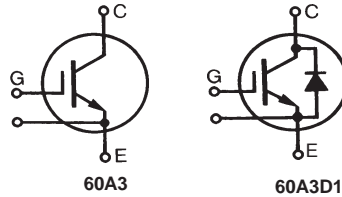


# GenX3™ 600V IGBT

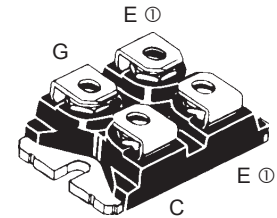
## IXGN120N60A3 IXGN120N60A3D1

$V_{CES} = 600V$   
 $I_{C110} = 120A$   
 $V_{CE(sat)} \leq 1.35V$

Ultra-low  $V_{sat}$  PT IGBTs for up to 5kHz switching



SOT-227B, miniBLOC  
 E153432



G = Gate, C = Collector, E = Emitter  
 Ⓧ Either Emitter Terminal can be used as Main or Kelvin Emitter

Symbol	Test Conditions	Maximum Ratings	
$V_{CES}$	$T_J = 25^\circ C$ to $150^\circ C$	600	V
$V_{CGR}$	$T_J = 25^\circ C$ to $150^\circ C$ , $R_{GE} = 1M\Omega$	600	V
$V_{GES}$	Continuous	$\pm 20$	V
$V_{GEM}$	Transient	$\pm 30$	V
$I_{C25}$	$T_C = 25^\circ C$	200	A
$I_{C110}$	$T_C = 110^\circ C$	120	A
$I_{F110}$	$T_C = 110^\circ C$ IXGN120N60A3D1	36	A
$I_{CM}$	$T_C = 25^\circ C$ , 1ms	800	A
<b>SSOA</b>	$V_{GE} = 15V$ , $T_{VJ} = 125^\circ C$ , $R_G = 1.5\Omega$	$I_{CM} = 200$	A
<b>(RBSOA)</b>	Clamped Inductive Load	@ $V_{CES} \leq 600$	V
$P_C$	$T_C = 25^\circ C$	595	W
$T_J$		-55 ... +150	$^\circ C$
$T_{JM}$		150	$^\circ C$
$T_{stg}$		-55 ... +150	$^\circ C$
$V_{ISOL}$	50/60Hz	$t = 1min$	2500 V~
	$I_{ISOL} \leq 1mA$	$t = 1s$	3000 V~
$M_d$	Mounting Torque	1.5/13	Nm/lb.in.
	Terminal Connection Torque (M4)	1.3/11.5	Nm/lb.in.
<b>Weight</b>		30	g

### Features

- Optimized for Low Conduction Losses
- Square RBSOA
- Anti-Parallel Ultra Fast Diode
- International Standard Package miniBLOC
- UL Recognized
- Aluminium Nitride Isolation
- Isolation Voltage 3000 V~
- Low  $V_{CE(sat)}$  for Minimum On-State

### Advantages

- High Power Density
- Low Gate Drive Requirement

### Applications

- Power Inverters
- UPS
- Motor Drives
- SMPS
- PFC Circuits
- Battery Chargers
- Welding Machines
- Lamp Ballasts
- Inrush Current Protection Circuits
- High Power Density

Symbol	Test Conditions ( $T_J = 25^\circ C$ , Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
$V_{GE(th)}$	$I_C = 500\mu A$ , $V_{CE} = V_{GE}$	3.0		5.0 V
$I_{CES}$	$V_{CE} = V_{CES}$ , $V_{GE} = 0V$ , Note 3 $T_J = 125^\circ C$	120N60A3		50 $\mu A$
		120N60A3D1		650 $\mu A$
		120N60A3		1 mA
		120N60A3D1		5 mA
$I_{GES}$	$V_{CE} = 0V$ , $V_{GE} = \pm 20V$			$\pm 400$ nA
$V_{CE(sat)}$	$I_C = 100A$ , $V_{GE} = 15V$ , Note 1	1.20	1.35	V

Symbol	Test Conditions ( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
$g_{fs}$	$I_C = 60\text{A}$ , $V_{CE} = 10\text{V}$ , Note 1	65	108	S
$C_{ies}$	$V_{CE} = 25\text{V}$ , $V_{GE} = 0\text{V}$ , $f = 1\text{MHz}$		14.8	nF
$C_{oes}$			800	pF
$C_{res}$			140	pF
$Q_{g(on)}$	$I_C = I_{C110}$ , $V_{GE} = 15\text{V}$ , $V_{CE} = 0.5 \cdot V_{CES}$		450	nC
$Q_{ge}$			67	nC
$Q_{gc}$			130	nC
$t_{d(on)}$	<b>Inductive Load, <math>T_J = 25^\circ\text{C}</math></b> $I_C = 100\text{A}$ , $V_{GE} = 15\text{V}$ $V_{CE} = 480\text{V}$ , $R_G = 1.5\Omega$ , Note 2		39	ns
$t_{ri}$			82	ns
$E_{on}$			2.7	mJ
$t_{d(off)}$			295	ns
$t_{fi}$			260	ns
$E_{off}$			6.6	mJ
$t_{d(on)}$	<b>Inductive Load, <math>T_J = 125^\circ\text{C}</math></b> $I_C = 100\text{A}$ , $V_{GE} = 15\text{V}$ $V_{CE} = 480\text{V}$ , $R_G = 1.5\Omega$ , Note 2		40	ns
$t_{ri}$			83	ns
$E_{on}$			3.5	mJ
$t_{d(off)}$			420	ns
$t_{fi}$			410	ns
$E_{off}$			10.4	mJ
$R_{thJC}$			0.21	$^\circ\text{C/W}$
$R_{thCK}$		0.05		$^\circ\text{C/W}$

**SOT-227B miniBLOC**


SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	1.240	1.255	31.50	31.88
B	.307	.323	7.80	8.20
C	.161	.169	4.09	4.29
D	.161	.169	4.09	4.29
E	.161	.169	4.09	4.29
F	.587	.595	14.91	15.11
G	1.186	1.193	30.12	30.30
H	1.496	1.505	38.00	38.23
J	.460	.481	11.68	12.22
K	.351	.378	8.92	9.60
L	.030	.033	0.76	0.84
M	.496	.506	12.60	12.85
N	.990	1.001	25.15	25.42
O	.078	.084	1.98	2.13
P	.195	.235	4.95	5.97
Q	1.045	1.059	26.54	26.90
R	.155	.174	3.94	4.42
S	.186	.191	4.72	4.85
T	.968	.987	24.59	25.07
U	-.002	.004	-0.05	0.1

**Reverse Diode (FRED)**

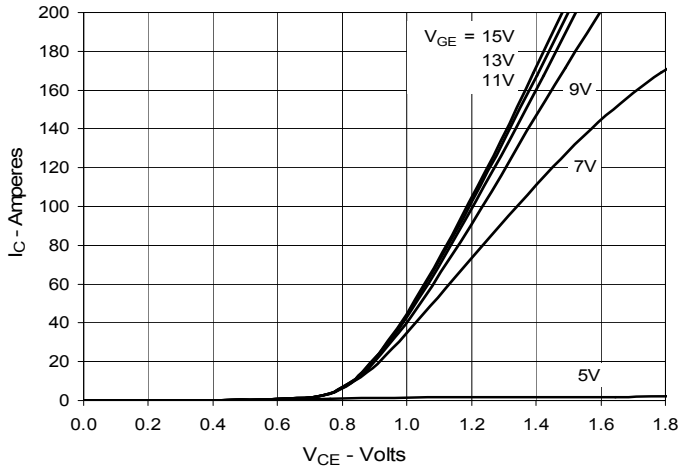
Symbol	Test Conditions ( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)	Characteristic Values		
		Min	Typ.	Max.
$V_F$	$I_F = 60\text{A}$ , Note 1 $V_{GE} = 0\text{V}$		2.1	V
	$T_J = 150^\circ\text{C}$		1.4	V
$I_{RM}$	$I_F = 60\text{A}$ , $V_{GE} = 0\text{V}$ , $-di_F/dt = 100\text{A}/\mu\text{s}$ $V_R = 300\text{V}$ , $T_J = 100^\circ\text{C}$		8.0	A
$t_{rr}$			175	ns
$R_{thJC}$			0.85	$^\circ\text{C/W}$

- Note: 1. Pulse Test,  $t \leq 300\mu\text{s}$ ; Duty Cycle,  $d \leq 2\%$ .  
 2. Remarks: Switching Times may increase for  $V_{CE}(\text{Clamp}) > 0.8 \cdot V_{CES}$ , Higher  $T_J$  or Increased  $R_G$ .  
 3. Parts must be HeatSunk for High Temperature  $I_{CES}$  Measurements.

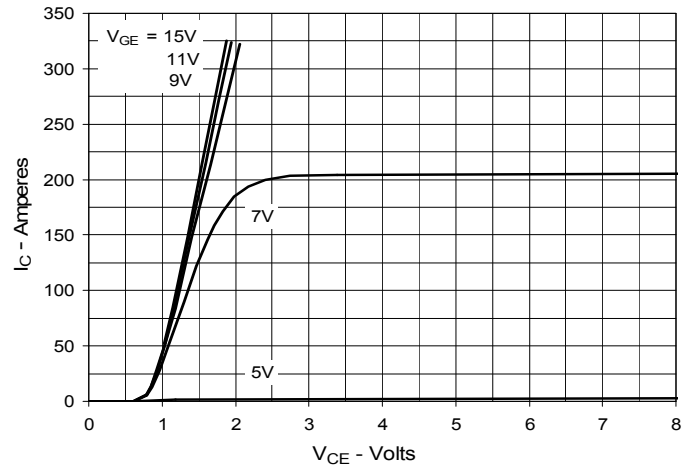
IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:	4,835,592	4,931,844	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
	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	

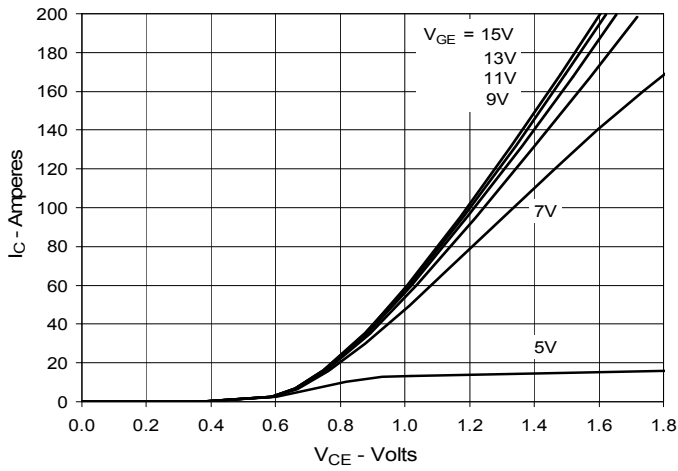
**Fig. 1. Output Characteristics @ 25°C**



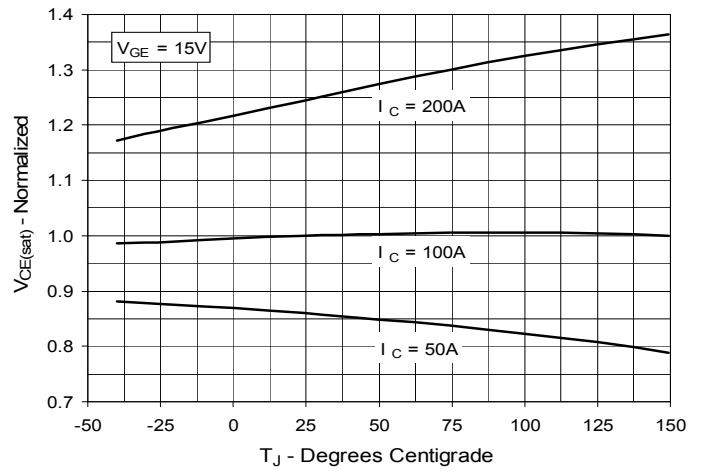
**Fig. 2. Extended Output Characteristics @ 25°C**



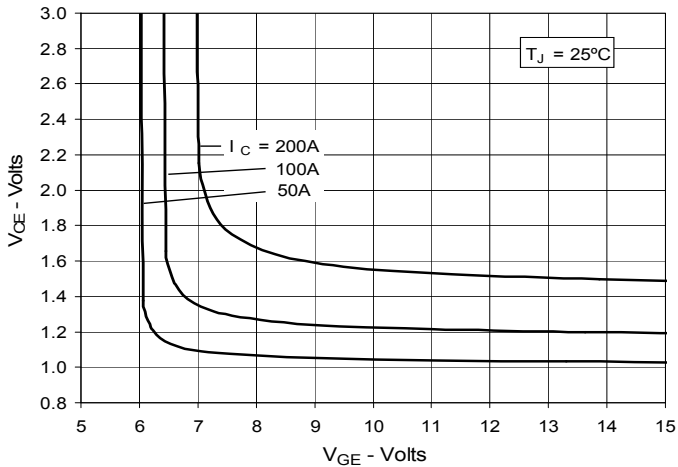
**Fig. 3. Output Characteristics @ 125°C**



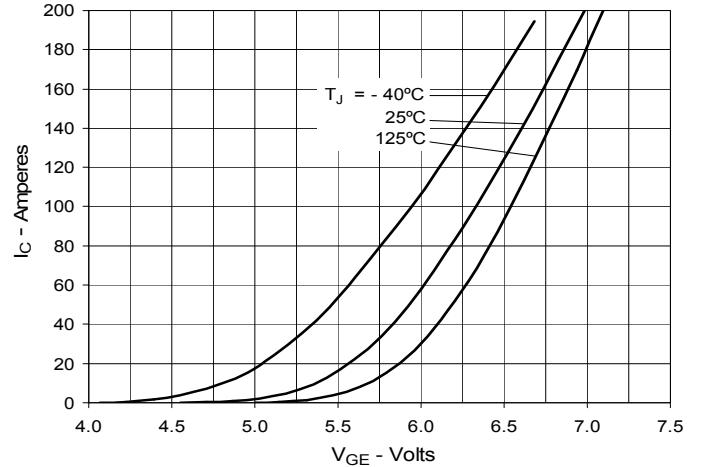
**Fig. 4. Dependence of  $V_{CE(sat)}$  on Junction Temperature**



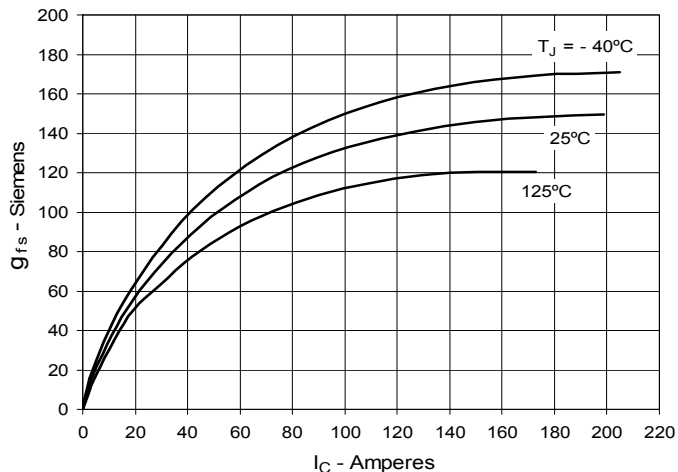
**Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage**



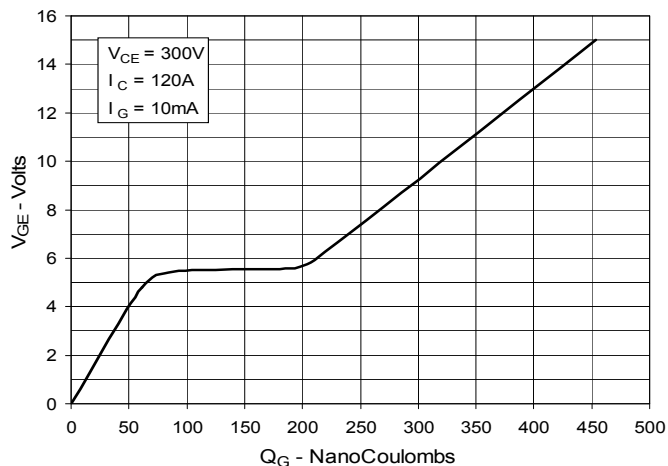
**Fig. 6. Input Admittance**



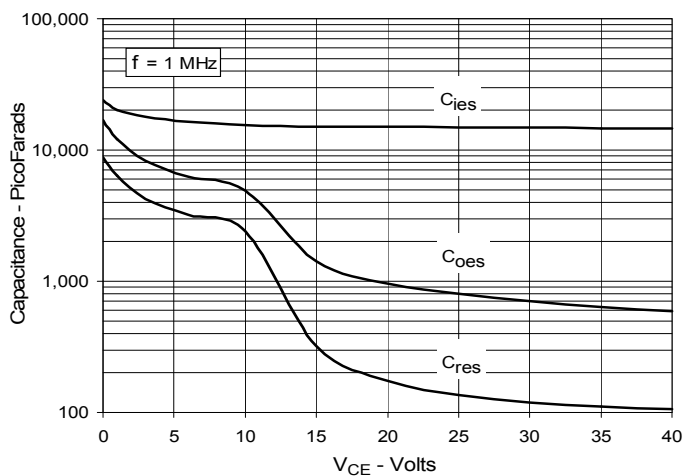
**Fig. 7. Transconductance**



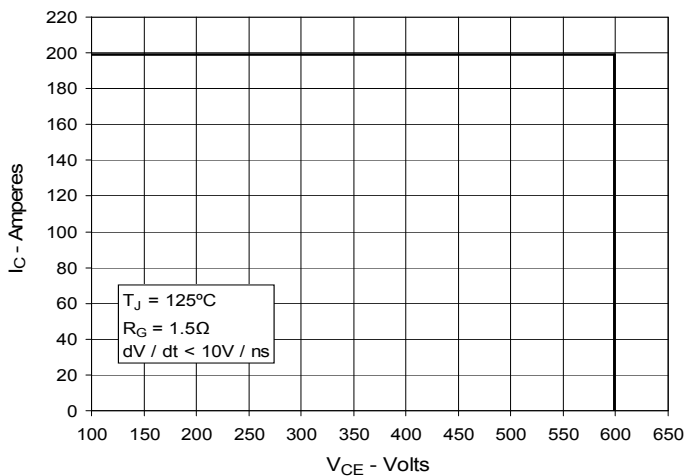
**Fig. 8. Gate Charge**



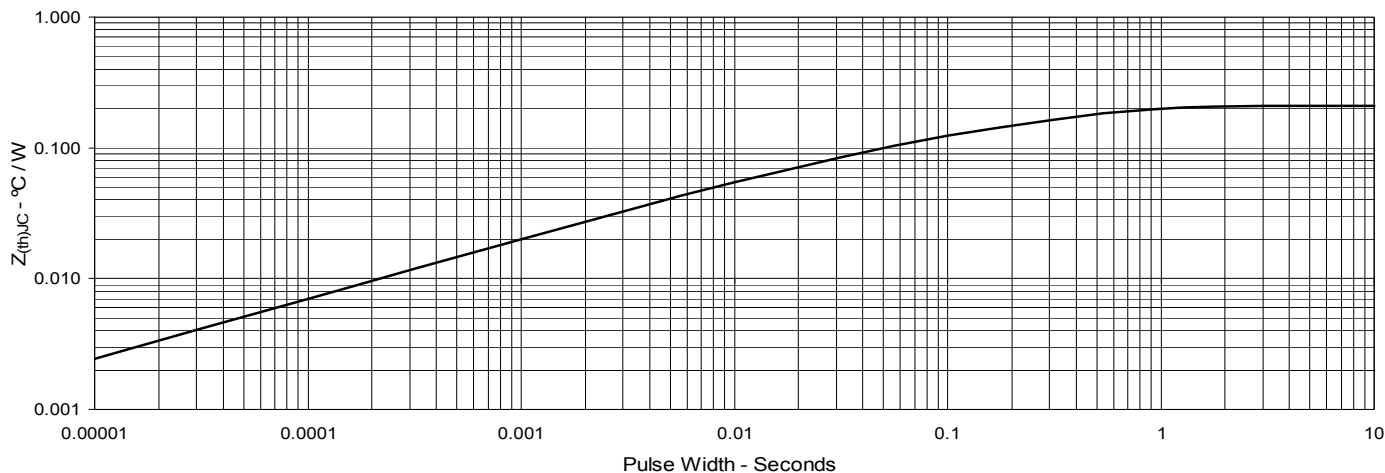
**Fig. 9. Capacitance**



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



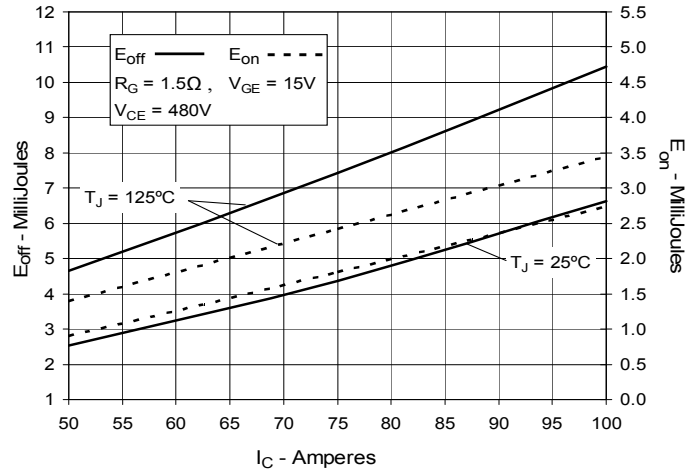
**Fig. 11. Maximum Transient Thermal Impedance**



**Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance**



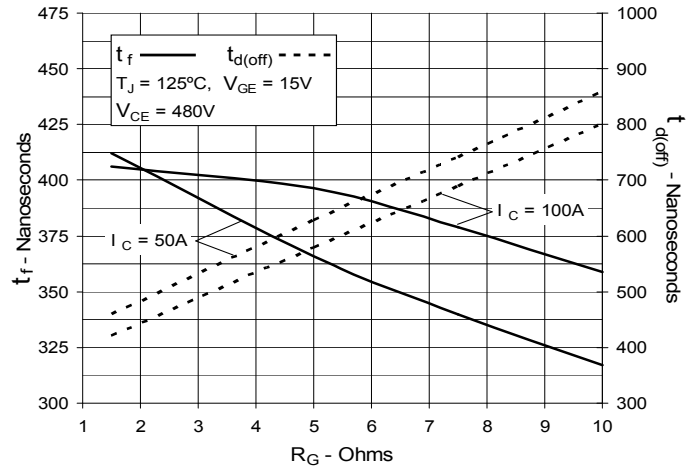
**Fig. 13. Inductive Switching Energy Loss vs. Collector Current**



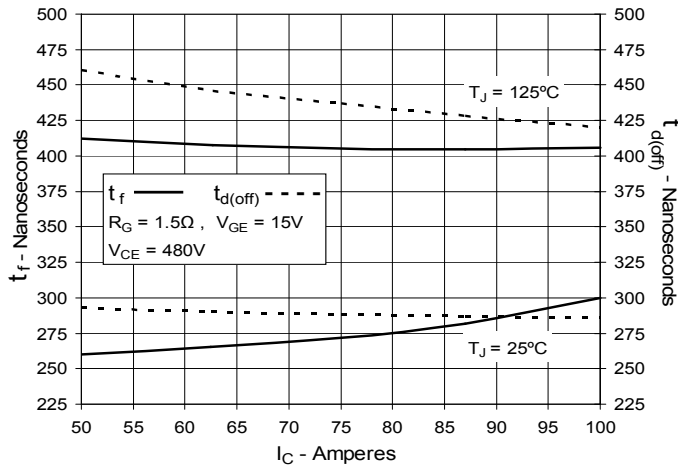
**Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature**



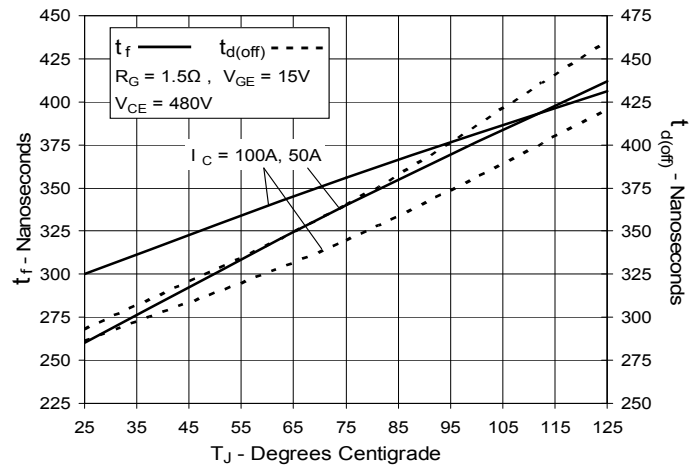
**Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance**



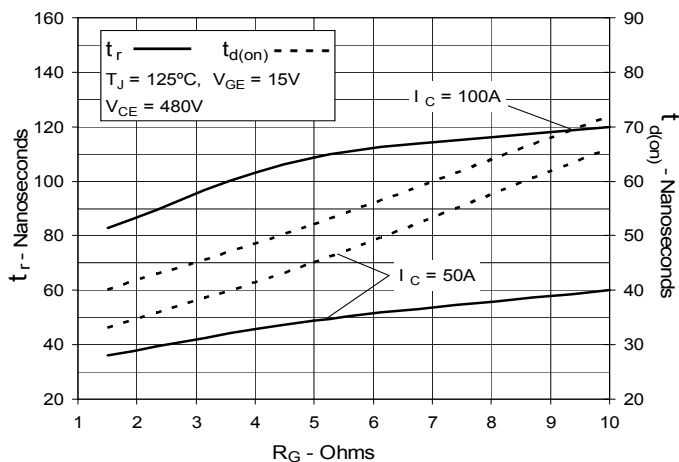
**Fig. 16. Inductive Turn-off Switching Times vs. Collector Current**



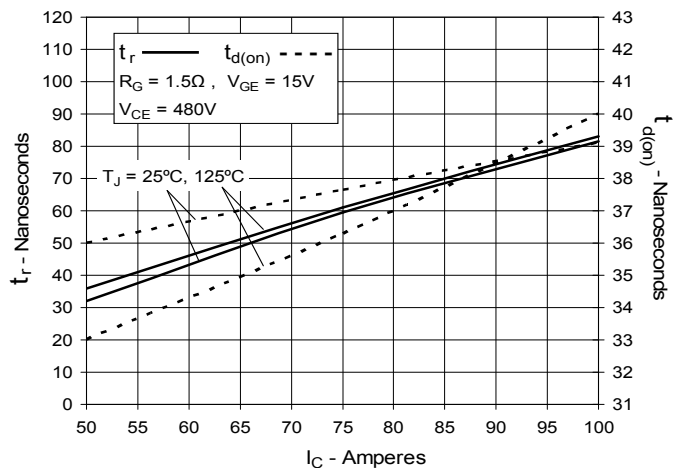
**Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature**



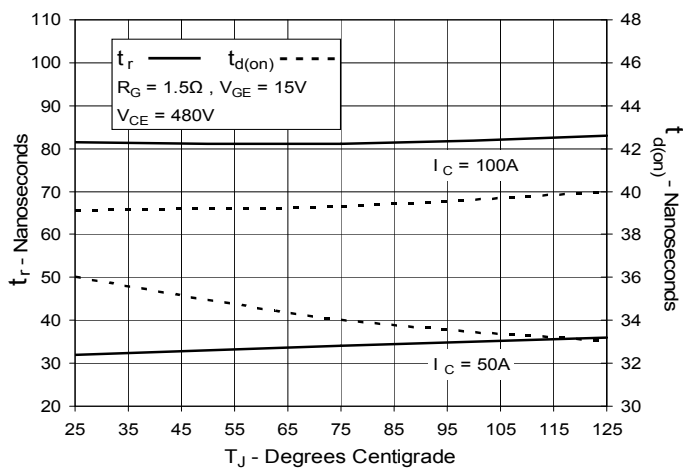
**Fig. 18. Inductive Turn-on  
Switching Times vs. Gate Resistance**



**Fig. 19. Inductive Turn-on  
Switching Times vs. Collector Current**



**Fig. 20. Inductive Turn-on  
Switching Times vs. Junction Temperature**



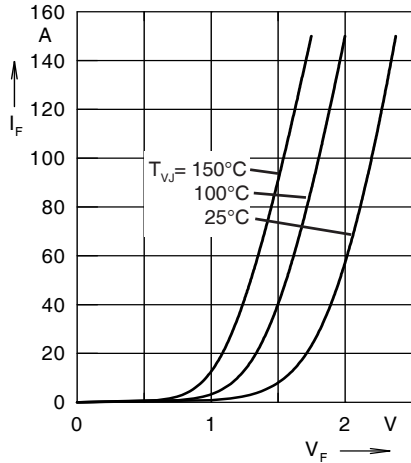


Fig. 21. Forward Current  $I_F$  Versus  $V_F$

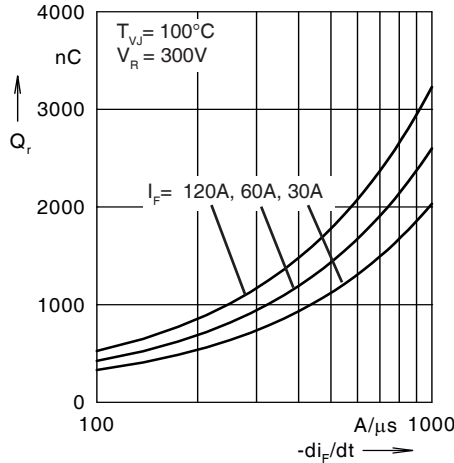


Fig. 22. Reverse Recovery Charge  $Q_r$  Versus  $-di_F/dt$

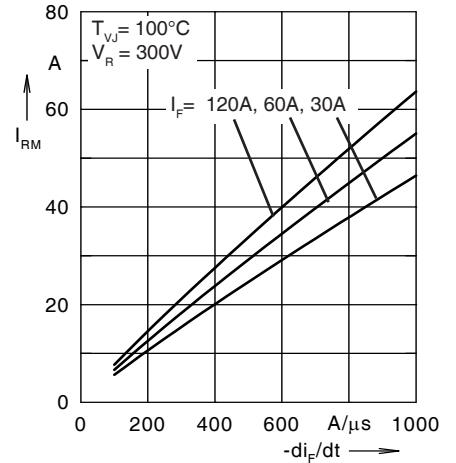


Fig. 23. Peak Reverse Current  $I_{RM}$  Versus  $-di_F/dt$

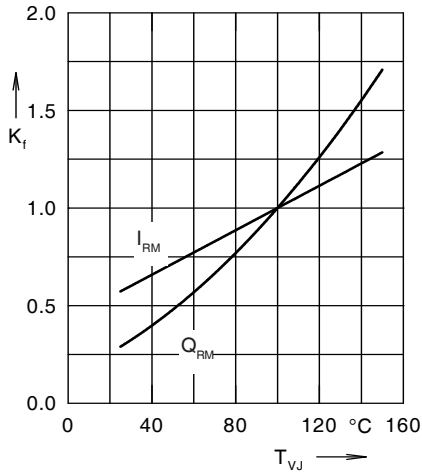


Fig. 24. Dynamic Parameters  $Q_r, I_{RM}$  Versus  $T_{VJ}$

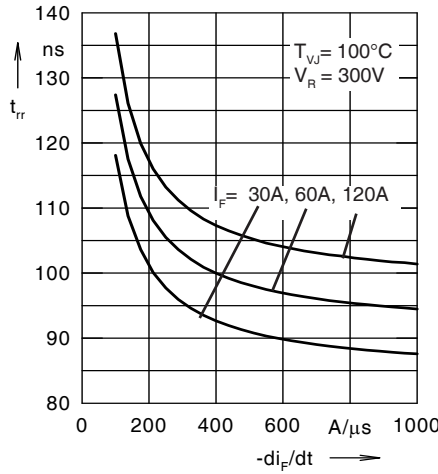


Fig. 25. Recovery Time  $t_{rr}$  Versus  $-di_F/dt$

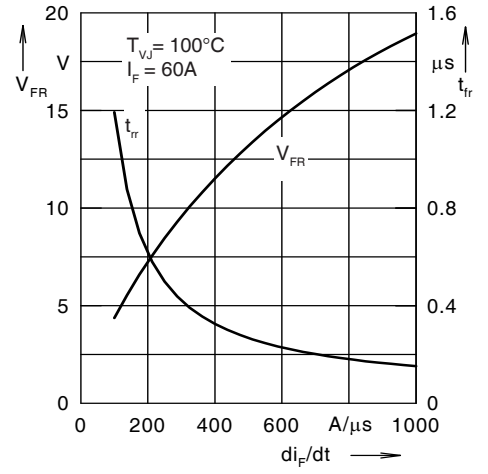


Fig. 26. Peak Forward Voltage  $V_{FR}$  and  $t_{rr}$  Versus  $-di_F/dt$

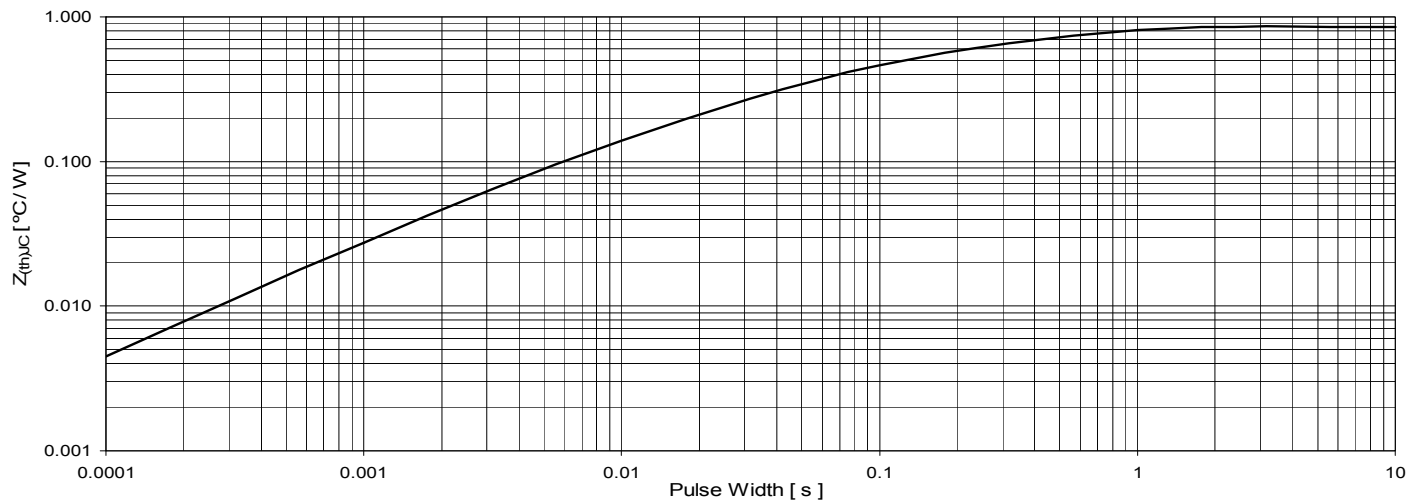


Fig. 27. Maximum Transient Thermal Impedance (for Diode)



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