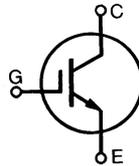


Low $V_{CE(sat)}$ IGBT

IXSH 45N100
IXSM 45N100

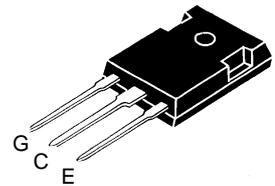
$V_{CES} = 1000\text{ V}$
 $I_{C25} = 75\text{ A}$
 $V_{CE(sat)} = 2.7\text{ V}$

Short Circuit SOA Capability

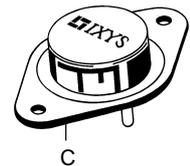


| Symbol | Test Conditions | Maximum Ratings | |
|---|---|-----------------------------------|------------------|
| V_{CES} | $T_J = 25^\circ\text{C}$ to 150°C | 1000 | V |
| V_{CGR} | $T_J = 25^\circ\text{C}$ to 150°C ; $R_{GE} = 1\text{ M}\Omega$ | 1000 | V |
| V_{GES} | Continuous | ± 20 | V |
| V_{GEM} | Transient | ± 30 | V |
| I_{C25} | $T_C = 25^\circ\text{C}$ | 75 | A |
| I_{C90} | $T_C = 90^\circ\text{C}$ | 45 | A |
| I_{CM} | $T_C = 25^\circ\text{C}$, 1 ms | 180 | A |
| SSOA (RBSOA) | $V_{GE} = 15\text{ V}$, $T_J = 125^\circ\text{C}$, $R_G = 2.7\ \Omega$ Clamped inductive load, $L = 30\ \mu\text{H}$ | $I_{CM} = 90$ @ $0.8\ V_{CES}$ | A |
| t_{SC} (SCSOA) | $V_{GE} = 15\text{ V}$, $V_{CE} = 0.6 \cdot V_{CES}$, $T_J = 125^\circ\text{C}$ $R_G = 22\ \Omega$, non repetitive | 10 | μs |
| P_C | $T_C = 25^\circ\text{C}$ | 300 | W |
| T_J | | -55 ... +150 | $^\circ\text{C}$ |
| T_{JM} | | 150 | $^\circ\text{C}$ |
| T_{stg} | | -55 ... +150 | $^\circ\text{C}$ |
| M_d | Mounting torque | 1.13/10 | Nm/lb.in. |
| Weight | | TO-204 = 18 g, TO-247 = 6 g | |
| Maximum lead temperature for soldering 1.6 mm (0.062 in.) from case for 10 s | | 300 | $^\circ\text{C}$ |

TO-247 AD (IXSH)



TO-204 AE (IXSM)



G = Gate, C = Collector,
E = Emitter, TAB = Collector

Features

- International standard packages
- Guaranteed Short Circuit SOA capability
- Low $V_{CE(sat)}$
 - for low on-state conduction losses
- High current handling capability
- MOS Gate turn-on
 - drive simplicity

Applications

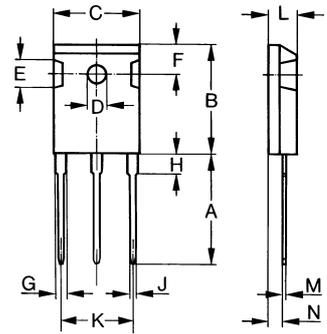
- AC motor speed control
- Uninterruptible power supplies (UPS)
- Welding

Advantages

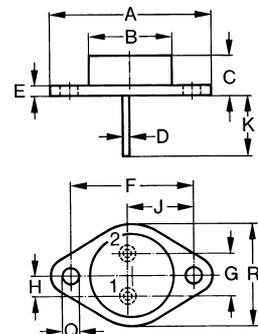
- Easy to mount with 1 screw (TO-247) (isolated mounting screw hole)
- High power density

| Symbol | Test Conditions | Characteristic Values ($T_J = 25^\circ\text{C}$, unless otherwise specified) | | |
|---------------|--|---|------|---------------------------|
| | | min. | typ. | max. |
| BV_{CES} | $I_C = 3\text{ mA}$, $V_{GE} = 0\text{ V}$ | 1000 | | V |
| $V_{GE(th)}$ | $I_C = 4\text{ mA}$, $V_{CE} = V_{GE}$ | 5 | | V |
| I_{CES} | $V_{CE} = 0.8 \cdot V_{CES}$, $T_J = 25^\circ\text{C}$ $V_{GE} = 0\text{ V}$, $T_J = 125^\circ\text{C}$ | | | 250 μA 1 mA |
| I_{GES} | $V_{CE} = 0\text{ V}$, $V_{GE} = \pm 20\text{ V}$ | | | $\pm 100\text{ nA}$ |
| $V_{CE(sat)}$ | $I_C = I_{C90}$, $V_{GE} = 15\text{ V}$ | | | 2.7 V |

| Symbol | Test Conditions | Characteristic Values ($T_J = 25^\circ\text{C}$, unless otherwise specified) | | | |
|--------------|--|---|------|------|-----|
| | | min. | typ. | max. | |
| g_{fs} | $I_C = I_{C90}$; $V_{CE} = 10\text{ V}$, Pulse test, $t \leq 300\ \mu\text{s}$, duty cycle $d \leq 2\%$ | 20 | 25 | S | |
| $I_{C(on)}$ | $V_{GE} = 15\text{ V}$, $V_{CE} = 10\text{ V}$ | | 195 | A | |
| C_{ies} | $V_{CE} = 25\text{ V}$, $V_{GE} = 0\text{ V}$, $f = 1\text{ MHz}$ | | 4150 | pF | |
| C_{oes} | | | 300 | pF | |
| C_{res} | | | 60 | pF | |
| Q_g | $I_C = I_{C90}$, $V_{GE} = 15\text{ V}$, $V_{CE} = 0.5 V_{CES}$ | | 165 | 260 | nC |
| Q_{ge} | | | 40 | 60 | nC |
| Q_{gc} | | | 80 | 200 | nC |
| $t_{d(on)}$ | Inductive load, $T_J = 25^\circ\text{C}$ $I_C = I_{C90}$, $V_{GE} = 15\text{ V}$, $L = 100\ \mu\text{H}$ $V_{CE} = 0.8 V_{CES}$, $R_G = 2.7\ \Omega$ Remarks: Switching times may increase for $V_{CE}(\text{Clamp}) > 0.8 \cdot V_{CES}$, higher T_J or increased R_G | | 80 | | ns |
| t_{ri} | | | 150 | | ns |
| $t_{d(off)}$ | | | 400 | | ns |
| t_{fi} | | | 1000 | 1500 | ns |
| E_{off} | | | 15 | | mJ |
| $t_{d(on)}$ | Inductive load, $T_J = 125^\circ\text{C}$ $I_C = I_{C90}$, $V_{GE} = 15\text{ V}$, $L = 100\ \mu\text{H}$ $V_{CE} = 0.8 V_{CES}$, $R_G = 2.7\ \Omega$ Remarks: Switching times may increase for $V_{CE}(\text{Clamp}) > 0.8 \cdot V_{CES}$, higher T_J or increased R_G | | 100 | | ns |
| t_{ri} | | | 300 | | ns |
| E_{on} | | | 5.4 | | mJ |
| $t_{d(off)}$ | | | 550 | 900 | ns |
| t_{fi} | | | 2200 | 2900 | ns |
| E_{off} | | 25 | | mJ | |
| R_{thJC} | | | | 0.42 | K/W |
| R_{thCK} | | | | 0.25 | K/W |

TO-247 AD (IXSH) Outline


| Dim. | Millimeter | | Inches | |
|------|------------|-------|--------|-------|
| | Min. | Max. | Min. | Max. |
| A | 19.81 | 20.32 | 0.780 | 0.800 |
| B | 20.80 | 21.46 | 0.819 | 0.845 |
| C | 15.75 | 16.26 | 0.610 | 0.640 |
| D | 3.55 | 3.65 | 0.140 | 0.144 |
| E | 4.32 | 5.49 | 0.170 | 0.216 |
| F | 5.4 | 6.2 | 0.212 | 0.244 |
| G | 1.65 | 2.13 | 0.065 | 0.084 |
| H | - | 4.5 | - | 0.177 |
| J | 1.0 | 1.4 | 0.040 | 0.055 |
| K | 10.8 | 11.0 | 0.426 | 0.433 |
| L | 4.7 | 5.3 | 0.185 | 0.209 |
| M | 0.4 | 0.8 | 0.016 | 0.031 |
| N | 1.5 | 2.49 | 0.087 | 0.102 |

TO-204 AE (IXSM) Outline


| Dim. | Millimeter | | Inches | |
|------|------------|-------|--------|-------|
| | Min. | Max. | Min. | Max. |
| A | 38.61 | 39.12 | 1.520 | 1.540 |
| B | - | 22.22 | - | 0.875 |
| C | 6.40 | 11.40 | 0.252 | 0.449 |
| D | 1.45 | 1.60 | 0.057 | 0.063 |
| E | 1.52 | 3.43 | 0.060 | 0.135 |
| F | 30.15 | BSC | 1.187 | BSC |
| G | 10.67 | 11.17 | 0.420 | 0.440 |
| H | 5.21 | 5.71 | 0.205 | 0.225 |
| J | 16.64 | 17.14 | 0.655 | 0.675 |
| K | 11.18 | 12.19 | 0.440 | 0.480 |
| Q | 3.84 | 4.19 | 0.151 | 0.165 |
| R | 25.16 | 26.66 | 0.991 | 1.050 |

Fig.1 Saturation Characteristics

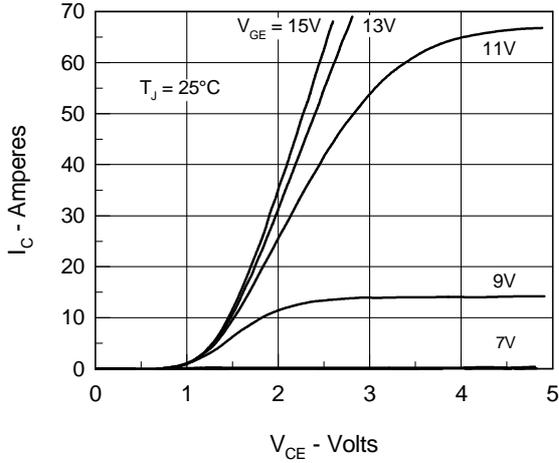


Fig.2 Output Characteristics

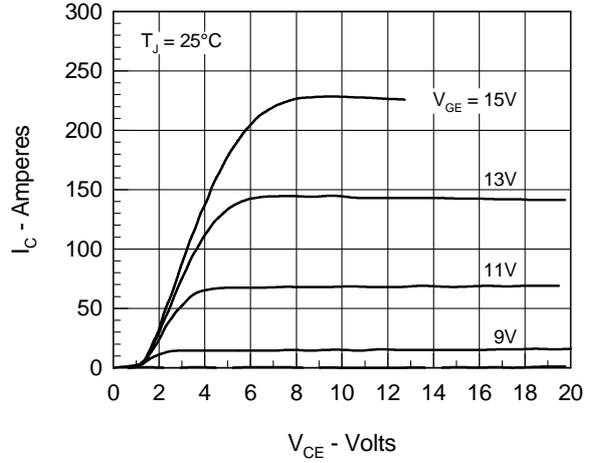


Fig.3 Collector-Emitter Voltage vs. Gate-Emitter Voltage

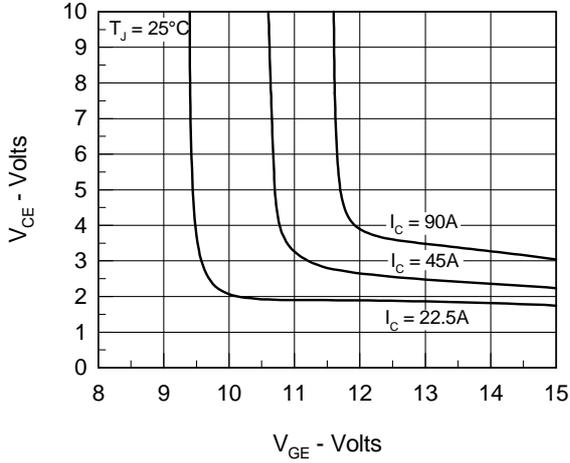


Fig.4 Temperature Dependence of Output Saturation Voltage

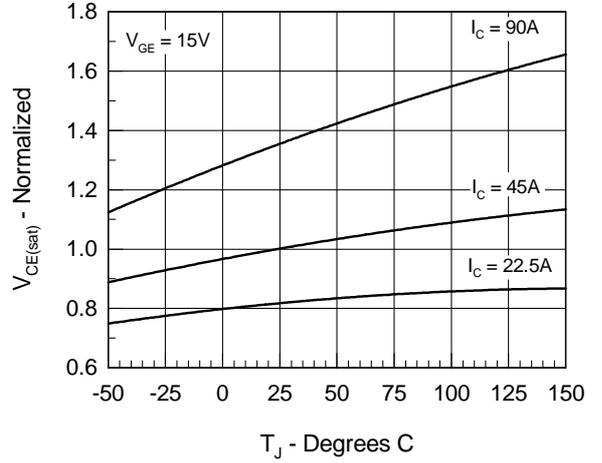


Fig.5 Input Admittance

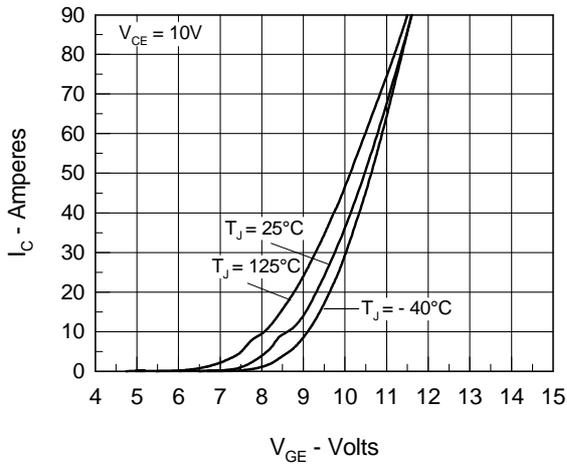


Fig.6 Temperature Dependence of Breakdown and Threshold Voltage

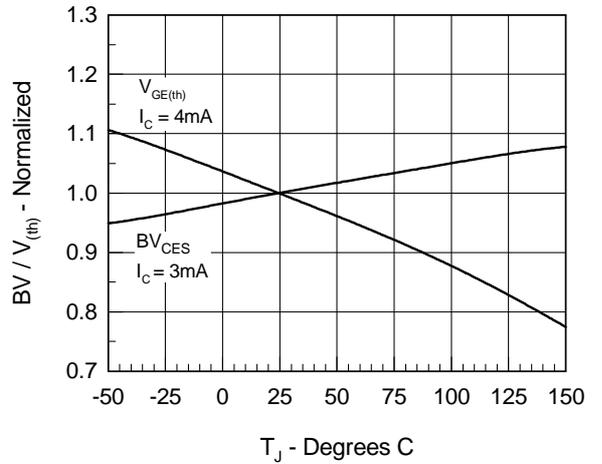


Fig.7 Turn-Off Energy per Pulse and Fall Time on Collector Current

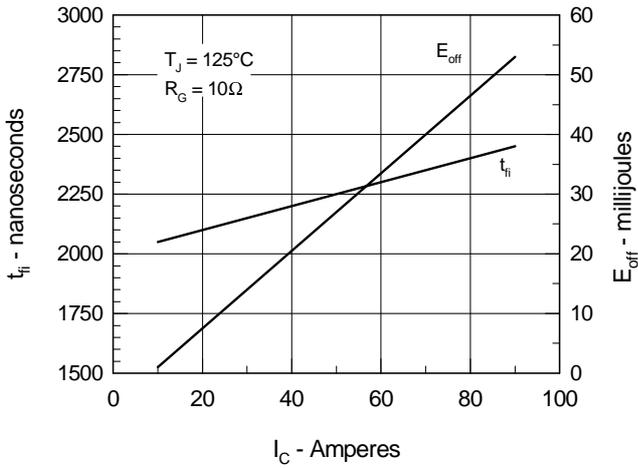


Fig.8 Dependence of Turn-Off Energy Per Pulse and Fall Time on R_G

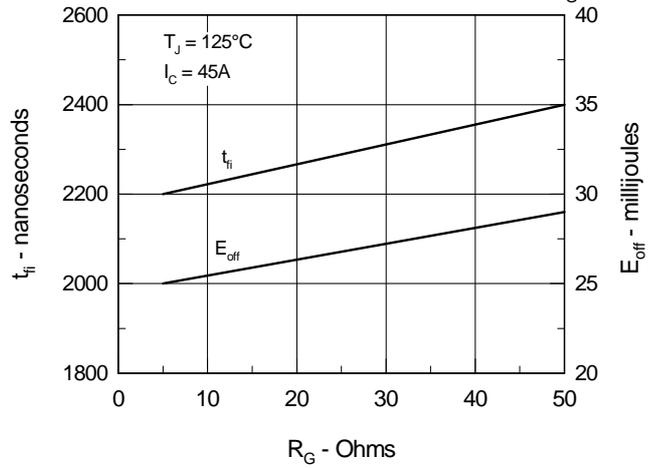


Fig.9 Gate Charge Characteristic Curve

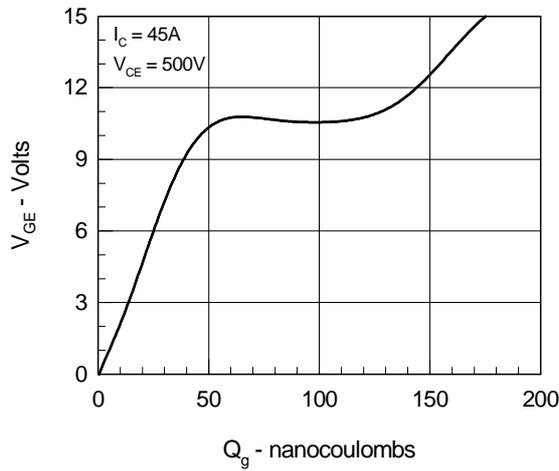


Fig.10 Turn-Off Safe Operating Area

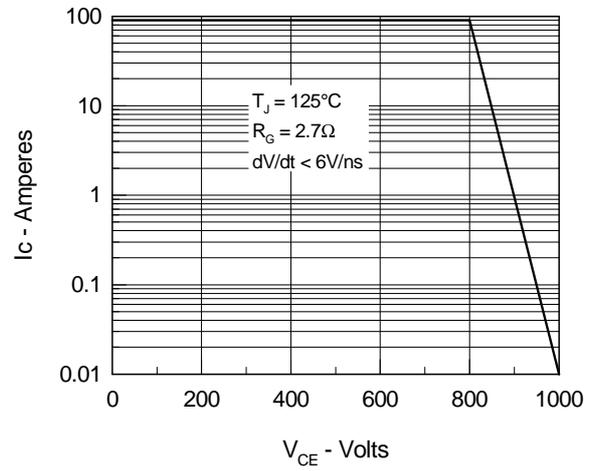
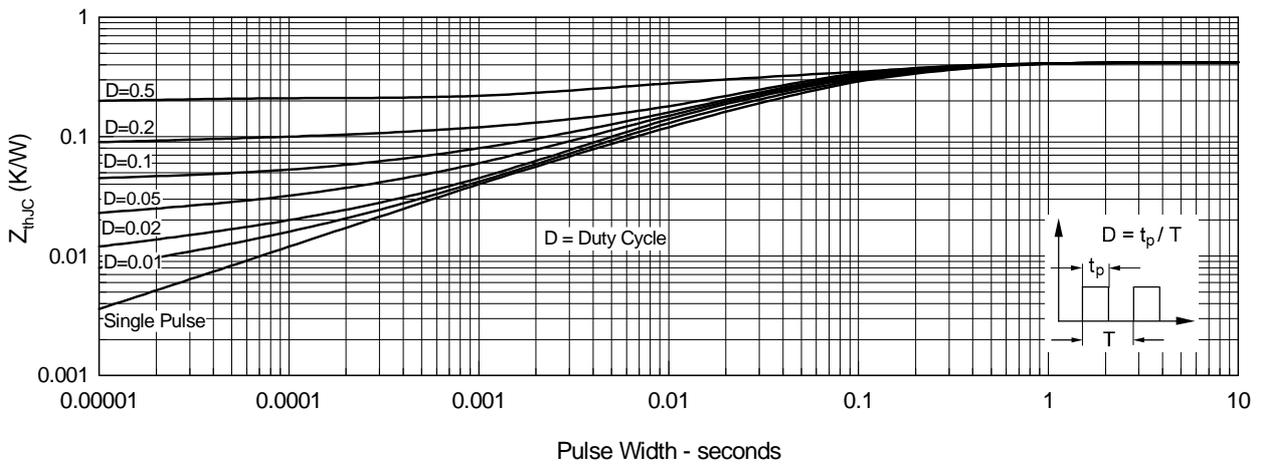


Fig.11 Transient Thermal Impedance



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