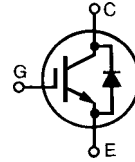


HiPerFAST™ IGBT with Diode

IXGH 32N60CD1
IXGT 32N60CD1

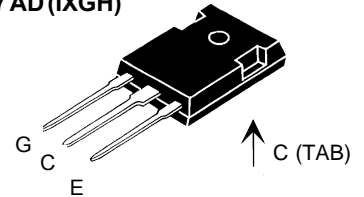
$V_{CES} = 600 \text{ V}$
 $I_{C25} = 60 \text{ A}$
 $V_{CE(SAT)typ} = 2.1 \text{ V}$
 $t_{fi(typ)} = 55 \text{ ns}$

Light Speed Series

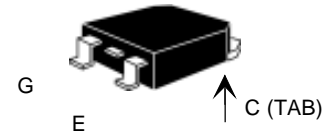


| Symbol | Test Conditions | Maximum Ratings | |
|---|--|-----------------|------------------|
| V_{CES} | $T_J = 25^\circ\text{C to } 150^\circ\text{C}$ | 600 | V |
| V_{CGR} | $T_J = 25^\circ\text{C to } 150^\circ\text{C}; R_{GE} = 1 \text{ M}\Omega$ | 600 | V |
| V_{GES} | Continuous | ± 20 | V |
| V_{GEM} | Transient | ± 30 | V |
| I_{C25} | $T_C = 25^\circ\text{C}$ | 60 | A |
| I_{C90} | $T_C = 90^\circ\text{C}$ | 32 | A |
| I_{CM} | $T_C = 25^\circ\text{C}, 1 \text{ ms}$ | 120 | A |
| SSOA (RBSOA) | $V_{GE} = 15 \text{ V}, T_{VJ} = 125^\circ\text{C}, R_G = 10 \Omega$ Clamped inductive load @ $0.8 V_{CES}$ | $I_{CM} = 64$ | A |
| P_C | $T_C = 25^\circ\text{C}$ | 200 | W |
| T_J | | -55 ... +150 | $^\circ\text{C}$ |
| T_{JM} | | 150 | $^\circ\text{C}$ |
| T_{stg} | | -55 ... +150 | $^\circ\text{C}$ |
| Maximum Lead and Tab temperature for soldering 1.6 mm (0.062 in.) from case for 10 s | | 300 | $^\circ\text{C}$ |
| M_d | Mounting torque, TO-247 AD | 1.13/10 | Nm/lb.in. |
| Weight | TO-247 AD | 6 | g |
| | TO-268 | 5 | g |

TO-247 AD (IXGH)



TO-268 (D3) (IXGT)



G = Gate C = Collector
E = Emitter

Features

- International standard TO-247AD package
- High current handling capability
- Latest generation HDMOS™ process
- MOS Gate turn-on - drive simplicity

Applications

- Uninterruptible power supplies (UPS)
- Switched-mode and resonant-mode power supplies
- AC motor speed control
- DC servo and robot drives
- DC choppers

Advantages

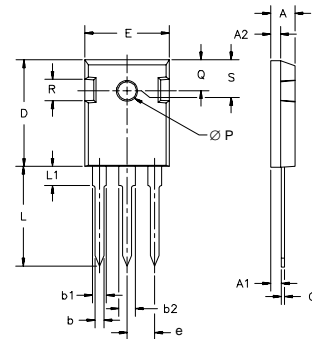
- High power density
- Very fast switching speeds for high frequency applications
- High power surface mountable package

| Symbol | Test Conditions | Characteristic Values ($T_J = 25^\circ\text{C}$, unless otherwise specified) | | |
|---------------|--|---|------|----------------------|
| | | min. | typ. | max. |
| BV_{CES} | $I_C = 250 \mu\text{A}, V_{GE} = 0 \text{ V}$ | 600 | | V |
| $V_{GE(th)}$ | $I_C = 250 \mu\text{A}, V_{CE} = V_{GE}$ | 2.5 | | 5.0 V |
| I_{CES} | $V_{CE} = 0.8 \cdot V_{CES}$ $V_{GE} = 0 \text{ V}$ | $T_J = 25^\circ\text{C}$ | | 200 μA |
| | | $T_J = 125^\circ\text{C}$ | | 3 mA |
| I_{GES} | $V_{CE} = 0 \text{ V}, V_{GE} = \pm 20 \text{ V}$ | | | $\pm 100 \text{ nA}$ |
| $V_{CE(sat)}$ | $I_C = I_{C90}, V_{GE} = 15 \text{ V}$ | 2.1 | 2.5 | V |

| Symbol | Test Conditions | Characteristic Values | | |
|---------------------------|--|---|---------|----------|
| | | (T _J = 25°C, unless otherwise specified) | | |
| | | min. | typ. | max. |
| g_{fs} | I _C = I _{C90} ; V _{CE} = 10 V, Pulse test, t ≤ 300 μs, duty cycle ≤ 2 % | | 25 | S |
| C_{ies} | V _{CE} = 25 V, V _{GE} = 0 V, f = 1 MHz | | 2700 | pF |
| C_{oes} | | | 240 | pF |
| C_{res} | | | 50 | pF |
| Q_g | I _C = I _{C90} , V _{GE} = 15 V, V _{CE} = 0.5 V _{CES} | | 110 | nC |
| Q_{ge} | | | 22 | nC |
| Q_{gc} | | | 40 | nC |
| t_{d(on)} | Inductive load, T_J = 25°C I _C = I _{C90} , V _{GE} = 15 V V _{CE} = 0.8 V _{CES} , R _G = R _{off} = 4.7 Ω Remarks: Switching times may increase for V _{CE} (Clamp) > 0.8 • V _{CES} , higher T _J or increased R _G | | 25 | ns |
| t_{ri} | | | 20 | ns |
| t_{d(off)} | | | 85 | ns |
| t_{fi} | | | 55 | ns |
| E_{off} | | | 0.32 | mJ |
| t_{d(on)} | Inductive load, T_J = 125°C I _C = I _{C90} , V _{GE} = 15 V V _{CE} = 0.8 V _{CES} , R _G = R _{off} = 4.7 Ω Remarks: Switching times may increase for V _{CE} (Clamp) > 0.8 • V _{CES} , higher T _J or increased R _G | | 25 | ns |
| t_{ri} | | | 25 | ns |
| E_{on} | | | 1 | mJ |
| t_{d(off)} | | | 110 | 170 ns |
| t_{fi} | | | 100 | 160 ns |
| E_{off} | | 0.85 | 1.25 mJ | |
| R_{thJC} | | | | 0.62 K/W |
| R_{thCK} | | 0.25 | | K/W |

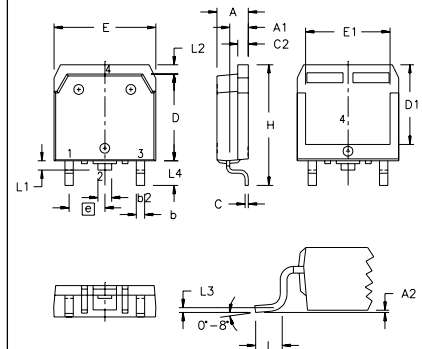
| Symbol | Test Conditions | Characteristic Values | | |
|-------------------------|--|---|------|---------|
| | | (T _J = 25°C, unless otherwise specified) | | |
| | | min. | typ. | max. |
| V_F | I _F = I _{C90} , V _{GE} = 0 V, Pulse test t ≤ 300 μs, duty cycle d ≤ 2 % | T _J = 150°C | | 1.6 V |
| | | T _J = 25°C | | 2.5 V |
| I_{RM} | I _F = I _{C90} , V _{GE} = 0 V, -di _F /dt = 100 A/μs V _R = 100 V I _F = 1 A; -di _F /dt = 100 A/μs; V _R = 30 V | T _J = 100°C | 6 | A |
| t_{rr} | | T _J = 25°C | 100 | ns |
| | | | 25 | ns |
| R_{thJC} | | | | 0.9 K/W |

TO-247 AD 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 |
| ØP | 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 Outline



Terminals: 1 - Gate 2 - Collector
3 - Emitter

| SYM | INCHES | | MILLIMETERS | |
|----------------|----------|------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | .193 | .201 | 4.90 | 5.10 |
| A ₁ | .106 | .114 | 2.70 | 2.90 |
| A ₂ | .001 | .010 | 0.02 | 0.25 |
| b | .045 | .057 | 1.15 | 1.45 |
| b ₂ | .075 | .083 | 1.90 | 2.10 |
| C | .016 | .026 | 0.40 | 0.65 |
| C ₂ | .057 | .063 | 1.45 | 1.60 |
| D | 54.3 | 55.1 | 13.80 | 14.00 |
| D ₁ | 4.88 | 5.00 | 12.40 | 12.70 |
| E | .624 | .632 | 15.85 | 16.05 |
| E ₁ | 5.24 | 5.35 | 13.30 | 13.60 |
| e | .215 BSC | | 5.45 BSC | |
| H | .736 | .752 | 18.70 | 19.10 |
| L | .094 | .106 | 2.40 | 2.70 |
| L ₁ | .047 | .055 | 1.20 | 1.40 |
| L ₂ | .039 | .045 | 1.00 | 1.15 |
| L ₃ | .010 BSC | | 0.25 BSC | |
| L ₄ | .150 | .161 | 3.80 | 4.10 |

IXYS reserves the right to change limits, test conditions, and dimensions.

| | | | | | | | |
|--|-----------|-----------|-----------|-----------|-----------|-----------|-------------|
| IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents: | 4,835,592 | 4,881,106 | 5,017,508 | 5,049,961 | 5,187,117 | 5,486,715 | 6,306,728B1 |
| | 4,850,072 | 4,931,844 | 5,034,796 | 5,063,307 | 5,237,481 | 5,381,025 | |

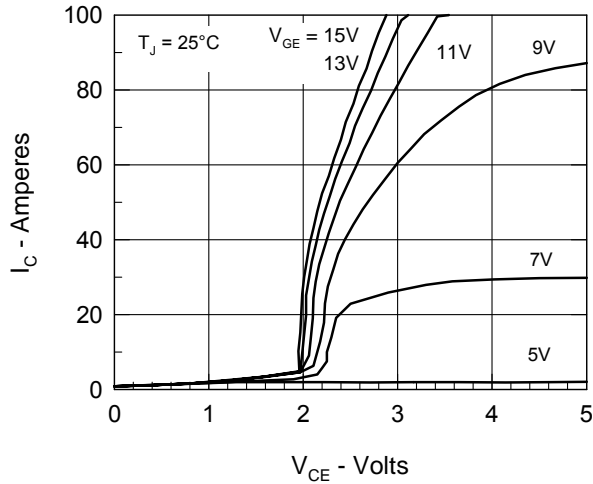


Fig. 1. Output Characteristics

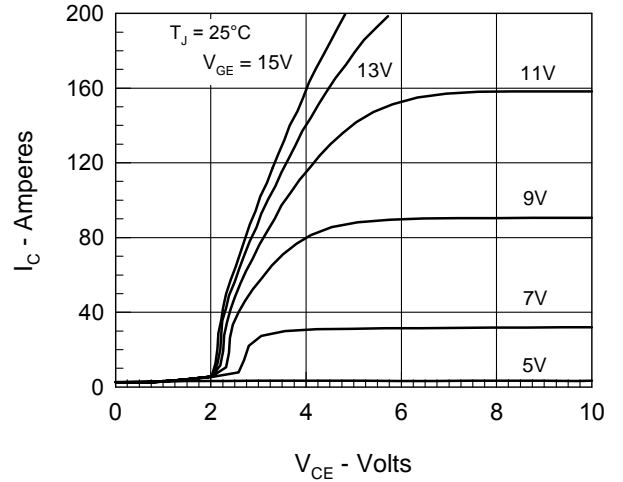


Fig. 2. Extended Output Characteristics

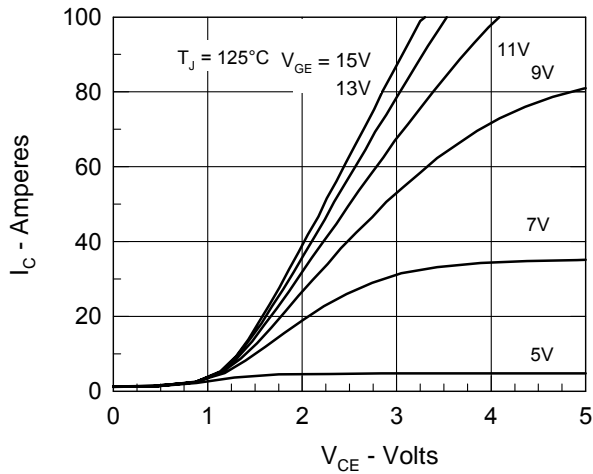


Fig. 3. High Temperature Output Characteristics

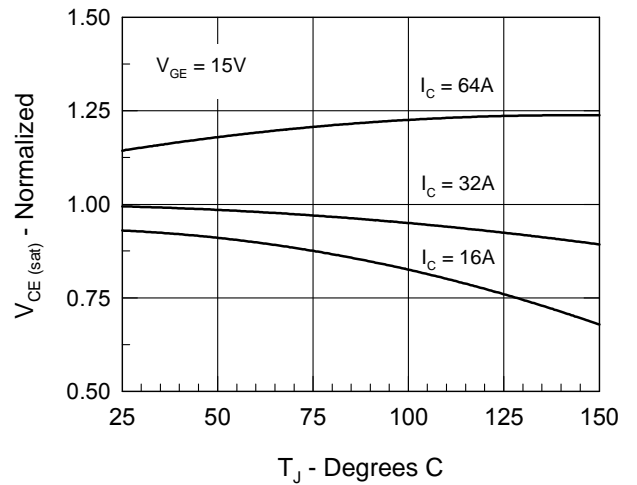
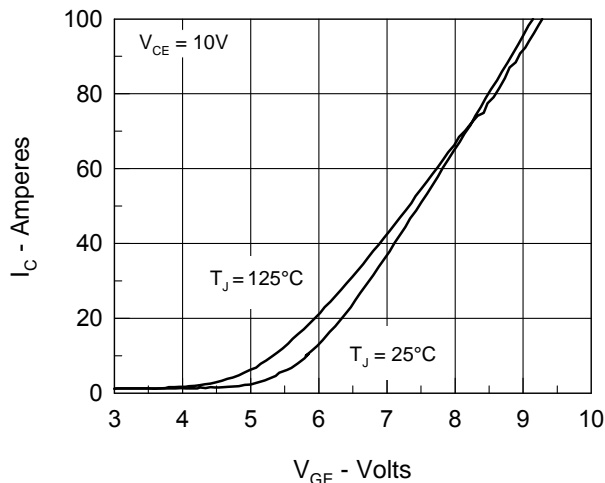

 Fig. 4. Temperature Dependence of $V_{CE(sat)}$


Fig. 5. Admittance Curves

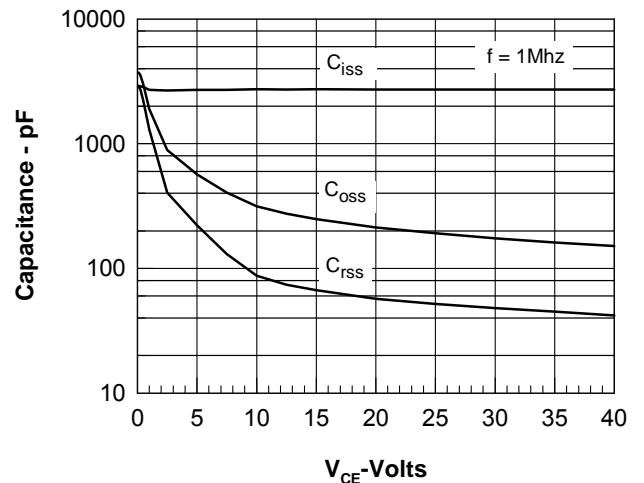


Fig. 6. Capacitance Curves

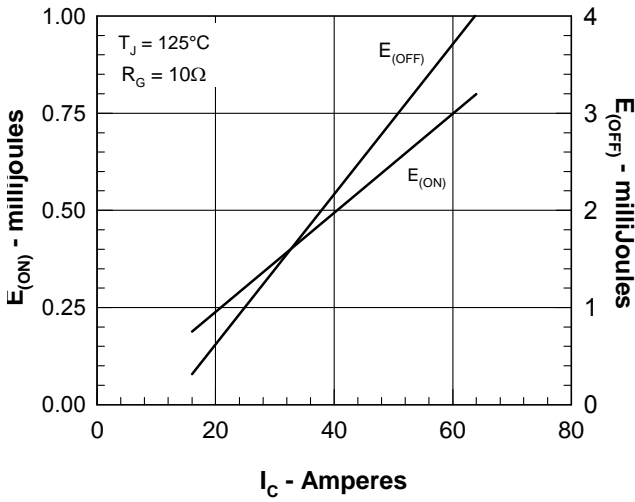


Fig. 7. Dependence of E_{ON} and E_{OFF} on I_C .

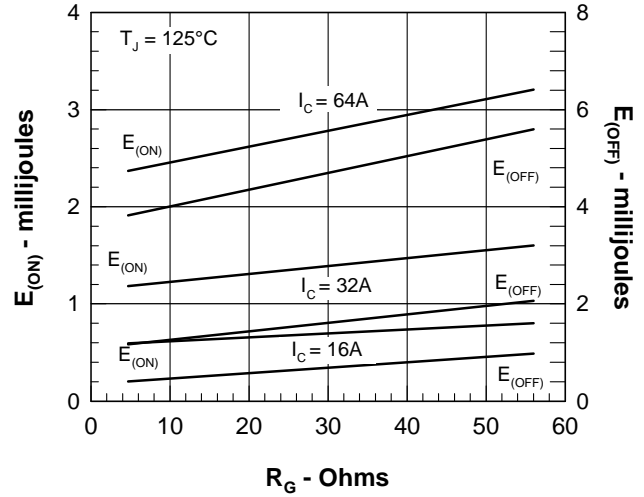


Fig. 8. Dependence of E_{ON} and E_{OFF} on R_G .

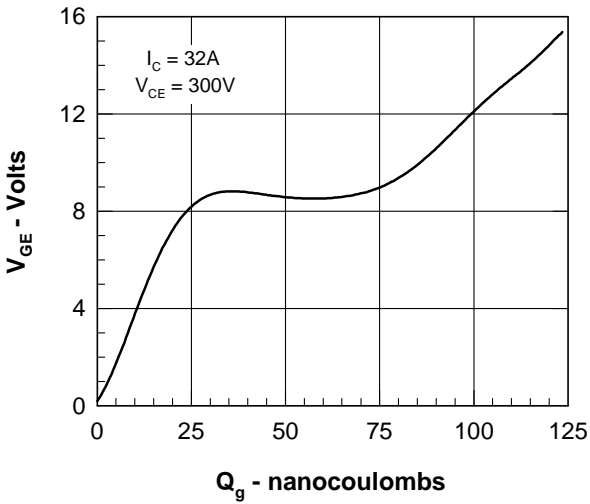


Fig. 9. Gate Charge

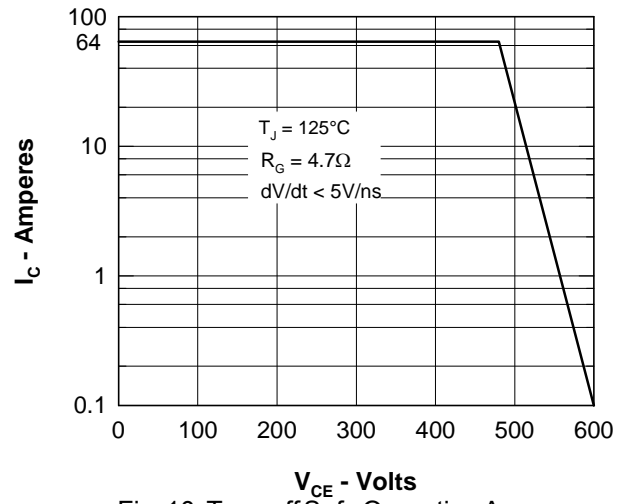


Fig. 10. Turn-off Safe Operating Area

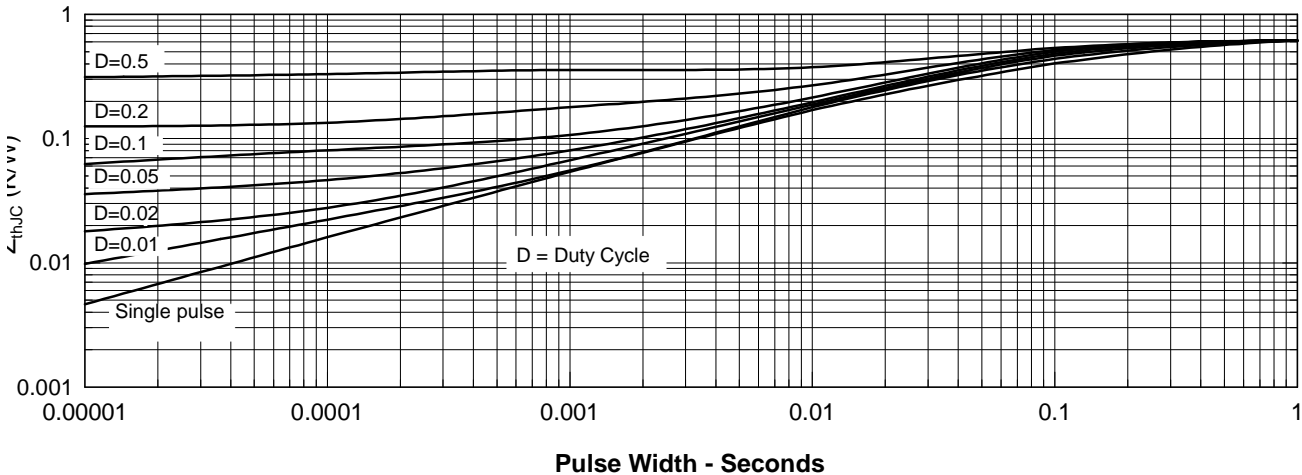


Fig. 11. Transient Thermal Resistance

IXYS reserves the right to change limits, test conditions, and dimensions.

IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:

| | | | | | | |
|-----------|-----------|-----------|-----------|-----------|-----------|-------------|
| 4,835,592 | 4,881,106 | 5,017,508 | 5,049,961 | 5,187,117 | 5,486,715 | 6,306,728B1 |
| 4,850,072 | 4,931,844 | 5,034,796 | 5,063,307 | 5,237,481 | 5,381,025 | |

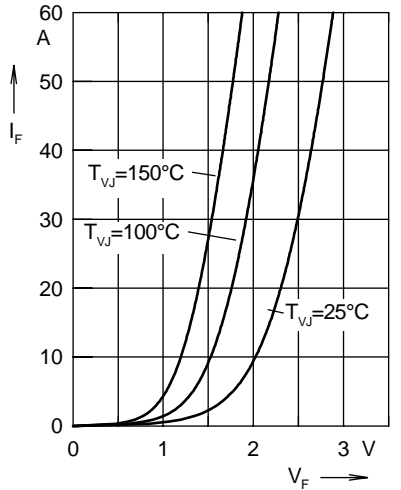


Fig. 12 Forward current I_F versus V_F

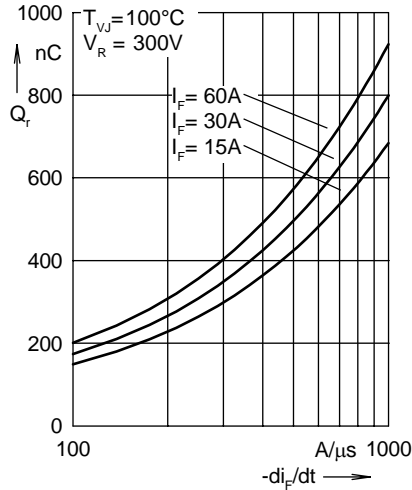


Fig. 13 Reverse recovery charge Q_r versus $-di_F/dt$

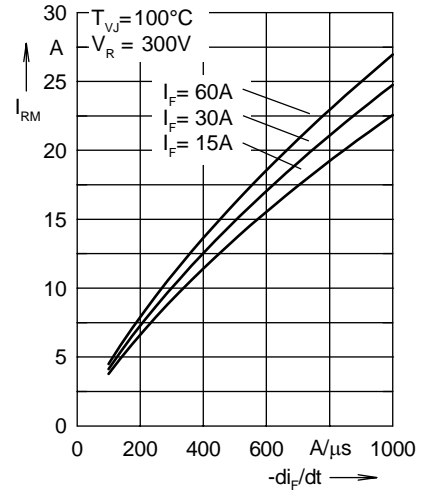


Fig. 14 Peak reverse current I_{RM} versus $-di_F/dt$

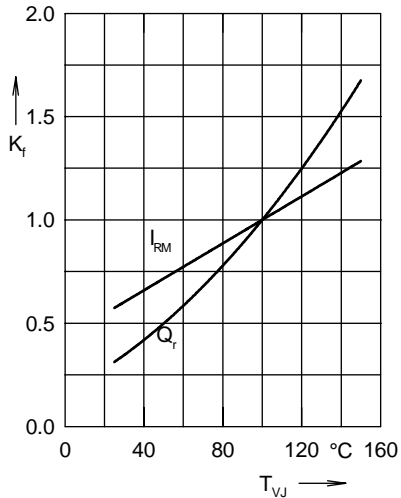


Fig. 15 Dynamic parameters Q_r , I_{RM} versus T_{VJ}

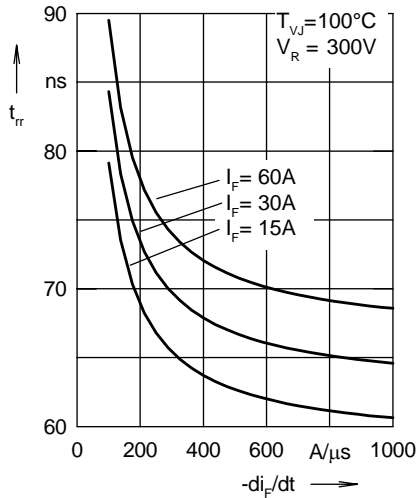


Fig. 16 Recovery time t_{rr} versus $-di_F/dt$

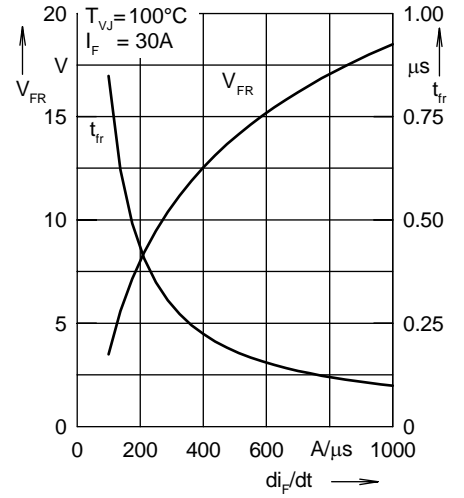


Fig. 17 Peak forward voltage V_{FR} and t_{rr} versus di_F/dt

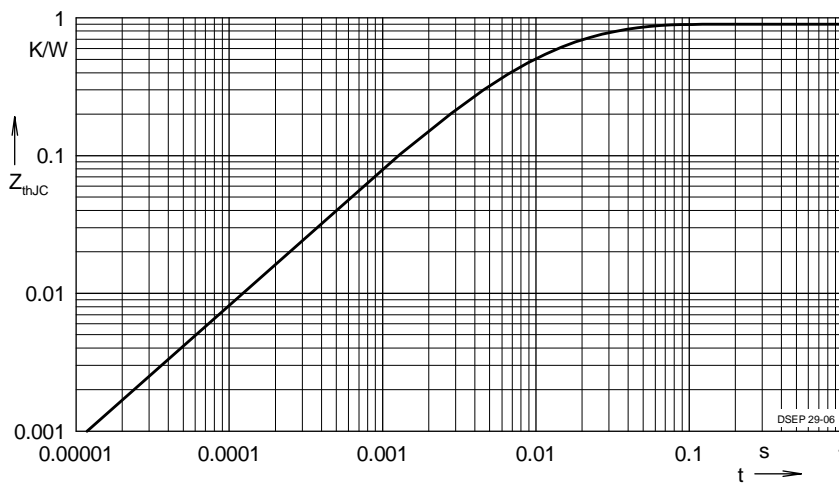


Fig. 18 Transient thermal resistance junction to case

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 |