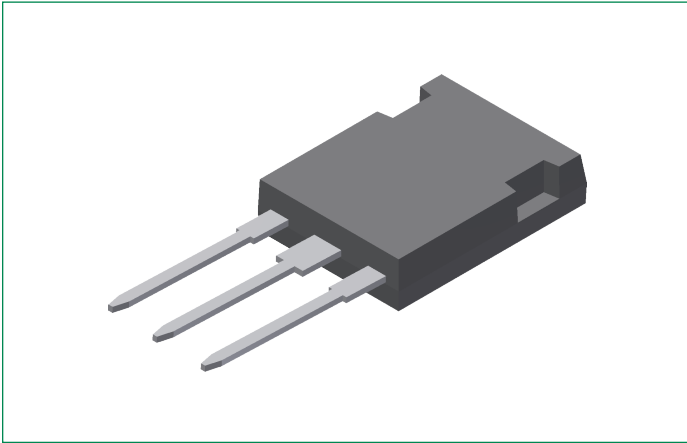


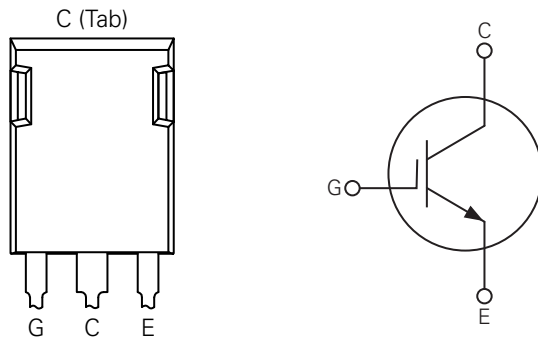
IXYX220N65A5

650 V, 220 A Gen5 XPT™ IGBT

Extreme Light Punch Through IGBT for up to 5kHz Switching



Pinout Diagram PLUS-247 (IXYX)



G: Gate; **C:** Collector; **E:** Emitter; **Tab:** 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 drive 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}	220	A
$V_{CE(sat)}$	≤ 1.35	V
$t_{fi(typ)}$	225	ns

Maximum Ratings

Symbol	Characteristic	Conditions	Value	Unit
V_{CES}	Collector-Emitter Voltage	$T_J = 25\text{ °C to }175\text{ °C}$	650	V
V_{CGR}	Collector-Gate Voltage	$T_J = 25\text{ °C to }175\text{ °C}, R_{GE} = 1\text{ M}\Omega$	650	V
V_{GES}	Gate-Emitter Voltage	Continuous	± 20	V
V_{GEM}	Transient Gate-Emitter Voltage	Transient	± 30	V
I_{C25}	Continuous Collector Current	$T_C = 25\text{ °C}$ (Chip Capability)	510	A
I_{LRMS}	Terminal Current Limit	–	160	A
I_{C110}	Continuous Collector Current	$T_C = 110\text{ °C}$	220	A
I_{CM}	Peak Collector Current	$T_C = 25\text{ °C}, 1\text{ ms}$	1180	A
SSOA (RBSOA)	Switching Safe Operating Area (Reverse Biased Safe Operating Area)	$V_{GE} = 15\text{ V}, T_{VJ} = 125\text{ °C}, R_G = 3\ \Omega,$ Clamped Inductive Load, $I_{CM} = V_{CE} \leq V_{CES}$	300	A
P_C	Collector Power Dissipation	$T_C = 25\text{ °C}$	1610	W
T_J	Junction Temperature	–	-55 to 175	°C
T_{JM}	Maximum Junction Temperature	–	175	°C
T_{stg}	Storage Temperature	–	-55 to 175	°C
T_L	Maximum Lead Temperature for Soldering	1.6 mm (0.062 in.) from Case for 10 s	300	°C
F_C	Mounting Force	–	20..120 / 4.5..27	N/lb
W	Weight	–	6	g

Thermal Characteristics

Symbol	Characteristic	Value			Unit
		Min.	Typ.	Max.	
$R_{th, JC}$	Thermal Resistance, Junction-to-Case	–	–	0.093	°C/W
$R_{th, CS}$	Thermal Resistance, Case-to-Sink	–	0.15	–	°C/W

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

Symbol	Characteristic	Conditions	Value			Unit
			Min.	Typ.	Max.	
BV_{CES}	Collector-Emitter Breakdown Voltage	$I_C = 250\ \mu\text{A}, V_{GE} = 0\text{ V}$	650	–	–	V
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C = 4\text{ mA}, V_{CE} = V_{GE}$	3.8	–	5.8	V
I_{GES}	Gate-Emitter Leakage Current	$V_{CE} = 0\text{ V}, V_{GE} = \pm 20\text{ V}$	–	–	± 100	nA
I_{CES}	Zero Gate Voltage Collector Current	$V_{CE} = V_{CES}, V_{GE} = 0\text{ V}$	–	–	25	μA
		$V_{CE} = V_{CES}, V_{GE} = 0\text{ V}, T_J = 150\text{ °C}$	–	–	2	mA
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage ¹	$I_C = 100\text{ A}, V_{GE} = 15\text{ V}$	–	1.15	1.35	V
		$I_C = 100\text{ A}, V_{GE} = 15\text{ V}, T_J = 150\text{ °C}$	–	1.15	–	V

Note 1: Pulse test, $t \leq 300\ \mu\text{s}$, 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	$I_C = 60\text{ A}, V_{CE} = 10\text{ V}$	72	120	–	S	
C_{ies}	Input Capacitance	$V_{GE} = 0\text{ V}, V_{CE} = 25\text{ V}, f = 1\text{ MHz}$	–	11.7	–	pF	
C_{oes}	Output Capacitance		–	570	–		
C_{res}	Reverse Transfer Capacitance		–	440	–		
$Q_{g(on)}$	Total Gate Charge	$V_{GE} = 15\text{ V}, V_{CE} = 0.5 \times V_{CES},$ $I_C = 220\text{ A}$	–	750	–	nC	
Q_{ge}	Gate-Emitter Charge		–	86	–		
Q_{gc}	Gate-Collector Charge		–	377	–		
$t_{d(on)}$	Turn-on Delay Time ²	Inductive Load, $V_{GE} = 15\text{ V}, V_{CE} = 300\text{ V},$ $I_C = 100\text{ A}, R_{G(ext)} = 1\ \Omega$	$T_J = 25\text{ }^\circ\text{C}$	–	64	–	ns
			$T_J = 150\text{ }^\circ\text{C}$	–	50	–	
t_{ri}	Turn-on Rise Time ²		$T_J = 25\text{ }^\circ\text{C}$	–	78	–	ns
			$T_J = 150\text{ }^\circ\text{C}$	–	70	–	
E_{on}	Turn-on Energy ²		$T_J = 25\text{ }^\circ\text{C}$	–	1.30	–	mJ
			$T_J = 150\text{ }^\circ\text{C}$	–	2.75	–	
$t_{d(off)}$	Turn-off Delay Time ²		$T_J = 25\text{ }^\circ\text{C}$	–	540	–	ns
			$T_J = 150\text{ }^\circ\text{C}$	–	480	–	
t_{fi}	Turn-off Fall Time ²		$T_J = 25\text{ }^\circ\text{C}$	–	225	–	ns
			$T_J = 150\text{ }^\circ\text{C}$	–	385	–	
E_{off}	Turn-off Energy ²	$T_J = 25\text{ }^\circ\text{C}$	–	7.95	–	mJ	
		$T_J = 150\text{ }^\circ\text{C}$	–	10.35	–		

Note 1: Pulse test, $t \leq 300\ \mu\text{s}$, 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 @ $T_J = 25\text{ }^\circ\text{C}$

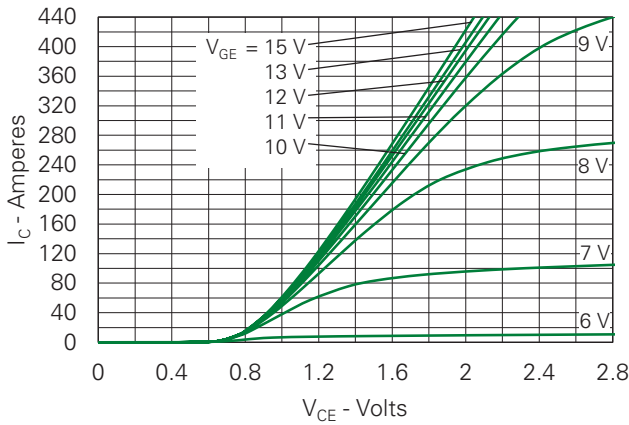


Fig. 2. Extended Output Characteristics @ $T_J = 25\text{ }^\circ\text{C}$

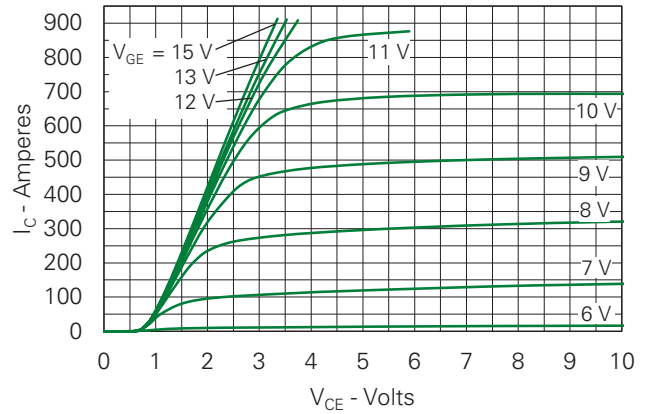


Fig. 3. Output Characteristics @ $T_J = 150\text{ }^\circ\text{C}$

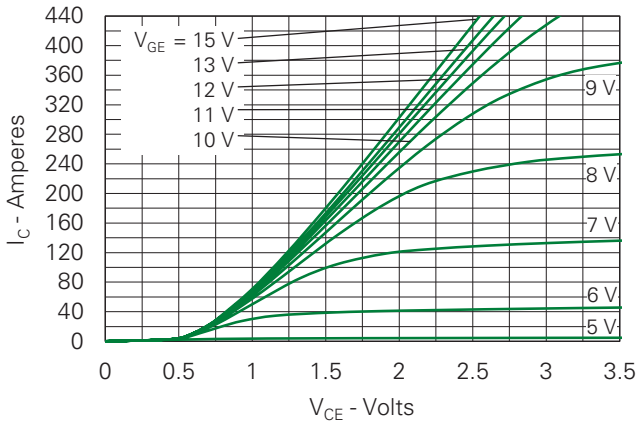


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

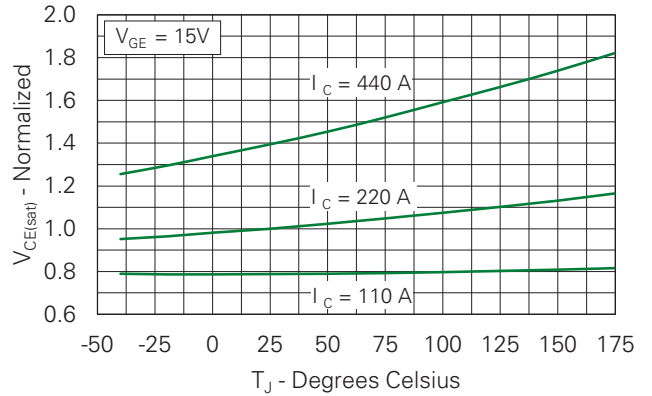


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

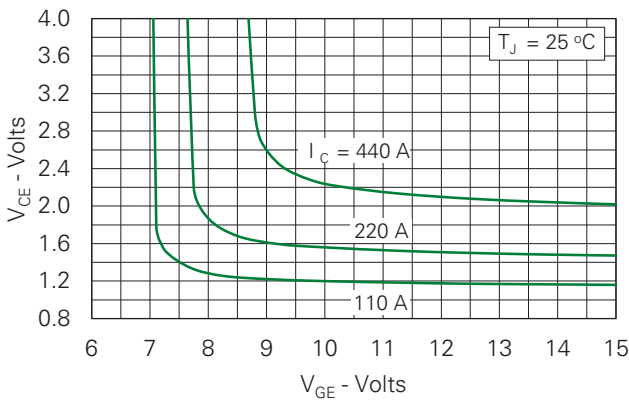


Fig. 6. Input Admittance

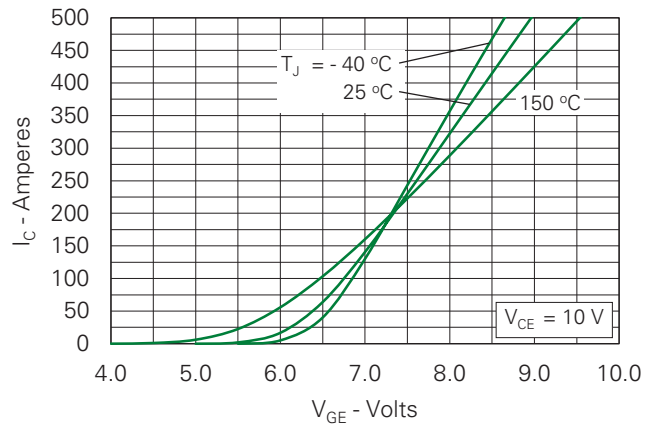


Fig. 7. Transconductance

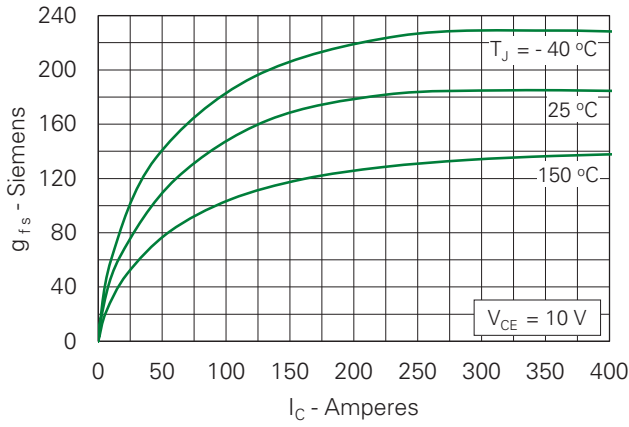


Fig. 8. Gate Charge

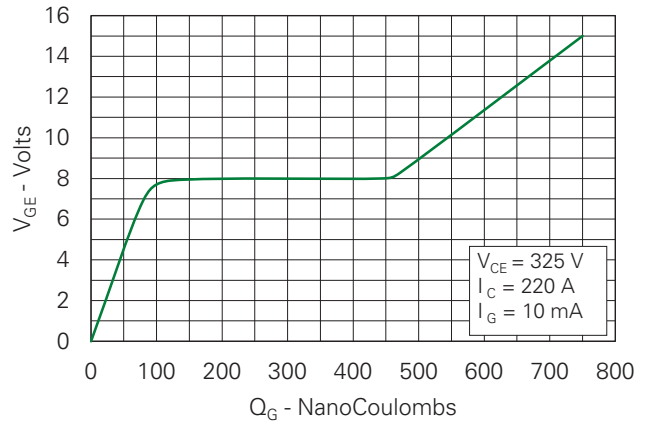


Fig. 9. Capacitance

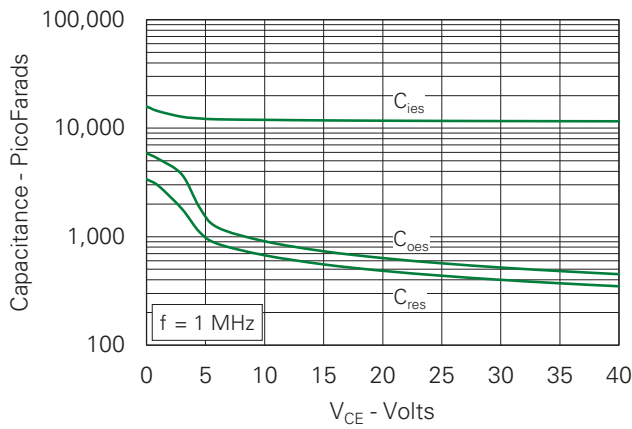


Fig. 10. Reverse-Bias Safe Operating Area

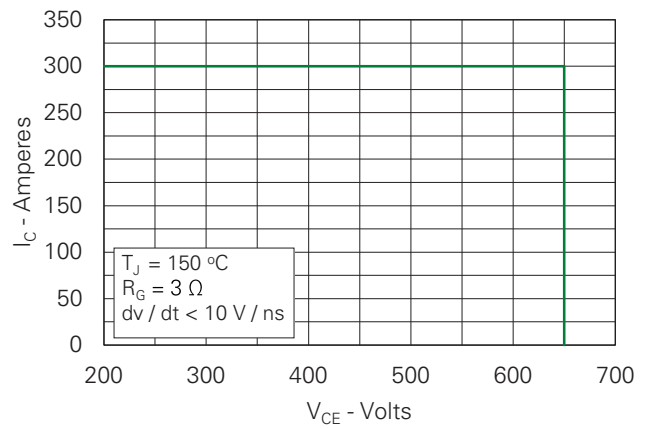


Fig. 11. Maximum Transient Thermal Impedance

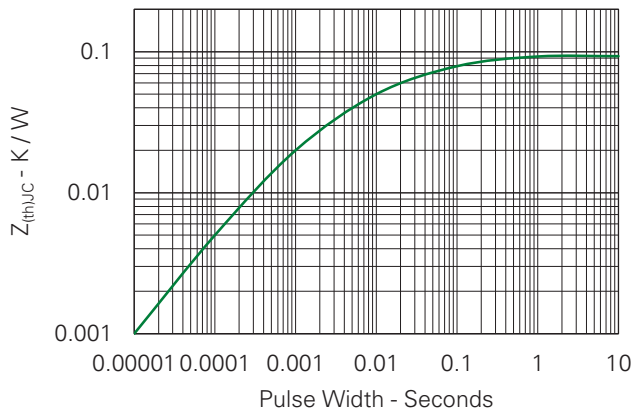


Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance

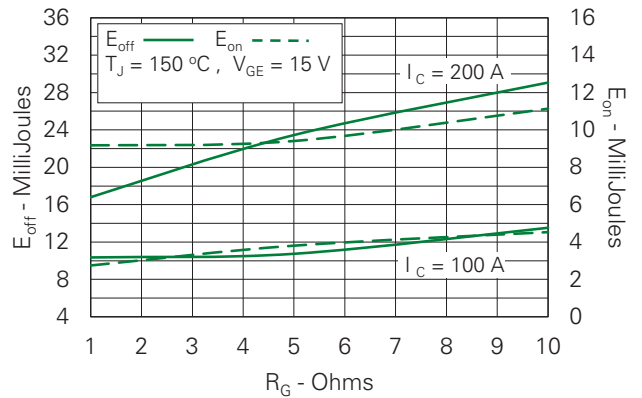


Fig. 13. Inductive Switching Energy Loss vs. Collector Current

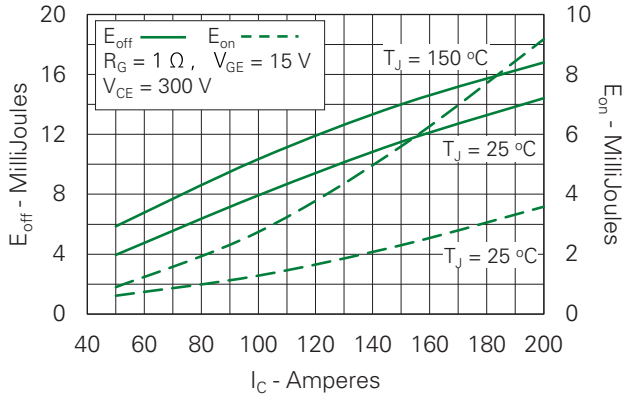


Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature

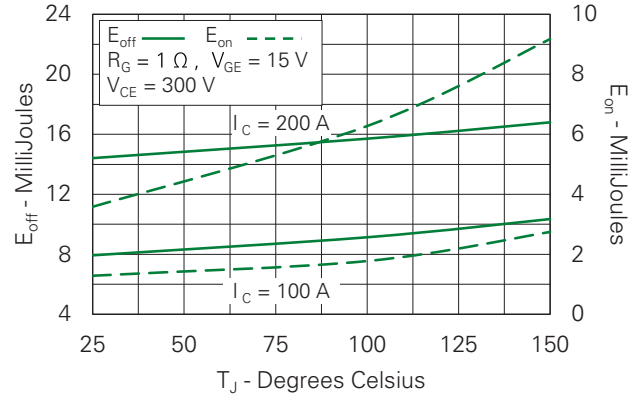


Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance

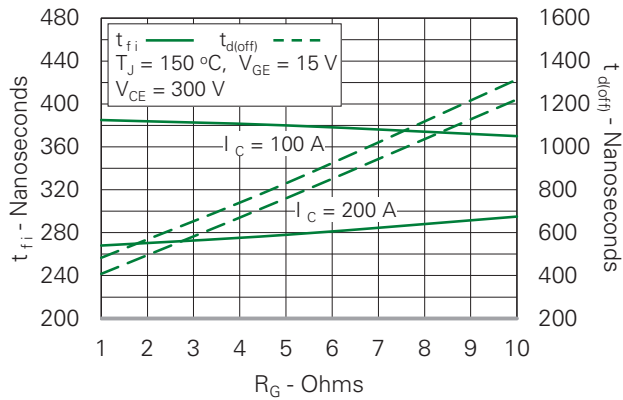


Fig. 16. Inductive Turn-off Switching Times vs. Collector Current

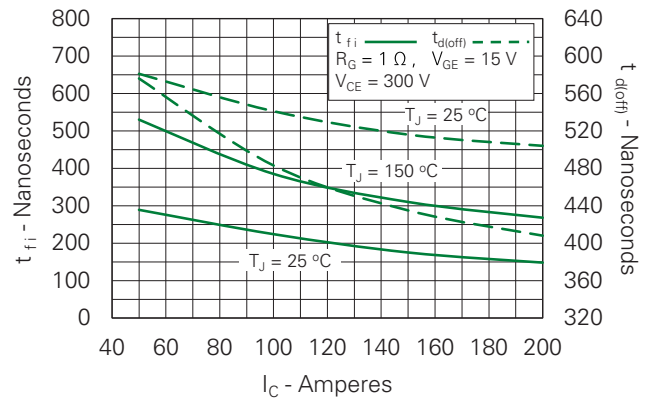


Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature

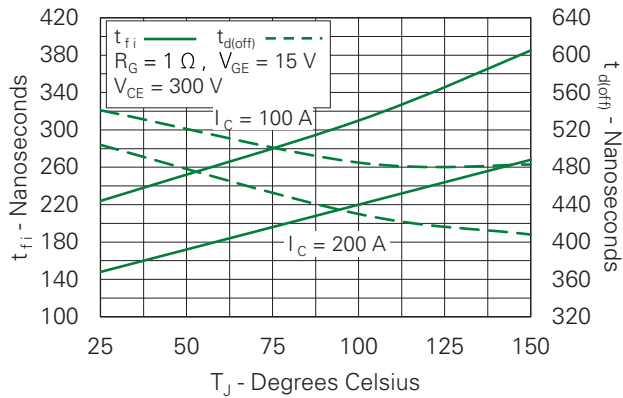


Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance

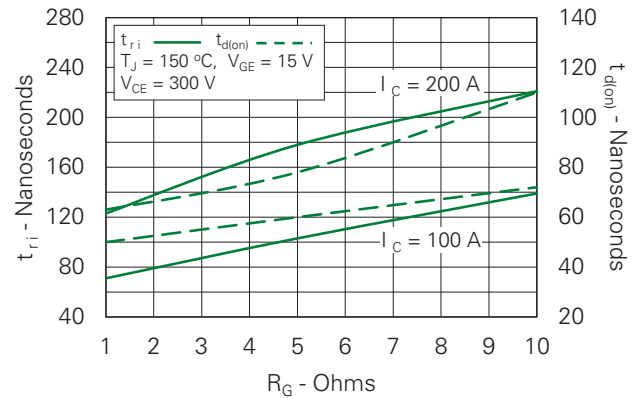


Fig. 19. Inductive Turn-on Switching Times vs. Collector Current

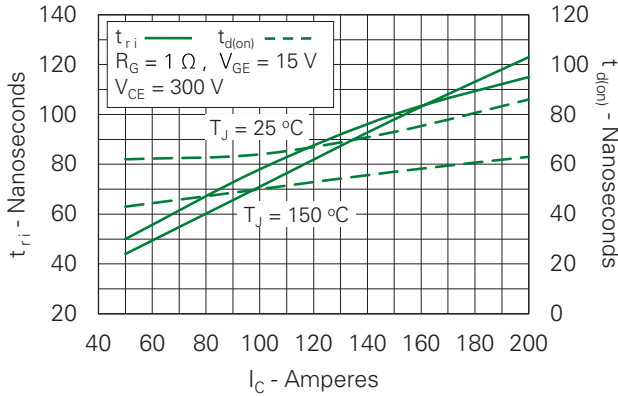
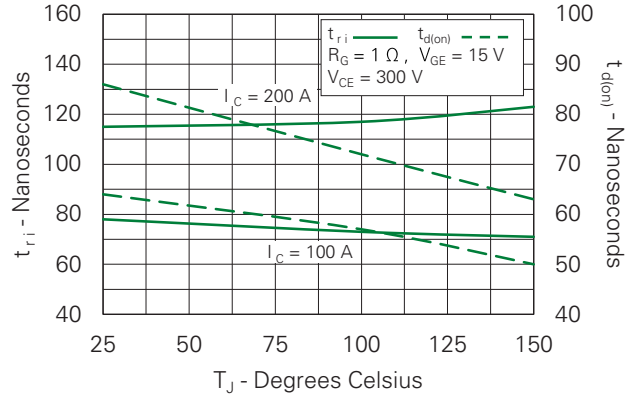
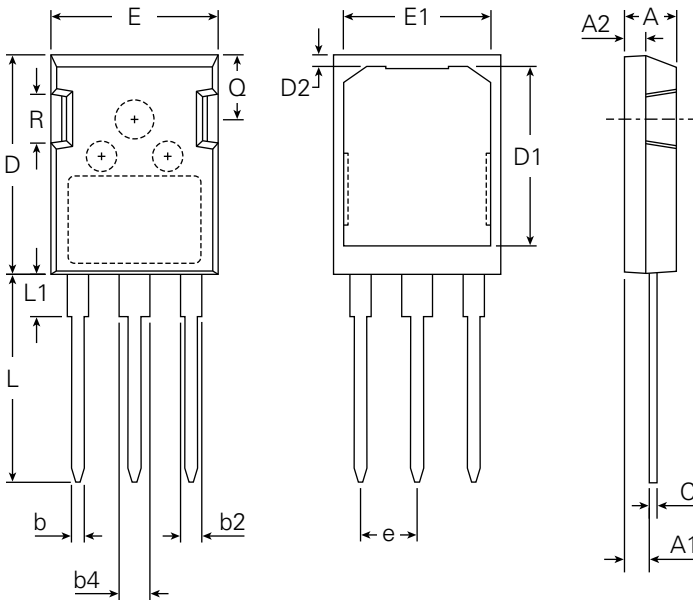


Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature



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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