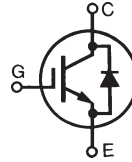


# 1200V XPT™ IGBT GenX3™ w/ Diode

## IXYT20N120C3D1HV

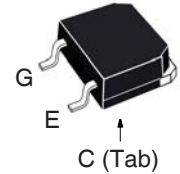
$V_{CES} = 1200V$   
 $I_{C110} = 17A$   
 $V_{CE(sat)} \leq 3.4V$   
 $t_{fi(typ)} = 108ns$

High-Speed IGBT  
for 20-50 kHz Switching



Symbol	Test Conditions	Maximum Ratings	
$V_{CES}$	$T_J = 25^\circ C$ to $150^\circ C$	1200	V
$V_{CGR}$	$T_J = 25^\circ C$ to $150^\circ C$ , $R_{GE} = 1M\Omega$	1200	V
$V_{GES}$	Continuous	$\pm 20$	V
$V_{GEM}$	Transient	$\pm 30$	V
$I_{C25}$	$T_C = 25^\circ C$	36	A
$I_{C110}$	$T_C = 110^\circ C$	17	A
$I_{F110}$	$T_C = 110^\circ C$	20	A
$I_{CM}$	$T_C = 25^\circ C$ , 1ms	88	A
$I_A$	$T_C = 25^\circ C$	10	A
$E_{AS}$	$T_C = 25^\circ C$	400	mJ
<b>SSOA</b> <b>(RBSOA)</b>	$V_{GE} = 15V$ , $T_{VJ} = 150^\circ C$ , $R_G = 10\Omega$ Clamped Inductive Load	$I_{CM} = 40$ $@V_{CE} \leq V_{CES}$	A
$P_C$	$T_C = 25^\circ C$	230	W
$T_J$		-55 ... +150	$^\circ C$
$T_{JM}$		150	$^\circ C$
$T_{stg}$		-55 ... +150	$^\circ C$
$T_L$	Maximum Lead Temperature for Soldering	300	$^\circ C$
$T_{SOLD}$	1.6 mm (0.062in.) from Case for 10s	260	$^\circ C$
<b>Weight</b>		4	g

TO-268HV



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

### Features

- Optimized for Low Switching Losses
- Square RBSOA
- Positive Thermal Coefficient of  $V_{ce(sat)}$
- High Voltage Package
- Anti-Parallel Ultra Fast Diode
- Avalanche Rated

### Advantages

- High Power Density
- Low Gate Drive Requirement

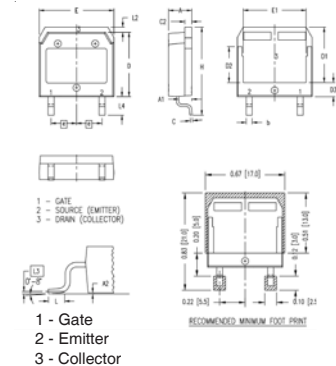
### Applications

- High Frequency Power Inverters
- UPS
- Motor Drives
- SMPS
- PFC Circuits
- Battery Chargers
- Welding Machines
- Lamp Ballasts

Symbol	Test Conditions ( $T_J = 25^\circ C$ , Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
$BV_{CES}$	$I_C = 250\mu A$ , $V_{GE} = 0V$	1200		V
$V_{GE(th)}$	$I_C = 250\mu A$ , $V_{CE} = V_{GE}$	3.0		V
$I_{CES}$	$V_{CE} = V_{CES}$ , $V_{GE} = 0V$ $T_J = 125^\circ C$			25 $\mu A$ 350 $\mu A$
$I_{GES}$	$V_{CE} = 0V$ , $V_{GE} = \pm 20V$			$\pm 100$ nA
$V_{CE(sat)}$	$I_C = 20A$ , $V_{GE} = 15V$ , Note 1 $T_J = 150^\circ C$		4.0	3.4 V V

Symbol	Test Conditions	Characteristic Values		
		Min.	Typ.	Max.
$g_{fs}$	$I_C = 20A, V_{CE} = 10V$ , Note 1	7.0	11.5	S
$C_{ies}$	$V_{CE} = 25V, V_{GE} = 0V, f = 1MHz$		1110	pF
$C_{oes}$			120	pF
$C_{res}$			27	pF
$Q_{g(on)}$	$I_C = 20A, V_{GE} = 15V, V_{CE} = 0.5 \cdot V_{CES}$		53	nC
$Q_{ge}$			9	nC
$Q_{gc}$			22	nC
$t_{d(on)}$	<b>Inductive load, <math>T_J = 25^\circ C</math></b> $I_C = 20A, V_{GE} = 15V$ $V_{CE} = 0.5 \cdot V_{CES}, R_G = 10\Omega$ Note 2		20	ns
$t_{ri}$			29	ns
$E_{on}$			1.3	mJ
$t_{d(off)}$			90	ns
$t_{fi}$			108	ns
$E_{off}$			0.5	1.0 mJ
$t_{d(on)}$	<b>Inductive load, <math>T_J = 150^\circ C</math></b> $I_C = 20A, V_{GE} = 15V$ $V_{CE} = 0.5 \cdot V_{CES}, R_G = 10\Omega$ Note 2		20	ns
$t_{ri}$			40	ns
$E_{on}$			3.7	mJ
$t_{d(off)}$			115	ns
$t_{fi}$			105	ns
$E_{off}$			0.7	mJ
$R_{thJC}$				0.54 °C/W

### TO-268HV Outline



Dim.	Millimeter		Inches	
	min	max	min	max
A	4.90	5.10	0.193	0.201
A1	2.70	2.90	0.106	0.114
A2	0.02	0.25	0.001	0.100
b	1.15	1.45	0.045	0.057
C	0.40	0.65	0.016	0.026
C 2	1.45	1.60	0.057	0.063
D	13.80	14.00	0.543	0.551
D1	11.80	12.10	0.465	0.476
D2	7.50	7.80	0.295	0.307
D3	2.90	3.20	0.114	0.126
E	15.85	16.05	0.624	0.632
E1	13.30	13.60	0.524	0.535
e	5.45 BSC		0.215 BSC	
H	18.70	19.10	0.736	0.752
L	1.70	2.00	0.067	0.079
L2	1.00	1.15	0.039	0.045
L3	0.25 BSC		0.010 BSC	
L4	3.80	4.10	0.150	0.161

### Reverse Diode (FRED)

Symbol	Test Conditions	Characteristic Value		
		Min.	Typ.	Max.
$V_F$	$I_F = 30A, V_{GE} = 0V$ , Note 1		1.75	3.00 V
		$T_J = 150^\circ C$		V
$I_{RM}$	$I_F = 30A, V_{GE} = 0V, -di_F/dt = 100A/\mu s, V_R = 600V$			9 A
$t_{rr}$		$T_J = 100^\circ C$	195	ns
$R_{thJC}$				0.90 °C/W

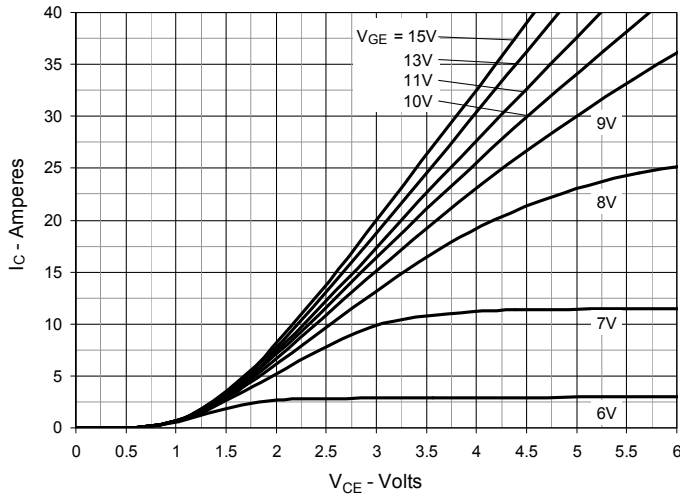
### Notes:

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

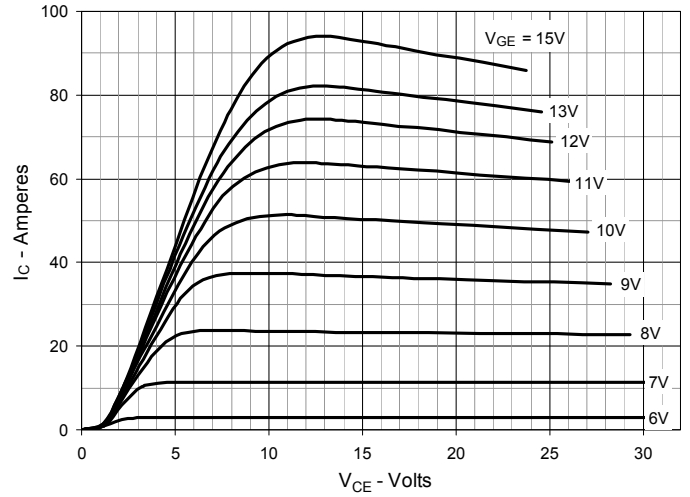
IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

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
	4,860,072	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	

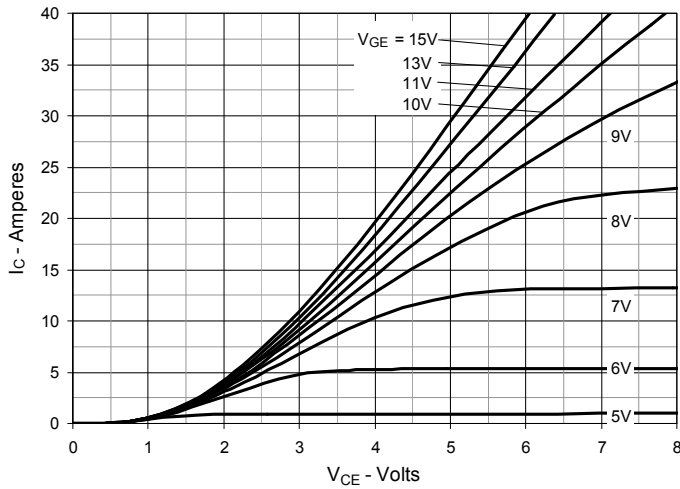
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



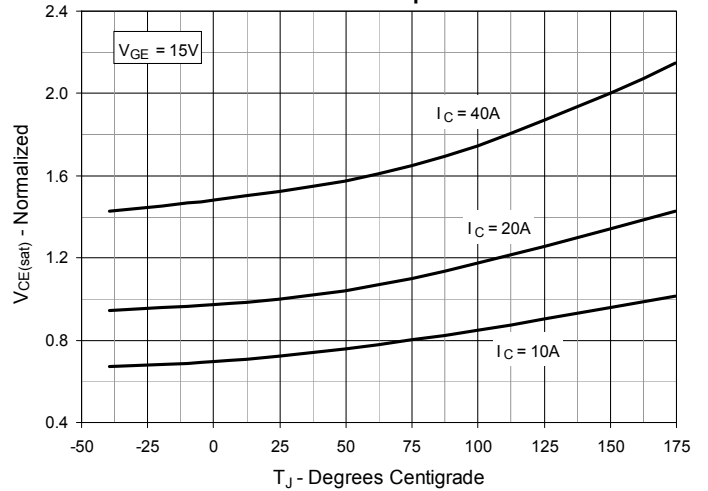
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



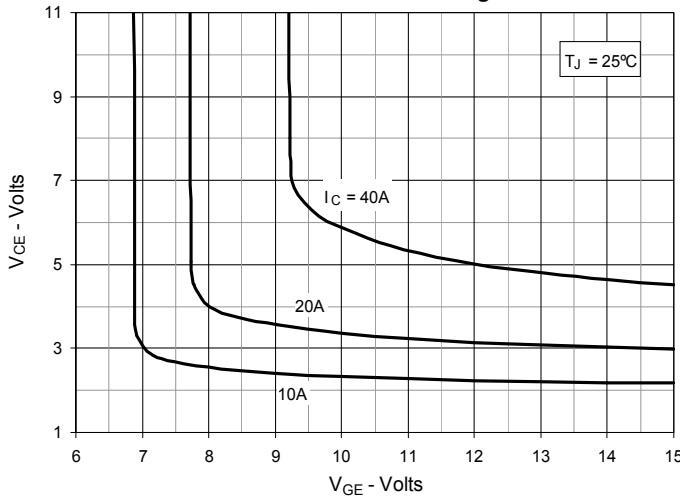
**Fig. 3. Output Characteristics @  $T_J = 150^\circ\text{C}$**



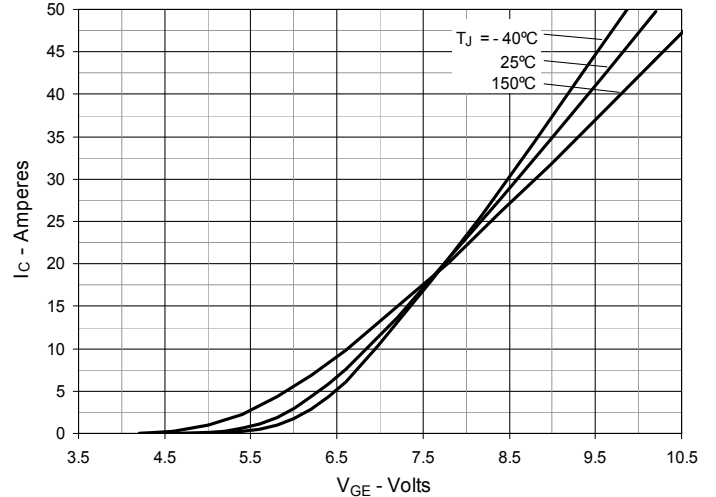
**Fig. 4. Dependence of  $V_{CE(sat)}$  on Junction Temperature**



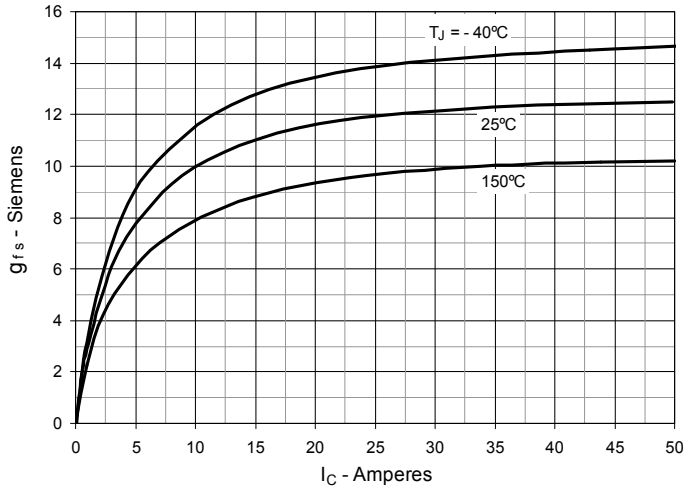
**Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage**



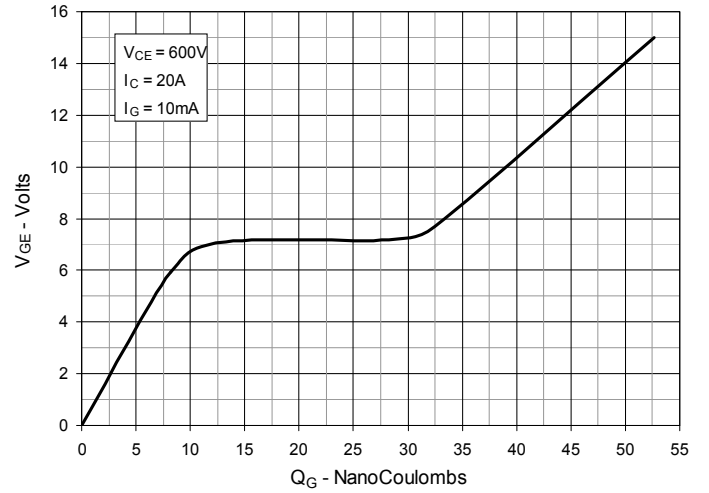
**Fig. 6. Input Admittance**



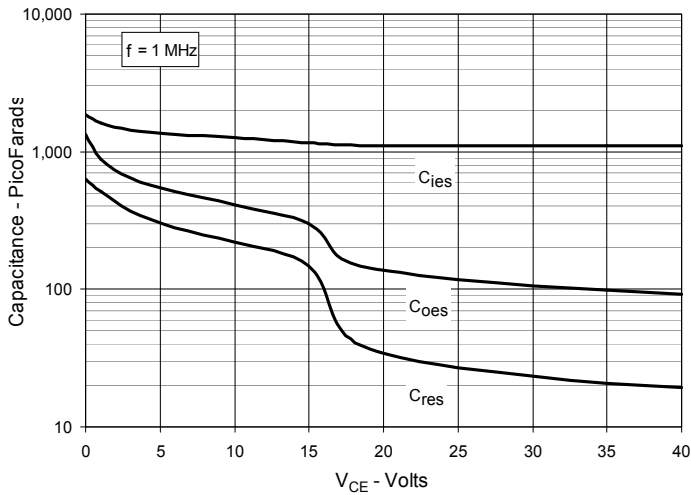
**Fig. 7. Transconductance**



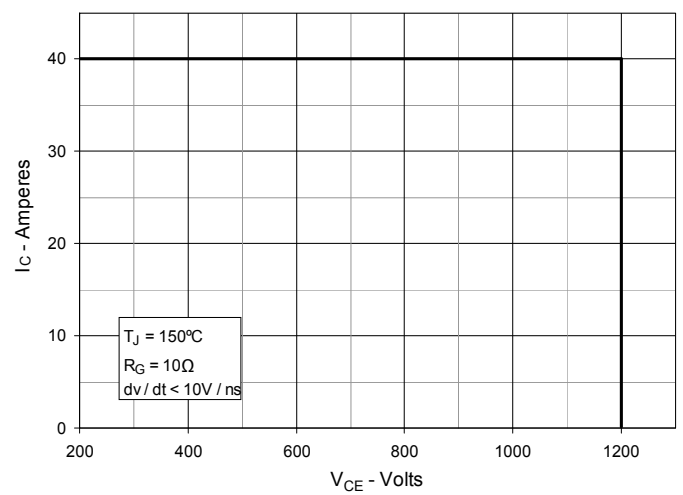
**Fig. 8. Gate Charge**



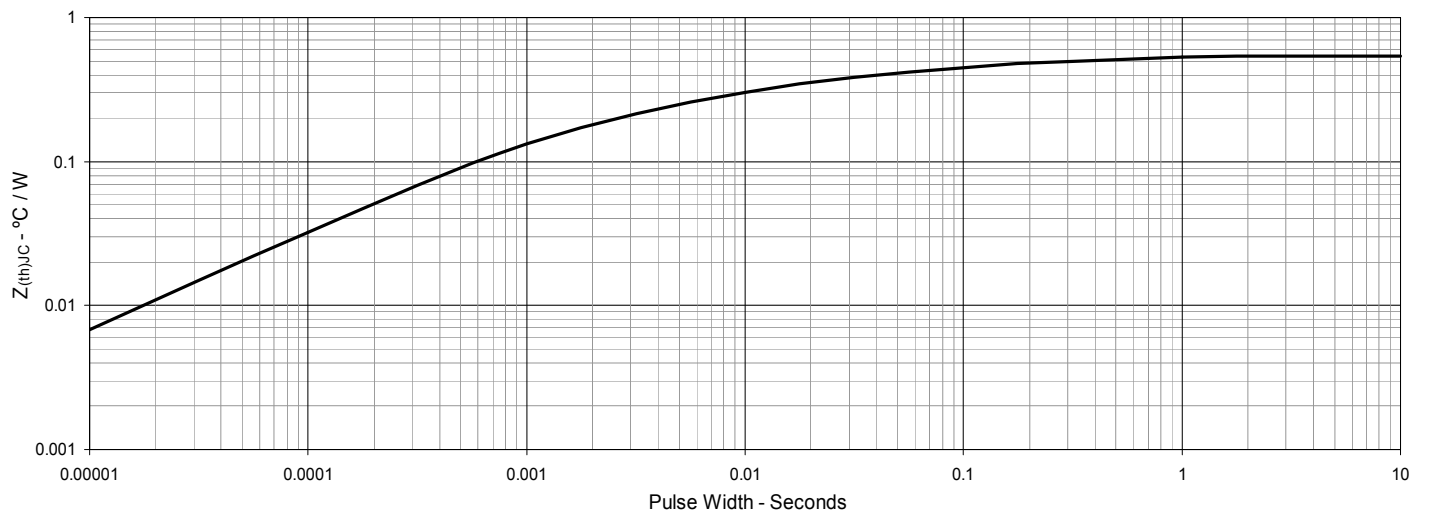
**Fig. 9. Capacitance**



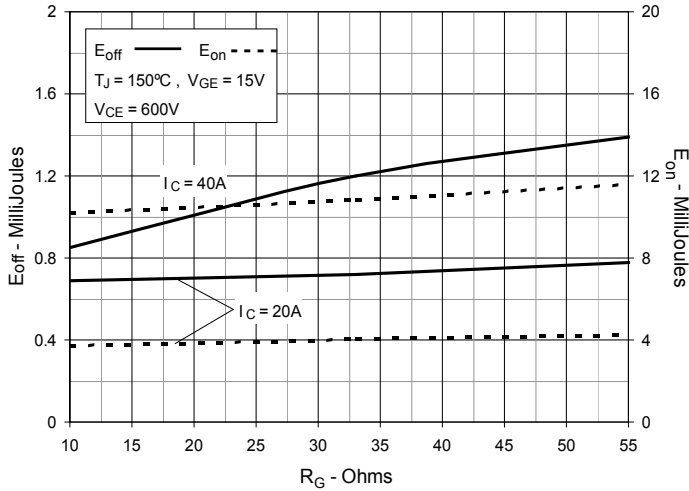
**Fig. 10. Reverse-Bias Safe Operating Area**



**Fig. 11. Maximum Transient Thermal Impedance (IGBT)**



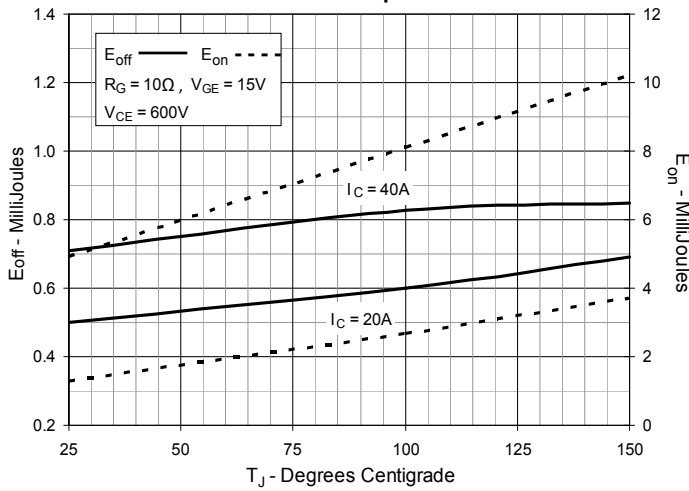
**Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance**



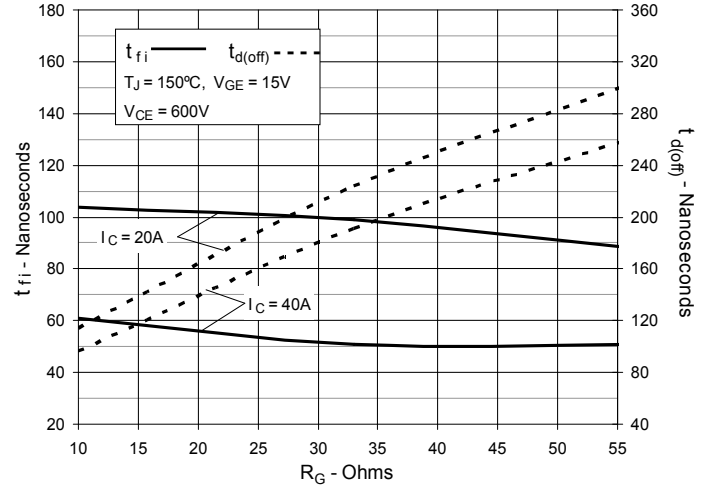
**Fig. 13. Inductive Switching Energy Loss vs. Collector Current**



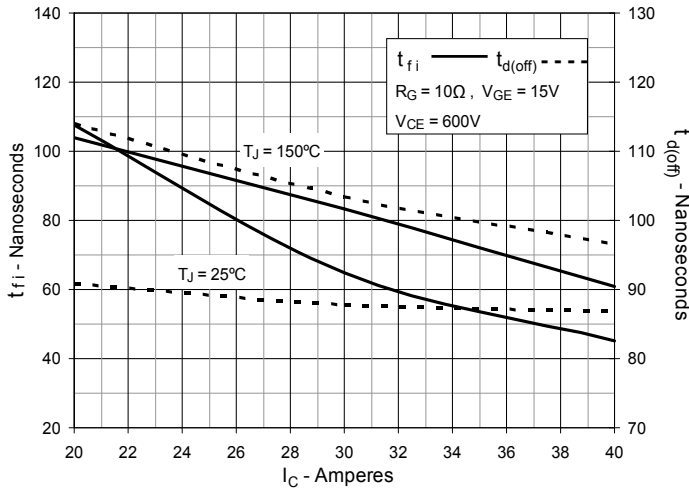
**Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature**



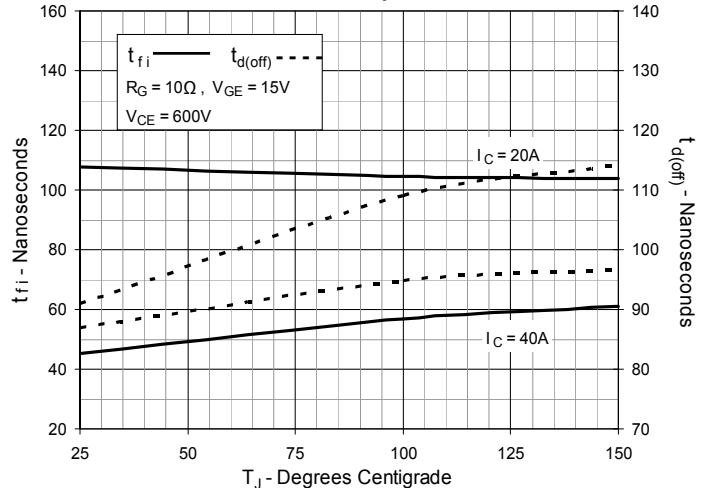
**Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance**



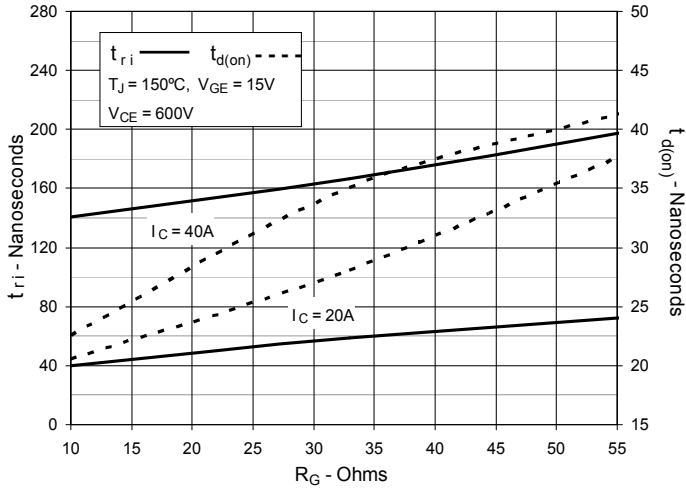
**Fig. 16. Inductive Turn-off Switching Times vs. Collector Current**



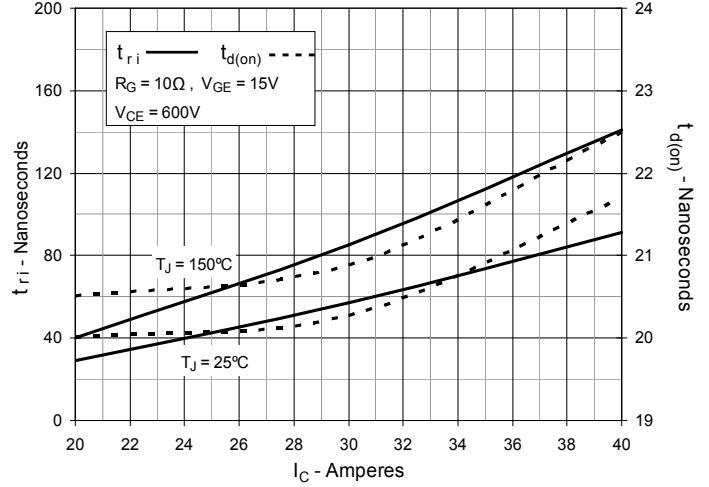
**Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature**



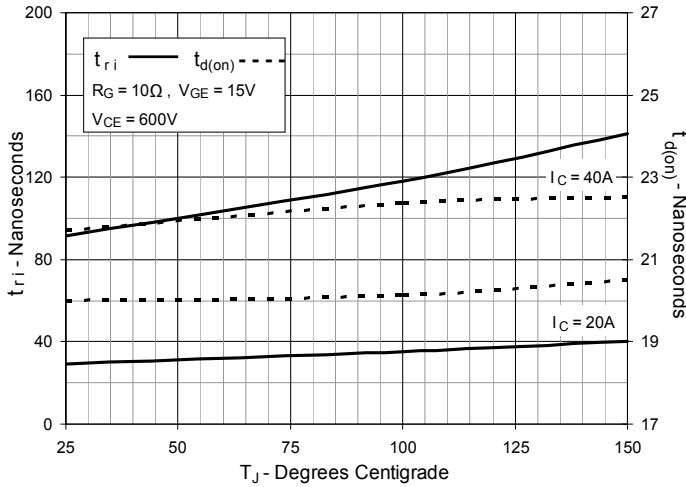
**Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance**



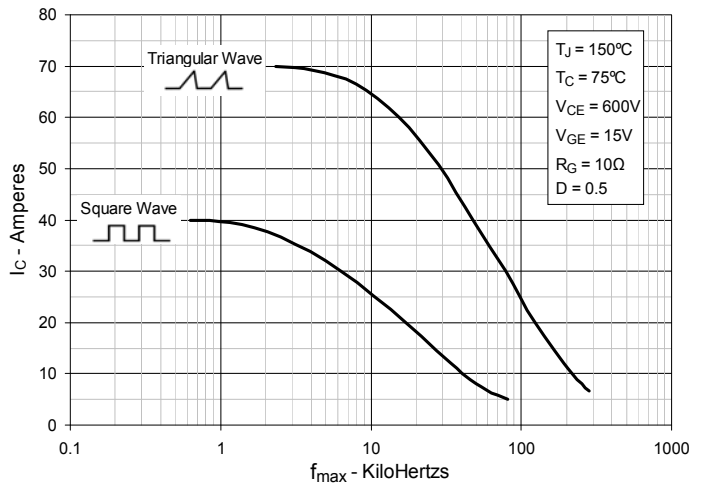
**Fig. 19. Inductive Turn-on Switching Times vs. Collector Current**



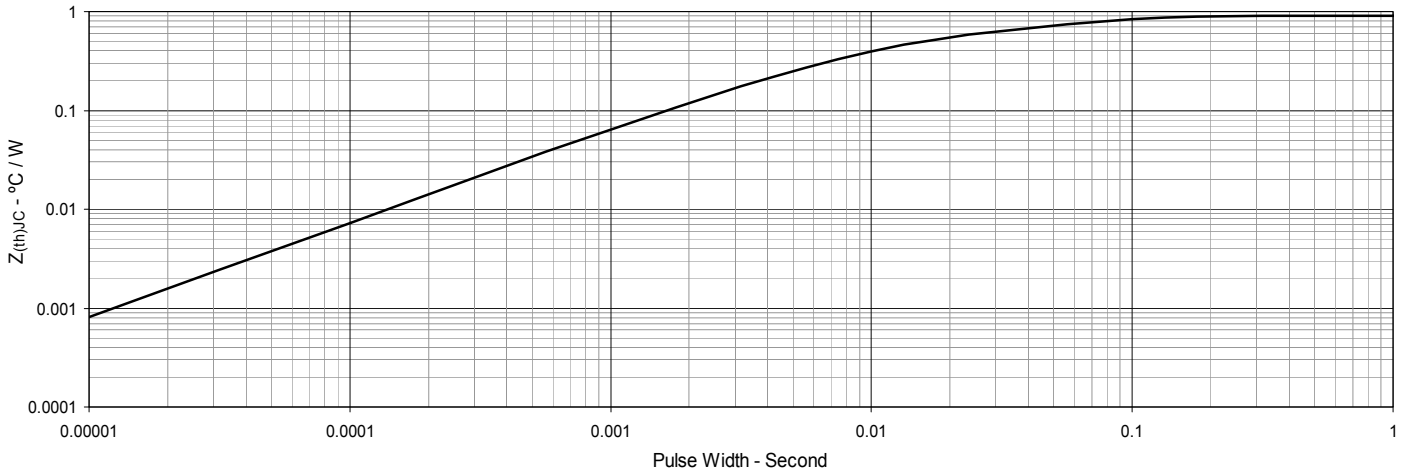
**Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature**

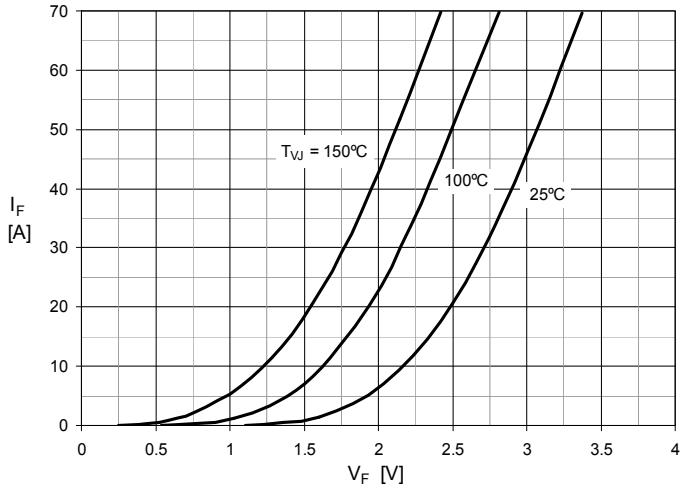
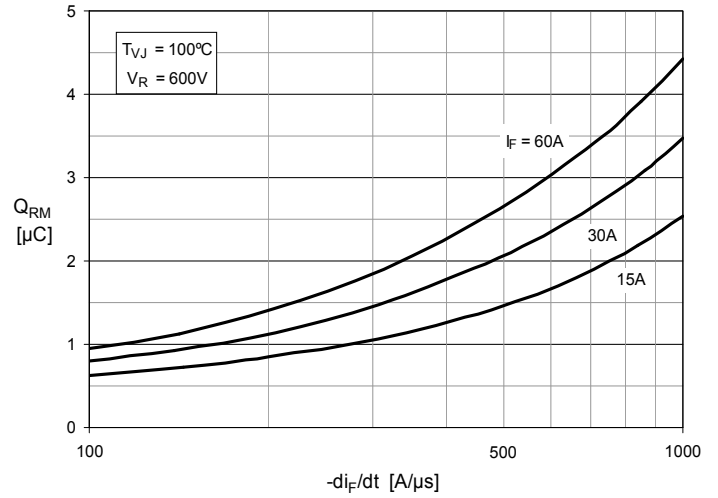
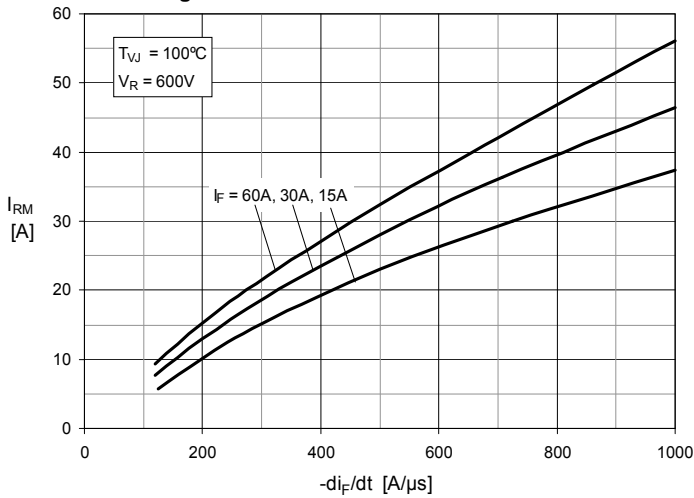
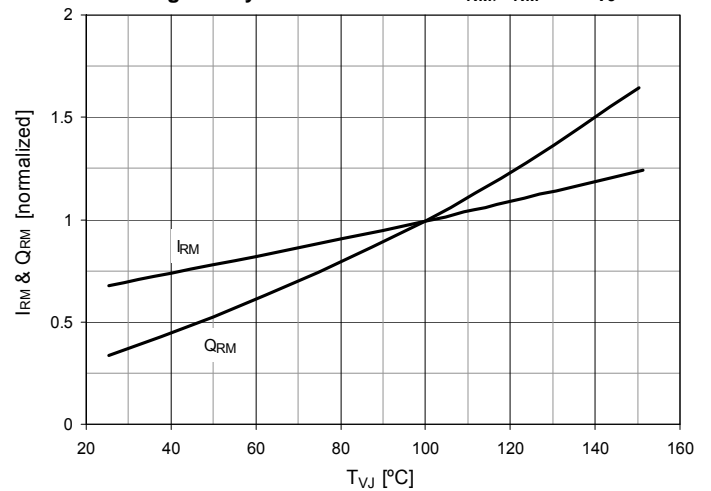
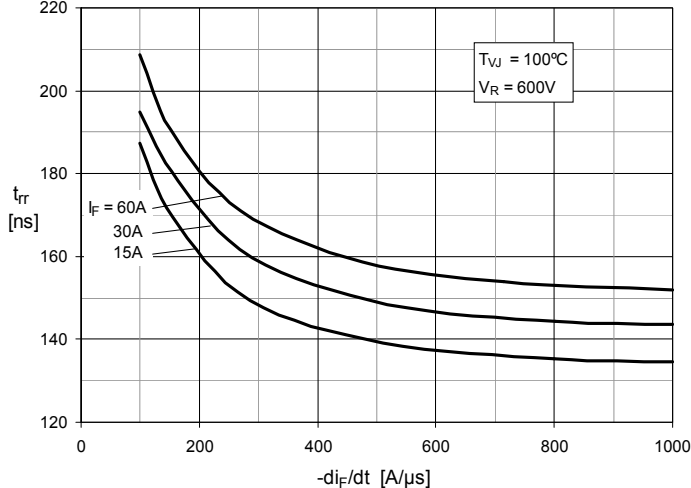
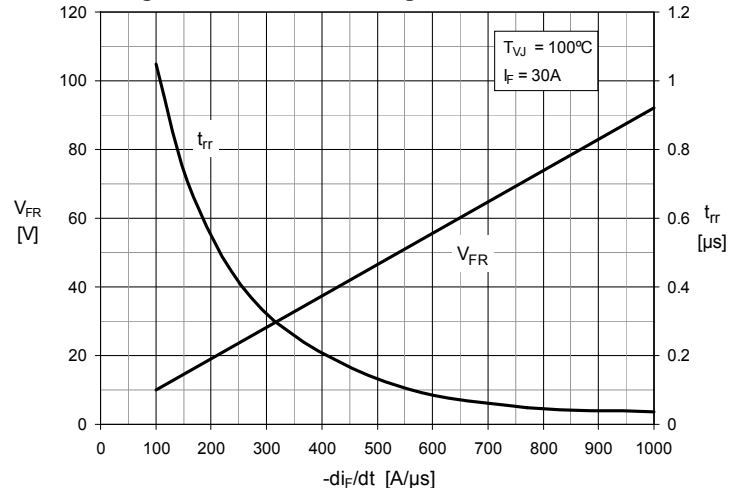


**Fig. 21. Maximum Peak Load Current vs. Frequency**



**Fig. 22 . Maximum Transient Thermal Impedance (Diode)**



**Fig. 23. Forward Current  $I_F$  vs  $V_F$** 

**Fig. 24. Reverse Recovery Charge  $Q_{RM}$  vs.  $-di_F/dt$** 

**Fig. 25. Peak Reverse Current  $I_{RM}$  vs.  $-di_F/dt$** 

**Fig. 26. Dynamic Parameters  $Q_{RM}$ ,  $I_{RM}$  vs.  $T_{VJ}$** 

**Fig. 27. Recovery Time  $t_{rr}$  vs.  $-di_F/dt$** 

**Fig. 28. Peak Forward Voltage  $V_{FR}$ ,  $t_{rr}$  vs  $-di_F/dt$** 




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