# AIF10N65AS

Trench FSII Fast IGBT

## Product Summary

| $V_{(BR)CES}$ | $V_{CE(SAT)TYP}$ | $I_C$(100℃) |
|---|---|---|
| 650V | 1.8V@15V | 10A |

## Feature

- High ruggedness performance
- 10μs short circuit capability
- Positive $V_{CE(sat)}$ temperature coefficient
- High efficiency for motor control
- Excellent current sharing in parallel operation

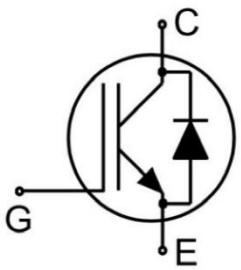
## Application

- Home appliances
- Motor drives

## Package

**ITO-220AB**

## Circuit diagram




## Marking

## Absolute maximum ratings (Tc=25℃ unless otherwise noted)

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Collector-Emitter Voltage | $V_{CES}$ | 650 | V |
| Gate-Emitter Voltage | $V_{GE}$ | ±20 | V |
| Continuous Collector Current | $I_C$ | 20 | A |
| Continuous Collector Current ($T_C$ =100℃) | $I_C$(100℃) | 10 | A |
| Pulsed Collector Current,tp limited by $T_{vjmax}$ | $I_{CM}$ | 40 | A |
| Diode Continuous Forward Current ($T_C$ =100℃) | $I_F$(100℃) | 10 | A |
| Diode Maximum Current, $t_p$ limited by $T_{vjmax}$ | $I_{FM}$ | 40 | A |
| Short Circuit Withstand Time | $T_{SC}$ | 10 | μs |
| Power Dissipation | $P_{tot}$ | 35 | W |
| Thermal Resistance, Junction to case for Diode | $R_{\theta JC}$ | 5.6 | ℃/W |
| Thermal Resistance, Junction to case for IGBT | $R_{\theta JC}$ | 4.2 | ℃/W |
| Junction Temperature | $T_{vj}$ | -40 ~ +175 | ℃ |
| Storage Temperature Range | $T_{STG}$ | -55 ~ +150 | ℃ |

## Electrical characteristics ($T_{vj}$=25℃ unless otherwise noted)

| Parameter | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **Static Characteristics** | | | | | | |
| Collector-Emitter Breakdown Voltage | $V_{(BR)CES}$ | $V_{GE}$ = 0V, $I_C$ =250μA | 650 | | | V |
| Gate Threshold Voltage | $V_{GE(th)}$ | $V_{CE}$ =$V_{GE}$,$I_C$=1mA | 5.5 | 5.8 | 6.2 | V |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $V_{GE}$=15V,$I_C$=10A | | 1.8 | | V |
| | | $V_{GE}$=15V,$I_C$=10A,$T_{vj}$=150℃ | | 2.1 | | |
| Zero Gate Voltage Collector Curren | $I_{CES}$ | $V_{CE}$=650V,$V_{GE}$ =0V | | | 50 | uA |
| Gate to Emitter Leakage Current | $I_{GES}$ | $V_{CE}$ =0V, $V_{GE}$ =±20V | | | ±100 | nA |
| **Dynamic characteristics** | | | | | | |
| Input Capacitance | $C_{ies}$ | $V_{CE}$=30V,$V_{GE}$=0V, f=1MHz | | 670 | | pF |
| Output Capacitance | $C_{oes}$ | | | 37 | | |
| Reverse Transfer Capacitance | $C_{res}$ | | | 10 | | |
| Gate Charge | $Q_g$ | $V_{CC}$=520V,$V_{GE}$ =15V,$I_C$=10A | | 28 | | nC |
| Turn-on delay time | $t_{d(on)}$ | $V_{CC}$=400V,$V_{GE}$= 0V/15V, $I_C$ =10A,$R_G$=10Ω, Inductive load | | 12 | | nS |
| Turn-on rise time | $t_r$ | | | 11 | | |
| Turn-off delay time | $t_{d(off)}$ | | | 71 | | |
| Turn-off fall time | $t_f$ | | | 74 | | |
| Turn-on Switching Energy | $E_{on}$ | | | 0.18 | | mJ |
| Turn-off Switching Energy | $E_{off}$ | | | 0.17 | | |
| Total Switching Energy | $E_{ts}$ | | | 0.35 | | |
| Turn-on delay time | $t_{d(on)}$ | $V_{CC}$=400V,$V_{GE}$= 0V/15V, $I_C$ =10A,$R_G$=10Ω, Inductive load,$T_{vj}$=150℃ | | 10 | | nS |
| Turn-on rise time | $t_r$ | | | 12 | | |
| Turn-off delay time | $t_{d(off)}$ | | | 86 | | |
| Turn-off fall time | $t_f$ | | | 112 | | |
| Turn-on Switching Energy | $E_{on}$ | | | 0.21 | | mJ |
| Turn-off Switching Energy | $E_{off}$ | | | 0.25 | | |
| Total Switching Energy | $E_{ts}$ | | | 0.46 | | |

## Electrical characteristics of the Diode ($T_{vj}$=25℃ unless otherwise noted)

| Parameter | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Diode Forward Voltage | $V_F$ | $I_F$=10A | | 1.4 | | V |
| | | $I_F$=10A,$T_{vj}$=150℃ | | 1.2 | | |
| Peak Reverse Recovery Current | $I_{rrm}$ | $I_F$=10A,$V_R$=400V, $d_{iF}/dt$= -750A/μs | | 12 | | A |
| Diode reverse recovery Time | $t_{rr}$ | | | 57 | | nS |
| Reverse Recovery Charge | $Q_{rr}$ | | | 411 | | nC |
| Peak Reverse Recovery Current | $I_{rrm}$ | $I_F$=10A,$V_R$=400V, $d_{iF}/dt$= -750A/μs,$T_{vj}$=150℃ | | 13 | | A |
| Diode reverse recovery Time | $t_{rr}$ | | | 118 | | nS |
| Reverse Recovery Charge | $Q_{rr}$ | | | 728 | | nC |

## Typical Characteristics

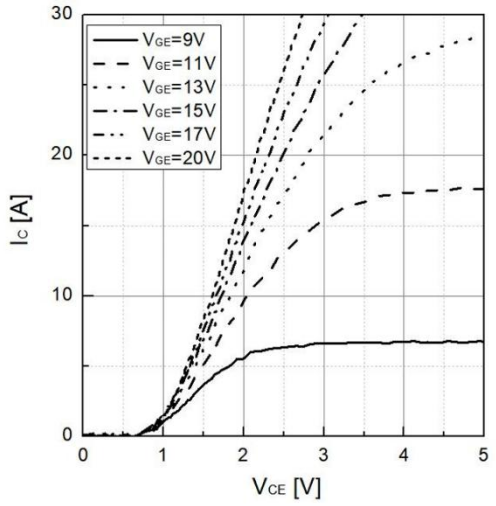



Fig 1. Typical output characteristic ($T_{vj}$=25℃)

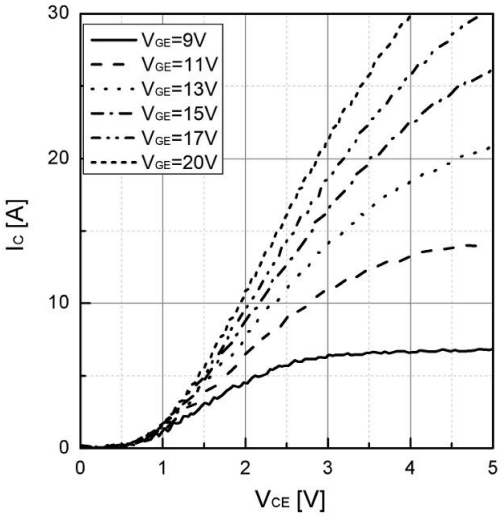



Fig 2. Typical output characteristic($T_{vj}$=150℃)

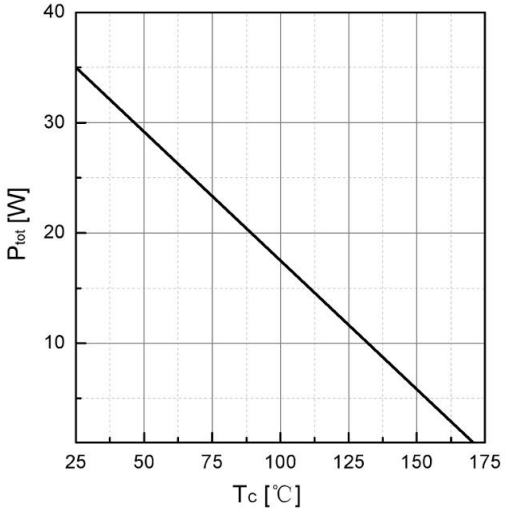



Fig 3. Power dissipation as a function of $T_C$

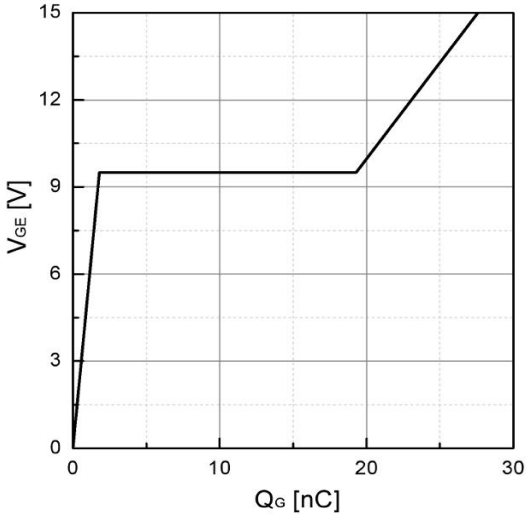



Fig 4. Typical Gate charge

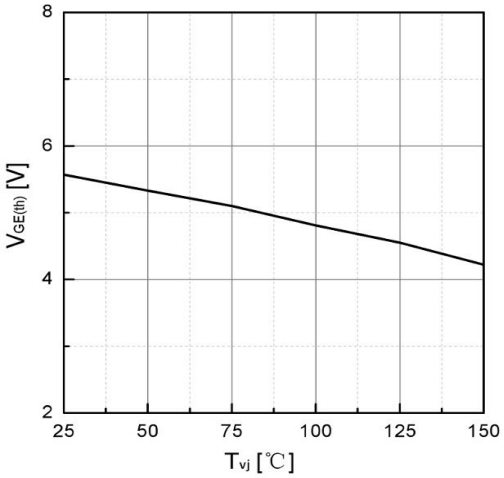



Fig 5. Typical $V_{GE(th)}$ as a function of $T_{vj}$ ($I_C$=1mA)

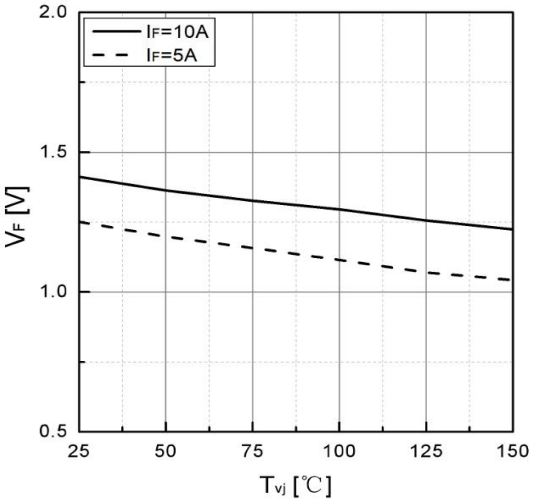



Fig 6. Typical $V_F$ as a function of $T_{vj}$



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## Typical Characteristics

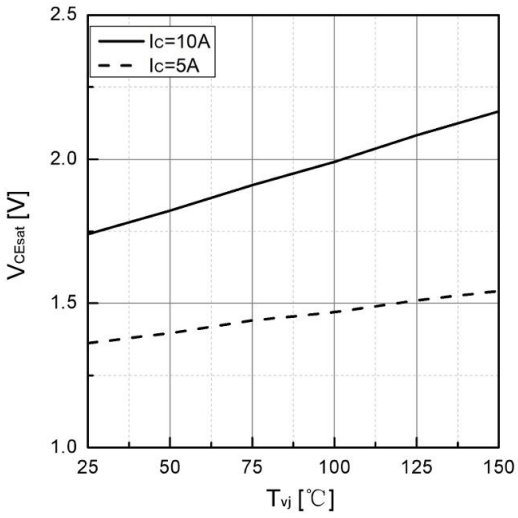



Fig 7. Typical $V_{CEsat}$ as a function of $T_{vj}$

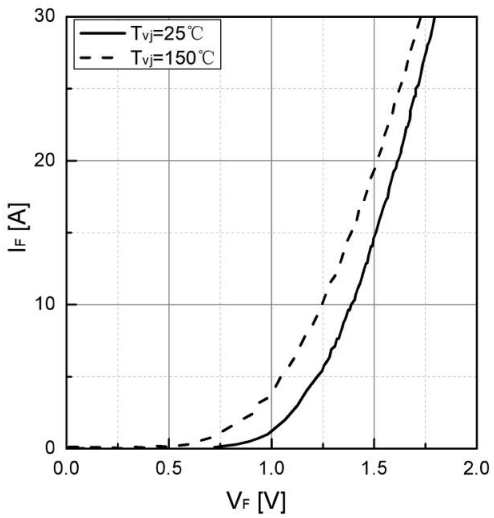



Fig 8. Typical $I_F$ as a function of $V_F$

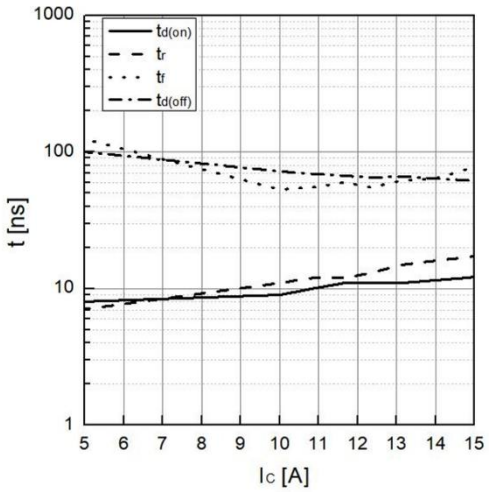



Fig 9. Typical switching time as a function of $I_C$

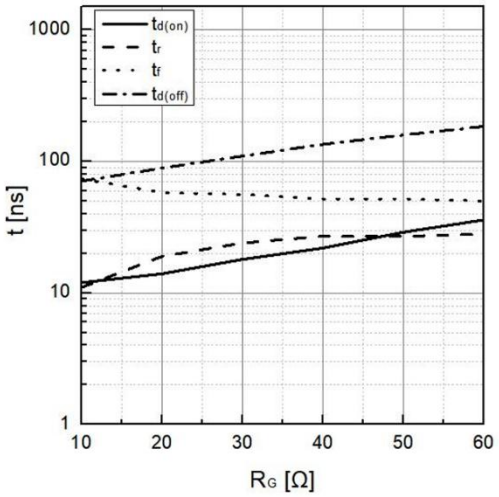



Fig 10. Typical switching times as a function of $R_G$

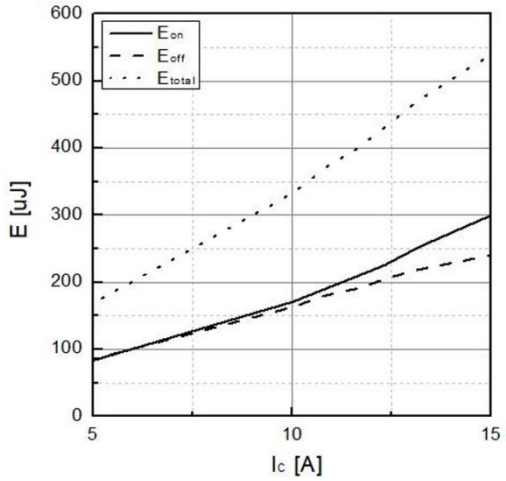



Fig 11. Typical switching energy losses as a function of $I_C$

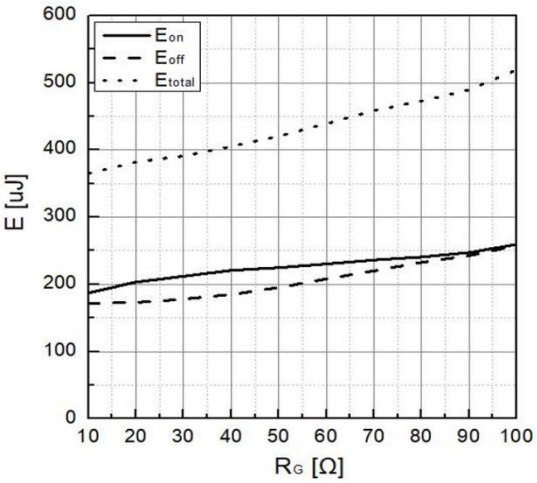



Fig 12. Typical switching energy losses as a function of $R_G$

## Typical Characteristics

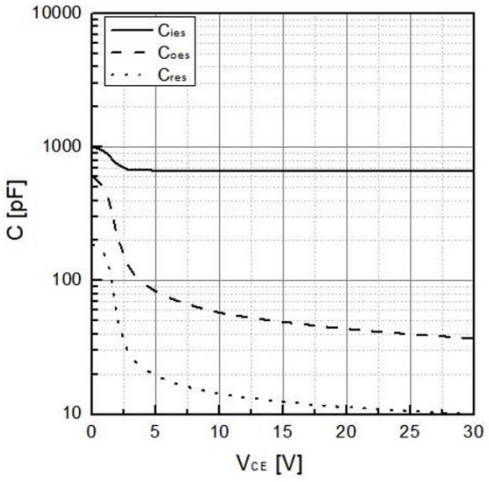



Fig 13. Typical capacitance as a function of $V_{CE}$ (f=1Mhz, $V_{GE}$=0V)

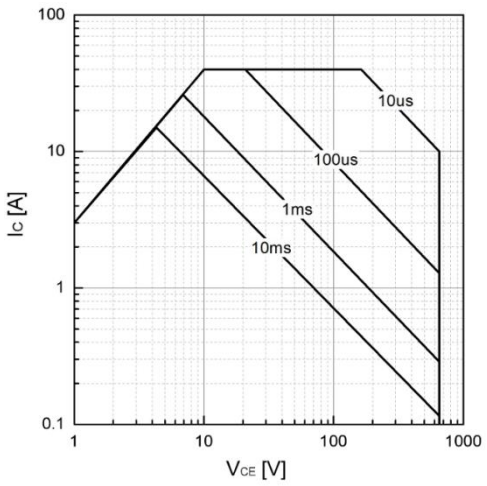
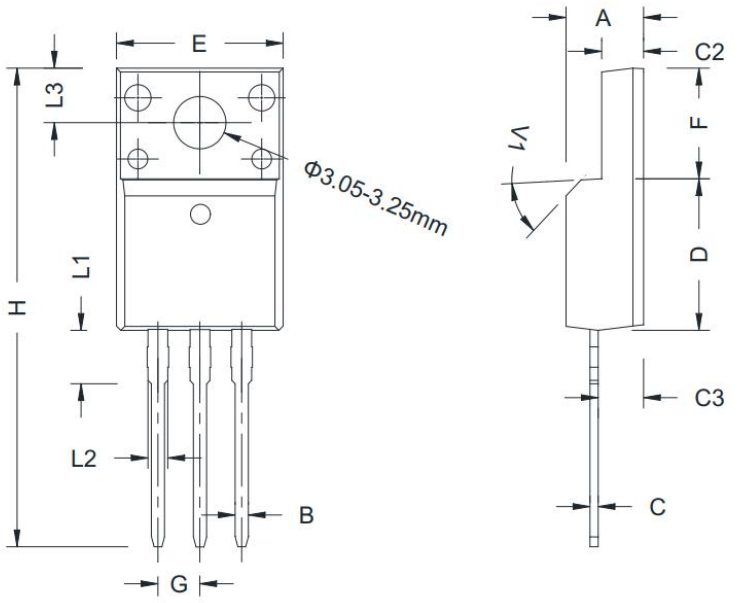



Fig 14. Safe operating area

## ITO-220AB Package Information




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min. | Max. | Min. | Max. |
| A | 4.500 | 4.900 | 0.177 | 0.193 |
| B | 0.740 | 0.830 | 0.029 | 0.033 |
| C | 0.470 | 0.660 | 0.019 | 0.026 |
| C2 | 2.450 | 2.750 | 0.096 | 0.108 |
| C3 | 2.600 | 3.000 | 0.102 | 0.118 |
| D | 8.800 | 9.300 | 0.346 | 0.366 |
| E | 9.800 | 10.400 | 0.386 | 0.410 |
| F | 6.400 | 6.800 | 0.252 | 0.268 |
| G | 2.400 | 2.700 | 0.094 | 0.106 |
| H | 28.000 | 29.800 | 1.102 | 1.173 |
| L1 | 3.630 REF. | | 0.143 REF. | |
| L2 | 1.140 | 1.700 | 0.045 | 0.067 |
| L3 | 3.300 REF. | | 0.130 REF. | |
| V1 | 45° | | 45° | |