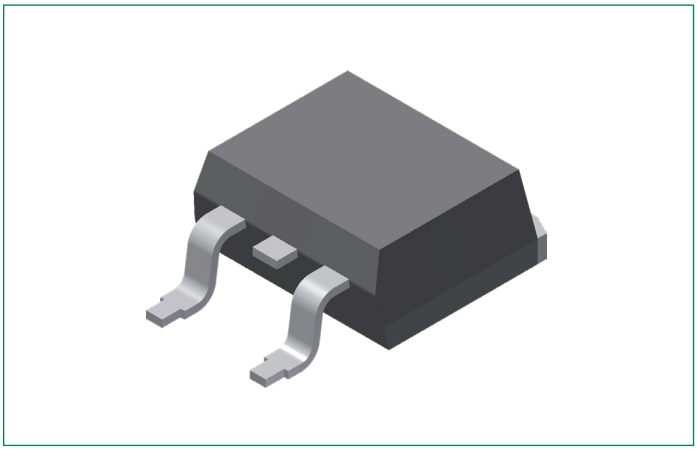
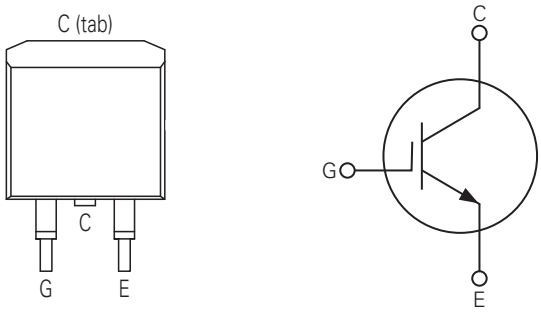
IXYA55N65B5

650 V, 55 A Gen5 XPT™ IGBT

Extreme Light Punch Through IGBT for 5 – 30 kHz Switching



Pinout Diagram (TO-263-2L)



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, this device feature reduced thermal resistance and optimization for low conduction losses.

Features & Benefits

- Optimized for 5 – 30 kHz Switching
- High Surge Current Capability
- Square RBSOA
- International Standard Package
- High Power Density
- Extremely Rugged
- Low Gate Drive Requirement

Applications

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

Product Summary

Characteristic	Value	Unit
V_{CES}	650	V
I_{C110}	55	A
$V_{CE(sat)}$	≤ 1.50	V
$t_{fi(typ)}$	84	ns

Revised: XZ 01/30/2024

Maximum Ratings (T_{vj} = 25°C unless otherwise specified)

Symbol	Characteristic	Conditions	Value	Unit
V_{CES}	Collector-Emitter Voltage	T_{vj} = 25°C to 175°C	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°C	122	A
I_{LRMS}	Terminal Current Limit	–	120	A
I_{C110}	Continuous Collector Current	T_C = 110°C	55	A
I_{CM}	Pulsed Collector Current	T_C = 25°C, 1 ms	250	A
SSOA (RBSOA)	Switching Safe Operating Area (Reverse Biased Safe Operating Area)	V_{GE} = 15 V, T_{vj} = 150°C, R_G = 5 Ω, I_{CM} @ $V_{CE} \le V_{CES}$	108	A
P_C	Collector Power Dissipation	T_C = 25°C	395	W
T_{vj}	Virtual Junction Temperature	–	–55 to 175	°C
T_{VJM}	Maximum Virtual Junction Temperature	–	175	°C
T_{stg}	Storage Temperature	–	–55 to 175	°C
T_{SOLD}	Soldering Temperature	Plastic Body for 10 s	260	°C
F_C	Mounting Force	–	10..65 / 2.2..14.6	N/lb
W	Weight	–	2.5	g

Thermal Characteristics

Symbol	Characteristic	Value			Unit
		Min.	Typ.	Max.	
$R_{th, JC}$	Thermal Resistance, junction-to-case	–	–	0.38	°C/W

Electrical Characteristics – Static (T_{vj} = 25°C unless otherwise specified)

Symbol	Characteristic	Conditions	Value			Unit
			Min.	Typ.	Max.	
BV_{CES}	Collector-Emitter Breakdown Voltage	I_C = 250 µA, V_{GE} = 0 V	650	–	–	V
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C = 250 µA, V_{CE} = V_{GE}	3.7	–	5.8	V
I_{CES}	Zero Gate Voltage Collector Current	V_{CE} = V_{CES}, V_{GE} = 0 V	–	–	10	µA
		V_{CE} = V_{CES}, V_{GE} = 0 V, T_{vj} = 150°C	–	–	250	µA
I_{GES}	Gate-Emitter Leakage Current	V_{CE} = 0 V, V_{GE} = ±20 V	–	–	±100	nA
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage[1]	I_C = 100 A, V_{GE} = 15 V	–	1.30	1.50	V
		I_C = 36 A, V_{GE} = 15 V, T_{vj} = 150°C	–	1.45	–	V

Note 1: Pulse test, t ≤ 300 µs, duty cycle, d ≤ 2%

Electrical Characteristics – Dynamic (T_J = 25°C unless otherwise specified)

Symbol	Characteristic	Conditions		Value			Unit
				Min.	Typ.	Max.	
g_{fs}	Transconductance[1]	I_C = 36 A, V_{CE} = 10 V		20	35	–	S
C_{ies}	Input Capacitance	V_{CE} = 25 V, V_{GE} = 0 V, f = 1 MHz		–	1970	–	pF
C_{oes}	Output Capacitance			–	100	–	
C_{res}	Reverse Transfer Capacitance			–	80	–	
$Q_{g(on)}$	Total Gate Charge	I_C = 36 A, V_{GE} = 15 V, V_{CE} = 0.5 x V_{CES}		–	130	–	nC
Q_{ge}	Gate-Emitter Charge			–	14	–	
Q_{gc}	Gate-Collector Charge			–	68	–	
$t_{d(on)}$	Turn-on Delay Time[2]	Inductive Load, V_{GE} = 15 V, V_{CE} = 300 V, I_C = 25 A, $R_{G(ext)}$ = 5 Ω	T_{vj} = 25°C	–	20	–	ns
			T_{vj} = 150°C	–	19	–	
t_{ri}	Turn-on Rise Time[2]		T_{vj} = 25°C	–	28	–	ns
			T_{vj} = 150°C	–	24	–	
E_{on}	Turn-on Energy[2]		T_{vj} = 25°C	–	0.55	–	mJ
			T_{vj} = 150°C	–	0.96	–	
$t_{d(off)}$	Turn-off Delay Time[2]		T_{vj} = 25°C	–	200	–	ns
			T_{vj} = 150°C	–	195	–	
t_{fi}	Turn-off Fall Time[2]		T_{vj} = 25°C	–	84	–	ns
			T_{vj} = 150°C	–	130	–	
E_{off}	Turn-off Energy[2]		T_{vj} = 25°C	–	0.60	–	mJ
			T_{vj} = 150°C	–	0.85	–	

Note 1: Pulse test, t ≤ 300 µs, duty cycle, d ≤ 2%
Note 2: Switching times and energy losses may increase for higher $V_{CE(clamp)}$, T_{vj}, or R_G.

Characteristic Curves

Fig. 1. Output Characteristics @ T_{vj} = 25ºC

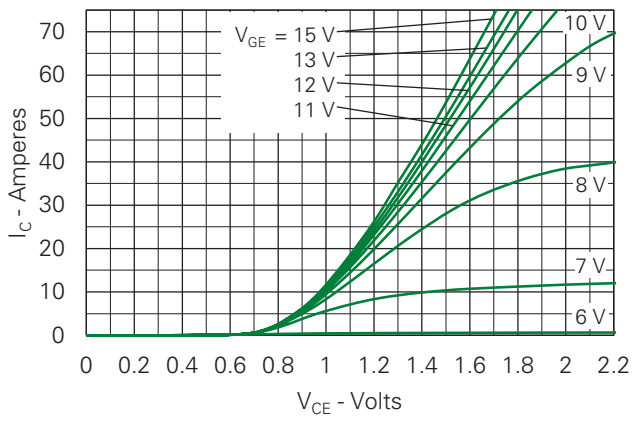


Fig. 2. Extended Output Characteristics @ T_{vj} = 25ºC

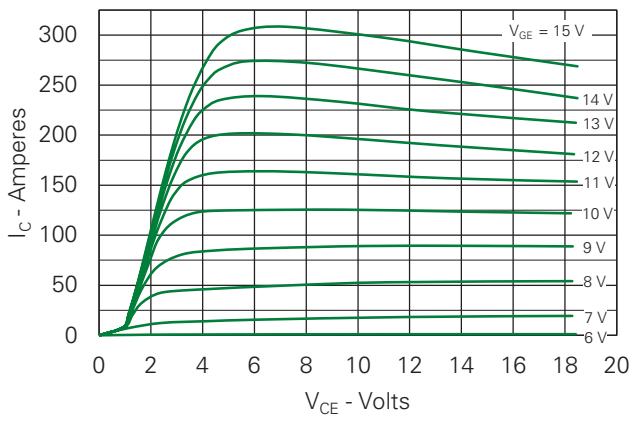


Fig. 3. Output Characteristics @ T_{vj} = 150ºC

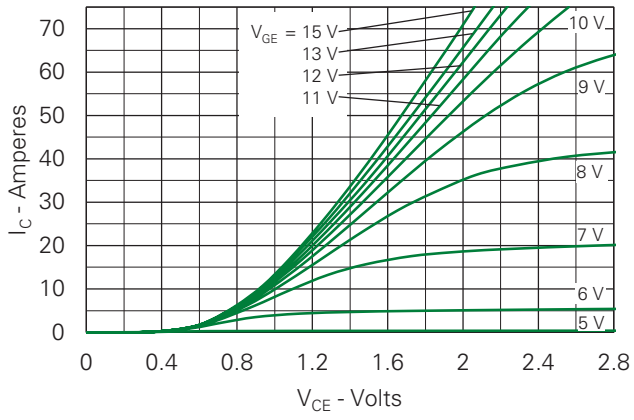


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

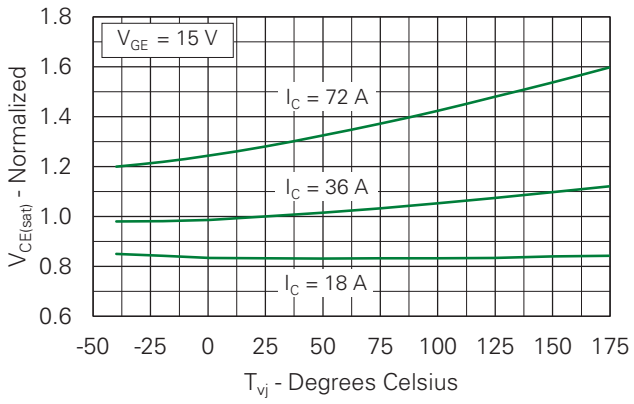


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

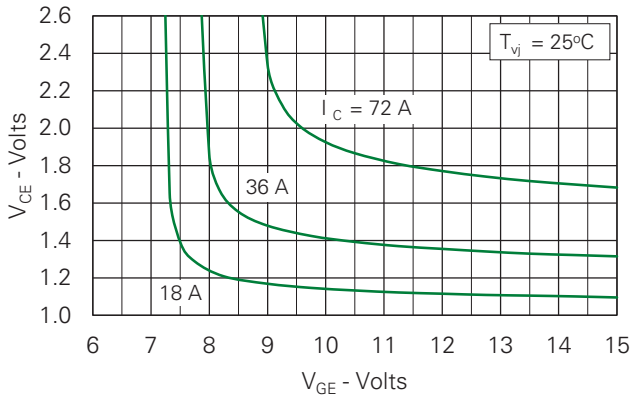


Fig. 6. Input Admittance

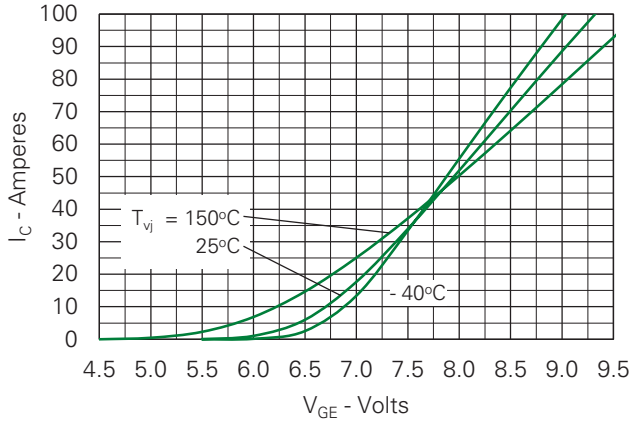


Fig. 7. Transconductance

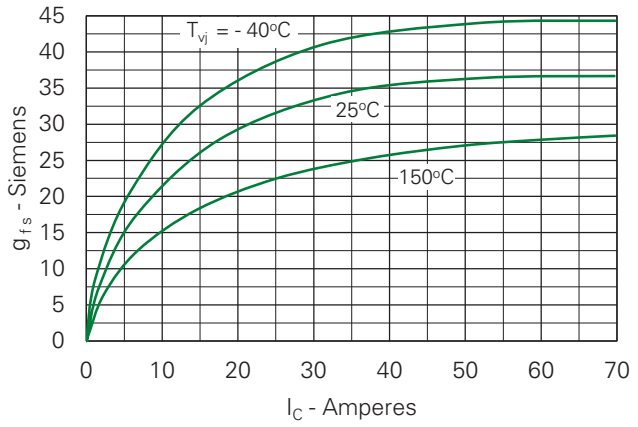


Fig. 8. Gate Charge

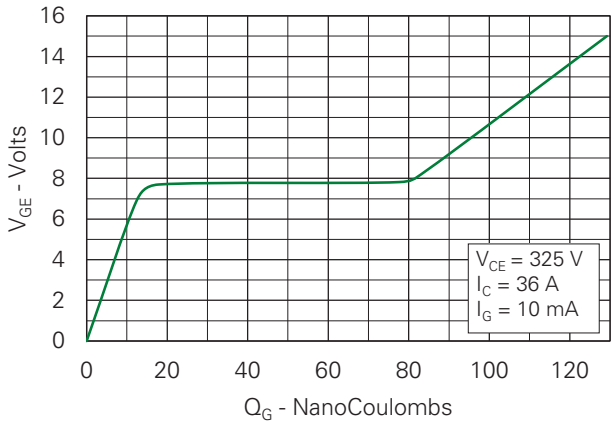


Fig. 9. Capacitance

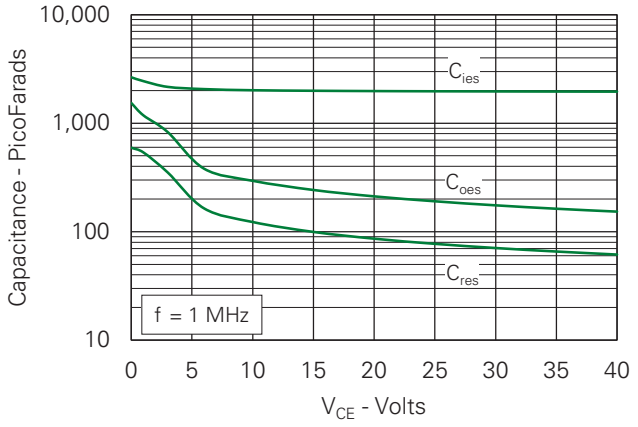


Fig. 10. Reverse-Bias Safe Operating Area

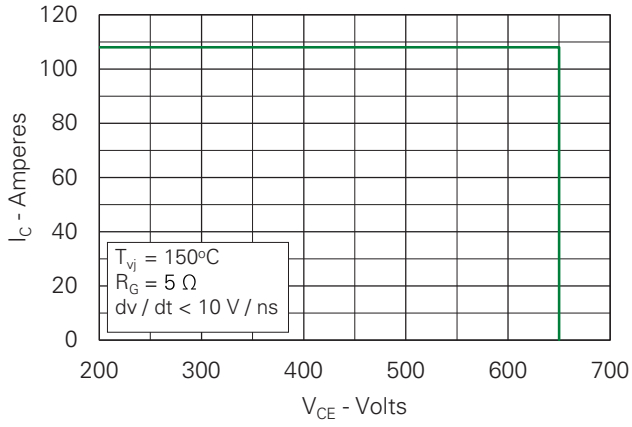


Fig. 11. Maximum Transient Thermal Impedance

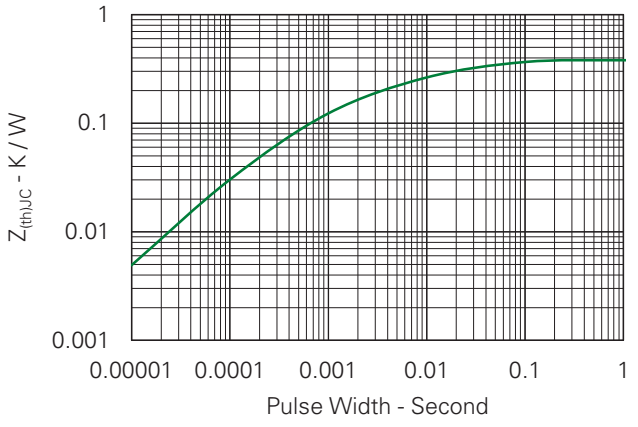
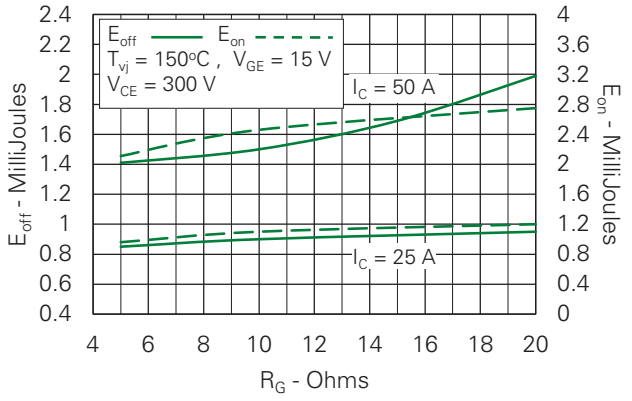


Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance



Characteristic Curves

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

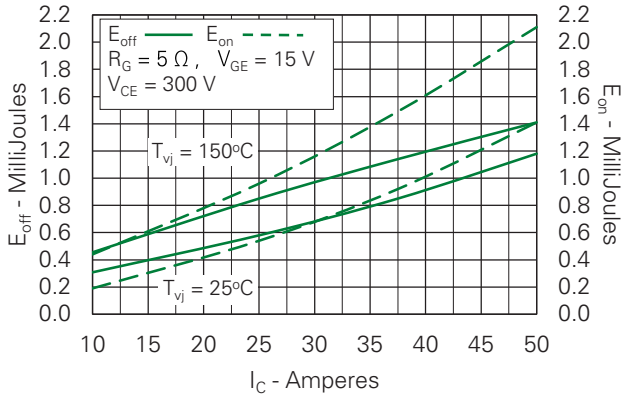


Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature

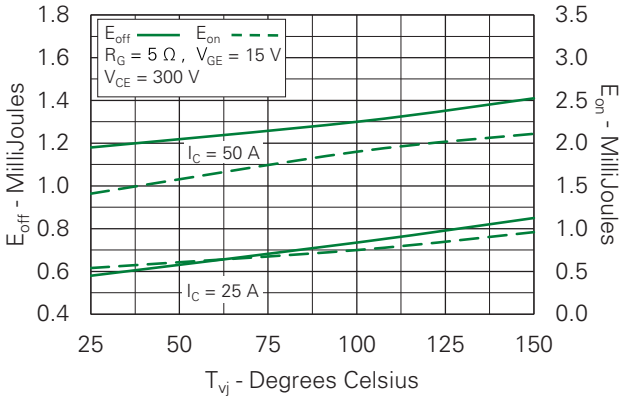


Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance

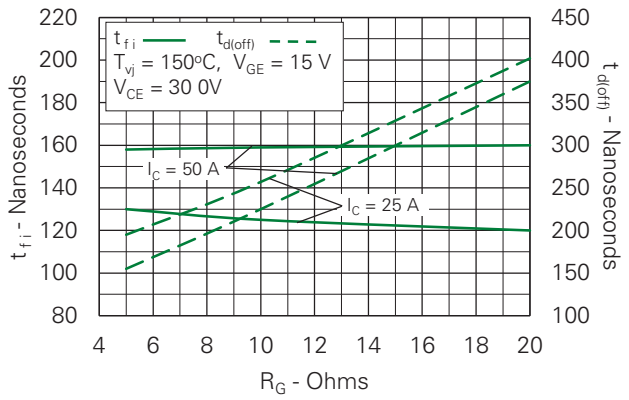


Fig. 16. Inductive Turn-off Switching Times vs. Collector Current

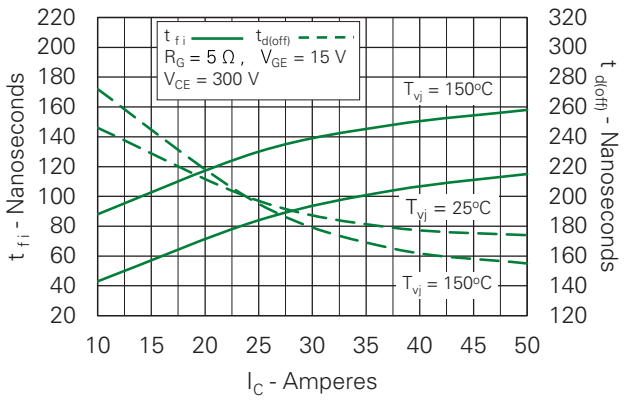


Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature

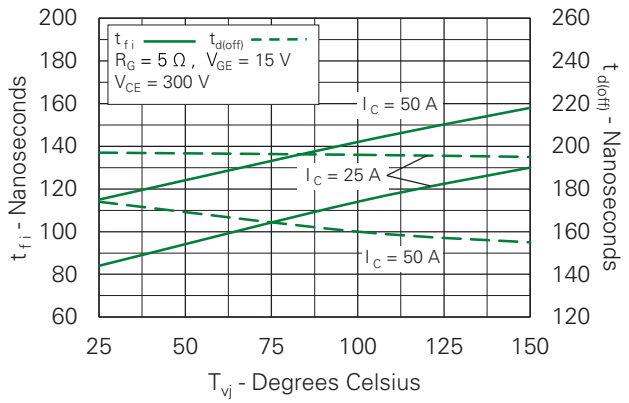


Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance

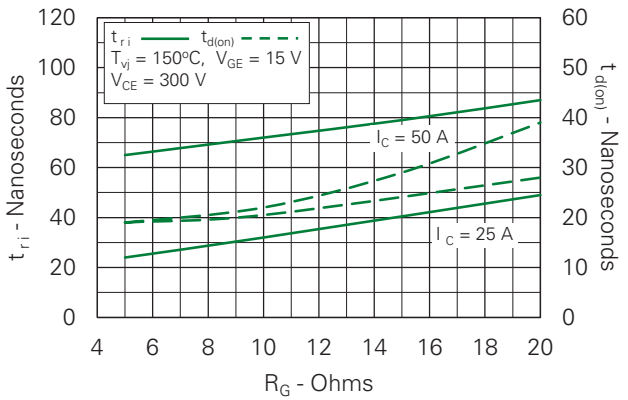


Fig. 19. Inductive Turn-on Switching Times vs. Collector Current

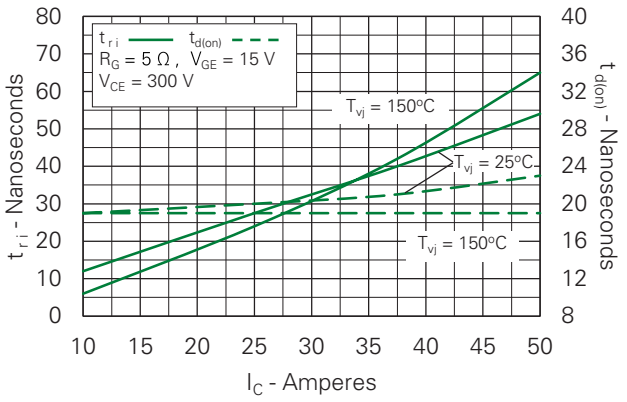


Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature

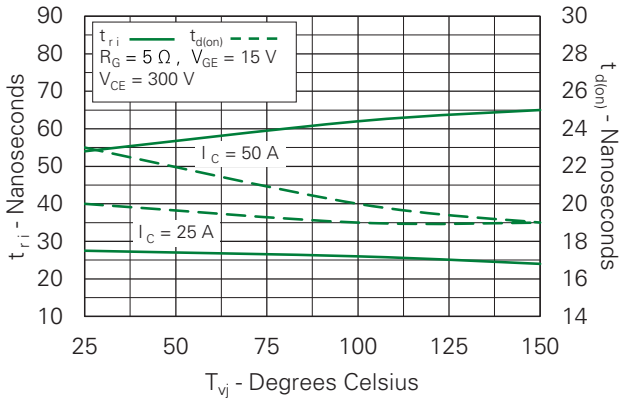
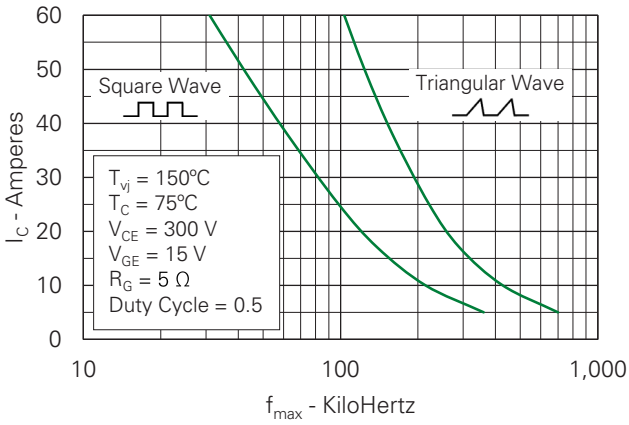
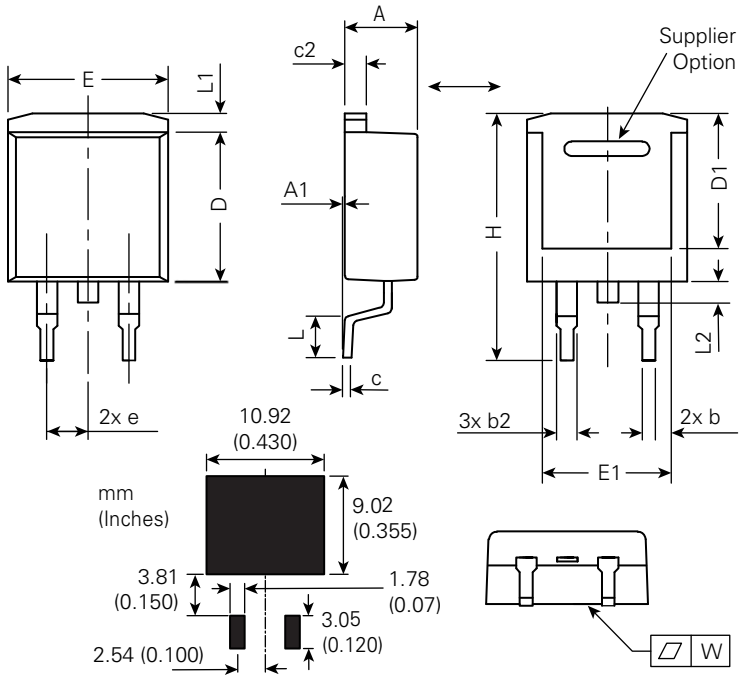


Fig. 21. Maximum Peak Load Current vs. Frequency



Part Outline Drawing (TO-263-2L)



Symbol	Inches		Millimeters	
	Min.	Max.	Min.	Max.
A	0.160	0.190	4.06	4.83
A1	Typ. 0.004		Typ. 0.10	
b	0.020	0.039	0.51	0.99
b2	0.045	0.055	1.14	1.40
c	0.016	0.029	0.40	0.74
c2	0.045	0.055	1.14	1.40
D	0.330	0.370	8.38	9.40
D1	0.315	0.350	8.00	8.89
E	0.380	0.410	9.65	10.41
E1	0.245	0.320	6.22	8.13
e	0.100		2.54 BSC	
H	0.575	0.625	14.61	15.88
L	0.070	0.110	1.78	2.79
L1	0.040	0.066	1.02	1.68
W	Typ. 8.0e-4	0.002	Typ. 0.02	0.040