# THE DATASHEET OF

# IXGQ85N33PCD1

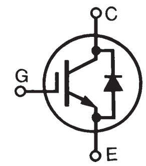
IXYS

# Polar™ High Speed IGBT w/ Diode

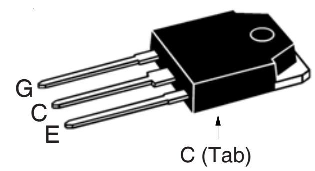
# IXGQ85N33PCD1

$V_{CES}$ = 330V
$I_{CP}$ = 340A
$V_{CE(sat)}$ ≤ 2.10V

Anti-Parallel Diode for
PDP Sustain Circuit




**TO-3P (IXGQ)**




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

| Symbol | Test Conditions | Maximum Ratings | |
|---|---|---|---|
| $V_{CES}$ | $T_J$ = 25°C to 150°C | 330 | V |
| $V_{GES}$ | Continuous | ±20 | V |
| $V_{GEM}$ | Transient | ±30 | V |
| $I_{C25}$ | $T_C$ = 25°C | 85 | A |
| $I_{DP}$ | $T_J$ ≤ 150°C, tp ≤ 10μs, | 40 | A |
| $I_{CP}$ | $T_J$ ≤ 150°C, tp ≤ 1μs, D ≤ 1% | 340 | A |
| **SSOA** | $V_{GE}$ = 15V, $T_{VJ}$ = 150°C, $R_G$ = 20Ω | $I_{CM}$ = 96 | A |
| **(RBSOA)** | Clamped Inductive Load | @$V_{CE}$ ≤ 300 | V |
| $P_C$ | $T_C$ = 25°C | 150 | W |
| $T_J$ | | -55 ... +150 | °C |
| $T_{JM}$ | | 150 | °C |
| $T_{stg}$ | | -55 ... +150 | °C |
| $T_L$ | Maximum Lead Temperature for Soldering | 300 | °C |
| $T_{SOLD}$ | 1.6 mm (0.062in.) from Case for 10s | 260 | °C |
| $M_d$ | Mounting Torque | 1.13/10 | Nm/lb.in |
| **Weight** | | 5.5 | g |

| Symbol | Test Conditions<br>($T_J$ = 25°C, Unless Otherwise Specified) | Characteristic Values<br>Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $V_{GE(th)}$ | $I_C$ = 1mA, $V_{CE}$ = $V_{GE}$ | 3.0 | | 6.0 | V |
| $I_{CES}$ | $V_{CE}$ = $V_{CES}$, $V_{GE}$ = 0V | | | 1 | μA |
| | $T_J$ = 125°C | | | 200 | μA |
| $I_{GES}$ | $V_{CE}$ = 0V, $V_{GE}$ = ±20V | | | ±100 | nA |
| $V_{CE(sat)}$ | $I_C$ = 50A, $V_{GE}$ = 15V, Note 1 $T_J$ = 25°C | | 1.43 | 2.10 | V |
| | $I_C$ = 100A | | 1.85 | 3.00 | V |
| | $I_C$ = 50A, $V_{GE}$ = 15V, Note 1 $T_J$ = 125°C | | 1.47 | | V |
| | $I_C$ = 100A | | 2.00 | | V |

## Features

- International standard package
- Low $V_{CE(sat)}$
  - for minimum on-state conduction losses
- Fast switching
- Anti-Parallel Diode

## Advantages

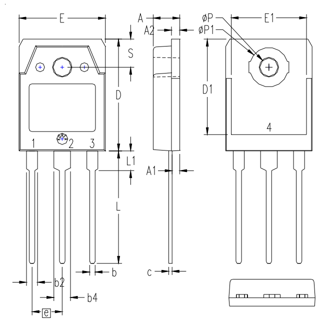
- High Power Density
- Low Gate Drive Requirement

## Applications

- PDP Screen Drivers

| Symbol | Test Conditions ($T_J$ = 25°C Unless Otherwise Specified) | Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $g_{fs}$ | $I_C$ = 43A, $V_{CE}$ = 10V, Note 1 | 30 | 49 | | S |
| $C_{ies}$ | $V_{CE}$ = 25V, $V_{GE}$ = 0V, f = 1MHz | | 2200 | | pF |
| $C_{oes}$ | | | 155 | | pF |
| $C_{res}$ | | | 25 | | pF |
| $Q_g$ | $I_C$ = 43A, $V_{GE}$ = 15V, $V_{CE}$ = 0.5 • $V_{CES}$ | | 80 | | nC |
| $Q_{ge}$ | | | 15 | | nC |
| $Q_{gc}$ | | | 23 | | nC |
| $t_{d(on)}$ | **Resistive load, $T_J$ = 25°C** | | 20 | | ns |
| $t_r$ | $I_C$ = 50A, $V_{GE}$ = 15V | | 43 | | ns |
| $t_{d(off)}$ | $V_{CE}$ = 240V, $R_G$ = 5Ω | | 87 | | ns |
| $t_f$ | | | 72 | 350 | ns |
| $t_{d(on)}$ | **Resistive load, $T_J$ = 125°C** | | 20 | | ns |
| $t_r$ | $I_C$ = 50A, $V_{GE}$ = 15V | | 95 | | ns |
| $t_{d(off)}$ | $V_{CE}$ = 240V, $R_G$ = 5Ω | | 88 | | ns |
| $t_f$ | | | 130 | | ns |
| $R_{thJC}$ | | | | 0.833 | °C/W |
| $R_{thCS}$ | | | 0.25 | | °C/W |

**TO-3P Outline**




1 = Gate 2,4 = Collector
3 = Emitter

| SYM | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | .185 | .193 | 4.70 | 4.90 |
| A1 | .051 | .059 | 1.30 | 1.50 |
| A2 | .057 | .065 | 1.45 | 1.65 |
| b | .035 | .045 | 0.90 | 1.15 |
| b2 | .075 | .087 | 1.90 | 2.20 |
| b4 | .114 | .126 | 2.90 | 3.20 |
| c | .022 | .031 | 0.55 | 0.80 |
| D | .780 | .799 | 19.80 | 20.30 |
| D1 | .665 | .677 | 16.90 | 17.20 |
| E | .610 | .622 | 15.50 | 15.80 |
| E1 | .531 | .539 | 13.50 | 13.70 |
| e | .215 BSC | | 5.45 BSC | |
| L | .779 | .795 | 19.80 | 20.20 |
| L1 | .134 | .142 | 3.40 | 3.60 |
| ØP | .126 | .134 | 3.20 | 3.40 |
| ØP1 | .272 | .280 | 6.90 | 7.10 |
| S | .193 | .201 | 4.90 | 5.10 |

**Reverse Diode (FRED)**

| Symbol | Test Conditions ($T_J$ = 25°C Unless Otherwise Specified) | | Min. | Typ. | Max. | |
|---|---|---|---|---|---|---|
| $V_F$ | $I_F$ = 30A, $V_{GE}$ = 0V, Note 1 | $T_J$ = 25°C | | | 1.40 | V |
| | $I_F$ = 60A | | | | 1.69 | V |
| | $I_F$ = 30A, $V_{GE}$ = 0V, Note 1 | $T_J$ = 150°C | | | 1.13 | V |
| | $I_F$ = 60A | | | | 1.46 | V |
| $I_{RM}$ | $I_F$ = 30A, -di$_F$/dt = 200A/μs, $V_R$ = 270V | $T_J$ = 25°C | | 4.0 | | A |
| | | $T_J$ = 125°C | | 8.5 | | A |
| $t_{rr}$ | | $T_J$ = 25°C | | 45 | | ns |
| | | $T_J$ = 125°C | | 85 | | ns |
| $R_{thJC}$ | | | | | 0.95 | °C/W |

Note: 1. Pulse test, t ≤ 300μs, duty cycle, d ≤ 2%.

**Fig. 1. Output Characteristics @ $T_J = 25^oC$**

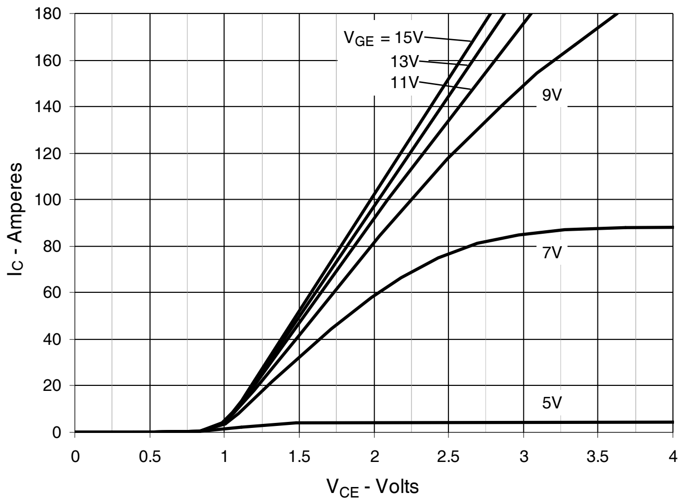



**Fig. 2. Extended Output Characteristics @ $T_J = 25^oC$**

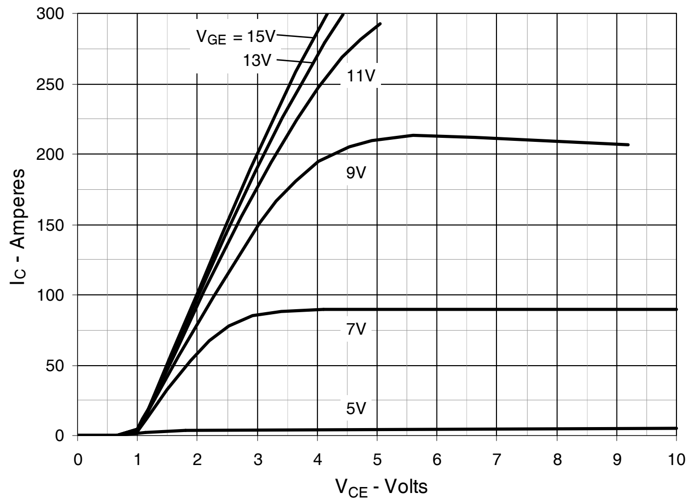



**Fig. 3. Output Characteristics @ $T_J = 125^oC$**

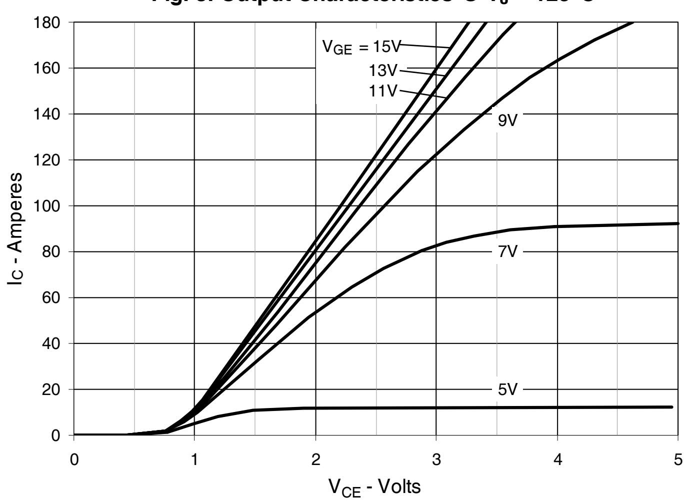



**Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature**

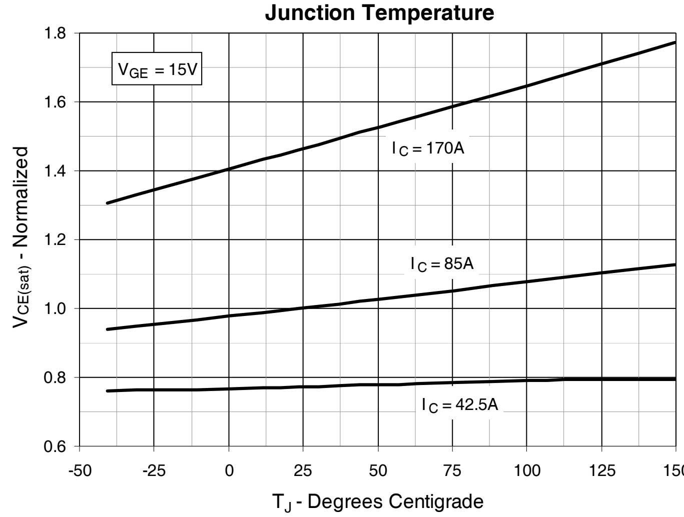



**Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage**

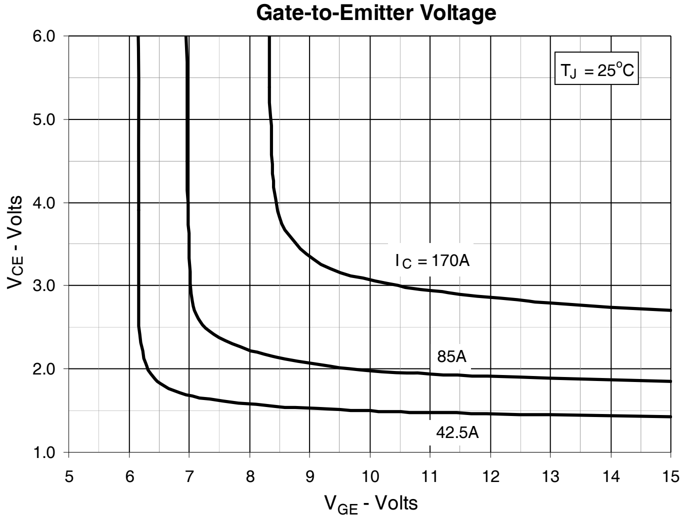



**Fig. 6. Input Admittance**

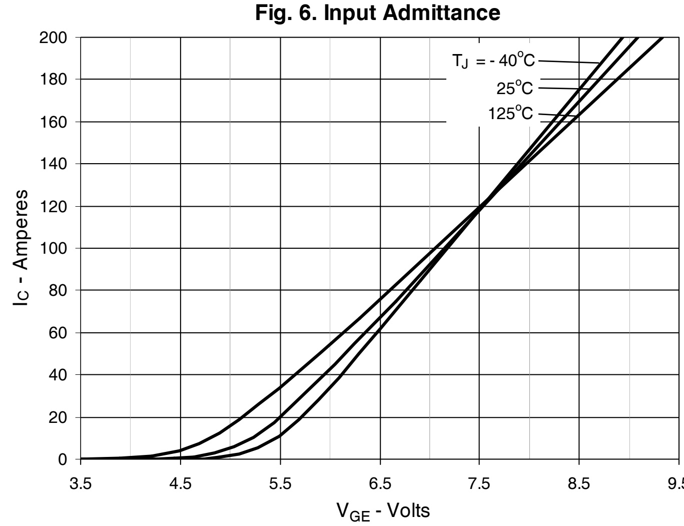


**Fig. 7. Transconductance**

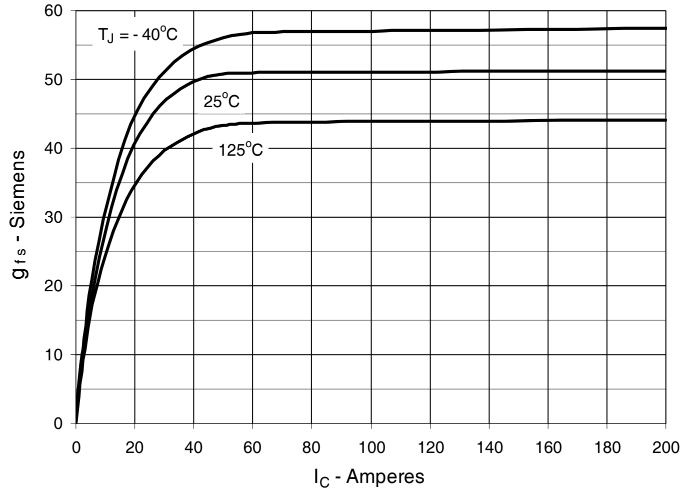



**Fig. 8. Gate Charge**

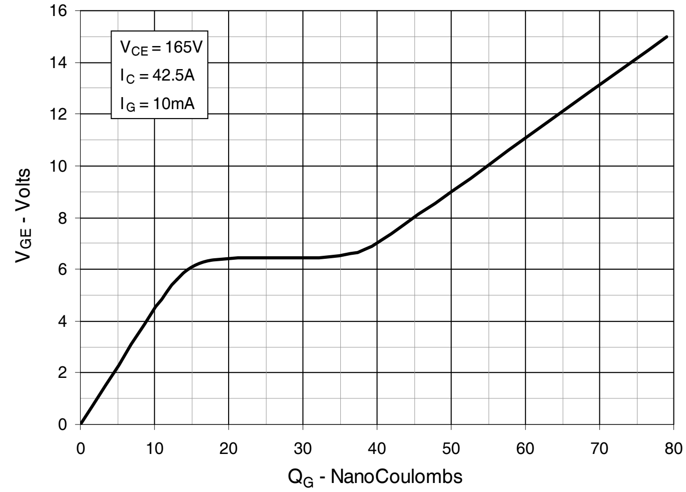



**Fig. 9. Capacitance**

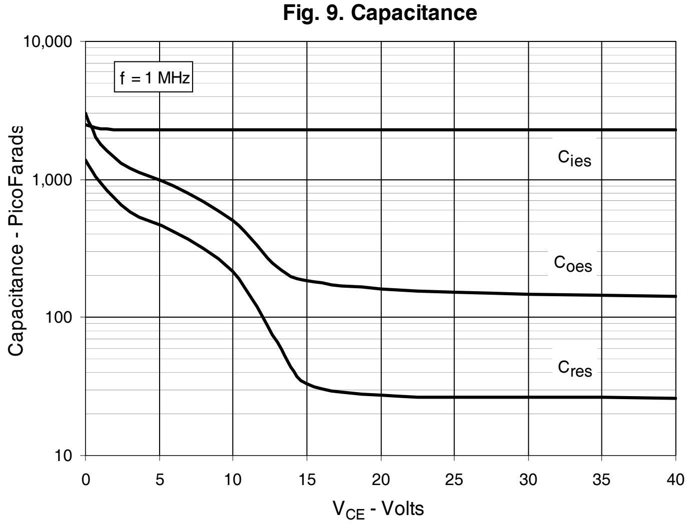



**Fig. 10. Reverse-Bias Safe Operating Area**

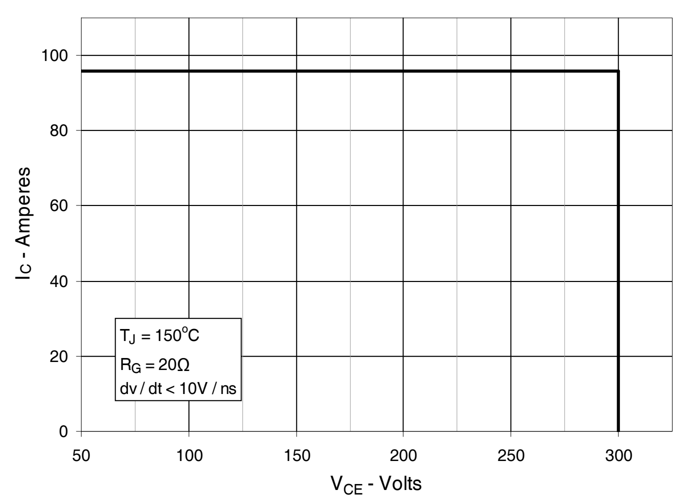



**Fig. 11. MaximumTransisent Thermal Impedance (IGBT)**

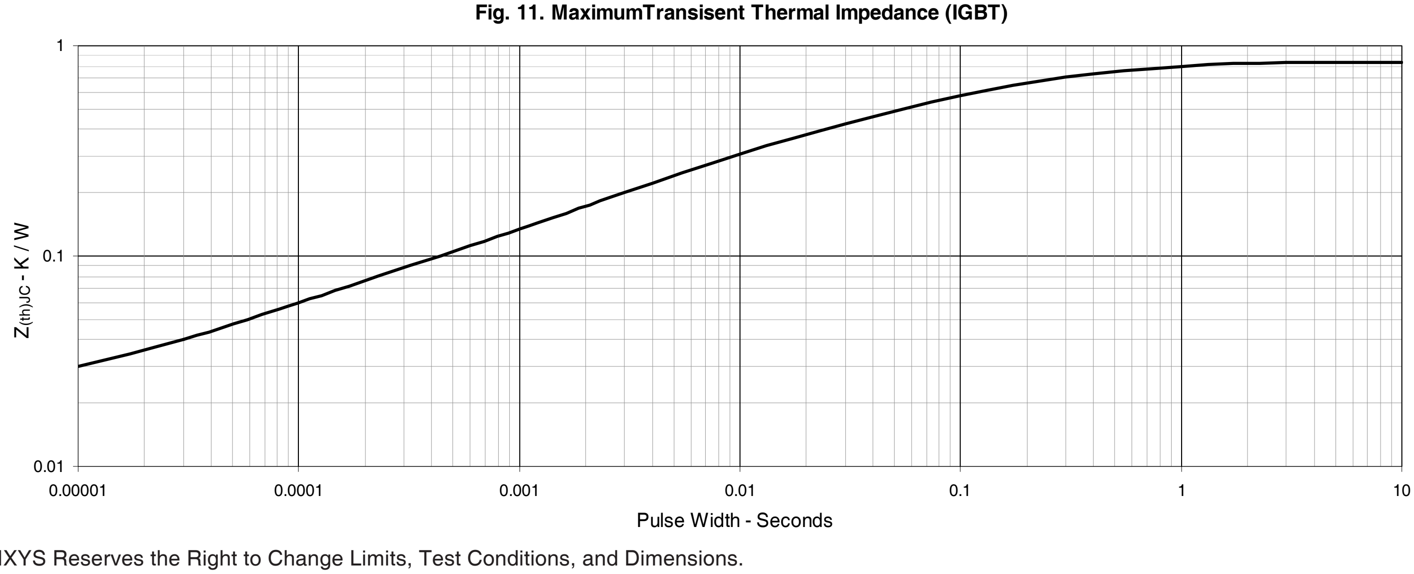


**Fig. 12. Resistive Turn-off Switching Times vs. Gate Resistance**

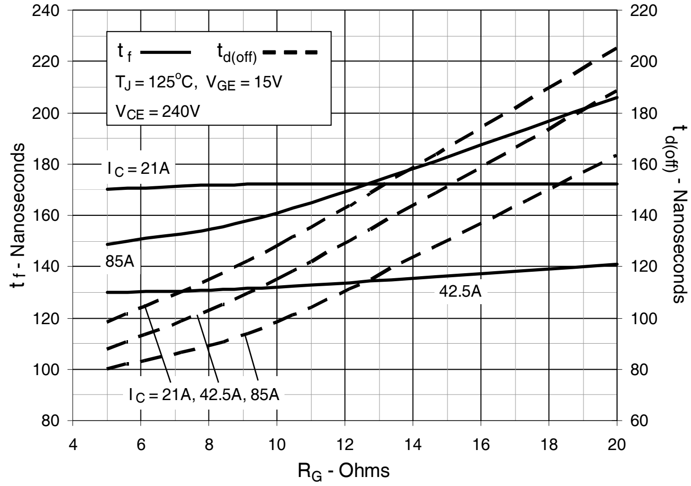



**Fig. 13. Resistive Turn-off Switching Times vs. Collector Current**

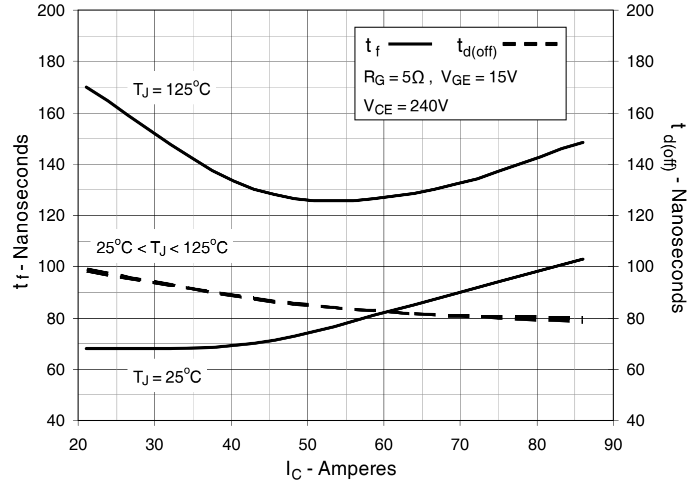



**Fig. 14. Resistive Turn-off Switching Times vs. Junction Temperature**

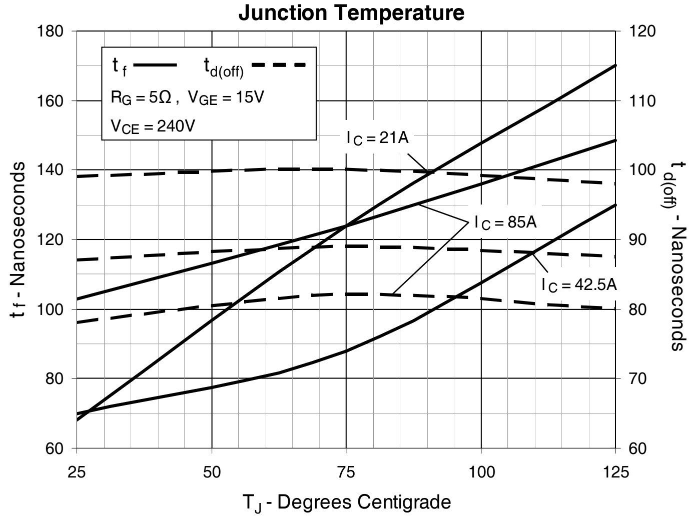



**Fig. 15. Resistive Turn-on Switching Times vs. Gate Resistance**

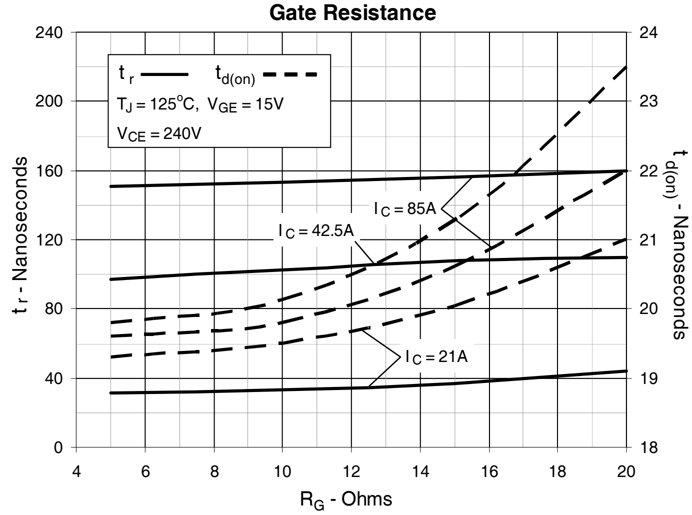



**Fig. 16. Resistive Turn-on Rise Time vs. Collector Current**

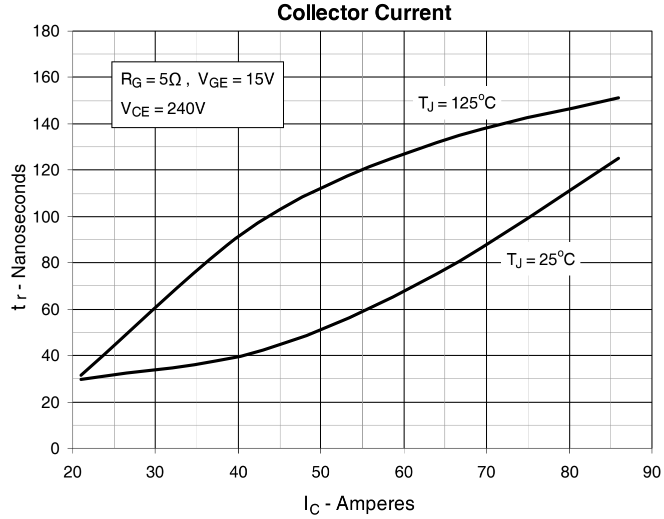



**Fig. 17. Resistive Turn-on Rise Time vs. Junction Temperature**

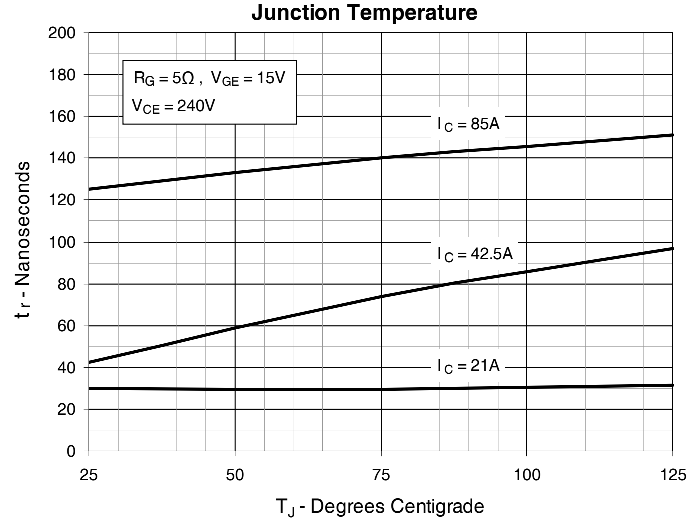


Fig. 18. Forward characteristics

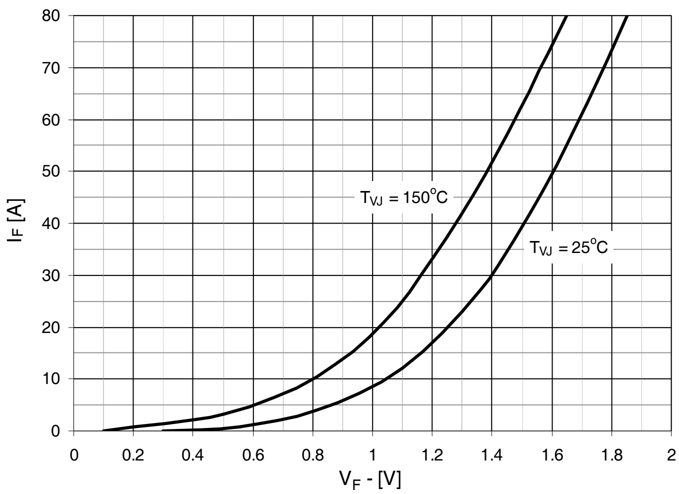



Fig. 19. Reverse Recovery Charge Qrr vs. -diF/dt

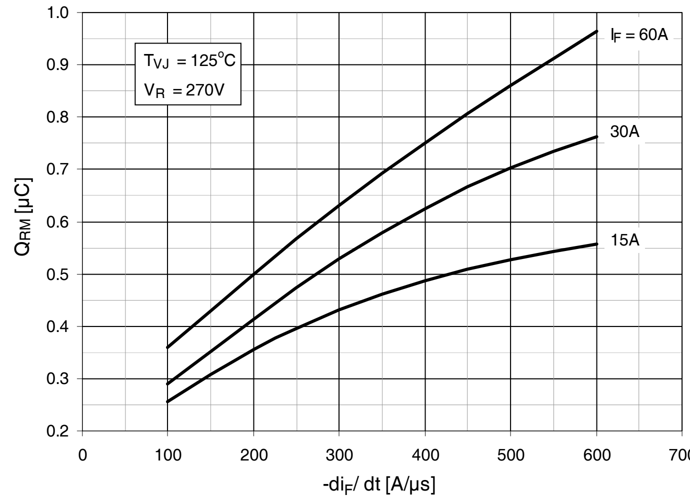



Fig. 20. Peak Reverse Current IRM vs. -diF/dt

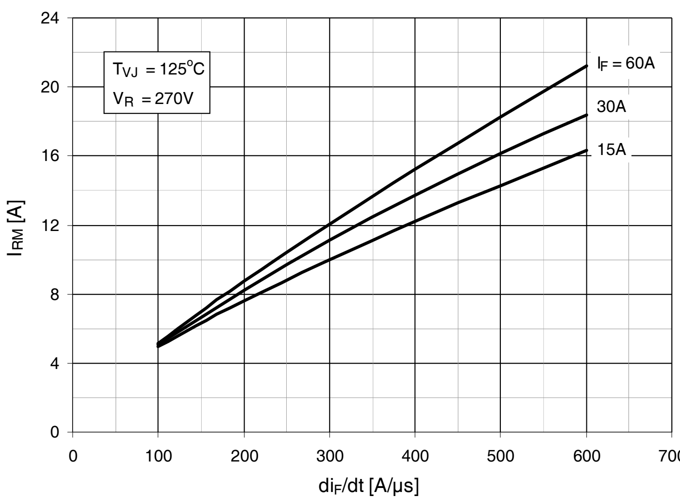



Fig. 21. Recovery Time trr vs. -diF/dt

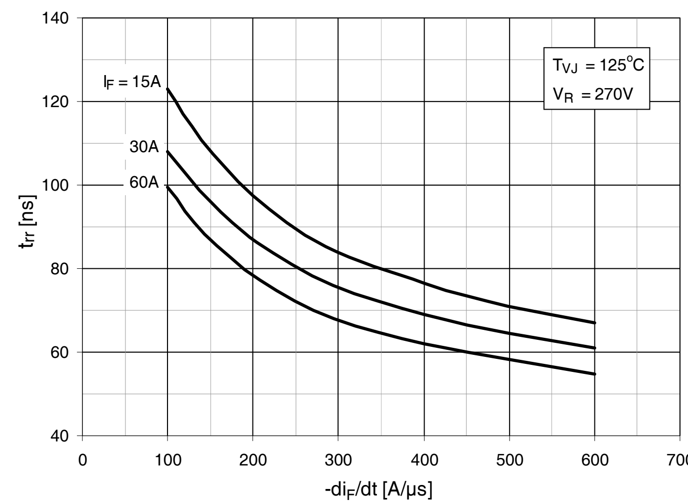



Fig. 22. Typ. Recovery Energy Erec vs. -diF/dt

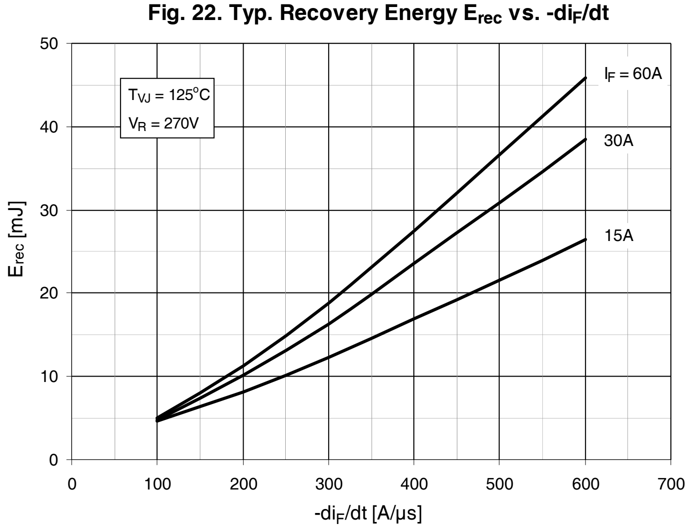
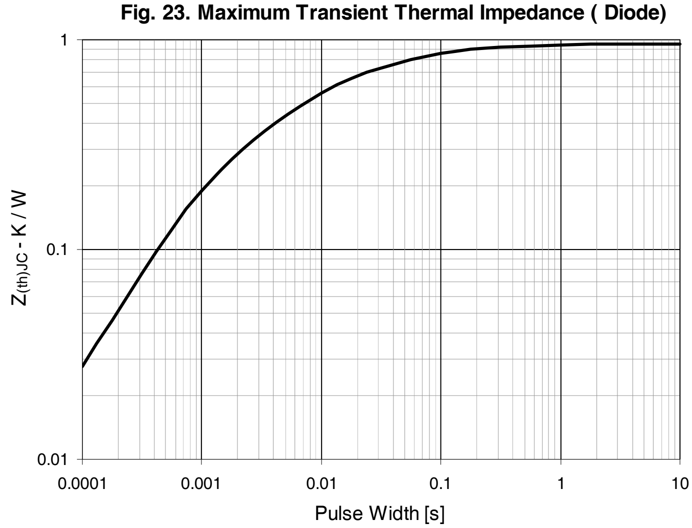



Fig. 23. Maximum Transient Thermal Impedance ( Diode)

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