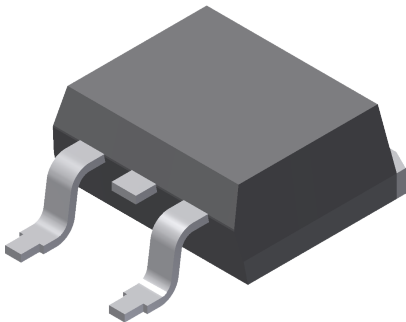


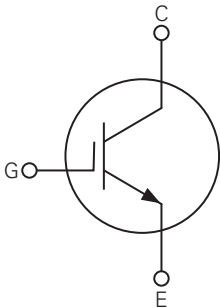
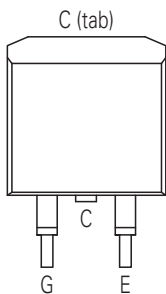
IXYA55N65B5

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, these devices 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

Maximum Ratings ($T_{vj} = 25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Characteristic	Conditions	Value	Unit
V_{CES}	Collector-Emitter Voltage	$T_{vj} = 25^{\circ}\text{C}$ 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	$T_C = 25^{\circ}\text{C}$	122	A
I_{LRMS}	Terminal Current Limit	–	120	A
I_{C110}	Continuous Collector Current	$T_C = 110^{\circ}\text{C}$	55	A
I_{CM}	Pulsed Collector Current	$T_C = 25^{\circ}\text{C}$, 1 ms	250	A
SSOA (RBSOA)	Switching Safe Operating Area (Reverse Biased Safe Operating Area)	$V_{GE} = 15\text{ V}$, $T_{vj} = 150^{\circ}\text{C}$, $R_G = 5\ \Omega$, $I_{CM} @ V_{CE} \leq V_{CES}$	108	A
P_C	Collector Power Dissipation	$T_C = 25^{\circ}\text{C}$	395	W
T_{vj}	Virtual 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_{SOLD}	Soldering Temperature	Plastic Body for 10 s	260	$^{\circ}\text{C}$
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	$^{\circ}\text{C}/\text{W}$

Electrical Characteristics – Static ($T_{vj} = 25^{\circ}\text{C}$ 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	$I_C = 250\ \mu\text{A}$, $V_{CE} = V_{GE}$	3.7	–	5.8	V
I_{CES}	Zero Gate Voltage Collector Current	$V_{CE} = V_{CES}$, $V_{GE} = 0\text{ V}$	–	–	10	μA
		$V_{CE} = V_{CES}$, $V_{GE} = 0\text{ V}$, $T_{vj} = 150^{\circ}\text{C}$	–	–	250	μA
I_{GES}	Gate-Emitter Leakage Current	$V_{CE} = 0\text{ V}$, $V_{GE} = \pm 20\text{ V}$	–	–	± 100	nA
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage ¹	$I_C = 100\text{ A}$, $V_{GE} = 15\text{ V}$	–	1.30	1.50	V
		$I_C = 36\text{ A}$, $V_{GE} = 15\text{ V}$, $T_{vj} = 150^{\circ}\text{C}$	–	1.45	–	V

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

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

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

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_{vj} , or R_G .

Characteristic Curves

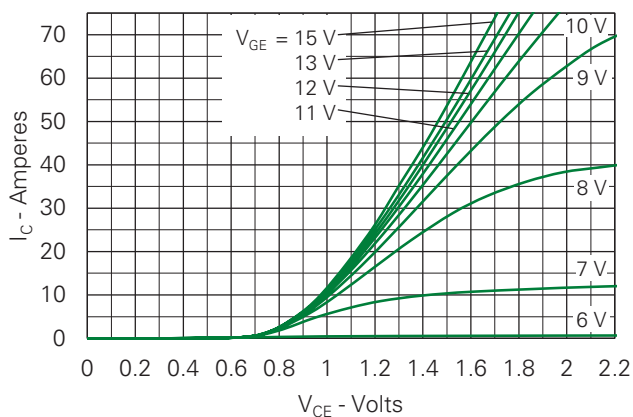
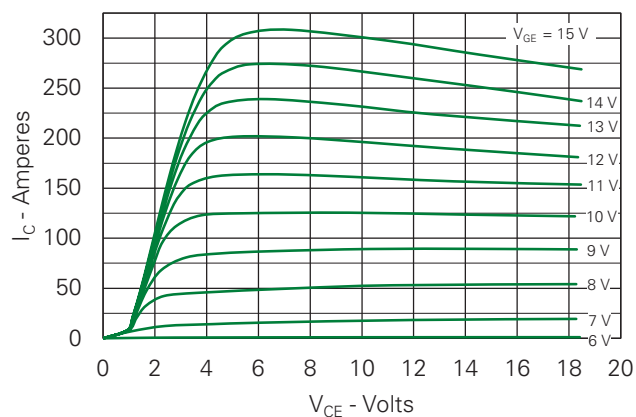
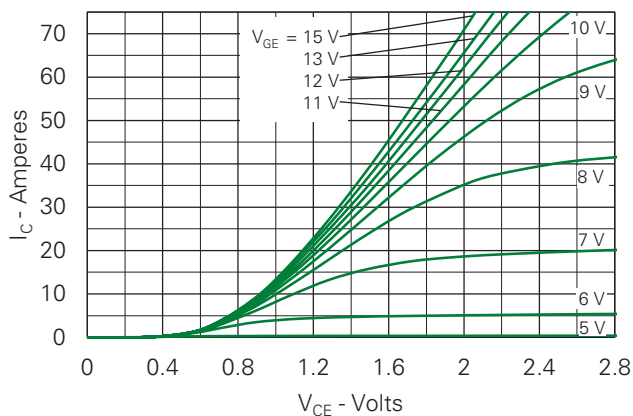
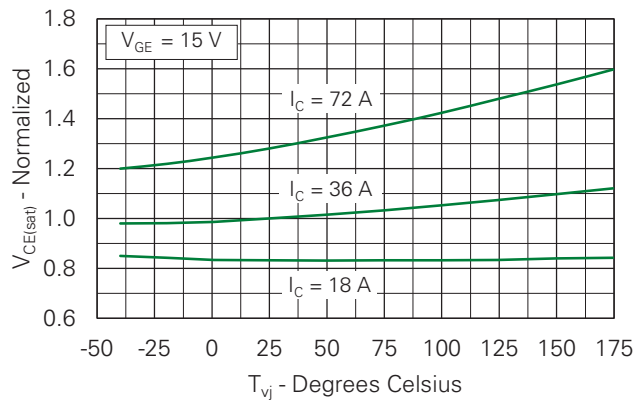
Fig. 1. Output Characteristics @ $T_{vj} = 25^{\circ}\text{C}$ Fig. 2. Extended Output Characteristics @ $T_{vj} = 25^{\circ}\text{C}$ Fig. 3. Output Characteristics @ $T_{vj} = 150^{\circ}\text{C}$ Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

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

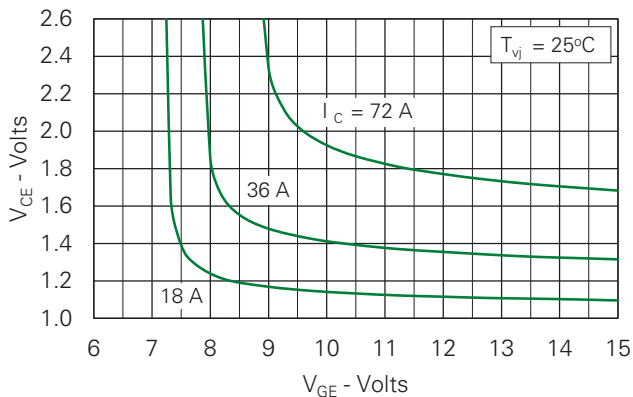


Fig. 6. Input Admittance

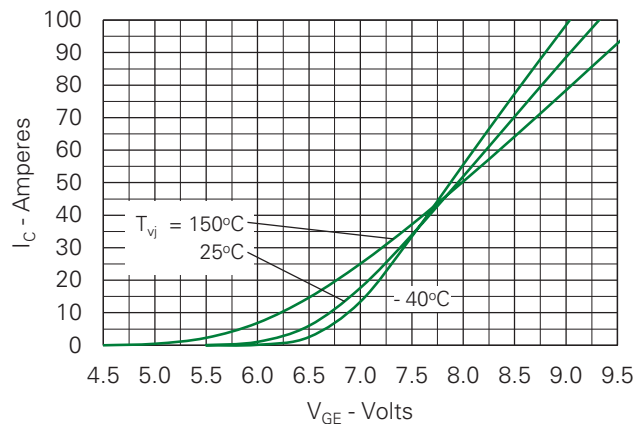


Fig. 7. Transconductance

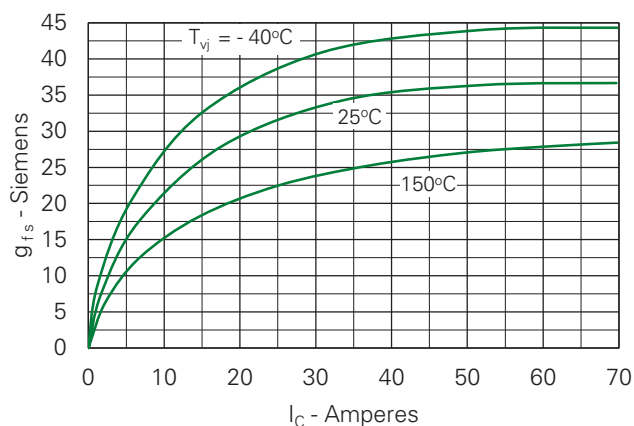


Fig. 8. Gate Charge

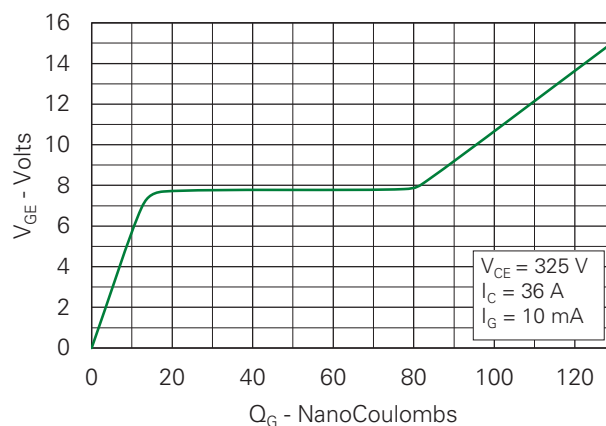


Fig. 9. Capacitance

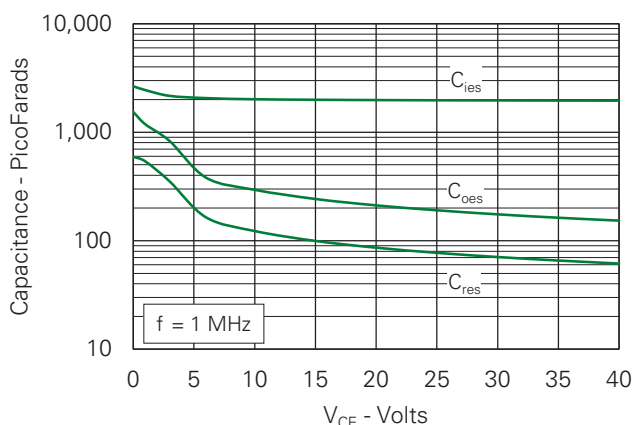


Fig. 10. Reverse-Bias Safe Operating Area

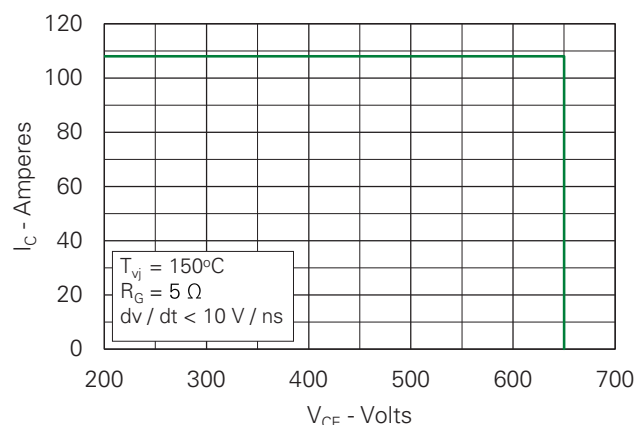


Fig. 11. Maximum Transient Thermal Impedance

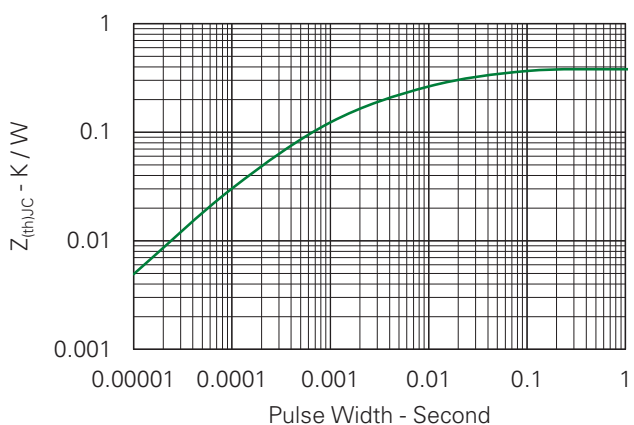
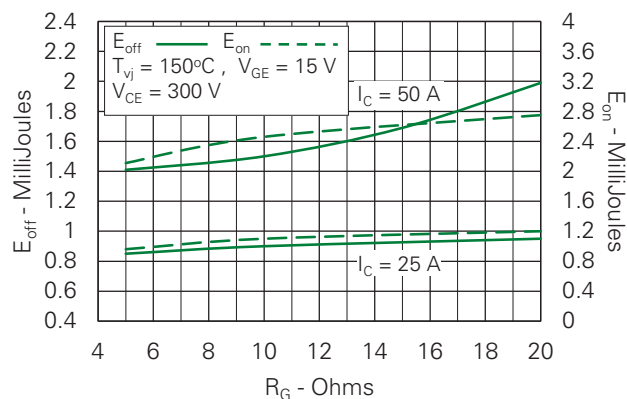


Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance



Characteristic Curves

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

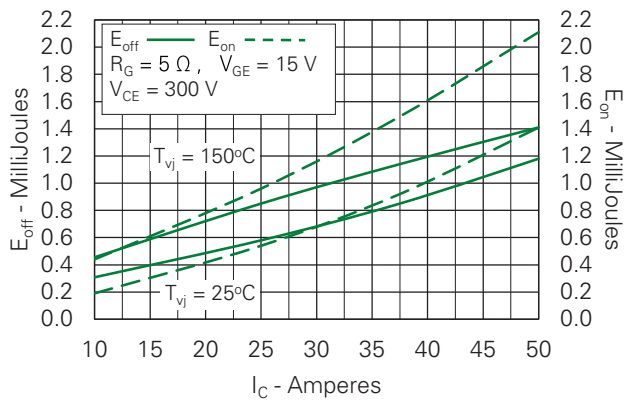


Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature

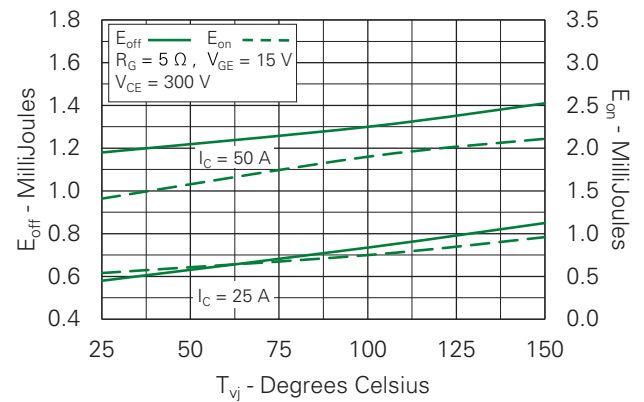


Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance

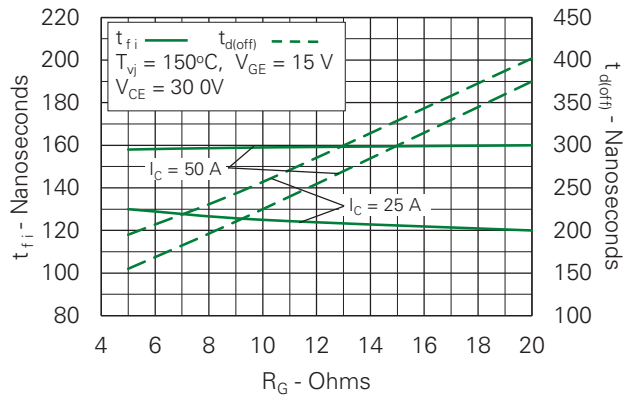


Fig. 16. Inductive Turn-off Switching Times vs. Collector Current

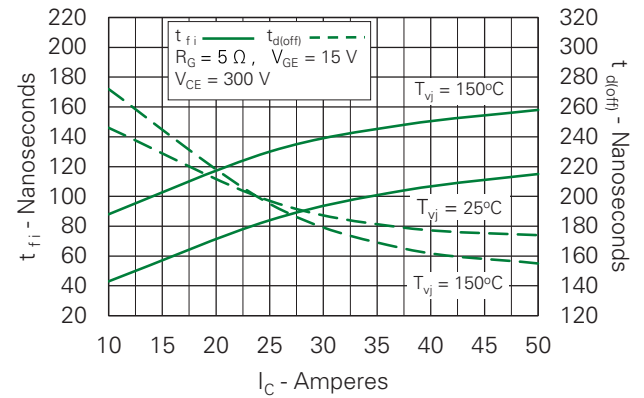


Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature

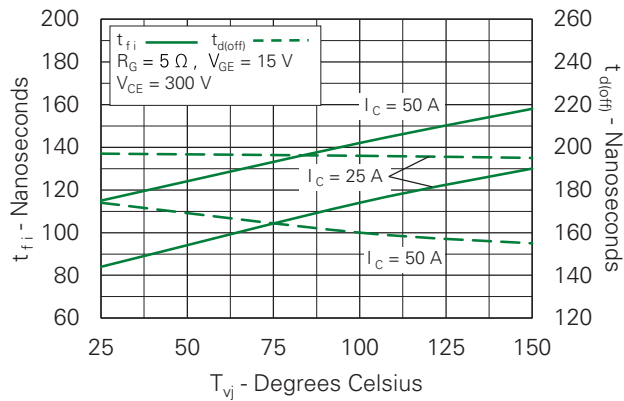


Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance

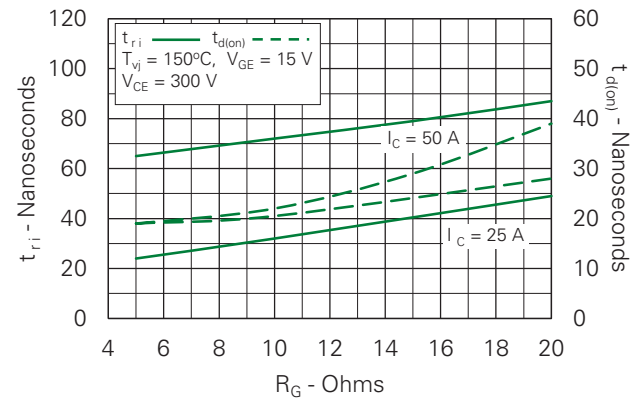


Fig. 19. Inductive Turn-on Switching Times vs. Collector Current

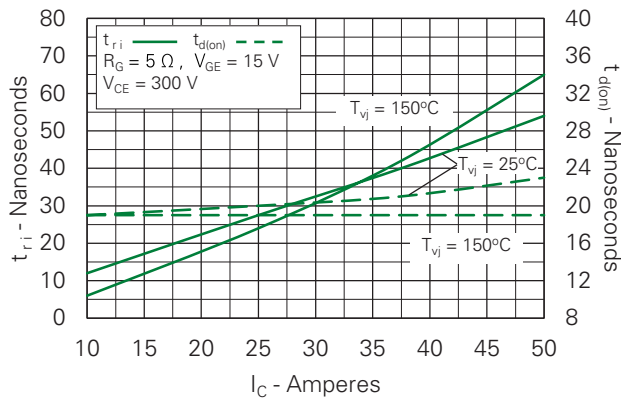


Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature

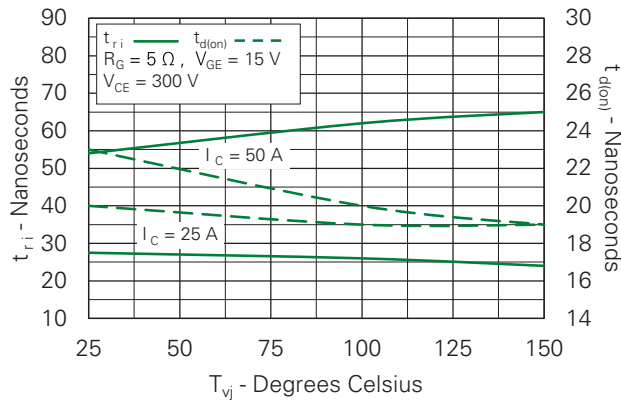
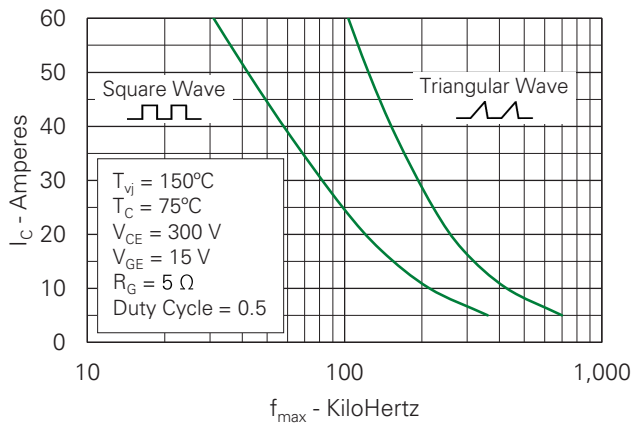
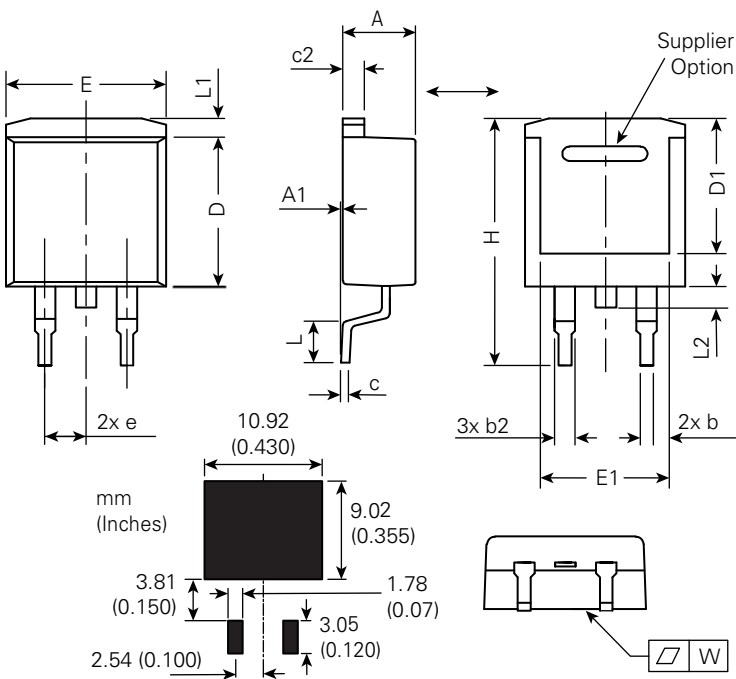


Fig. 21. Maximum Peak Load Current vs. Frequency



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

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