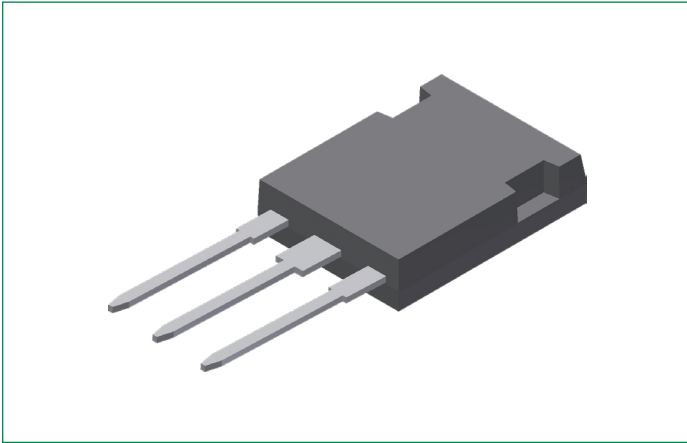


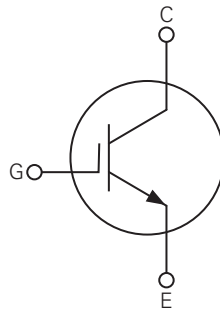
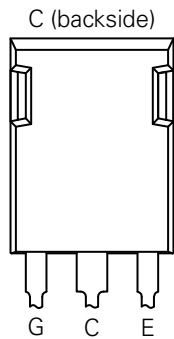
IXYX180N65A5

650 V, 180 A, Gen5 XPT™ IGBT

Extreme Light Punch Through IGBT for up to 5 kHz Switching



Pinout Diagram PLUS-247 (IXYX)



G: Gate; **C:** Collector; **E:** Emitter; **backside:** Collector

Description:

Developed using our proprietary XPT™ thin-wafer technology and state-of-the-art Trench IGBT process, these devices feature reduced thermal resistance, low conduction losses, and low gate driver requirements.

Features & Benefits:

- Optimized for Low Conduction Losses
- High Surge Current Capability
- Square RBSOA
- International Standard Package
- Low Gate Charge Q_G
- Low Gate Drive Requirement

Applications:

- Power Inverters
- UPS
- PFC Circuits
- Battery Chargers
- Welding Machines
- Lamp Ballasts
- Inrush Current Protection Circuits

Product Summary

Characteristic	Value	Unit
V_{CES}	650	V
I_{C110}	180	A
$V_{CE(sat)}$	≤ 1.35	V
$t_{fi(typ)}$	110	ns

Maximum Ratings

Symbol	Characteristic	Conditions	Value	Unit
V_{CES}	Collector-Emitter Voltage	$T_J = 25\text{ }^{\circ}\text{C}$ to $175\text{ }^{\circ}\text{C}$	650	V
V_{CGR}	Collector-Gate Voltage	$T_J = 25\text{ }^{\circ}\text{C}$ to $175\text{ }^{\circ}\text{C}$, $R_{GE} = 1\text{ M}\Omega$	650	V
V_{GES}	Gate-Emitter Voltage	Continuous	± 20	V
V_{GEM}	Transient Gate-Emitter Voltage	Transient	± 30	V
I_{C25}	Continuous Collector Current	$T_C = 25\text{ }^{\circ}\text{C}$ (Chip Capability)	400	A
I_{LRM}	Terminal Current Limit	–	160	A
I_{C110}	Continuous Collector Current	$T_C = 110\text{ }^{\circ}\text{C}$	180	A
I_{CM}	Peak Collector Current	$T_C = 25\text{ }^{\circ}\text{C}$, 1 ms	1030	A
SSOA (RBSOA)	Switching Safe Operating Area (Reverse Biased Safe Operating Area)	$V_{GE} = 15\text{ V}$, $T_{VJ} = 125\text{ }^{\circ}\text{C}$, $R_G = 2\text{ }\Omega$, Clamped Inductive Load, $I_{CM} = V_{CE} \leq V_{CES}$	360	A
P_C	Collector Power Dissipation	$T_C = 25\text{ }^{\circ}\text{C}$	1150	W
T_J	Junction Temperature	–	–55 to 175	$^{\circ}\text{C}$
T_{JM}	Maximum Junction Temperature	–	175	$^{\circ}\text{C}$
T_{stg}	Storage Temperature	–	–55 to 175	$^{\circ}\text{C}$
T_L	Maximum Lead Temperature for Soldering	1.6 mm (0.062 in.) from Case for 10 s	300	$^{\circ}\text{C}$
F_C	Mounting Force	–	20..120 / 4.5..27	N/lb
W	Weight	–	10	g

Thermal Characteristics

Symbol	Characteristic	Value			Unit
		Min.	Typ.	Max.	
$R_{th, JC}$	Thermal Resistance, Junction-to-Case	–	–	0.13	$^{\circ}\text{C}/\text{W}$
$R_{th, CS}$	Thermal Resistance, Case-to-Sink	–	0.21	–	$^{\circ}\text{C}/\text{W}$

Electrical Characteristics – Static ($T_J = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)

Symbol	Characteristic	Conditions	Value			Unit
			Min.	Typ.	Max.	
BV_{CES}	Collector-Emitter Breakdown Voltage	$I_C = 250\text{ }\mu\text{A}$, $V_{GE} = 0\text{ V}$	650	–	–	V
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C = 250\text{ }\mu\text{A}$, $V_{CE} = V_{GE}$	3.7	–	5.8	V
I_{GES}	Gate-Emitter Leakage Current	$V_{CE} = 0\text{ V}$, $V_{GE} = \pm 20\text{ V}$	–	–	± 200	nA
I_{CES}	Zero Gate Voltage Collector Current	$V_{CE} = V_{CES}$, $V_{GE} = 0\text{ V}$	–	–	25	μA
		$V_{CE} = V_{CES}$, $V_{GE} = 0\text{ V}$, $T_J = 150\text{ }^{\circ}\text{C}$	–	–	1.5	mA
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage ¹	$I_C = 100\text{ A}$, $V_{GE} = 15\text{ V}$	–	1.20	1.35	V
		$I_C = 100\text{ A}$, $V_{GE} = 15\text{ V}$, $T_J = 150\text{ }^{\circ}\text{C}$	–	1.25	–	V

Note 1: Pulse test, $t \leq 300\text{ }\mu\text{s}$, duty cycle, $d \leq 2\%$

Electrical Characteristics – Dynamic ($T_J = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)

Symbol	Characteristic	Conditions		Value			Unit			
				Min.	Typ.	Max.				
g_{fs}	Transconductance ¹	$I_C = 60\text{ A}, V_{CE} = 10\text{ V}$		63	105	–	S			
R_{Gi}	Gate Input Resistance	–		–	1.1	–	Ω			
C_{ies}	Input Capacitance	$V_{GE} = 0\text{ V}, V_{CE} = 25\text{ V}, f = 1\text{ MHz}$		–	870	–	pF			
C_{oes}	Output Capacitance			–	440	–				
C_{res}	Reverse Transfer Capacitance			–	250	–				
$Q_{g(on)}$	Total Gate Charge	$V_{GE} = 15\text{ V}, V_{CE} = 0.5 \times V_{CES},$ $I_C = 180\text{ A}$		–	654	–	nC			
Q_{ge}	Gate-Emitter Charge			–	63	–				
Q_{gc}	Gate-Collector Charge			–	345	–				
$t_{d(on)}$	Turn-on Delay Time ²	Inductive Load, $V_{GE} = 15\text{ V}, V_{CE} = 300\text{ V},$ $I_C = 100\text{ A}, R_{G(ext)} = 2\ \Omega$		$T_J = 25\text{ }^{\circ}\text{C}$	–	70	–	ns		
				$T_J = 150\text{ }^{\circ}\text{C}$	–	50	–			
t_{ri}	Turn-on Rise Time ²			$T_J = 25\text{ }^{\circ}\text{C}$	–	64	–	ns		
				$T_J = 150\text{ }^{\circ}\text{C}$	–	70	–			
E_{on}	Turn-on Energy ²			$T_J = 25\text{ }^{\circ}\text{C}$	–	0.42	–	mJ		
				$T_J = 150\text{ }^{\circ}\text{C}$	–	1.06	–			
$t_{d(off)}$	Turn-off Delay Time ²			$T_J = 25\text{ }^{\circ}\text{C}$	–	500	–	ns		
				$T_J = 150\text{ }^{\circ}\text{C}$	–	415	–			
t_{fi}	Turn-off Fall Time ²			$T_J = 25\text{ }^{\circ}\text{C}$	–	110	–	ns		
				$T_J = 150\text{ }^{\circ}\text{C}$	–	245	–			
E_{off}	Turn-off Energy ²			$T_J = 25\text{ }^{\circ}\text{C}$	–	4.10	–	mJ		
				$T_J = 150\text{ }^{\circ}\text{C}$	–	5.80	–			

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

Characteristic Curves

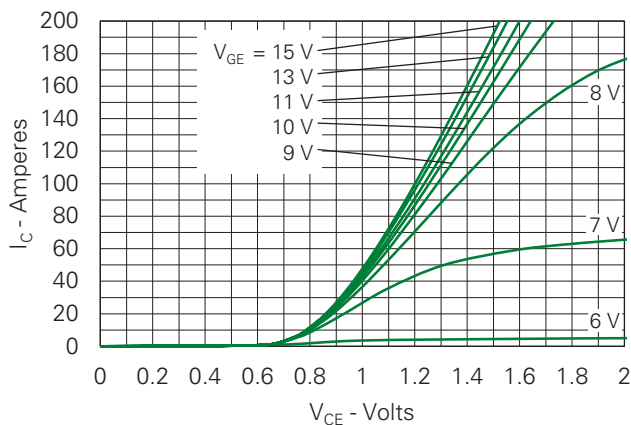
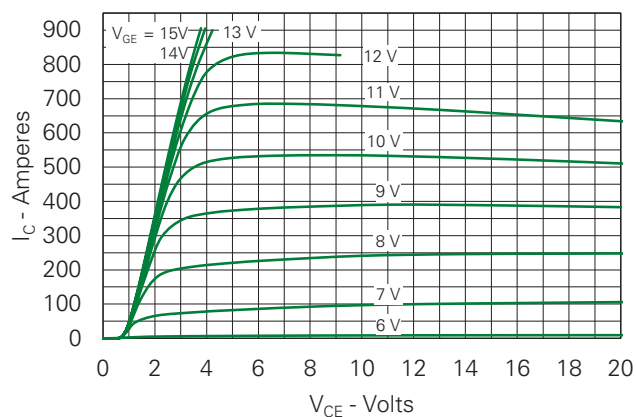
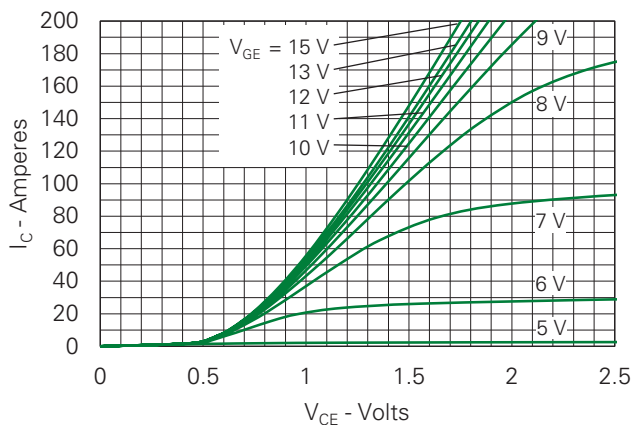
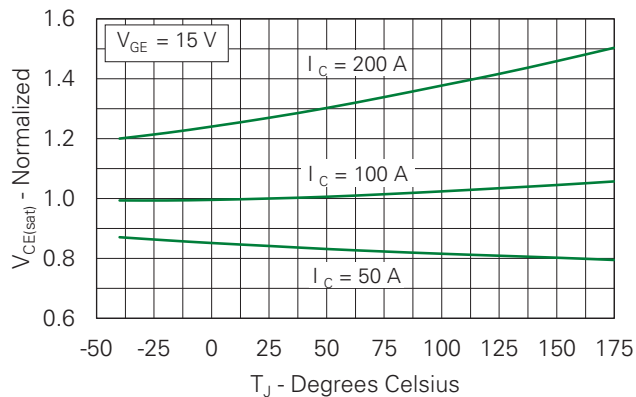
Fig. 1. Output Characteristics @ $T_J = 25^\circ\text{C}$ Fig. 2. Extended Output Characteristics @ $T_J = 25^\circ\text{C}$ Fig. 3. Output Characteristics @ $T_J = 150^\circ\text{C}$ Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

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

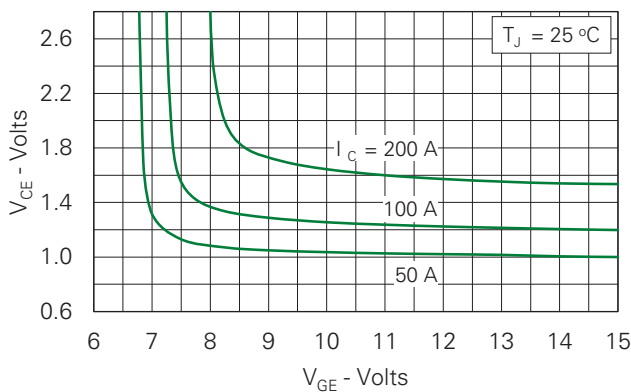


Fig. 6. Input Admittance

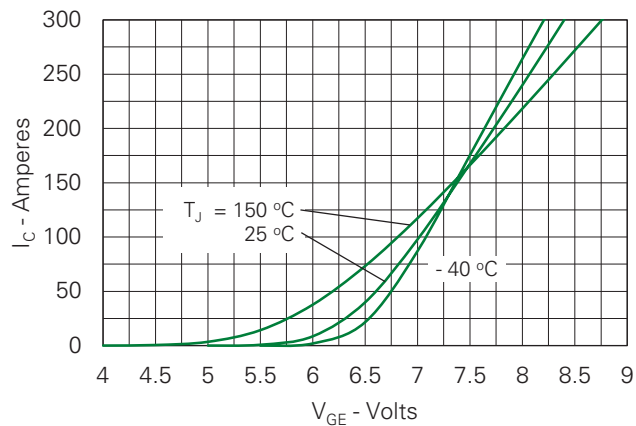


Fig. 7. Transconductance

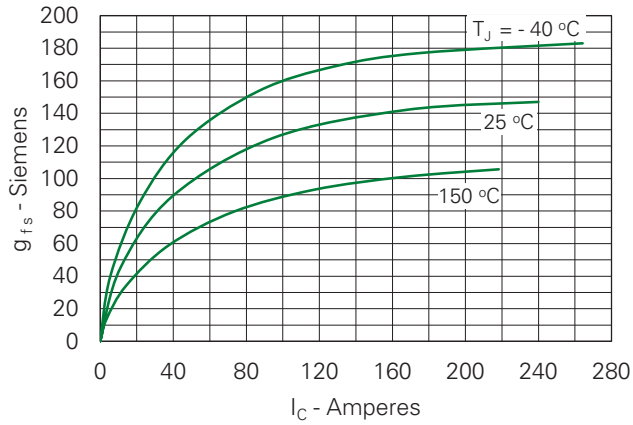


Fig. 8. Gate Charge

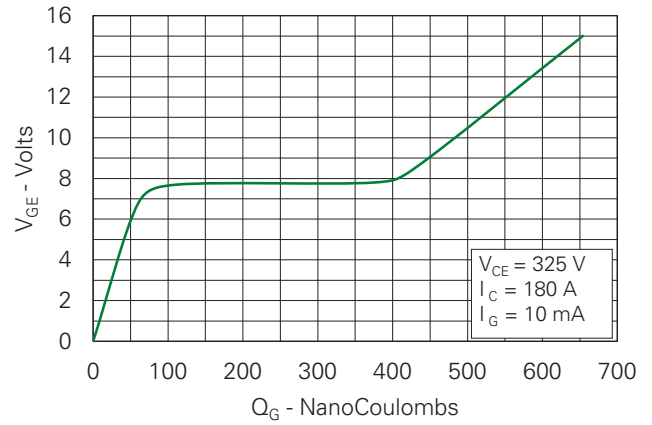


Fig. 9. Capacitance

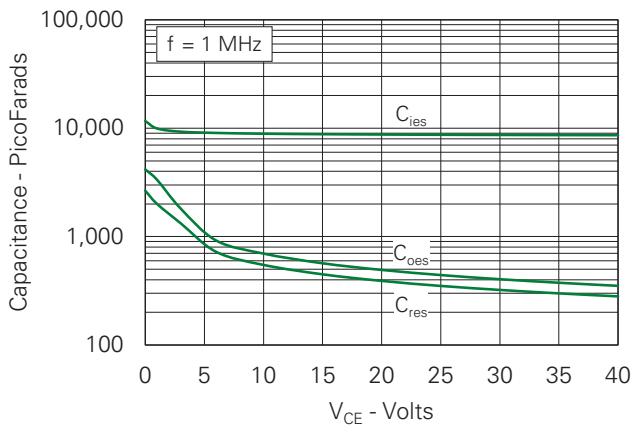


Fig. 10. Reverse-Bias Safe Operating Area

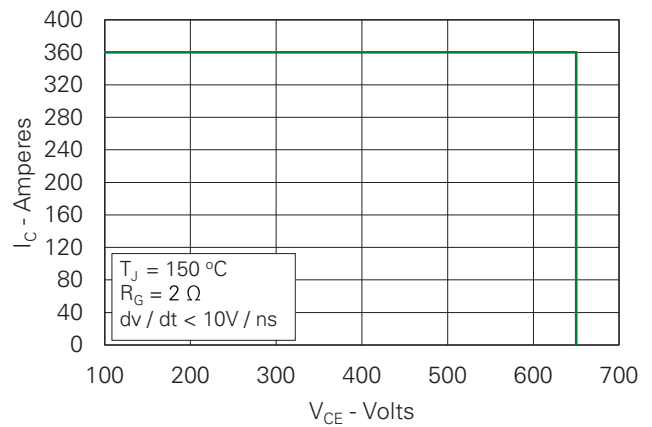


Fig. 11. Maximum Transient Thermal Impedance

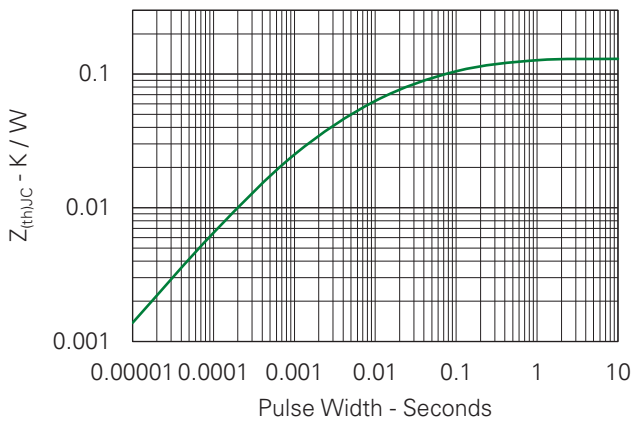


Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance

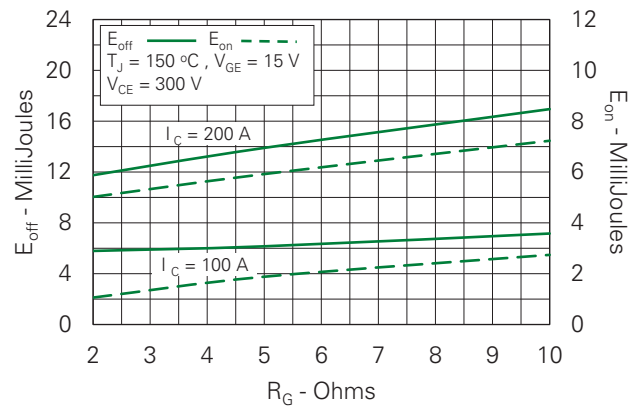


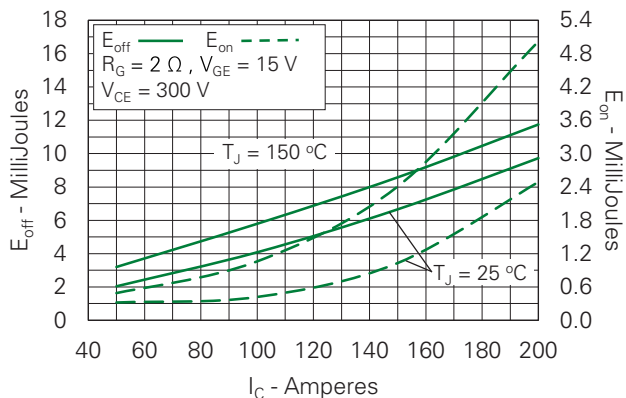
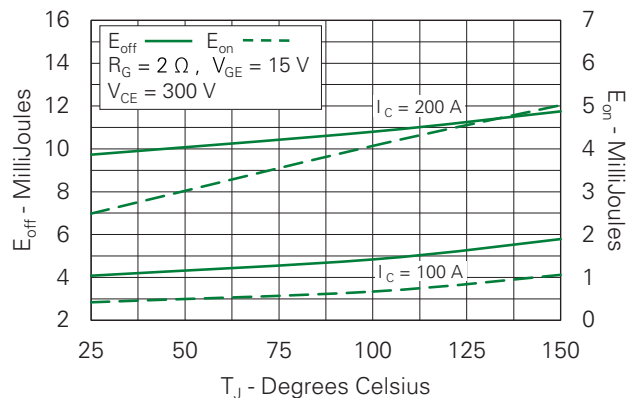
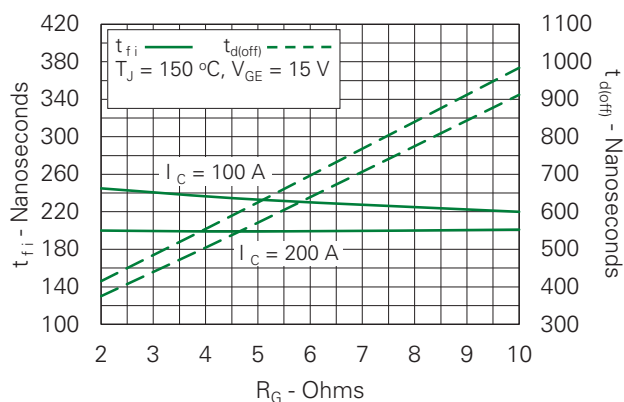
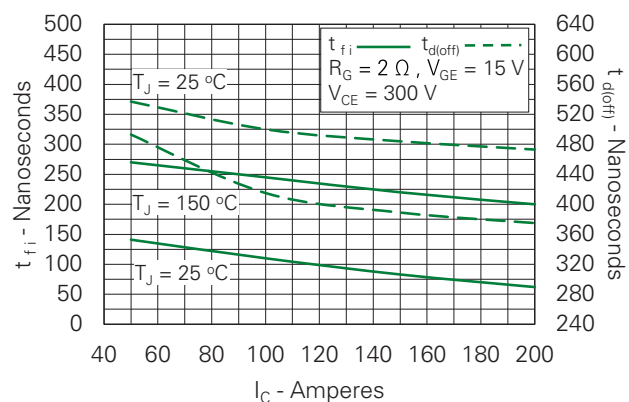
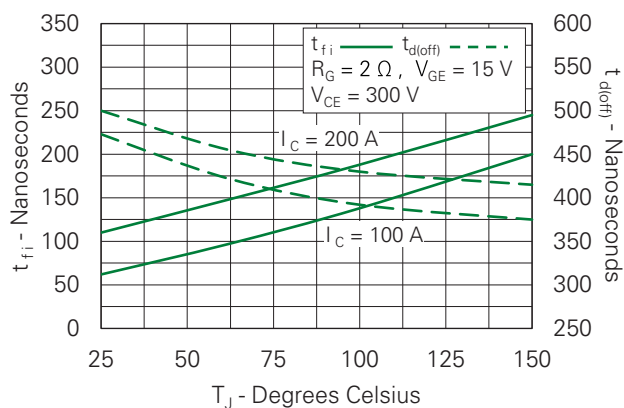
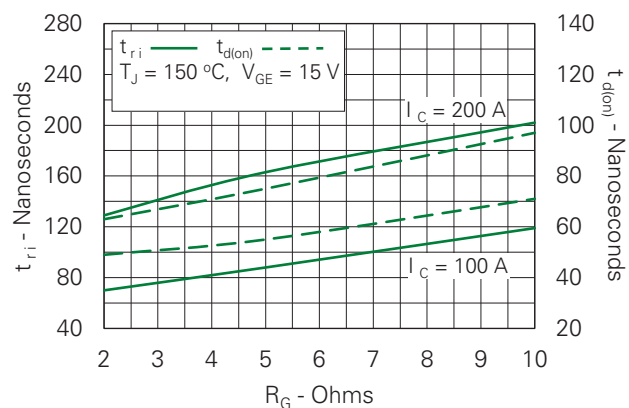
Fig. 13. Inductive Switching Energy Loss vs. Collector Current**Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature****Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance****Fig. 16. Inductive Turn-off Switching Times vs. Collector Current****Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature****Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance**

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

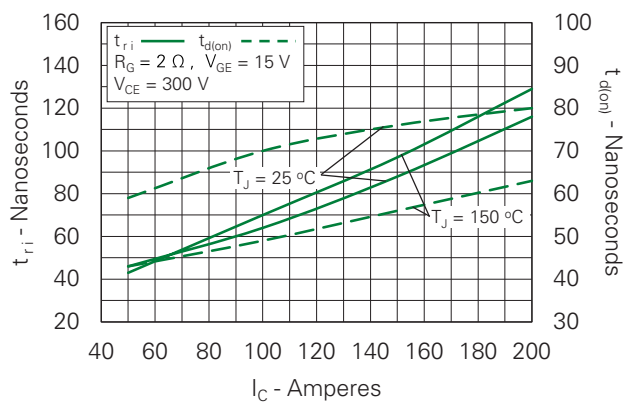


Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature

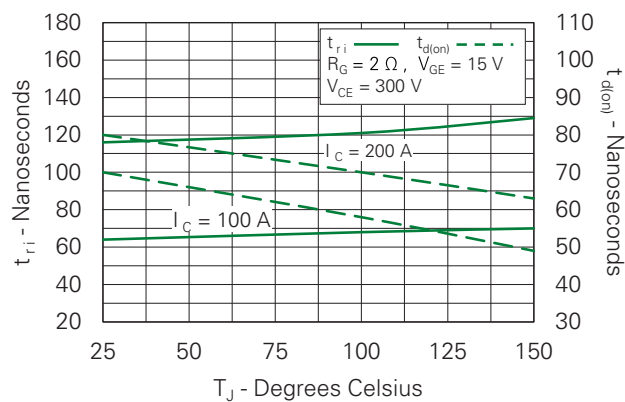
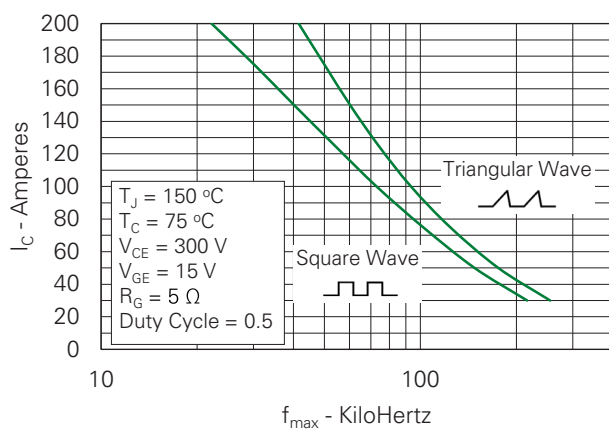
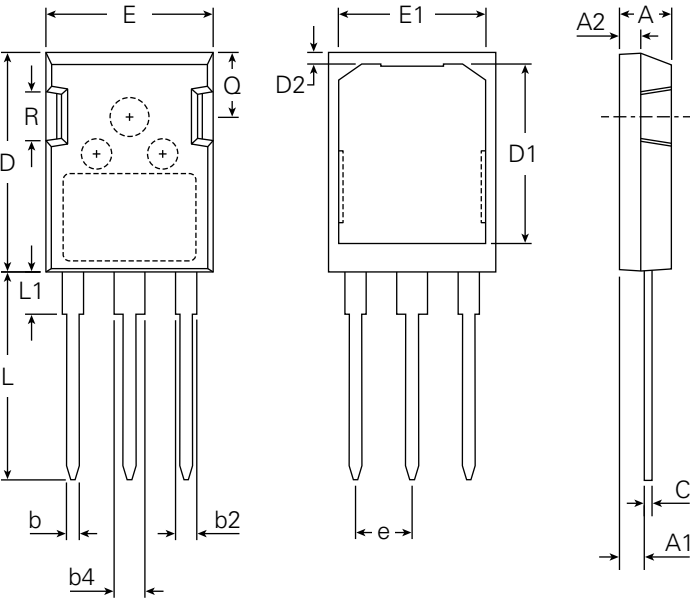


Fig. 21. Maximum Peak Load Current vs. Frequency



Part Outline Drawing PLUS-247 (IXYX)



Symbol	Inches			Millimeters		
	Min.	Typical	Max.	Min.	Typical	Max
A	0.190	–	0.205	4.83	–	5.21
A1	0.090	–	0.100	2.29	–	2.54
A2	0.075	–	0.085	1.91	–	2.16
b	0.045	–	0.055	1.14	–	1.40
b2	0.075	–	0.087	1.91	–	2.20
b4	0.115	–	0.126	2.92	–	3.20
C	0.024	–	0.031	0.61	–	0.80
D	0.819	–	0.840	20.80	–	21.34
D1	0.650	–	0.690	16.51	–	17.53
D2	0.035	–	0.050	0.89	–	1.27
E	0.620	–	0.635	15.75	–	16.13
E1	0.520	–	0.560	13.08	–	14.22
e	0.215 BSC			5.45 BSC		
L	0.780	–	0.810	19.81	–	20.57
L1	0.150	–	0.170	3.81	–	4.32
Q	0.220	–	0.244	5.59	–	6.20
R	0.170	–	0.190	4.32	–	4.83

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