

HiPerFAST™ IGBTs w/ Diode

IXGT40N60C2D1
IXGJ40N60C2D1
IXGH40N60C2D1

V_{CES} = 600V
I_{C110} = 40A
V_{CE(SAT)} ≤ 2.7V
t_{fi(typ)} = 32ns

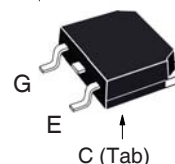
C2-Class High Speed IGBTs



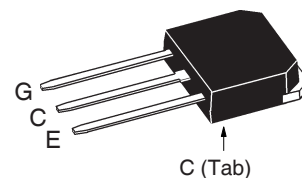
| Symbol | Test Conditions | Maximum Ratings | |
|-------------------------------|---|--|-----------|
| V _{CES} | T _J = 25°C to 150°C | 600 | V |
| V _{CGR} | T _J = 25°C to 150°C, R _{GE} = 1MΩ | 600 | V |
| V _{GES} | Continuous | ±20 | V |
| V _{GEM} | Transient | ±30 | V |
| I _{C25} | T _C = 25°C (Limited by Lead) | 75 | A |
| I _{C110} | T _C = 110°C | 40 | A |
| I _{CM} | T _C = 25°C, 1ms | 200 | A |
| SSOA (RBSOA) | V _{GE} = 15V, T _J = 125°C, R _G = 10Ω Clamped Inductive Load | I _{CM} = 80 V _{CE} ≤ V _{CES} | A |
| P _C | T _C = 25°C | 300 | W |
| T _J | | -55 ... +150 | °C |
| T _{JM} | | 150 | °C |
| T _{stg} | | -55 ... +150 | °C |
| T _L | 1.6mm (0.062 in.) from Case for 10s | 300 | °C |
| T _{SOLD} | Plastic Body for 10 seconds | 260 | °C |
| M _d | Mounting Torque (TO-247) | 1.13/10 | Nm/lb.in. |
| Weight | TO-247 | 6 | g |
| | TO-268 | 4 | g |

| Symbol | Test Conditions (T _J = 25°C, Unless Otherwise Specified) | Characteristic Values | | |
|----------------------|---|-----------------------|------------|----------------|
| | | Min. | Typ. | Max. |
| V _{GE(th)} | I _C = 250μA, V _{CE} = V _{GE} | 3.0 | | 5.0 V |
| I _{CES} | V _{CE} = V _{CES} , V _{GE} = 0V T _J = 125°C | | | 200 μA 3 mA |
| I _{GES} | V _{CE} = 0V, V _{GE} = ±20V | | | ±100 nA |
| V _{CE(sat)} | I _C = 30A, V _{GE} = 15V, Note 1 T _J = 125°C | | 2.2 1.7 | 2.7 V V |

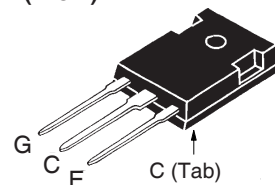
TO-268 (IXGT)



TO-268 (IXGJ)



TO-247 (IXGH)



G = Gate C = Collector
E = Emitter Tab = Collector

Features

- Very High Frequency IGBT
- Square RBSOA
- High Current Handling Capability

Applications

- Uninterruptible Power Supplies (UPS)
- Switch-Mode and Resonant-Mode Power Supplies
- AC Motor Speed Control
- DC Servo and Robot Drives
- DC Choppers

Advantages

- High Power Density
- Very Fast Switching Speeds for High Frequency Applications
- High Power Surface Mountable Packages

Symbol Test Conditions

($T_J = 25^\circ\text{C}$ Unless Otherwise Specified)

Characteristic Values

| | | Min. | Typ. | Max. | |
|--------------|---|---|------|------|--------------------|
| g_{fs} | $I_C = 30\text{A}, V_{CE} = 10\text{V}$, Note 1 | 20 | 36 | | S |
| C_{ies} | $V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$ | | 2500 | | pF |
| C_{oes} | | | 220 | | pF |
| C_{res} | | | 54 | | pF |
| Q_g | $I_C = 30\text{A}, V_{GE} = 15\text{V}, V_{CE} = 0.5 \cdot V_{CES}$ | | 95 | | nC |
| Q_{ge} | | | 14 | | nC |
| Q_{gc} | | | 36 | | nC |
| $t_{d(on)}$ | Inductive load, $T_J = 25^\circ\text{C}$ | | 18 | | ns |
| t_{ri} | | $I_C = 30\text{A}, V_{GE} = 15\text{V}$ | | 20 | |
| $t_{d(off)}$ | $V_{CE} = 400\text{V}, R_G = 3\Omega$ | | 90 | 140 | ns |
| t_{fi} | | | | 32 | |
| E_{off} | Note 2 | | 0.20 | 0.37 | mJ |
| $t_{d(on)}$ | Inductive load, $T_J = 125^\circ\text{C}$ | | 18 | | ns |
| t_{ri} | | $I_C = 30\text{A}, V_{GE} = 15\text{V}$ | | 20 | |
| E_{on} | $V_{CE} = 400\text{V}, R_G = 3\Omega$ | | 0.60 | | mJ |
| $t_{d(off)}$ | | | | 130 | |
| t_{fi} | Note 2 | | 80 | | ns |
| E_{off} | | | | 0.50 | |
| R_{thJC} | | | | 0.42 | $^\circ\text{C/W}$ |
| R_{thCS} | TO-247 & TO-268 | | 0.25 | | $^\circ\text{C/W}$ |

Reverse Diode (FRED)

Symbol Test Conditions

($T_J = 25^\circ\text{C}$ Unless Otherwise Specified)

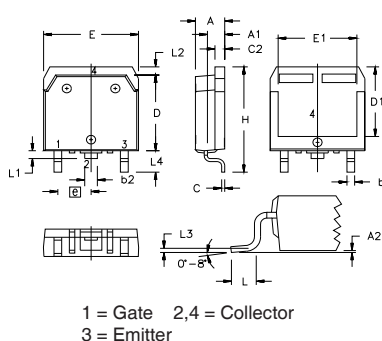
Characteristic Values

| | | Min. | Typ. | Max. | |
|------------|---|---------------------------|------|------|--------------------|
| V_F | $I_F = 30\text{A}, V_{GE} = 0\text{V}$, Note 1 | | | 2.5 | V |
| I_{RM} | $I_F = 30\text{A}, V_{GE} = 0\text{V}, -di_F/dt = 100\text{A}/\mu\text{s}, V_R = 100\text{V}$ | $T_J = 150^\circ\text{C}$ | 1.6 | | V |
| t_{rr} | | $T_J = 100^\circ\text{C}$ | | 100 | |
| | $I_F = 1\text{A}, V_{GE} = 0\text{V}, -di_F/dt = 100\text{A}/\mu\text{s}, V_R = 30\text{V}$ | | 25 | | ns |
| R_{thJC} | | | | 0.9 | $^\circ\text{C/W}$ |

Notes:

1. Pulse test, $t \leq 300\mu\text{s}$, duty cycle, $d \leq 2\%$.
2. Switching times & energy losses may increase for higher V_{CE} (clamp), T_J or R_G .

TO-268 Outline

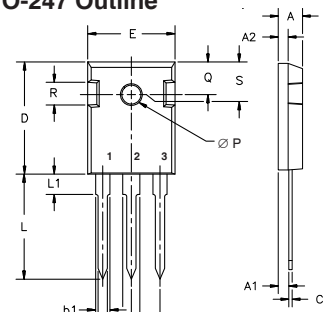


| SYM | INCHES | | MILLIMETERS | |
|-----|----------|------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | .193 | .201 | 4.90 | 5.10 |
| A1 | .106 | .114 | 2.70 | 2.90 |
| A2 | .001 | .010 | 0.02 | 0.25 |
| b | .045 | .057 | 1.15 | 1.45 |
| b2 | .075 | .083 | 1.90 | 2.10 |
| C | .016 | .026 | 0.40 | 0.65 |
| C2 | .057 | .063 | 1.45 | 1.60 |
| D | .543 | .551 | 13.80 | 14.00 |
| D1 | .488 | .500 | 12.40 | 12.70 |
| E | .624 | .632 | 15.85 | 16.05 |
| E1 | .524 | .535 | 13.30 | 13.60 |
| e | .215 BSC | | 5.45 BSC | |
| H | .736 | .752 | 18.70 | 19.10 |
| L | .094 | .106 | 2.40 | 2.70 |
| L1 | .047 | .055 | 1.20 | 1.40 |
| L2 | .039 | .045 | 1.00 | 1.15 |
| L3 | .010 BSC | | 0.25 BSC | |
| L4 | .150 | .161 | 3.80 | 4.10 |

IXYS Reserves The Right to Change Limits, Test Conditions, and Dimensions.

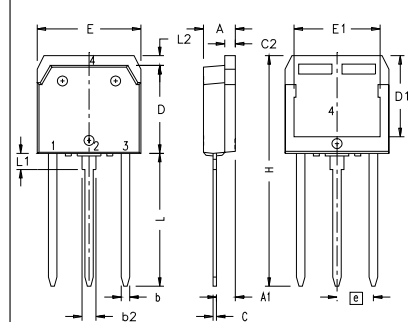
IXYS MOSFETs and IGBTs are covered 4,835,592 4,931,844 5,049,961 5,237,481 6,162,665 6,404,065 B1 6,683,344 6,727,585 7,005,734 B2 7,157,338B2
by one or more of the following U.S. patents: 4,850,072 5,017,508 5,063,307 5,381,025 6,259,123 B1 6,534,343 6,710,405 B2 6,759,692 7,063,975 B2
4,881,106 5,034,796 5,187,117 5,486,715 6,306,728 B1 6,583,505 6,710,463 6,771,478 B2 7,071,537

TO-247 Outline



| Dim. | Millimeter | | Inches | |
|----------------|------------|-------|--------|-------|
| | Min. | Max. | Min. | Max. |
| A | 4.7 | 5.3 | .185 | .209 |
| A ₁ | 2.2 | 2.54 | .087 | .102 |
| A ₂ | 2.2 | 2.6 | .059 | .098 |
| b | 1.0 | 1.4 | .040 | .055 |
| b ₁ | 1.65 | 2.13 | .065 | .084 |
| b ₂ | 2.87 | 3.12 | .113 | .123 |
| C | .4 | .8 | .016 | .031 |
| D | 20.80 | 21.46 | .819 | .845 |
| E | 15.75 | 16.26 | .610 | .640 |
| e | 5.20 | 5.72 | 0.205 | 0.225 |
| L | 19.81 | 20.32 | .780 | .800 |
| L ₁ | | 4.50 | | .177 |
| ∅P | 3.55 | 3.65 | .140 | .144 |
| Q | 5.89 | 6.40 | 0.232 | 0.252 |
| R | 4.32 | 5.49 | .170 | .216 |
| S | 6.15 | BSC | 242 | BSC |

TO-268 Ledged Outline



| SYM | INCHES | | MILLIMETERS | |
|-----|----------|-------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | .193 | .201 | 4.90 | 5.10 |
| A1 | .106 | .114 | 2.70 | 2.90 |
| b | .045 | .057 | 1.15 | 1.45 |
| b2 | .075 | .083 | 1.90 | 2.10 |
| C | .016 | .026 | 0.40 | 0.65 |
| C2 | .057 | .063 | 1.45 | 1.60 |
| D | .543 | .551 | 13.80 | 14.00 |
| D1 | .488 | .500 | 12.40 | 12.70 |
| E | .624 | .632 | 15.85 | 16.05 |
| E1 | .524 | .535 | 13.30 | 13.60 |
| e | .215 BSC | | 5.45 BSC | |
| H | 1.365 | 1.395 | 34.67 | 35.43 |
| L | .780 | .800 | 19.81 | 20.32 |
| L1 | .079 | .091 | 2.00 | 2.30 |
| L2 | .039 | .045 | 1.00 | 1.15 |

NOTE: ALL METAL AREA ARE SOLDER PLATED.

- 1 - GATE
- 2 - DRAIN (COLLECTOR)
- 3 - SOURCE (EMITTER)
- 4 - DRAIN (COLLECTOR)

Fig. 1. Output Characteristics
@ 25 Deg. C

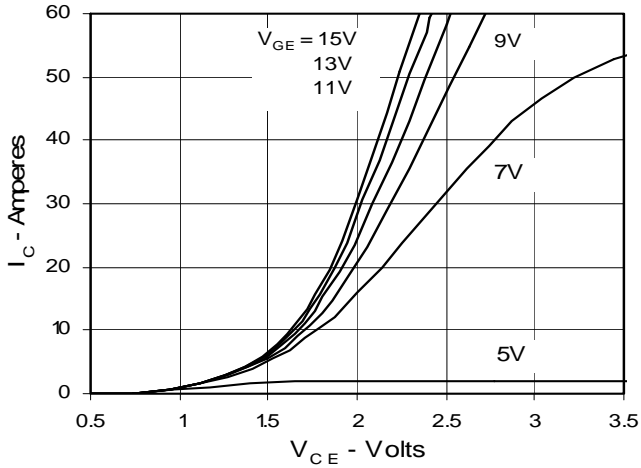


Fig. 2. Extended Output Characteristics
@ 25 deg. C

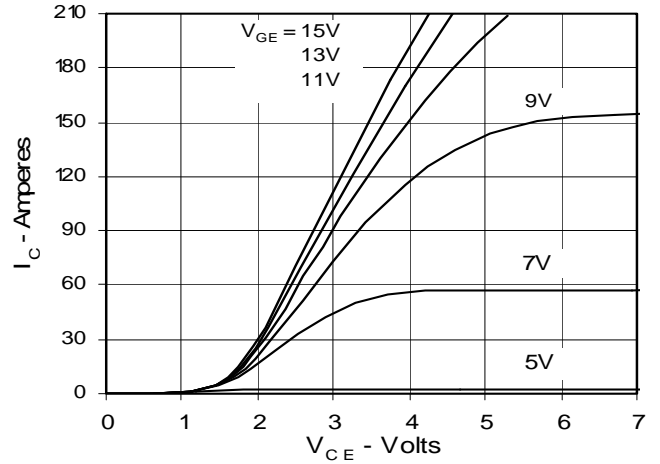


Fig. 3. Output Characteristics
@ 125 Deg. C

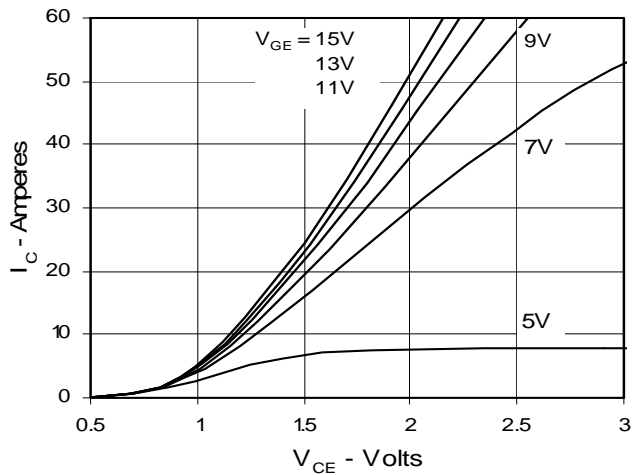


Fig. 4. Temperature Dependence of $V_{CE(sat)}$

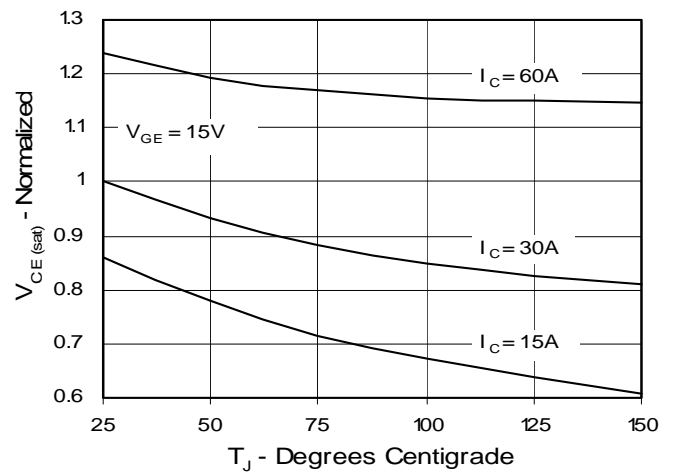


Fig. 5. Collector-to-Emitter Voltage
vs. Gate-to-Emitter voltage

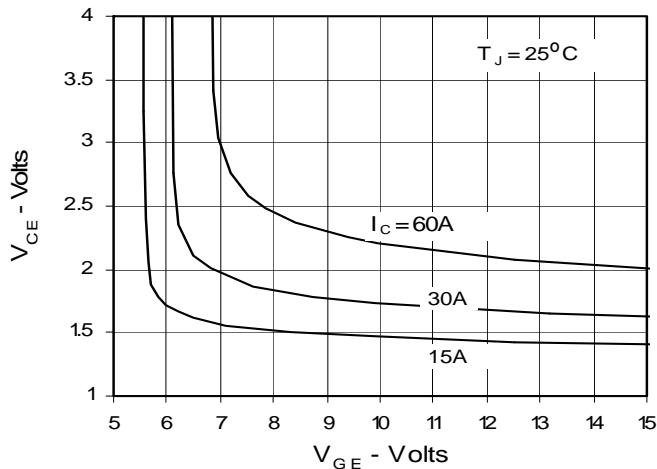


Fig. 6. Input Admittance

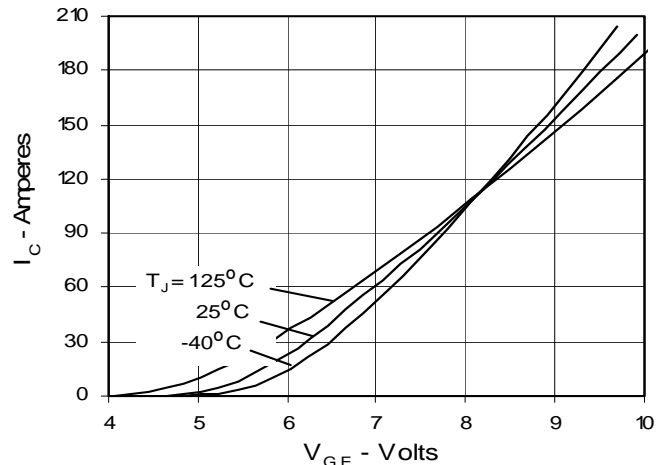


Fig. 7. Transconductance

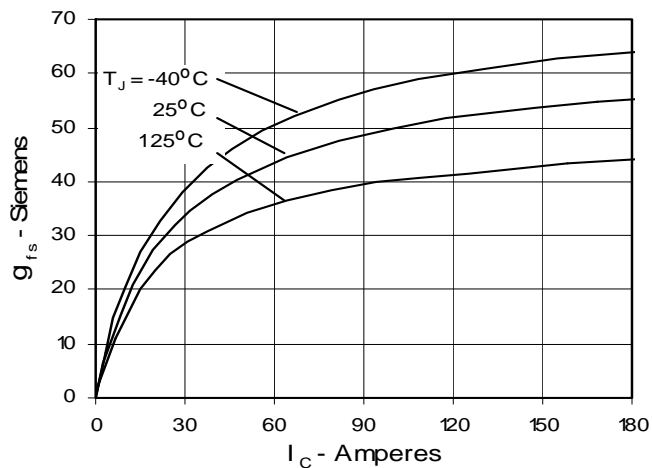


Fig. 8. Dependence of E_{off} on R_G

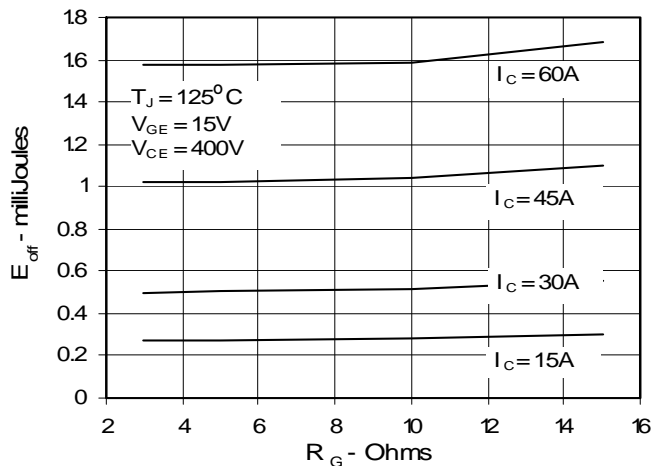


Fig. 9. Dependence of E_{off} on I_C

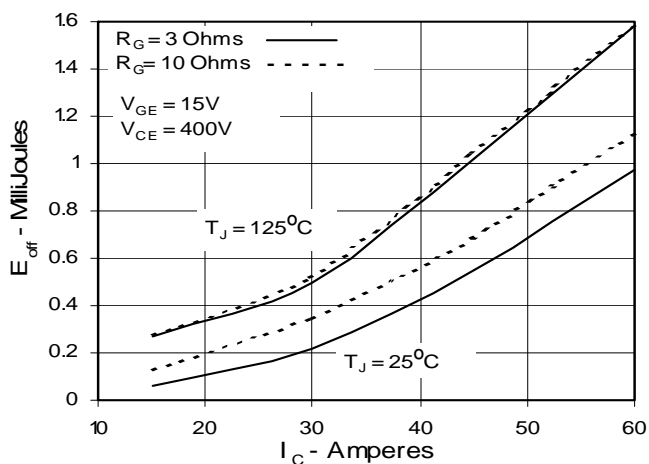


Fig. 10. Dependence of E_{off} on Temperature

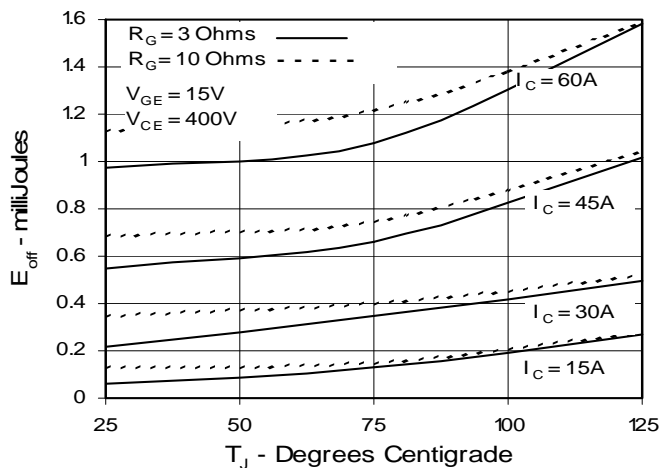


Fig. 11. Gate Charge

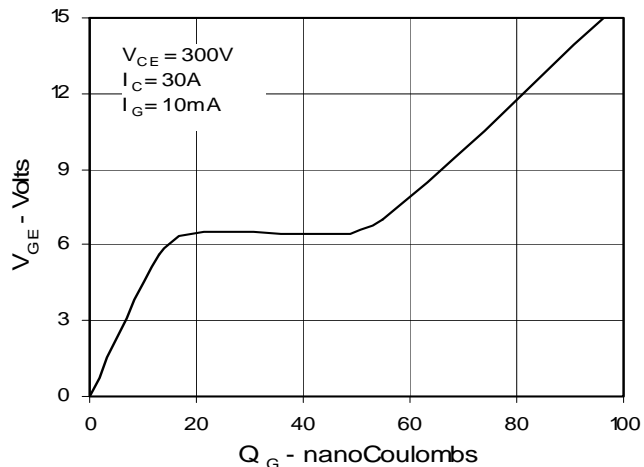


Fig. 12. Capacitance

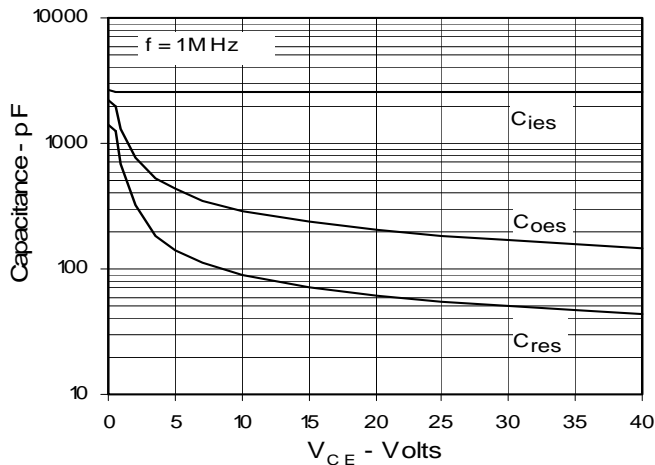
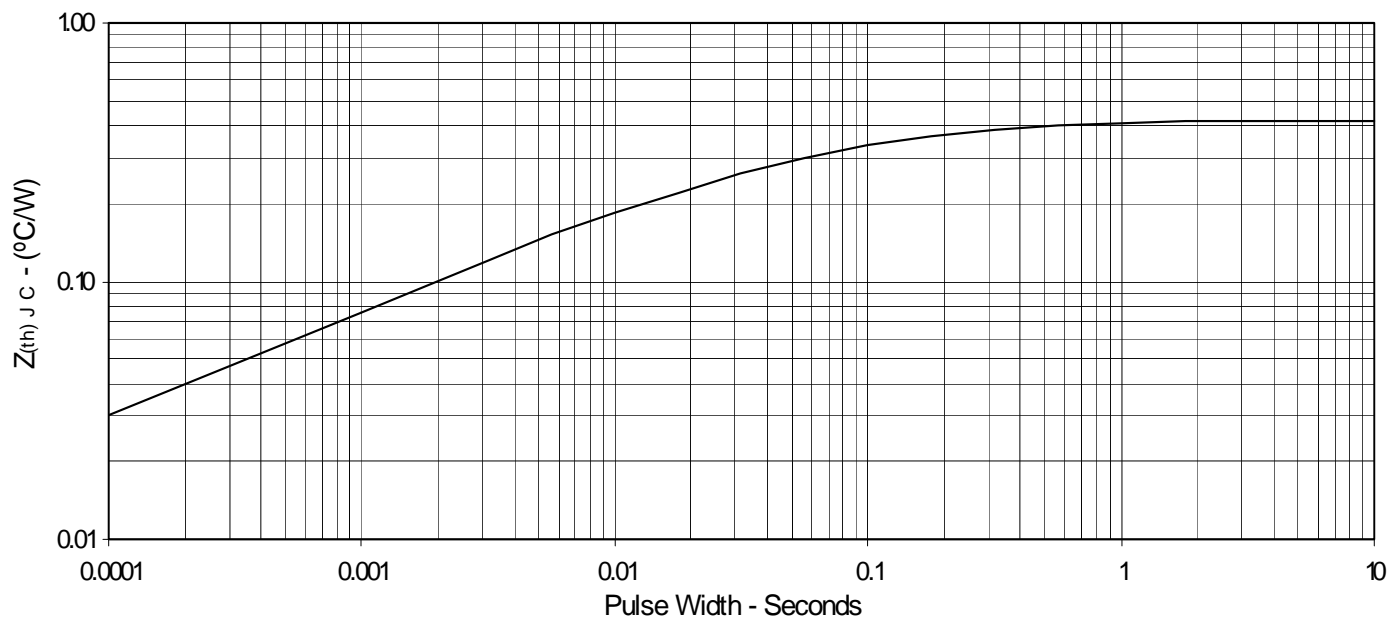


Fig. 13. Maximum Transient Thermal Impedance



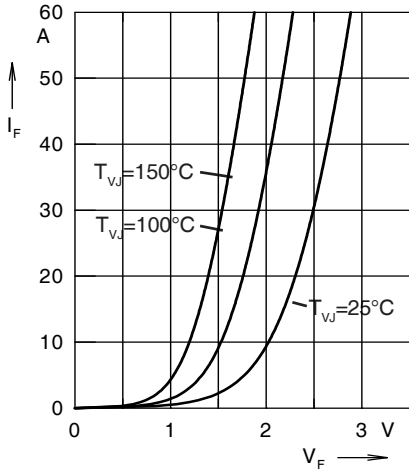


Fig. 14. Forward current I_F versus V_F

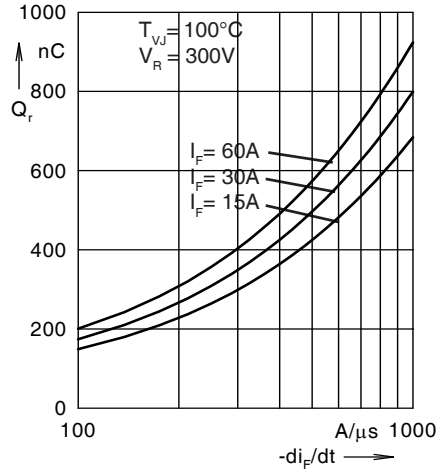


Fig. 15. Reverse recovery charge Q_r versus $-di_F/dt$

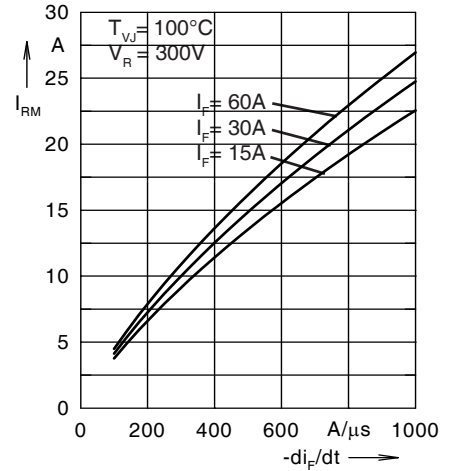


Fig. 16. Peak reverse current I_{RM} versus $-di_F/dt$

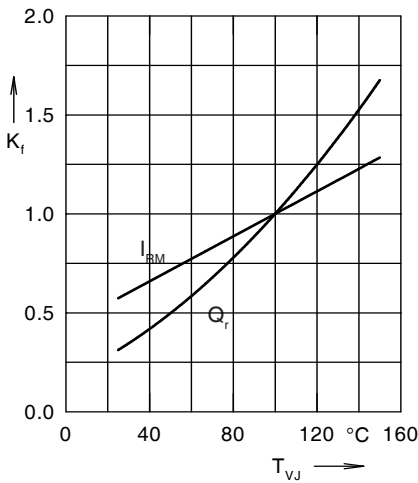


Fig. 17. Dynamic parameters Q_r, I_{RM} versus T_{VJ}

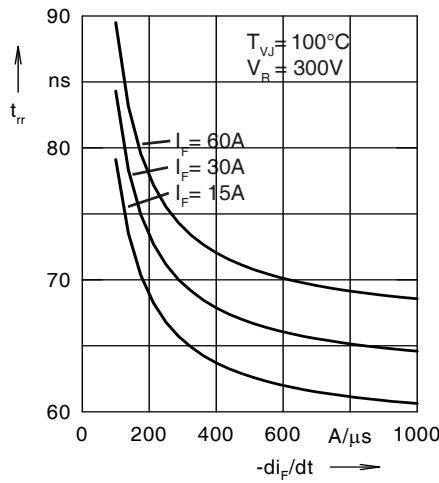


Fig. 18. Recovery time t_{rr} versus $-di_F/dt$

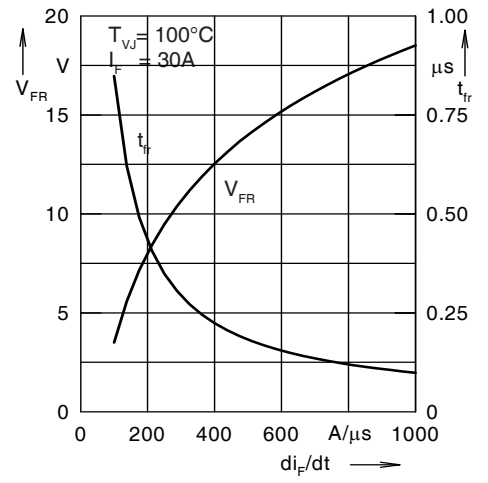


Fig. 19. Peak forward voltage V_{FR} and t_{rr} versus di_F/dt

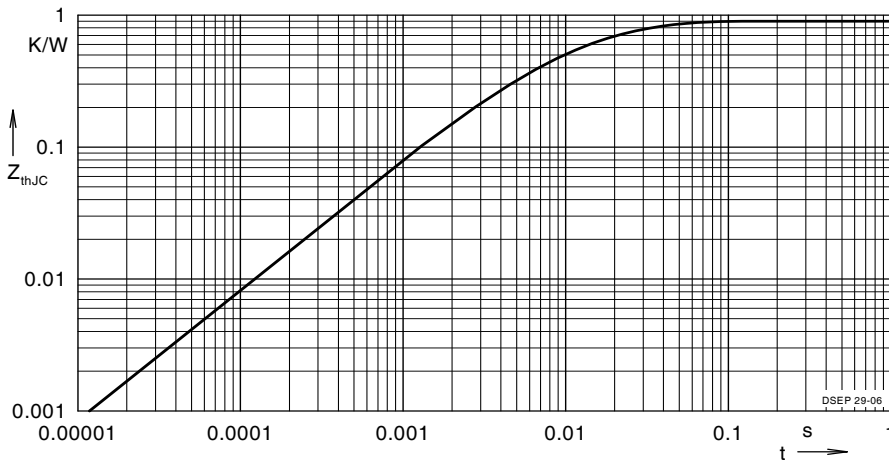


Fig. 20. Transient thermal resistance junction to case

Constants for Z_{thJC} calculation:

| i | R_{thi} (K/W) | t_i (s) |
|---|-----------------|-----------|
| 1 | 0.502 | 0.0052 |
| 2 | 0.193 | 0.0003 |
| 3 | 0.205 | 0.0162 |