

# GenX3™ 600V IGBT w/Diode

## IXGR72N60A3H1

(Electrically Isolated Tab)

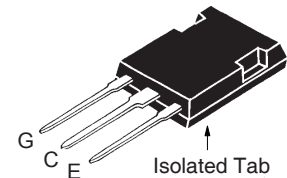
Ultra-Low  $V_{sat}$  PT IGBT for up to  
5kHz Switching



$$\begin{aligned} V_{CES} &= 600V \\ I_{C110} &= 52A \\ V_{CE(sat)} &\leq 1.45V \\ t_{fi(typ)} &= 250ns \end{aligned}$$

Symbol	Test Conditions	Maximum Ratings	
$V_{CES}$	$T_J = 25^\circ\text{C to } 150^\circ\text{C}$	600	V
$V_{CGR}$	$T_J = 25^\circ\text{C to } 150^\circ\text{C}, R_{GE} = 1M\Omega$	600	V
$V_{GES}$	Continuous	$\pm 20$	V
$V_{GEM}$	Transient	$\pm 30$	V
$I_{C25}$	$T_C = 25^\circ\text{C}$	75	A
$I_{C110}$	$T_C = 110^\circ\text{C}$	52	A
$I_{F110}$	$T_C = 110^\circ\text{C}$	32	A
$I_{CM}$	$T_C = 25^\circ\text{C}, 1\text{ms}$	400	A
<b>SSOA</b> <b>(RBSOA)</b>	$V_{GE} = 15V, T_{VJ} = 125^\circ\text{C}, R_G = 3\Omega$ Clamped Inductive Load	$I_{CM} = 150$ $V_{CE} \leq V_{CES}$	A
$P_C$	$T_C = 25^\circ\text{C}$	200	W
$T_J$		-55 ... +150	$^\circ\text{C}$
$T_{JM}$		150	$^\circ\text{C}$
$T_{stg}$		-55 ... +150	$^\circ\text{C}$
$V_{ISOL}$	50/60 Hz, RMS, $t = 1\text{minute}$	2500	V~
$F_C$	Mounting Force	20..120/4.5..27	N/lb
$T_L$	Maximum Lead Temperature for Soldering	300	$^\circ\text{C}$
$T_{SOLD}$	1.6mm (0.062 in.) from Case for 10s	260	$^\circ\text{C}$
<b>Weight</b>		5	g

### ISOPLUS247™



G = Gate      C = Collector  
E = Emitter

### Features

- Silicon Chip on Direct-Copper Bond (DCB) Substrate
- Isolated Mounting Surface
- 2500V Electrical Isolation
- Optimized for Low Conduction Losses
- Square RBSOA
- Anti-Parallel Ultra Fast Diode
- International Standard Package

### 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

Symbol	Test Conditions ( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
$V_{GE(th)}$	$I_C = 250\mu\text{A}, V_{CE} = V_{GE}$	3.0		5.0 V
$I_{CES}$	$V_{CE} = V_{CES}, V_{GE} = 0V$ $T_J = 125^\circ\text{C}$			300 $\mu\text{A}$ 5 mA
$I_{GES}$	$V_{CE} = 0V, V_{GE} = \pm 20V$			$\pm 100$ nA
$V_{CE(sat)}$	$I_C = 60A, V_{GE} = 15V, \text{Note 1}$			1.45 V

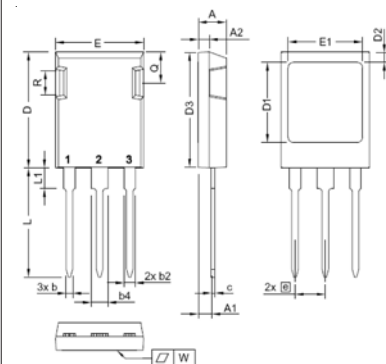
Symbol	Test Conditions	Characteristic Values		
		Min.	Typ.	Max.
$g_{fs}$	$I_C = 60A, V_{CE} = 10V, \text{Note 1}$	48	75	S
$C_{ies}$ $C_{oes}$ $C_{res}$	$V_{CE} = 25V, V_{GE} = 0V, f = 1MHz$		6600	pF
			360	pF
			80	pF
$Q_g$ $Q_{ge}$ $Q_{gc}$	$I_C = 60A, V_{GE} = 15V, V_{CE} = 0.5 \cdot V_{CES}$		230	nC
			40	nC
			80	nC
$t_{d(on)}$ $t_{ri}$ $E_{on}$ $t_{d(off)}$ $t_{fi}$ $E_{off}$	Inductive load, $T_J = 25^\circ C$ $I_C = 50A, V_{GE} = 15V$ $V_{CE} = 480V, R_G = 3\Omega$		31	ns
			34	ns
			1.4	mJ
			320	ns
			250	ns
			3.5	mJ
$t_{d(on)}$ $t_{ri}$ $E_{on}$ $t_{d(off)}$ $t_{fi}$ $E_{off}$	Inductive load, $T_J = 125^\circ C$ $I_C = 50A, V_{GE} = 15V$ $V_{CE} = 480V, R_G = 3\Omega$		29	ns
			34	ns
			2.6	mJ
			510	ns
			375	ns
			6.5	mJ
$R_{thJC}$ $R_{thCS}$		0.15	0.62 °C/W °C/W	

### Reverse Diode (FRED)

Symbol	Test Conditions	Characteristic Values		
		Min.	Typ.	Max.
$V_F$	$I_F = 60A, V_{GE} = 0V, \text{Note 1}$ $T_J = 150^\circ C$		1.6	2.3 V
			1.4	1.8 V
$I_{RM}$	$I_F = 60A, V_{GE} = 0V,$ $-di_F/dt = 200A/\mu s, V_R = 300V$ $T_J = 100^\circ C$		8.3	A
$t_{rr}$	$I_F = 60A, -di/dt = 200A/\mu s, V_R = 300V, T_J = 100^\circ C$		140	ns
$R_{thJC}$			0.8 °C/W	

Note 1. Pulse test,  $t \leq 300\mu s$ , duty cycle,  $d \leq 2\%$ .

### ISOPLUS247 (IXGR) Outline

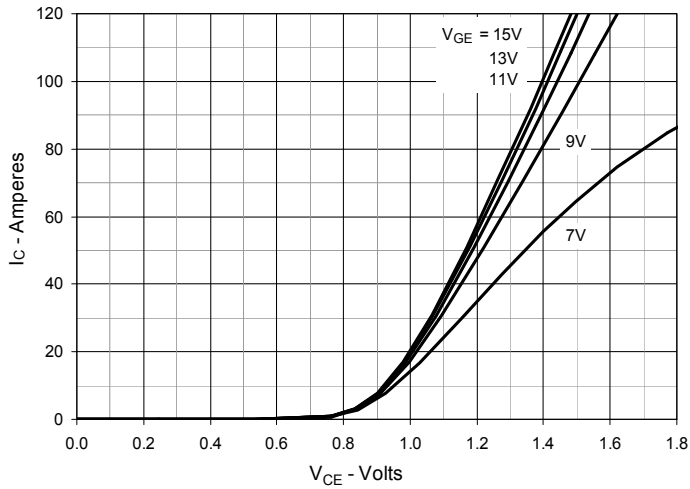
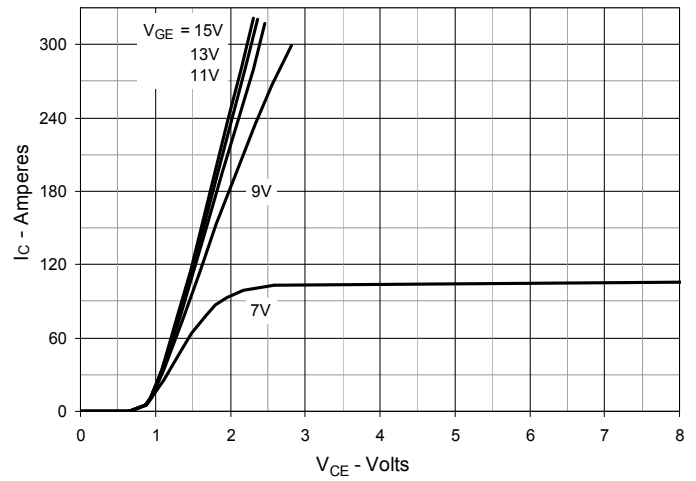
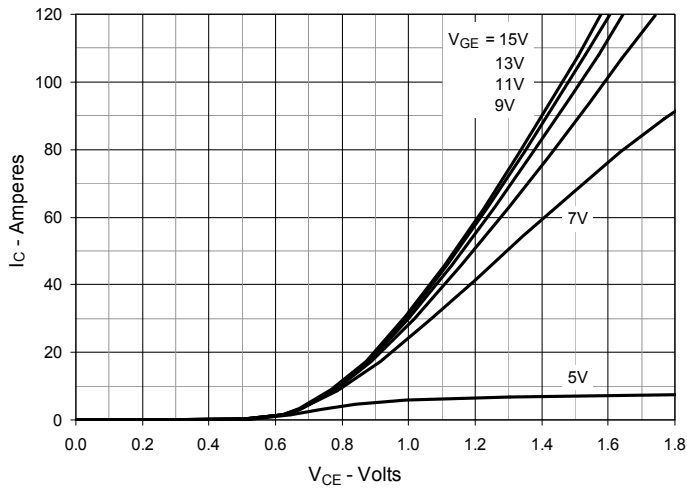
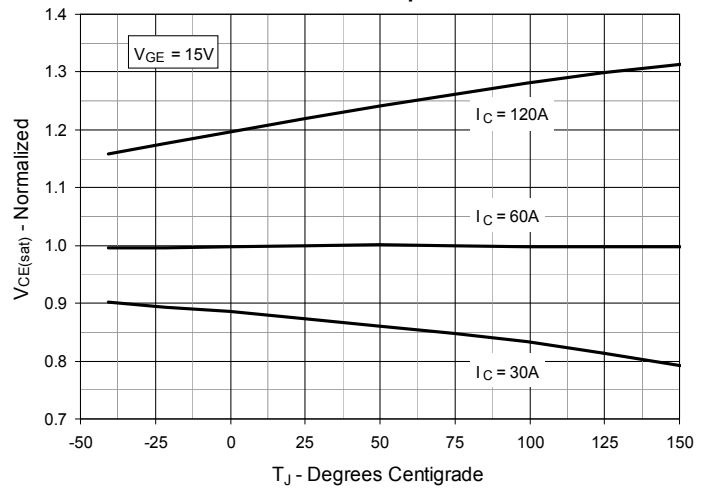
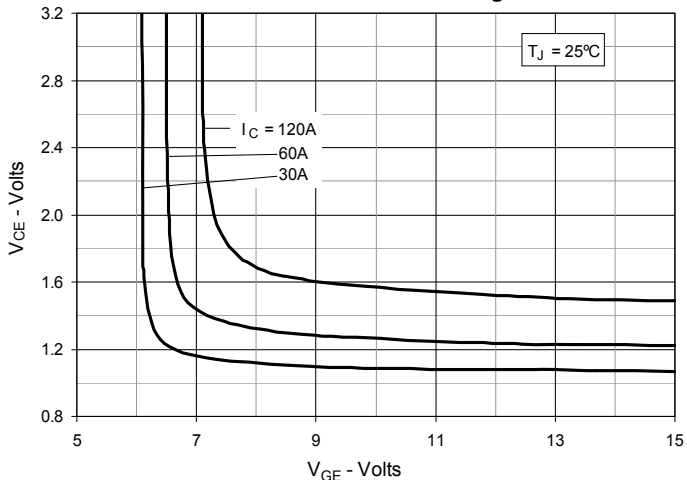
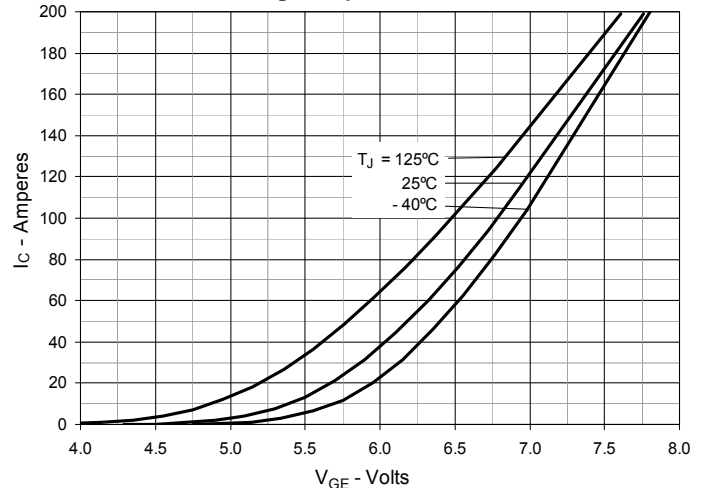


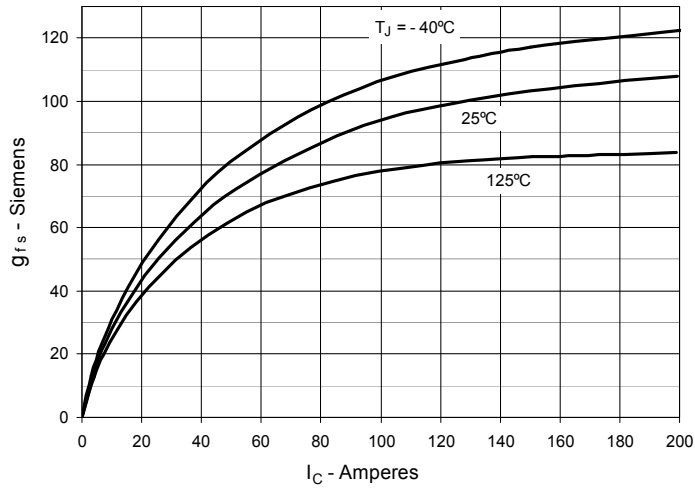
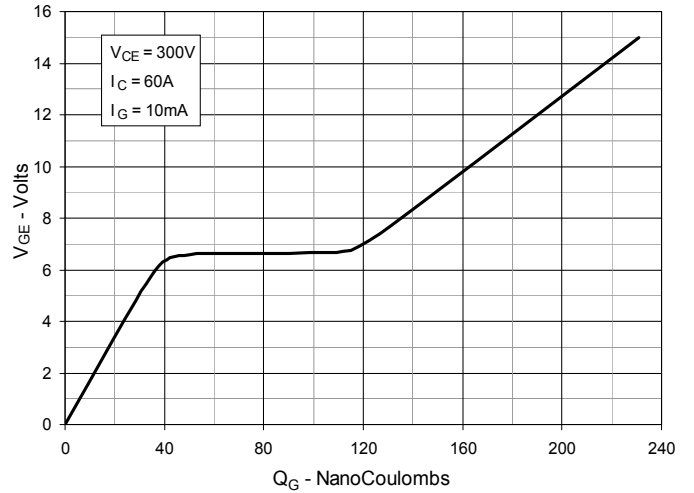
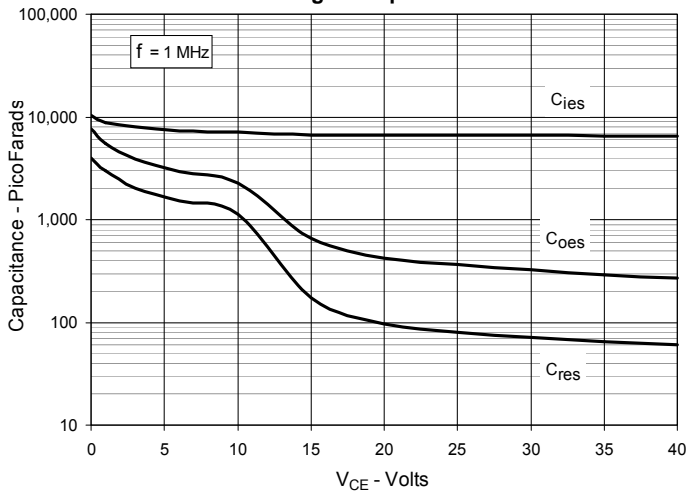
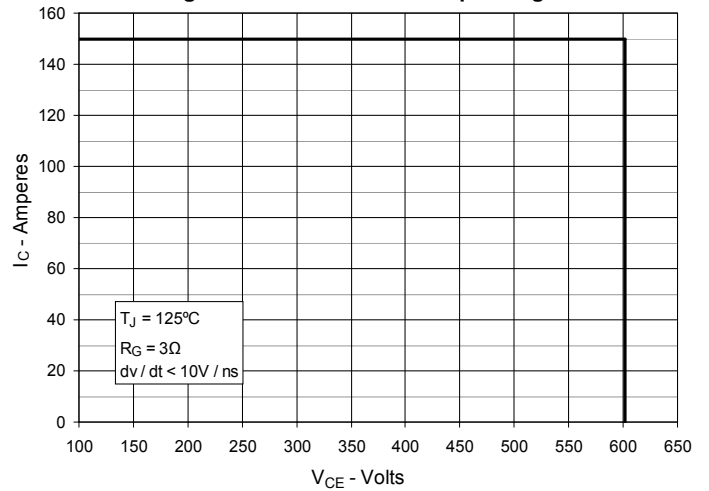
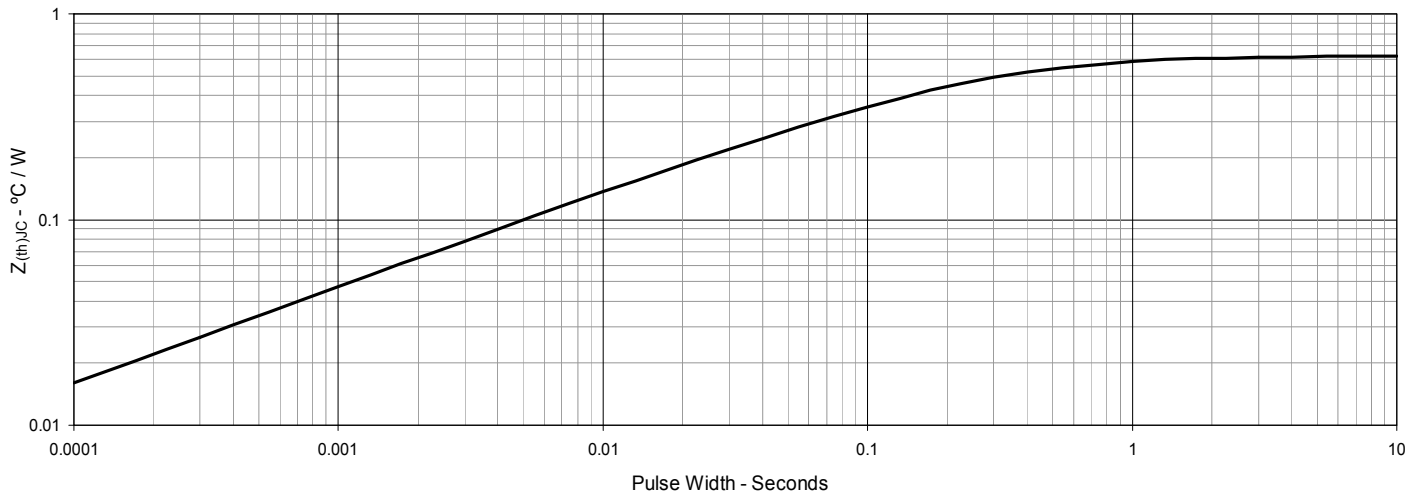
- 1 - Gate
- 2 - Collector
- 3 - Emitter

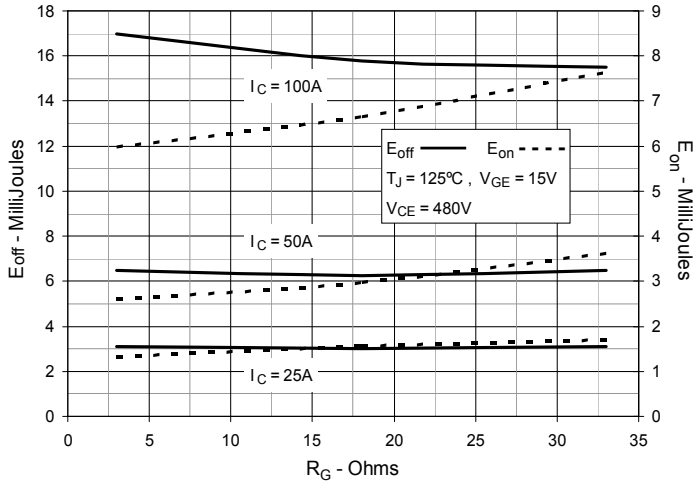
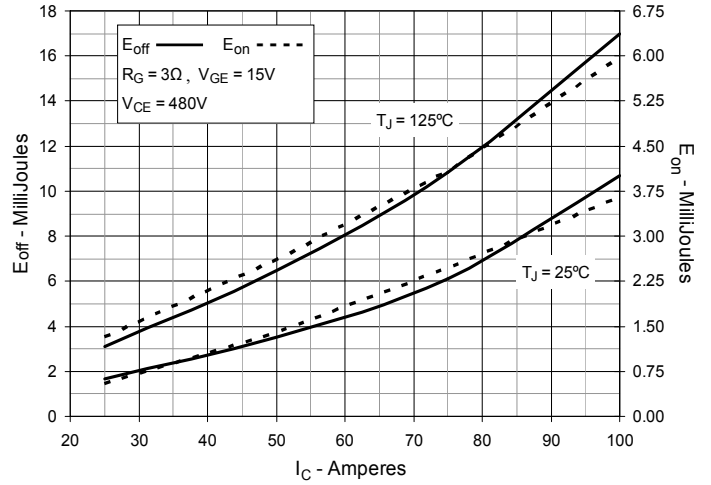
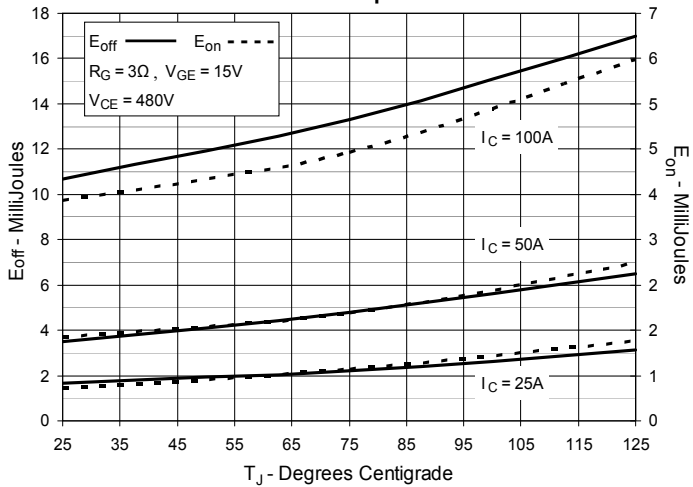
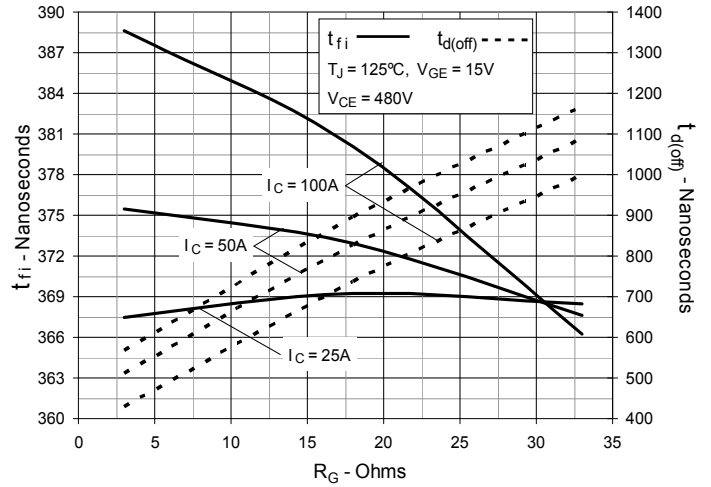
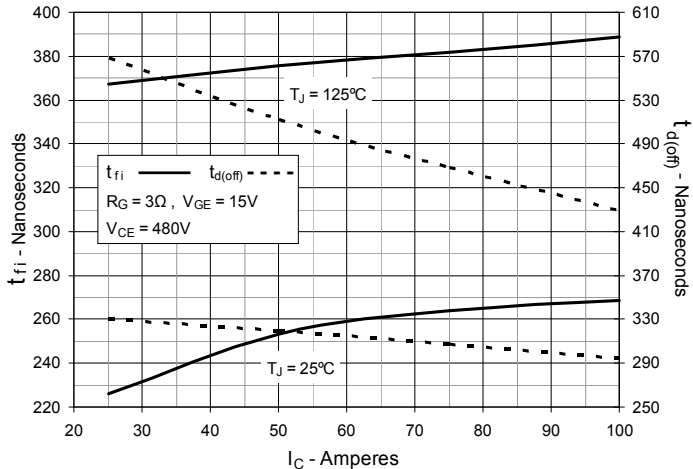
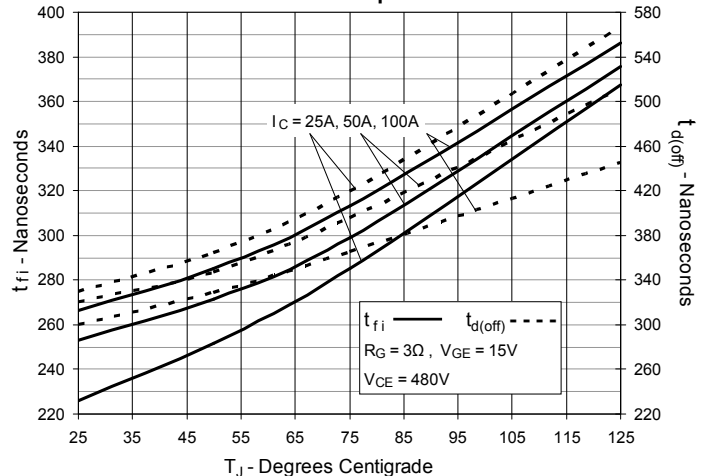
Dim.	Millimeter		Inches	
	min	max	min	max
A	4.83	5.21	0.190	0.205
A1	2.29	2.54	0.090	0.100
A2	1.91	2.16	0.075	0.085
b	1.14	1.40	0.045	0.055
b2	1.91	2.20	0.075	0.087
b4	2.92	3.24	0.115	0.128
c	0.61	0.83	0.024	0.033
D	20.80	21.34	0.819	0.840
D1	15.75	16.26	0.620	0.640
D2	1.65	2.15	0.065	0.085
D3	20.30	20.70	0.799	0.815
E	15.75	16.13	0.620	0.635
E1	13.21	13.72	0.520	0.540
e	5.45 BSC		0.215 BSC	
L	19.81	20.60	0.780	0.811
L1	3.81	4.38	0.150	0.172
Q	5.59	6.20	0.220	0.244
R	4.25	5.50	0.167	0.217
W	-	0.10	-	0.004

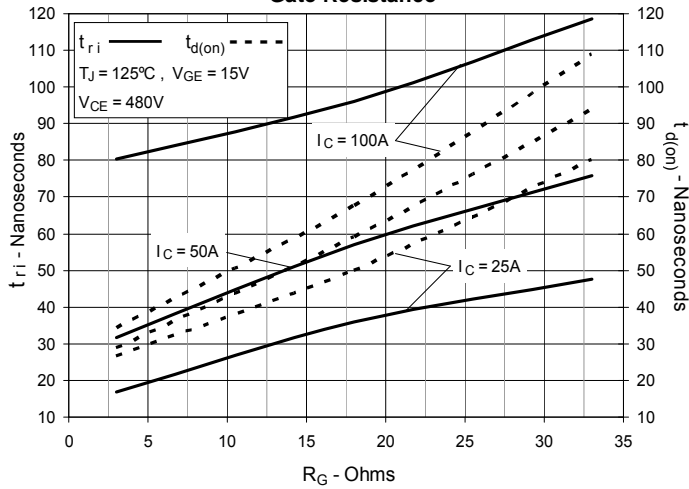
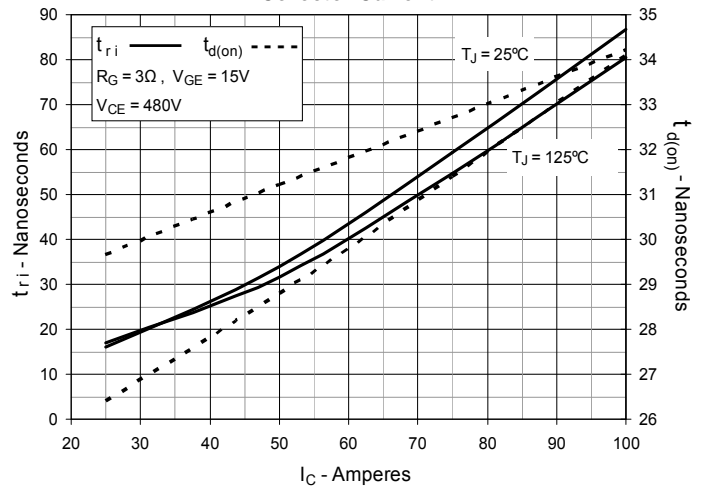
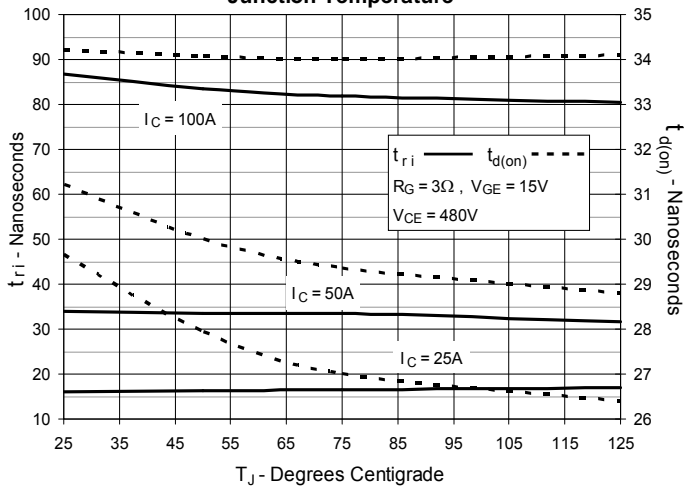
IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

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 @  $T_J = 125^\circ\text{C}$** 

**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**


**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**


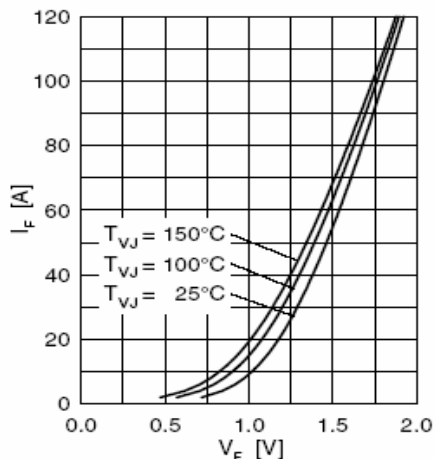


Fig. 21 Forward Current  $I_F$  vs.  $V_F$

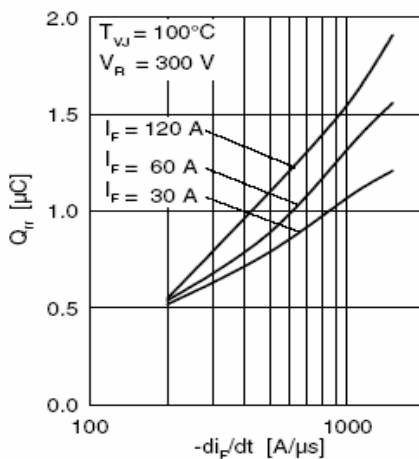


Fig. 22 Typ. Reverse Recovery Charge  $Q_{rr}$

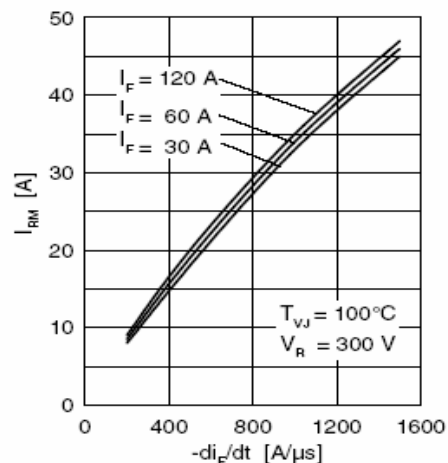


Fig. 23 Typ. Peak Reverse Current  $I_{RM}$

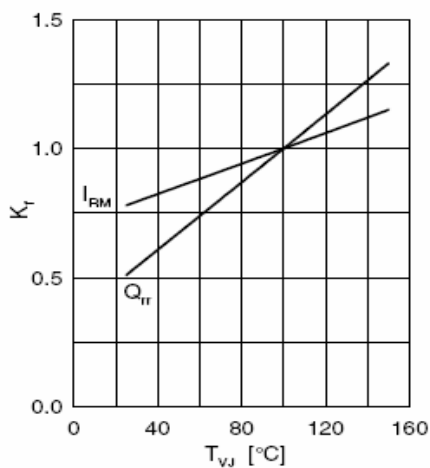


Fig. 24 Typ. Dynamic Parameters  $Q_{rr}$ ,  $I_{RM}$

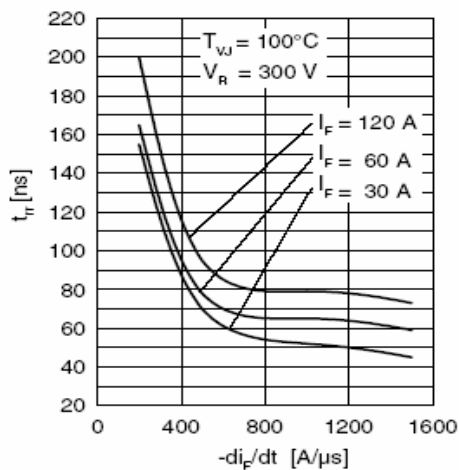


Fig. 25 Typ Recovery Time  $t_{rr}$

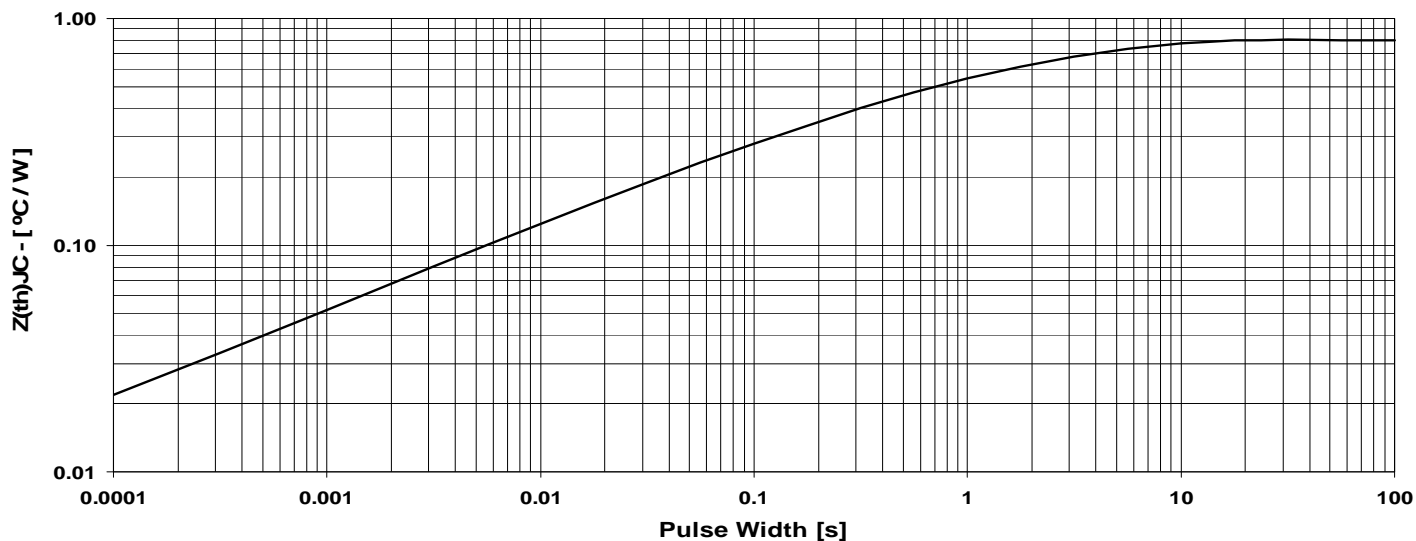


Fig. 26 Maximum Transient Thermal Impedance Junction to Case (for Diode)



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