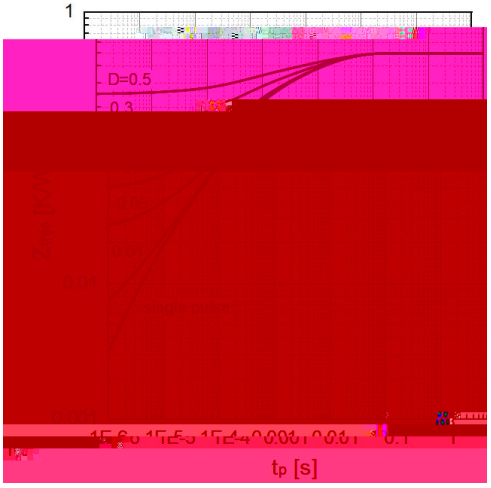
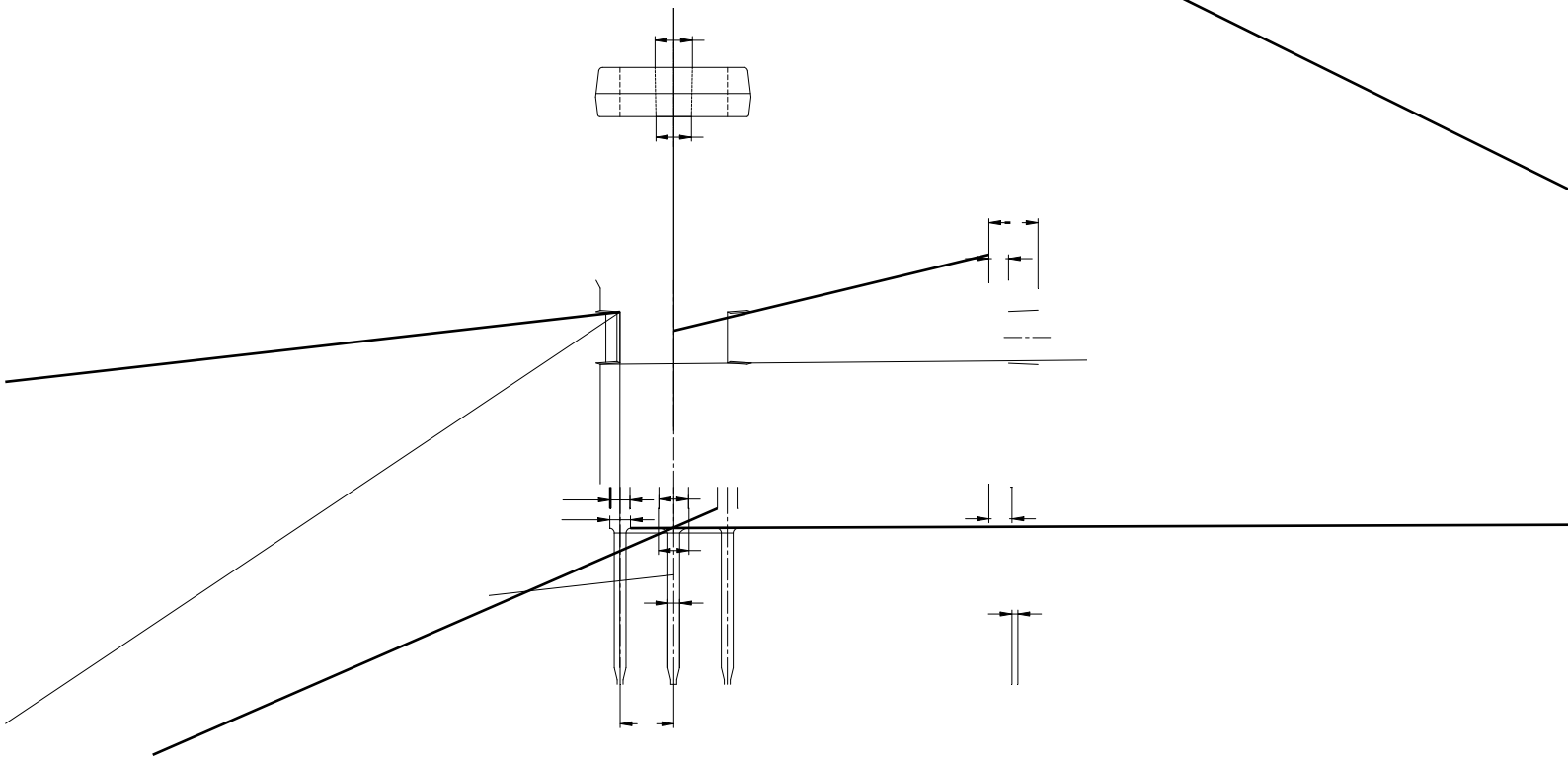



Fig 14. Transient thermal impedance of IGBT

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 | 21.20 | 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 | 5.25 | - | 5.65 | 0.207 | - | 0.222 |
| 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 |
| M | 2.80 | 3.00 | 3.20 | 0.110 | 0.118 | 0.126 |
| N | 2.90 | 3.10 | 3.30 | 0.114 | 0.122 | 0.130 |

| Date | Revision | Changes |
|---|---|---|
| 2024-03-06 | Rev 1.1 | Update |
| 2024-05-17 | Rev 1.2 | Update |
| 2024-10-22 | Rev 1.3 | Update |
| 2026-06-25 | Rev 1.4 | Update thermal |