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Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

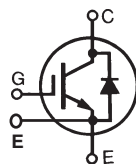
Email & Skype: info@chipsmall.com Web: www.chipsmall.com

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



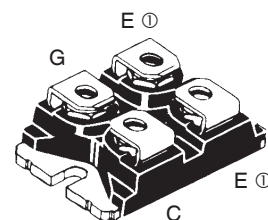
# XPT™ 650V GenX4™ IXXN110N65B4H1 w/ Sonic Diode

Extreme Light Punch Through  
IGBT for 10-30kHz Switching



$$\begin{aligned} V_{CES} &= 650V \\ I_{C110} &= 110A \\ V_{CE(sat)} &\leq 2.10V \\ t_{fi(typ)} &= 43ns \end{aligned}$$

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	
$V_{CES}$	$T_J = 25^\circ\text{C}$ to $175^\circ\text{C}$	650	V
$V_{CGR}$	$T_J = 25^\circ\text{C}$ to $175^\circ\text{C}$ , $R_{GE} = 1\text{M}\Omega$	650	V
$V_{GES}$	Continuous	$\pm 20$	V
$V_{GEM}$	Transient	$\pm 30$	V
$I_{C25}$	$T_C = 25^\circ\text{C}$ (Chip Capability)	230	A
$I_{C25}$	Terminal Current Limit	200	A
$I_{C110}$	$T_C = 110^\circ\text{C}$	110	A
$I_{F110}$	$T_C = 110^\circ\text{C}$	70	A
$I_{CM}$	$T_C = 25^\circ\text{C}$ , 1ms	650	A
<b>SSOA</b> <b>(RBSOA)</b>	$V_{GE} = 15\text{V}$ , $T_{VJ} = 150^\circ\text{C}$ , $R_G = 2\Omega$ Clamped Inductive Load	$I_{CM} = 220$ @ $V_{CE} \leq V_{CES}$	A
$t_{sc}$ <b>(SCSOA)</b>	$V_{GE} = 15\text{V}$ , $V_{CE} = 360\text{V}$ , $T_J = 150^\circ\text{C}$ $R_G = 82\Omega$ , Non Repetitive	10	$\mu\text{s}$
$P_C$	$T_C = 25^\circ\text{C}$	750	W
$T_J$		-55 ... +175	$^\circ\text{C}$
$T_{JM}$		175	$^\circ\text{C}$
$T_{stg}$		-55 ... +175	$^\circ\text{C}$
$V_{ISOL}$	50/60Hz $I_{ISOL} \leq 1\text{mA}$	$t = 1\text{min}$ $t = 1\text{s}$	2500 3000 V~ V~
$M_d$	Mounting Torque Terminal Connection Torque	1.5/13 1.3/11.5	Nm/lb.in. Nm/lb.in.
<b>Weight</b>		30	g

## Features

- International Standard Package
- miniBLOC, with Aluminium Nitride Isolation
- 2500V~ Isolation Voltage
- Anti-Parallel Sonic Diode
- Optimized for 10-30kHz Switching
- Square RBSOA
- Short Circuit Capability
- High Current Handling Capability

## Advantages

- High Power Density
- Low Gate Drive Requirement

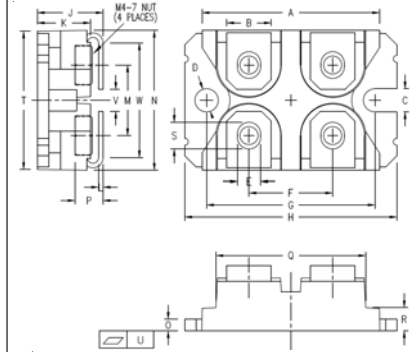
## Applications

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

Symbol	Test Conditions ( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
$BV_{CES}$	$I_C = 250\mu\text{A}$ , $V_{GE} = 0\text{V}$	650		V
$V_{GE(th)}$	$I_C = 250\mu\text{A}$ , $V_{CE} = V_{GE}$	4.0		6.5 V
$I_{CES}$	$V_{CE} = V_{CES}$ , $V_{GE} = 0\text{V}$ $T_J = 150^\circ\text{C}$			50 $\mu\text{A}$ 3 mA
$I_{GES}$	$V_{CE} = 0\text{V}$ , $V_{GE} = \pm 20\text{V}$			$\pm 100$ nA
$V_{CE(sat)}$	$I_C = 110\text{A}$ , $V_{GE} = 15\text{V}$ , Note 1 $T_J = 150^\circ\text{C}$		1.72 2.05	V V

Symbol Test Conditions ( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified)		Characteristic Values		
		Min.	Typ.	Max.
$g_{fs}$	$I_C = 60\text{A}, V_{CE} = 10\text{V}, \text{Note 1}$	30	52	S
$C_{ies}$	$V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$		3650	pF
$C_{oes}$			470	pF
$C_{res}$			80	pF
$Q_g$	$I_C = 110\text{A}, V_{GE} = 15\text{V}, V_{CE} = 0.5 \cdot V_{CES}$		183	nC
$Q_{ge}$			32	nC
$Q_{gc}$			83	nC
$t_{d(on)}$	<b>Inductive load, <math>T_J = 25^\circ\text{C}</math></b> $I_C = 55\text{A}, V_{GE} = 15\text{V}$ $V_{CE} = 400\text{V}, R_G = 2\Omega$ Note 2		26	ns
$t_{ri}$			40	ns
$E_{on}$			2.20	mJ
$t_{d(off)}$			146	ns
$t_{fi}$			43	ns
$E_{off}$			1.05	1.70 mJ
$t_{d(on)}$	<b>Inductive load, <math>T_J = 150^\circ\text{C}</math></b> $I_C = 55\text{A}, V_{GE} = 15\text{V}$ $V_{CE} = 400\text{V}, R_G = 2\Omega$ Note 2		25	ns
$t_{ri}$			40	ns
$E_{on}$			3.00	mJ
$t_{d(off)}$			140	ns
$t_{fi}$			110	ns
$E_{off}$			2.16	mJ
$R_{thJC}$			0.20	$^\circ\text{C/W}$
$R_{thCS}$		0.05		$^\circ\text{C/W}$

### SOT-227B miniBLOC (IXXN)



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	1.489	1.505	37.80	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
V	.130	.180	3.30	4.57
W	.780	.830	19.81	21.08

### Reverse Sonic Diode (FRD)

Symbol Test Conditions ( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified)		Characteristic Values		
		Min.	Typ.	Max.
$V_F$	$I_F = 100\text{A}, V_{GE} = 0\text{V}, \text{Note 1}$		1.7	2.3 V
	$T_J = 150^\circ\text{C}$		1.8	V
$I_{RM}$	$I_F = 100\text{A}, V_{GE} = 0\text{V},$ $-di_F/dt = 1500\text{A}/\mu\text{s}, V_R = 300\text{V}$		95	A
$t_{rr}$			100	ns
$R_{thJC}$			0.42	$^\circ\text{C/W}$

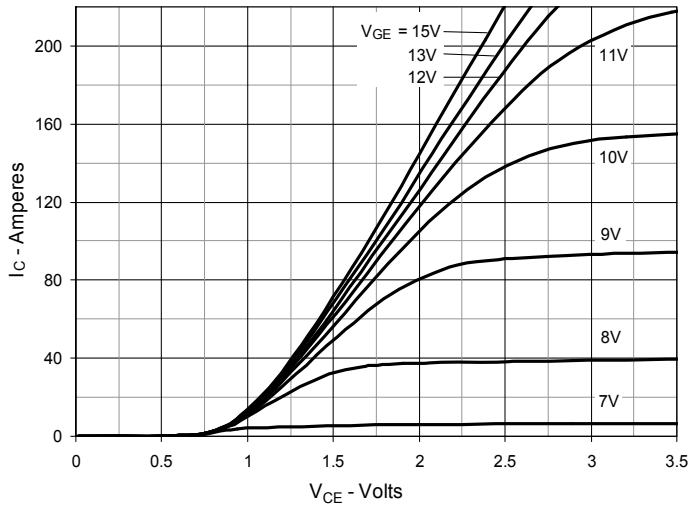
#### Notes:

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

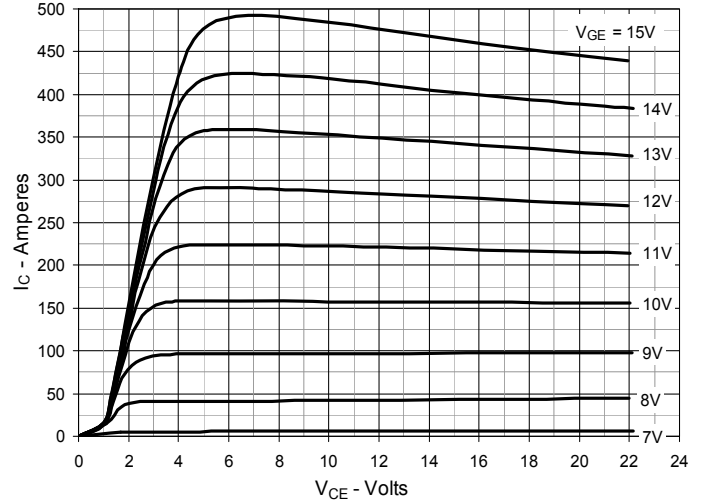
IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

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	

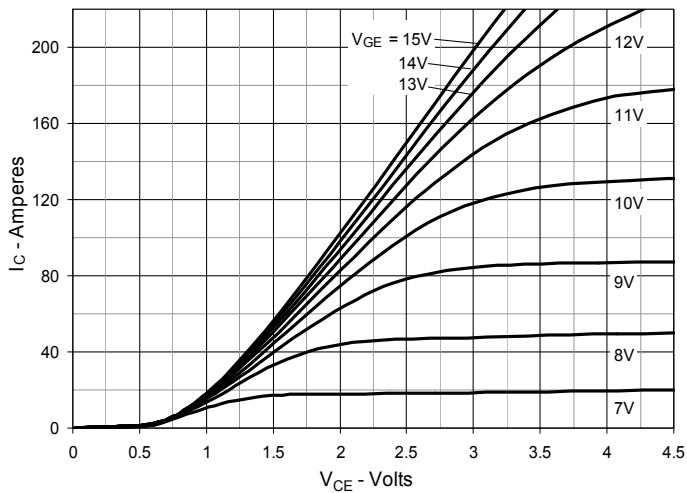
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



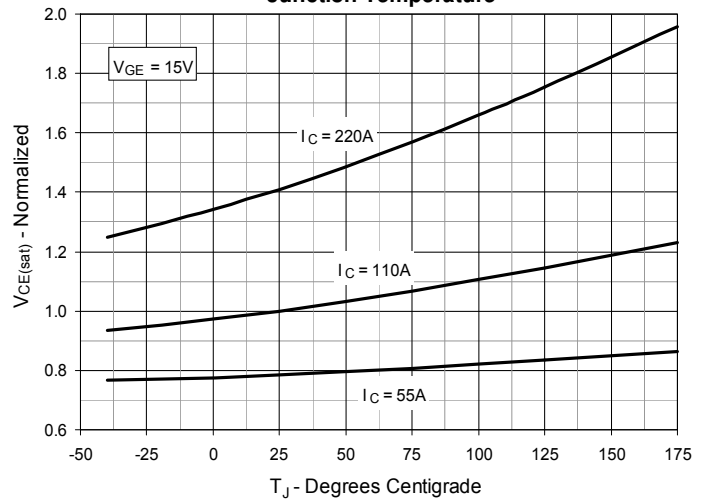
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



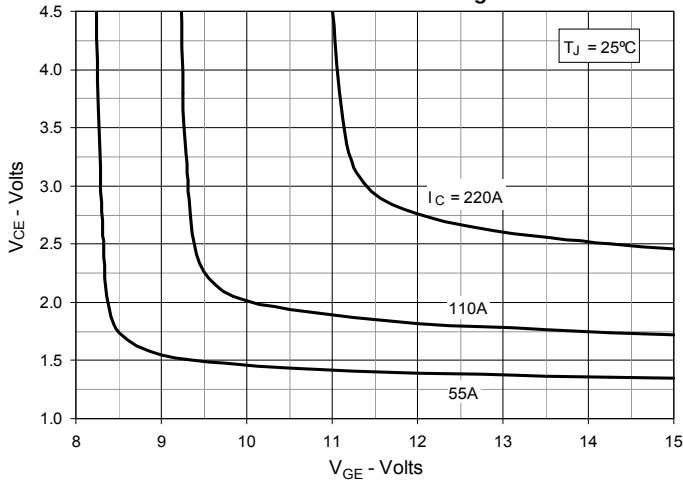
**Fig. 3. Output Characteristics @  $T_J = 150^\circ\text{C}$**



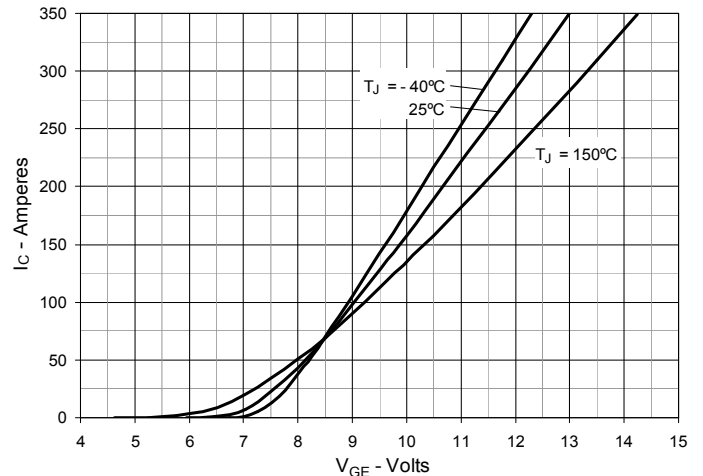
**Fig. 4. Dependence of  $V_{CE(sat)}$  on Junction Temperature**

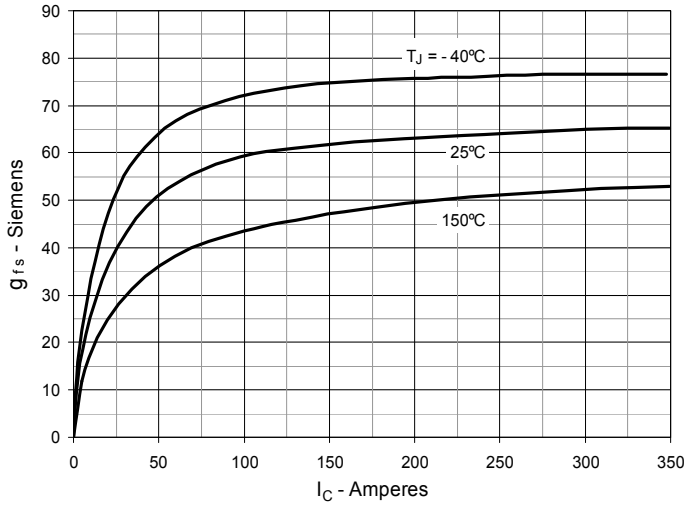
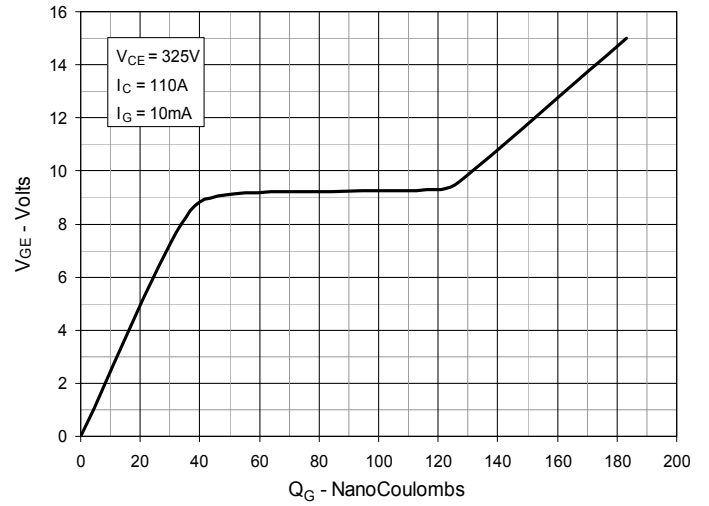
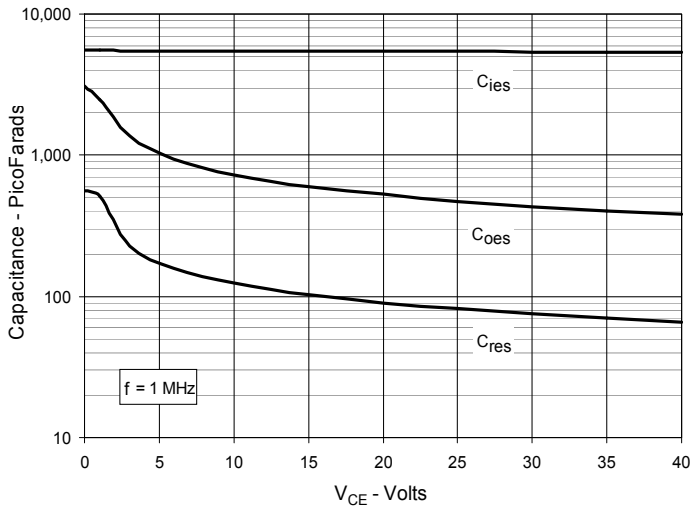
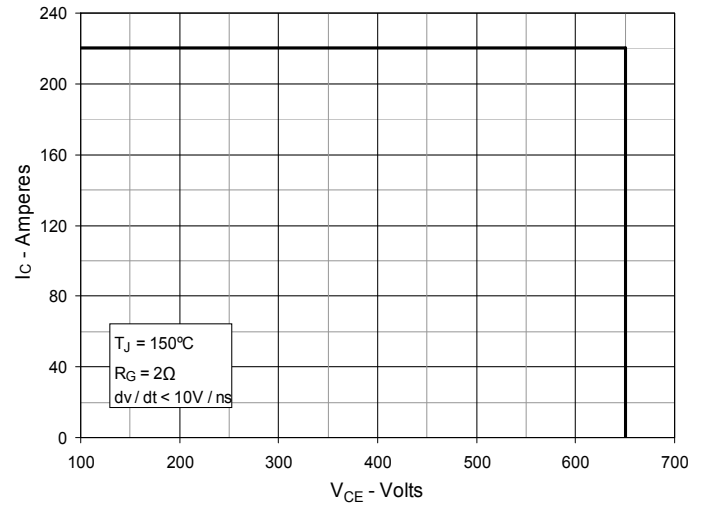
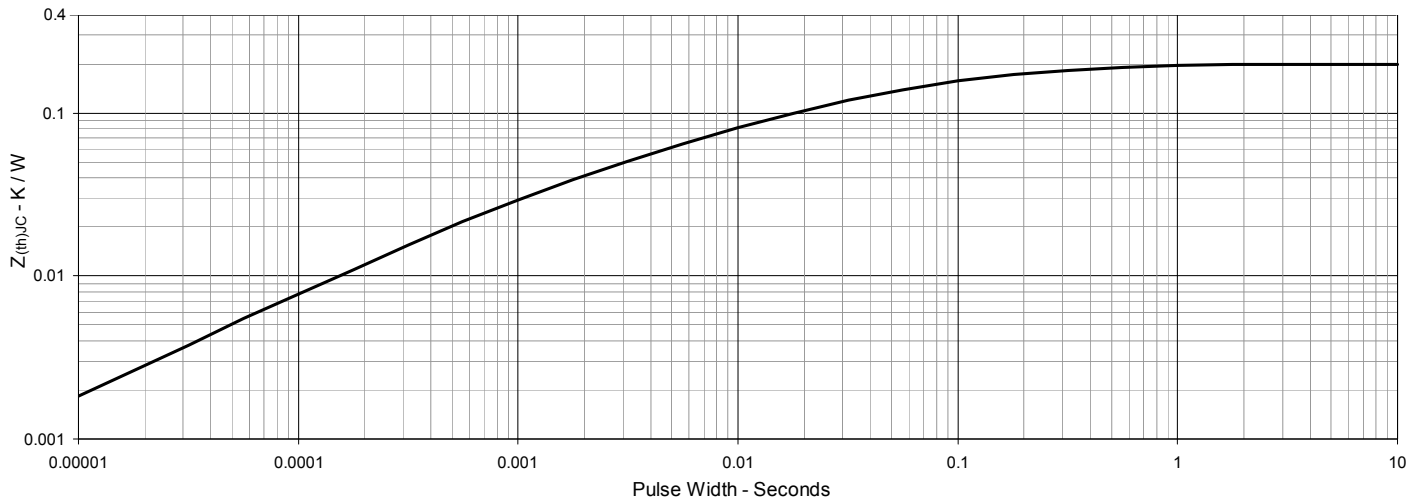


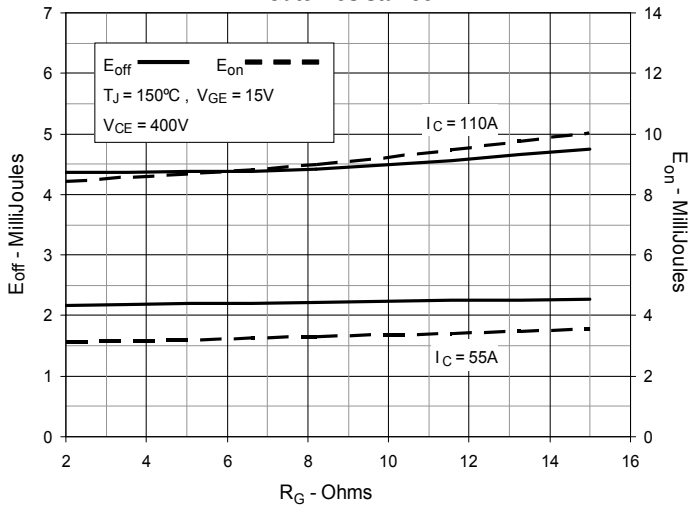
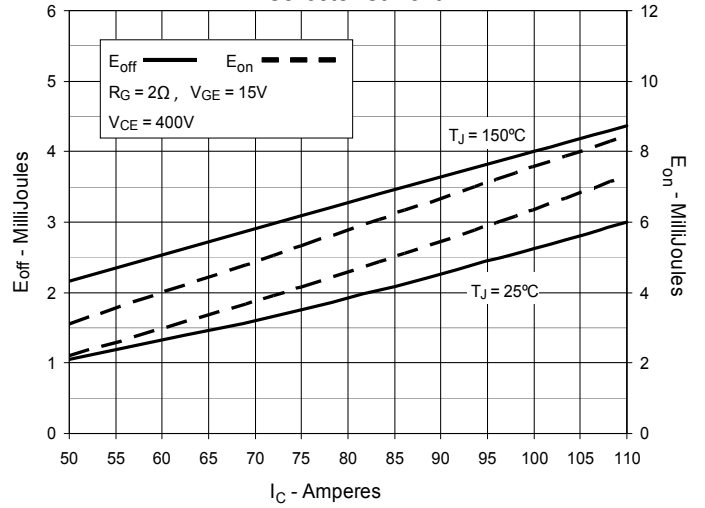
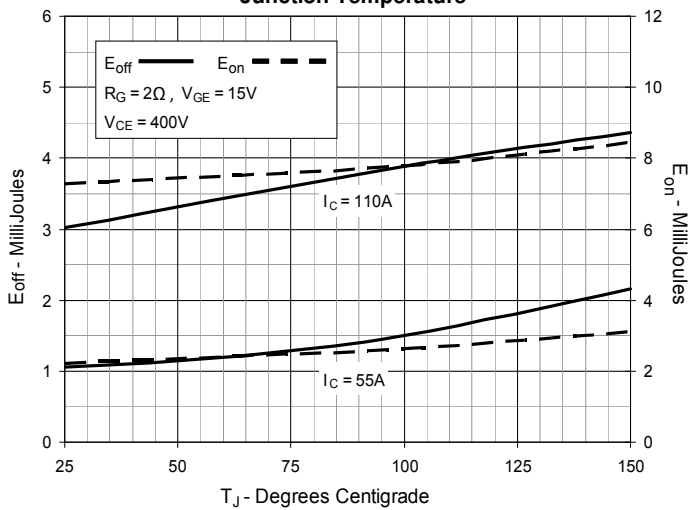
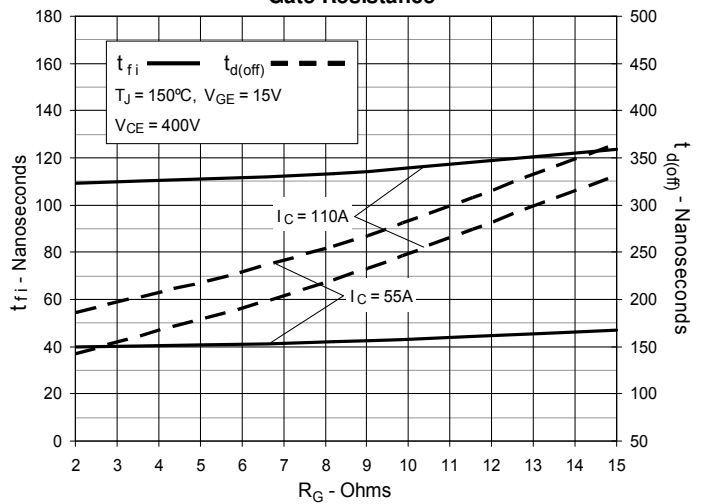
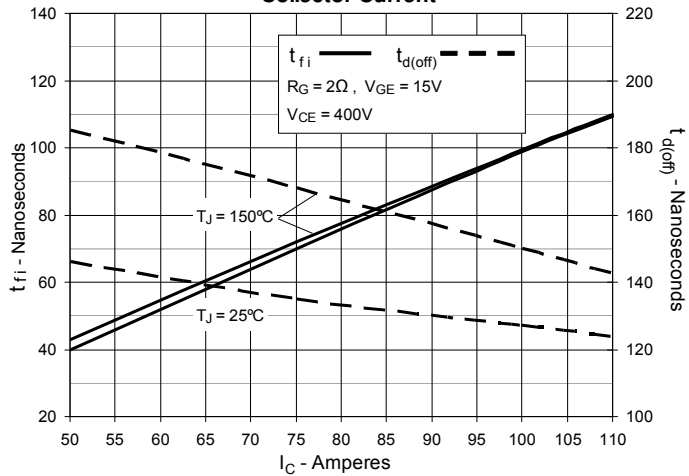
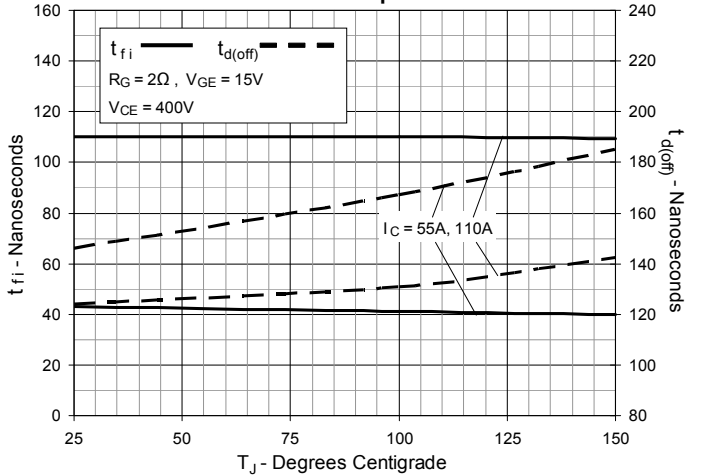
**Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage**

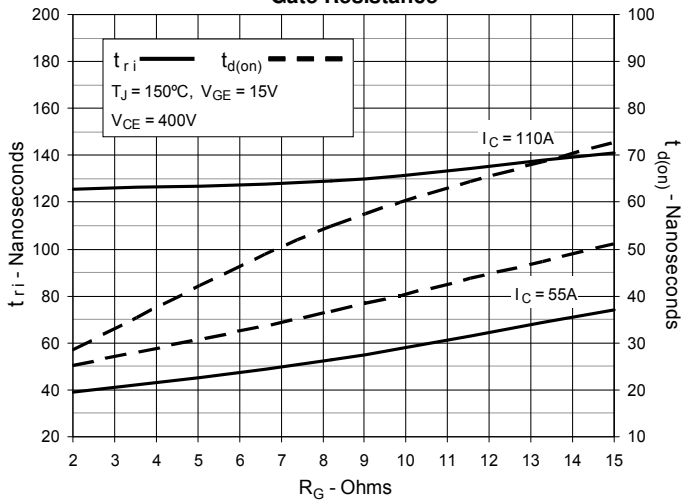
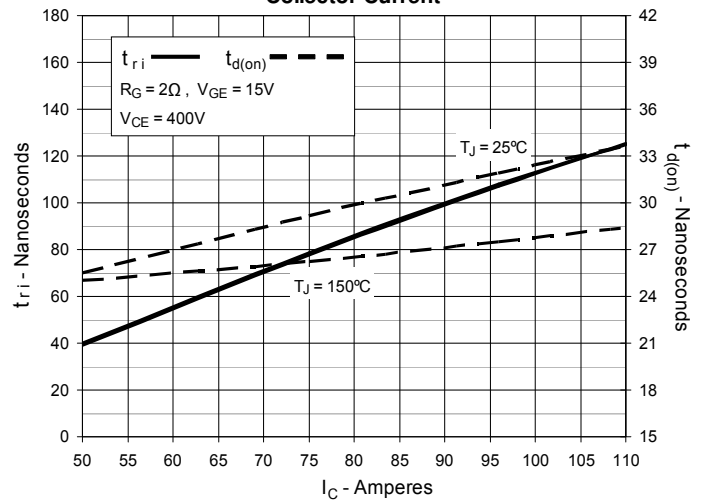
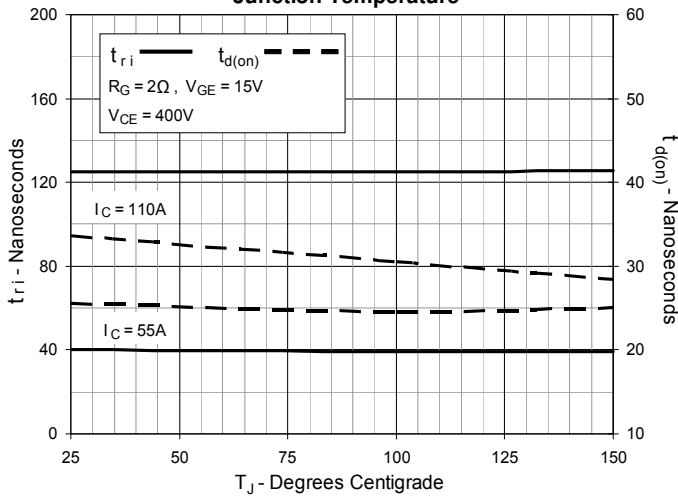


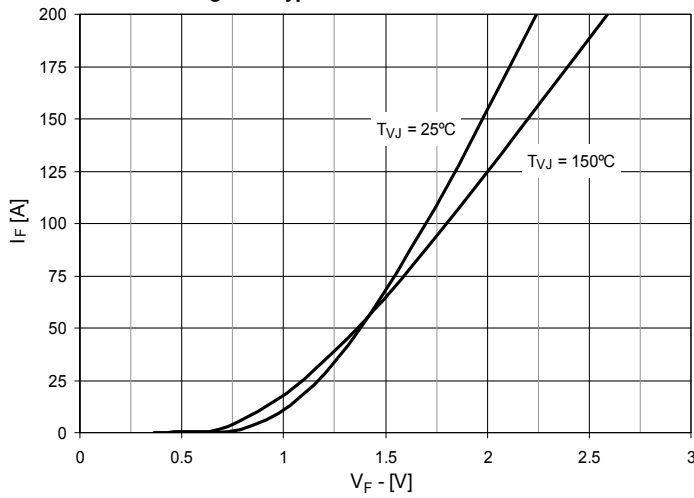
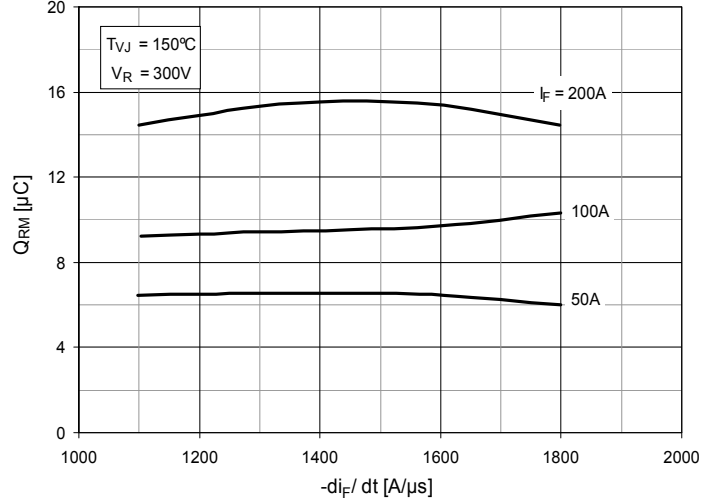
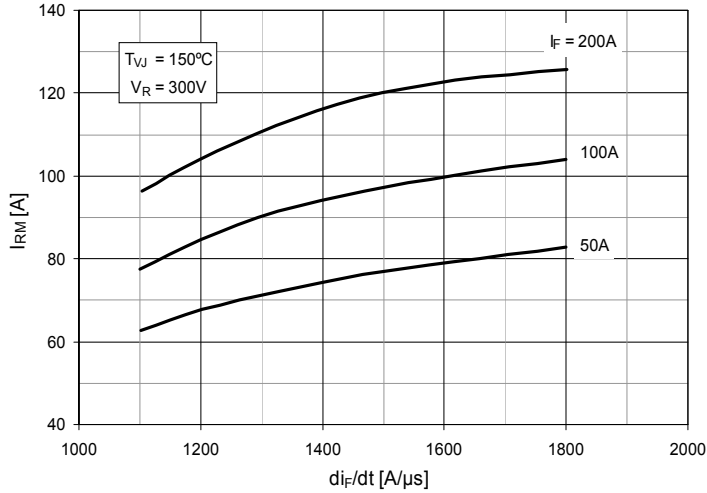
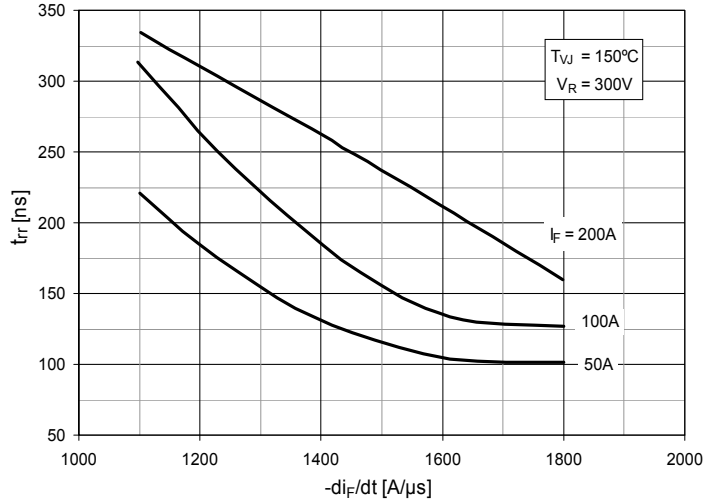
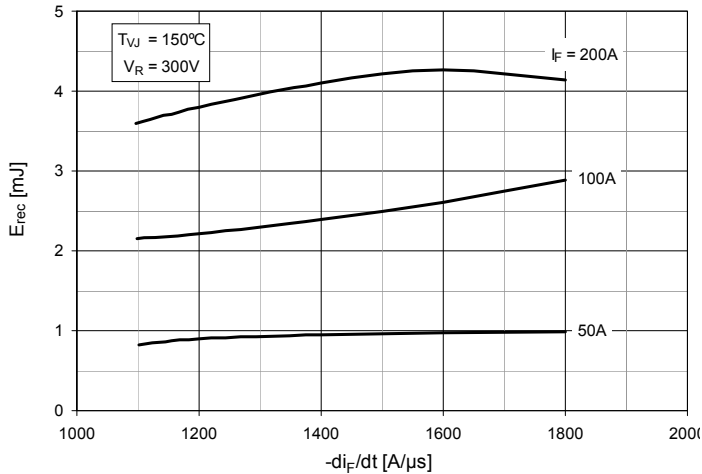
**Fig. 6. Input Admittance**



**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. Typ. Forward characteristics**

**Fig. 22. Typ. Reverse Recovery Charge  $Q_{RR}$  vs.  $-di_F/dt$** 

**Fig. 23. Typ. Peak Reverse Current  $I_{RM}$  vs.  $-di_F/dt$** 

**Fig. 24. Typ. Recovery Time  $t_{rr}$  vs.  $-di_F/dt$** 

**Fig. 25. Typ. Recovery Energy  $E_{rec}$  vs.  $-di_F/dt$** 

**Fig. 26. Maximum Transient Thermal Impedance ( Diode)**
