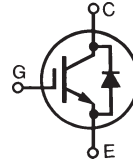


# HiPerFAST™ IGBT IXGR 32N90B2D1 with Fast Diode

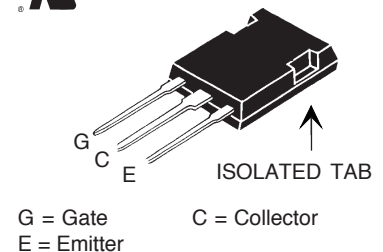
## Electrically Isolated Base



$$\begin{aligned} V_{CES} &= 900 \text{ V} \\ I_{C25} &= 47 \text{ A} \\ V_{CE(sat)} &= 2.9 \text{ V} \\ t_{fi\text{typ}} &= 150 \text{ ns} \end{aligned}$$

Symbol	Test Conditions	Maximum Ratings	
$V_{CES}$	$T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$	900	V
$V_{CGR}$	$T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ ; $R_{GE} = 1 \text{ M}\Omega$	900	V
$V_{GES}$	Continuous	$\pm 20$	V
$V_{GEM}$	Transient	$\pm 30$	V
$I_{C25}$	$T_C = 25^\circ\text{C}$	47	A
$I_{C110}$	$T_C = 110^\circ\text{C}$	22	A
$I_{CM}$	$T_C = 25^\circ\text{C}$ , 1 ms	200	A
<b>SSOA (RBSOA)</b>	$V_{GE} = 15 \text{ V}$ , $T_{VJ} = 125^\circ\text{C}$ , $R_G = 10 \Omega$ Clamped inductive load: $V_{CL} < 600\text{V}$	$I_{CM} = 64$	A
$P_C$	$T_C = 25^\circ\text{C}$	160	W
$T_J$		-55 ... +150	$^\circ\text{C}$
$T_{JM}$		150	$^\circ\text{C}$
$T_{stg}$		-55 ... +150	$^\circ\text{C}$
Maximum lead temperature for soldering 1.6 mm (0.062 in.) from case for 10 s		300	$^\circ\text{C}$
$V_{ISOL}$	50/60Hz, RMS, T= 1 minute $I_{isol} < 1\text{mA}$	2500 3000	V~ V~
$F_C$	Mounting force	20..120/4.5..26	N/lb
<b>Weight</b>		5	g

ISOPLUS247 (IXGR)  
E153432



### Features

- Electrically isolated mounting tab
- High frequency IGBT
- High current handling capability
- MOS Gate turn-on - drive simplicity

### Applications

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

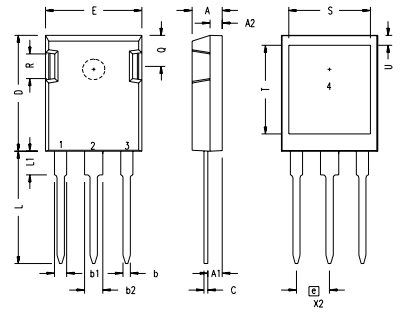
### Advantages

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

Symbol	Test Conditions	Characteristic Values ( $T_J = 25^\circ\text{C}$ unless otherwise specified)		
		min.	typ.	max.
$V_{GE(th)}$	$I_C = 250 \mu\text{A}$ , $V_{CE} = V_{GE}$	3.0		5.0 V
$I_{CES}$	$V_{CE} = V_{CES}$ $V_{GE} = 0 \text{ V}$ $T_J = 150^\circ\text{C}$			300 $\mu\text{A}$ 1.5 mA
$I_{GES}$	$V_{CE} = 0 \text{ V}$ , $V_{GE} = \pm 20 \text{ V}$			$\pm 100 \text{ nA}$
$V_{CE(sat)}$	$I_C = I_T$ , $V_{GE} = 15 \text{ V}$ , Note 1 $T_J = 125^\circ\text{C}$		2.1	2.9 V V

Symbol	Test Conditions	Characteristic Values ( $T_J = 25^\circ\text{C}$ unless otherwise specified)		
		min.	typ.	max.
$g_{fs}$	$I_C = I_T; V_{CE} = 10\text{ V}$	18	28	S
$C_{ies}$	$V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$		1790	pF
$C_{oes}$			146	pF
$C_{res}$			49	pF
$Q_g$	$I_C = I_T, V_{GE} = 15\text{ V}, V_{CE} = 0.5 V_{CES}$		89	nC
$Q_{ge}$			15	nC
$Q_{gc}$			34	nC
$t_{d(on)}$	Inductive load, $T_J = 25^\circ\text{C}$ $I_C = I_T, V_{GE} = 15\text{ V}$ $V_{CE} = 720\text{ V}, R_G = R_{off} = 5\ \Omega$		20	ns
$t_{ri}$			22	ns
$t_{d(off)}$			260	400 ns
$t_{fi}$			150	ns
$E_{off}$			2.2	4.5 mJ
$t_{d(on)}$	Inductive load, $T_J = 125^\circ\text{C}$ $I_C = I_T, V_{GE} = 15\text{ V}$ $V_{CE} = 720\text{ V}, R_G = R_{off} = 5\ \Omega$		20	ns
$t_{ri}$			22	ns
$E_{on}$			3.8	mJ
$t_{d(off)}$			360	ns
$t_{fi}$			330	ns
$E_{off}$		5.75	mJ	
$R_{thJC}$			0.8	KW
$R_{thCS}$		0.15		KW

### ISOPLUS247 Outline



SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.190	.205	4.83	5.21
A1	.090	.100	2.29	2.54
A2	.075	.085	1.91	2.16
b	.045	.055	1.14	1.40
b1	.075	.084	1.91	2.13
b2	.115	.123	2.92	3.12
C	.024	.031	0.61	0.80
D	.819	.840	20.80	21.34
E	.620	.635	15.75	16.13
e	.215 BSC		5.45 BSC	
L	.780	.800	19.81	20.32
L1	.150	.170	3.81	4.32
Q	.220	.244	5.59	6.20
R	.170	.190	4.32	4.83
S	.520	.540	13.21	13.72
T	.620	.640	15.75	16.26
U	.065	.080	1.65	2.03

- 1- GATE
- 2- COLLECTOR/CATHODE
- 3- EMITTER/ANODE
- 4- NO CONNECTION

NOTE: This drawing will meet all dimensions requirement of JEDEC outline TO-247AD except screw hole.

### Ultrafast Diode

Symbol	Conditions	Maximum Ratings	
$I_{FRMS}$		60	A
$I_{F110}$	$T_C = 110^\circ\text{C}$	22	A

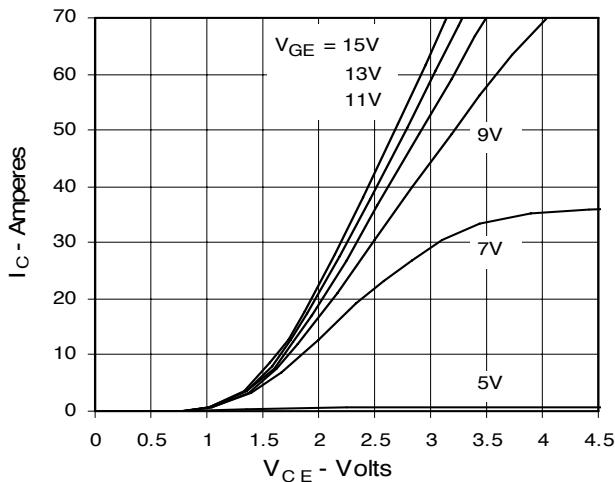
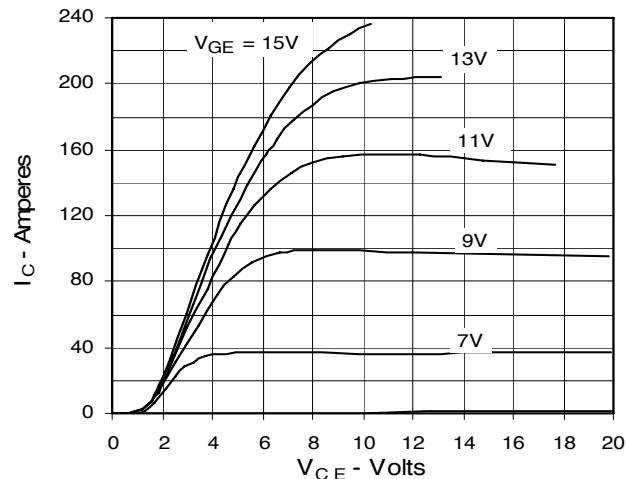
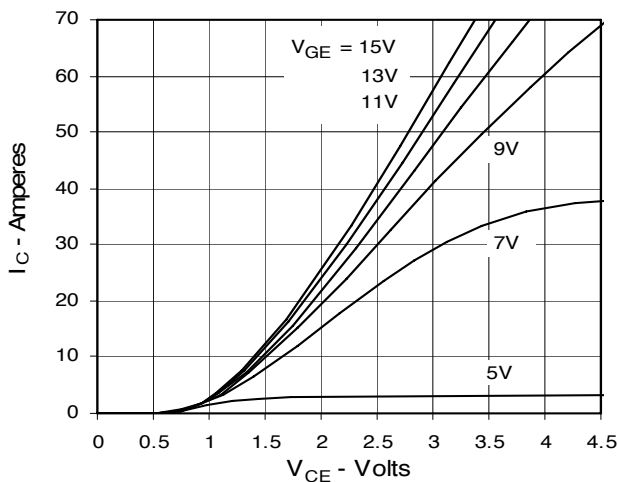
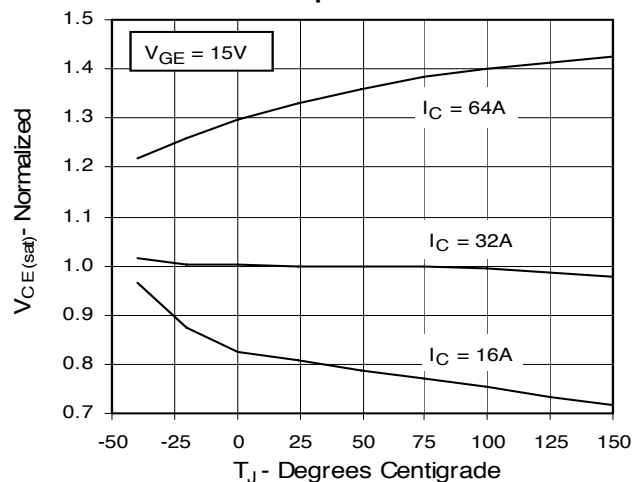
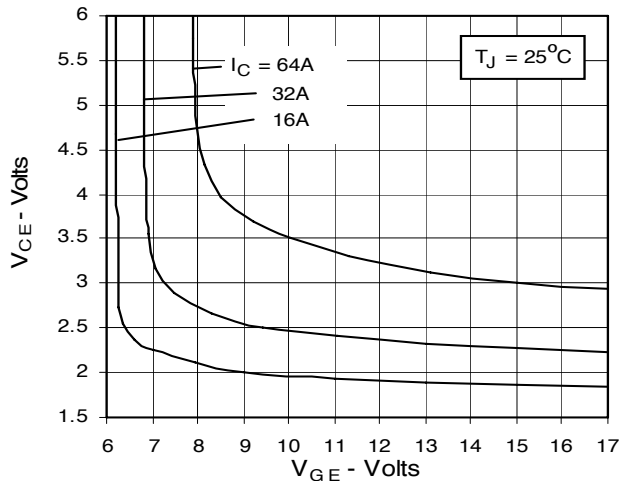
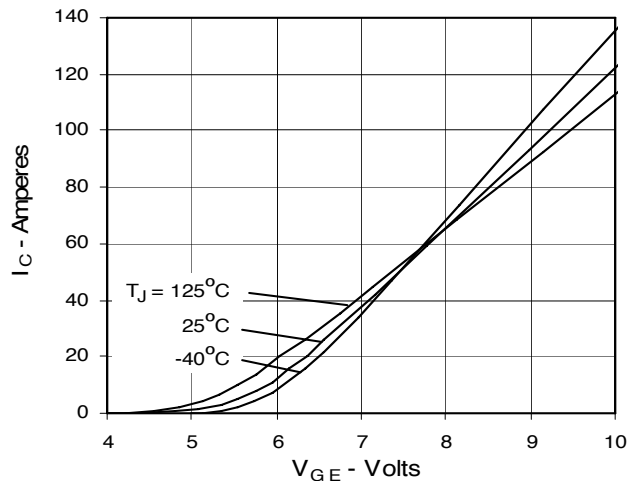
Symbol	Conditions	Characteristic Values		
		min.	typ.	max.
$V_F$	$I_F = 30\text{ A}$ $T_{VJ} = 125^\circ\text{C}$		1.8	2.75 V
$I_{RM}$	$I_F = 50\text{ A}; di_F/dt = -100\text{ A}/\mu\text{s}; T_{VJ} = 100^\circ\text{C}$ $V_R = 100\text{ V}; V_{GE} = 0\text{ V}$		5.5	11.4 A
$t_{rr}$			190	ns
$R_{thJC}$			0.15	1.1 KW
$R_{thCS}$				KW

### Notes:

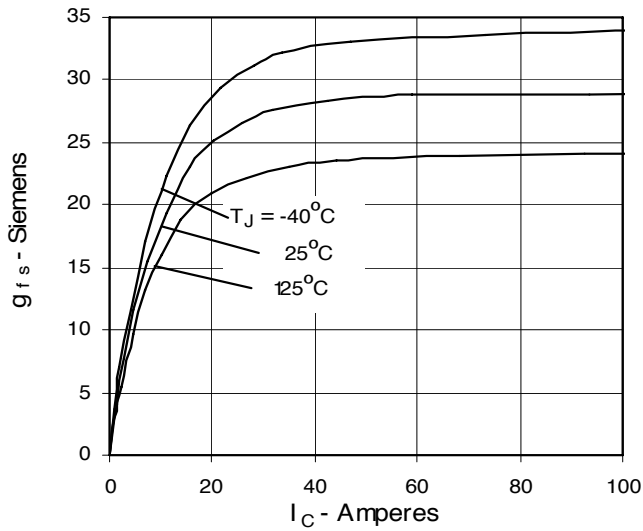
1. Pulse test: Pulse width < 300  $\mu\text{s}$ , duty cycle < 2 %;
2. Test current  $I_T = 32\text{ A}$ .

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

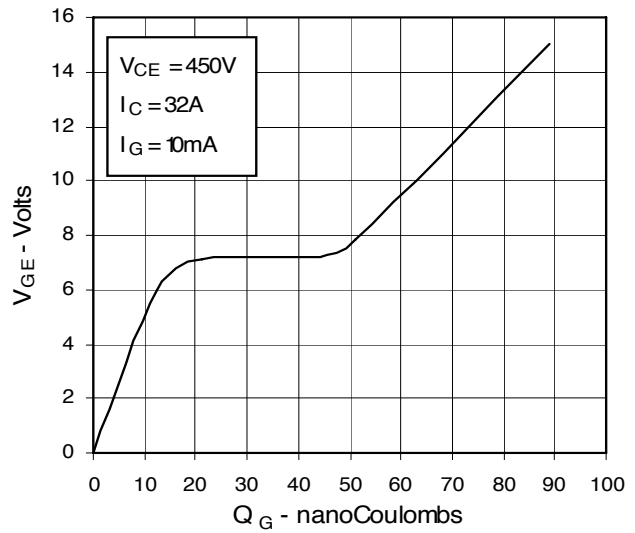
IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:	4,835,592	4,931,844	5,049,961	5,237,481	6,162,665	6,404,065 B1	6,683,344	6,727,585
	4,850,072	5,017,508	5,063,307	5,381,025	6,259,123 B1	6,534,343	6,710,405 B2	6,759,692
	4,881,106	5,034,796	5,187,117	5,486,715	6,306,728 B1	6,583,505	6,710,463	6,771,478 B2

**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  
Temperature**

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

**Fig. 6. Input Admittance**


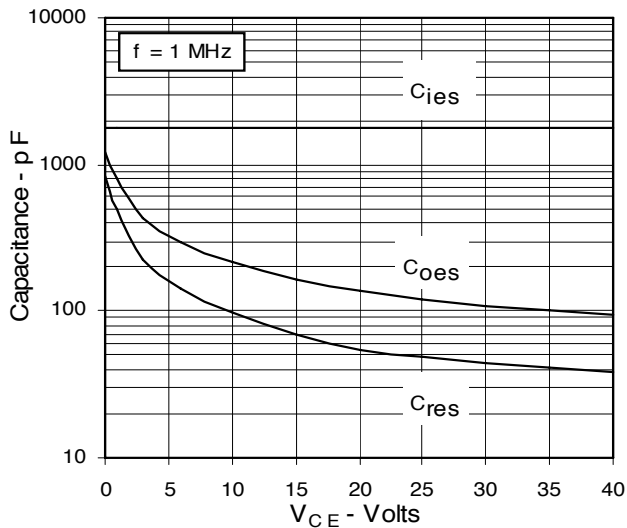
**Fig. 7. Transconductance**



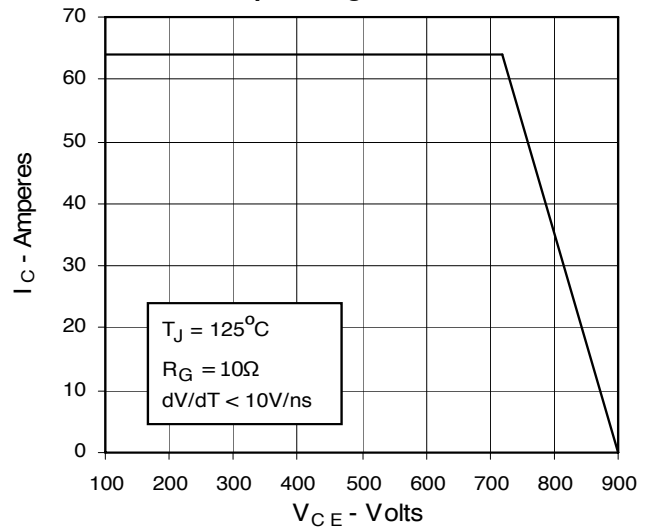
**Fig. 8. Gate Charge**



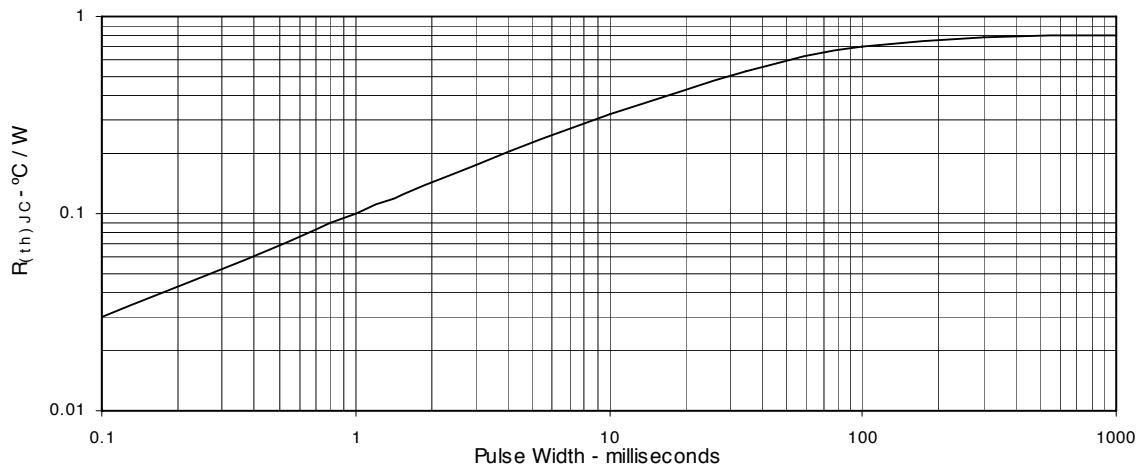
**Fig. 9. Capacitance**



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

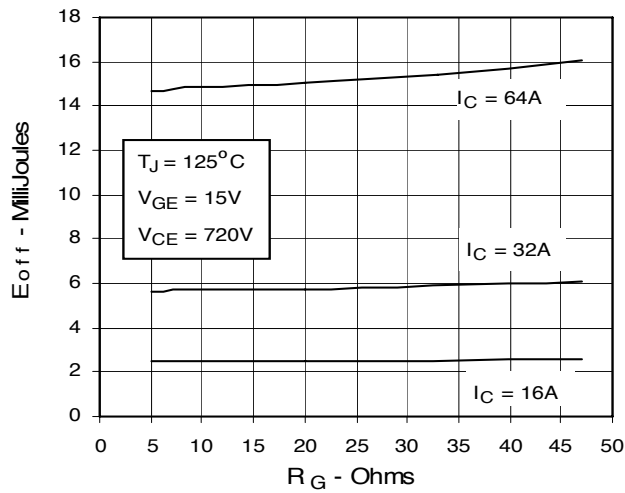
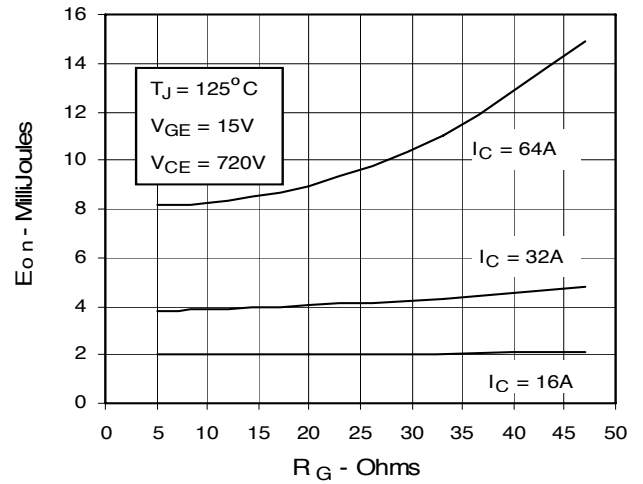
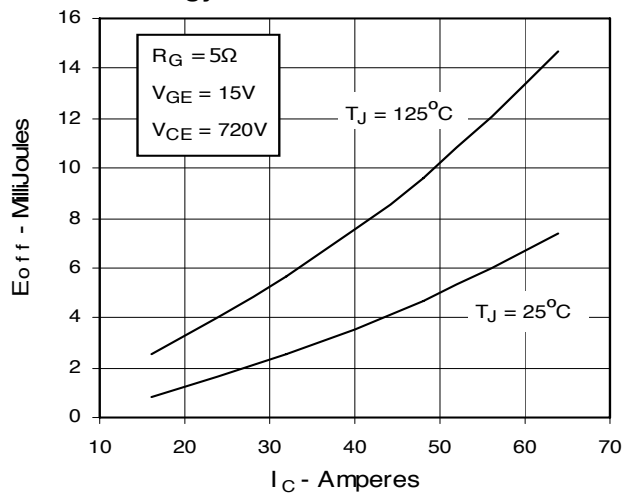
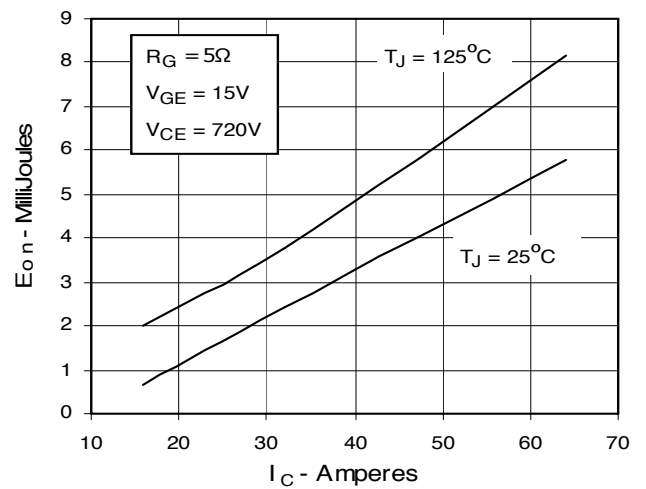
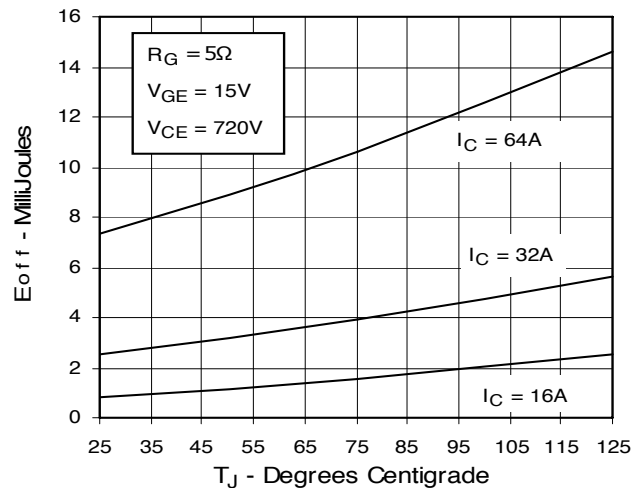
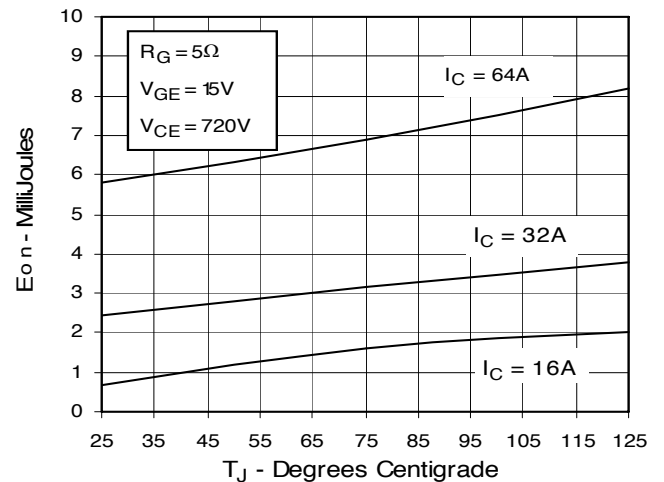


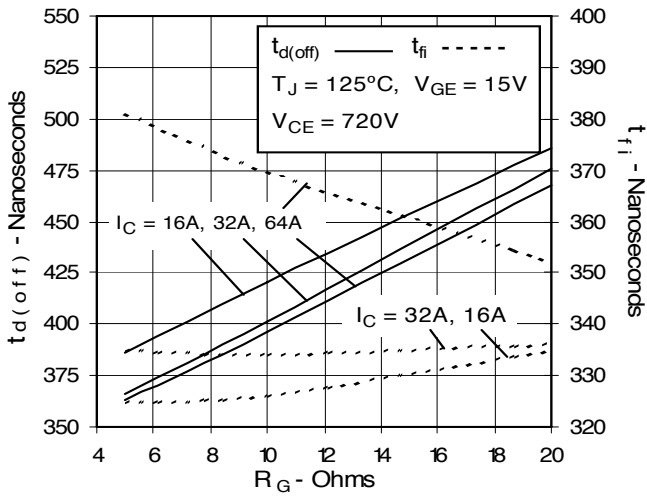
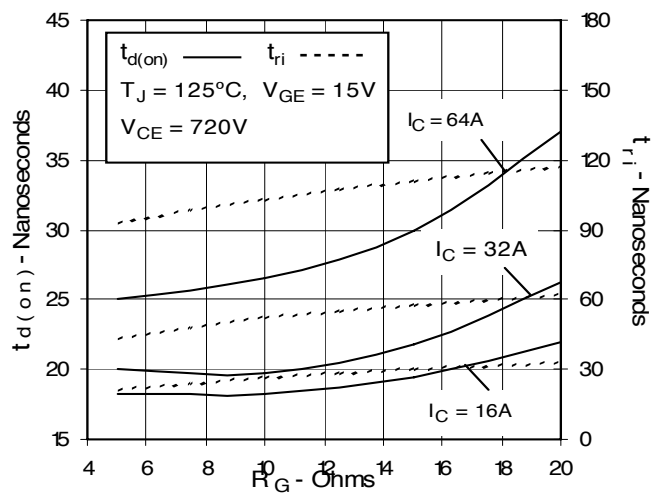
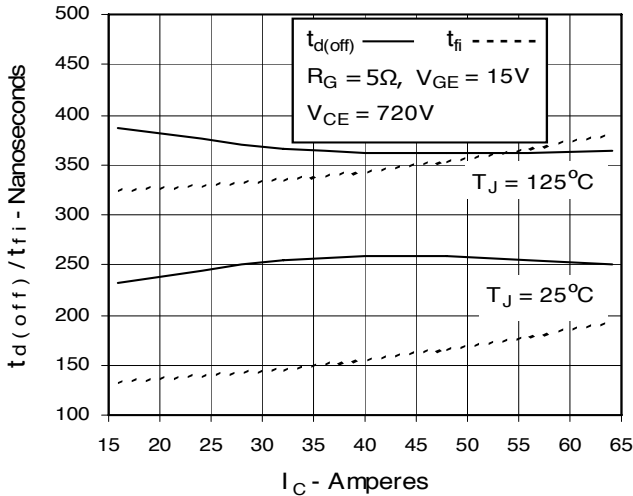
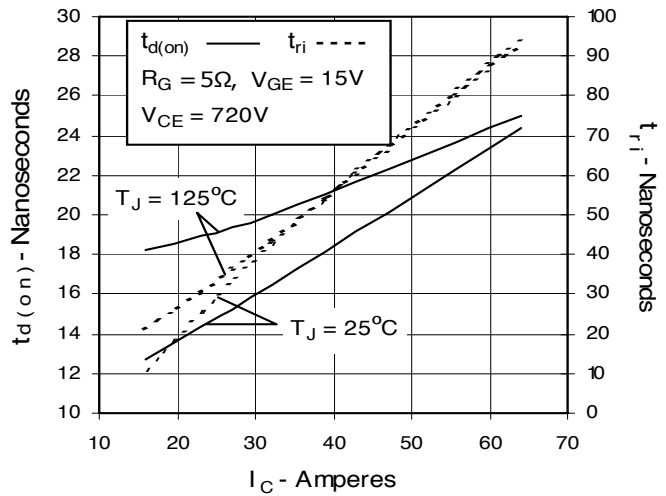
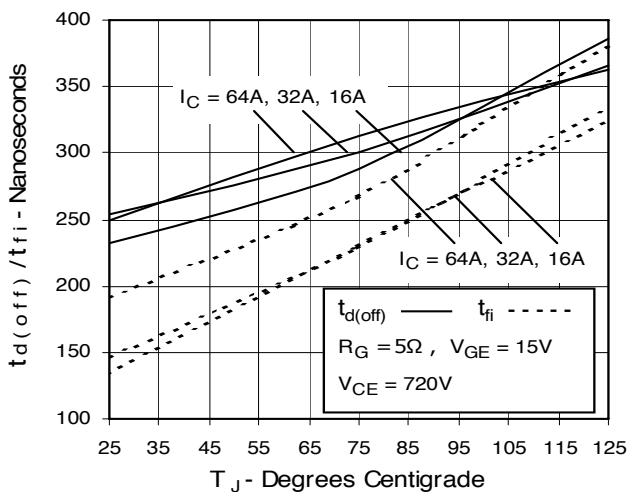
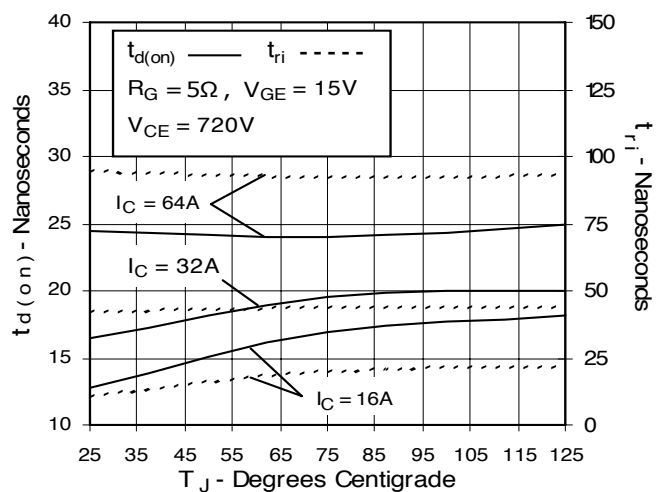
**Fig. 11. Maximum Transient Thermal Resistance**



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	4,931,844	5,049,961	5,237,481	6,162,665	6,404,065 B1	6,683,344	6,727,585
	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
	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

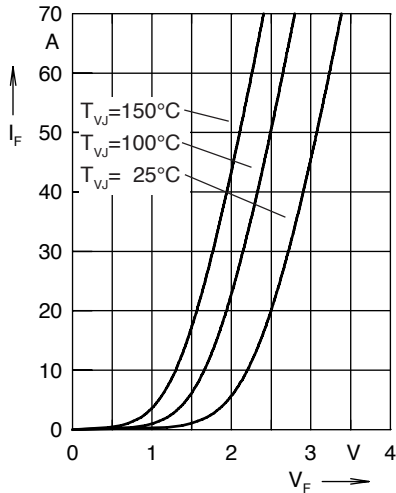
**Fig. 12. Dependence of Turn-off Energy Loss on Gate Resistance**

**Fig. 13. Dependence of Turn-on Energy Loss on Gate Resistance**

**Fig. 14. Dependence of Turn-off Energy Loss on Collector Current**

**Fig. 15. Dependence of Turn-on Energy Loss on Collector Current**

**Fig. 16. Dependence of Turn-off Energy Loss on Temperature**

**Fig. 17. Dependence of Turn-on Energy Loss on Temperature**


**Fig. 18. Dependence of Turn-off Switching Time on Gate Resistance**

**Fig. 19. Dependence of Turn-on Switching Time on Gate Resistance**

**Fig. 20. Dependence of Turn-off Switching Time on Collector Current**

**Fig. 21. Dependence of Turn-on Switching Time on Collector Current**

**Fig. 22. Dependence of Turn-off Switching Time on Temperature**

**Fig. 23. Dependence of Turn-on Switching Time on Temperature**


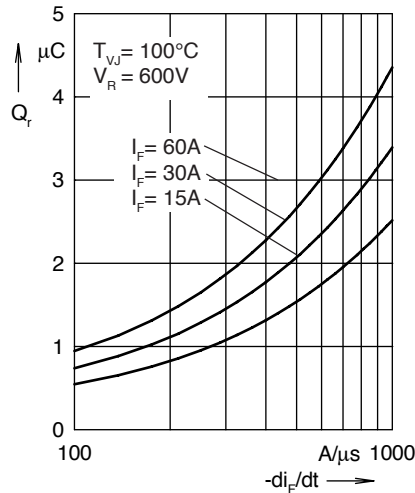
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	4,881,106	5,034,796	5,187,117	5,486,715	6,306,728 B1	6,583,505	6,710,463	6,771,478 B2

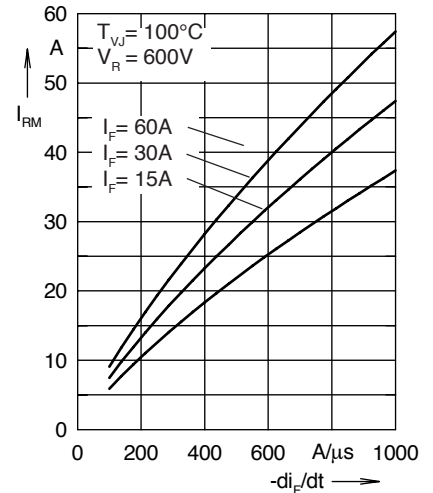
**Ultrafast Diode Characteristics**



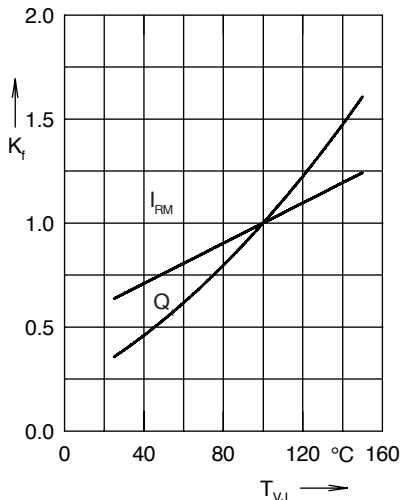
**Fig. 24. Forward current  $I_F$  versus  $V_F$**



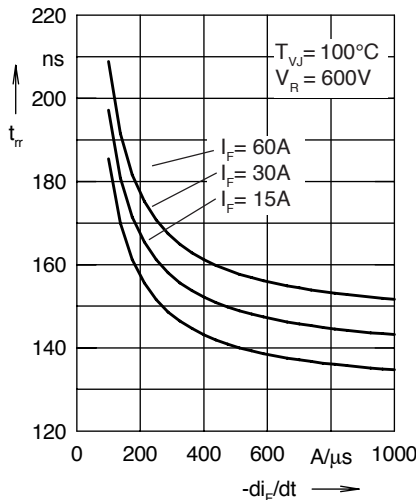
**Fig. 25. Reverse recovery charge  $Q_r$  versus  $-di_F/dt$**



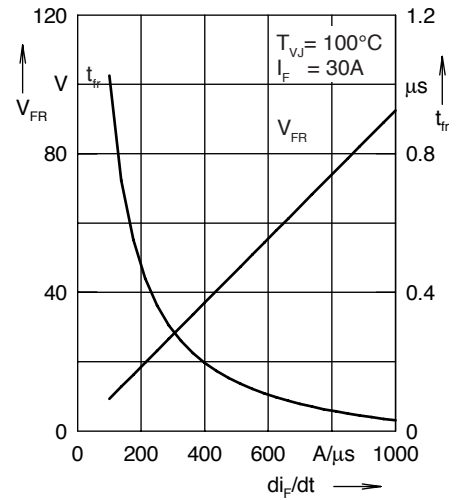
**Fig. 26. Peak reverse current  $I_{RM}$  versus  $-di_F/dt$**



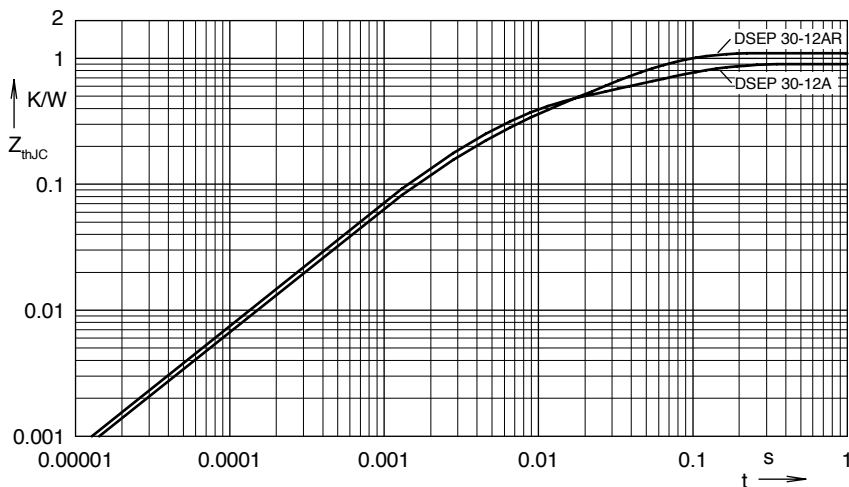
**Fig. 27. Dynamic parameters  $Q_r$ ,  $I_{RM}$  versus  $T_{VJ}$**



**Fig. 28. Recovery time  $t_{tr}$  versus  $-di_F/dt$**



**Fig. 29. Peak forward voltage  $V_{FR}$  and  $t_{tr}$  versus  $di_F/dt$**



**Fig. 30. Transient thermal resistance junction-to-case**

Constants for  $Z_{thJC}$  calculation for non-isolated diode (DSEP 30-12A):

i	$R_{thi}$ (K/W)	$t_i$ (s)
1	0.465	0.0052
2	0.179	0.0003
3	0.256	0.0397

Constants for  $Z_{thJC}$  calculation for isolated diode (DSEP 30-12AR):

i	$R_{thi}$ (K/W)	$t_i$ (s)
1	0.368	0.0052
2	0.1417	0.0003
3	0.0295	0.0004
4	0.5604	0.0092



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