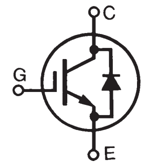
IXYS

GenX3™ 600V IGBT w/ Diode

IXGR60N60C3D1

(Electrically Isolated Back Surface)

High Speed PT IGBT for 40-100 kHz Switching

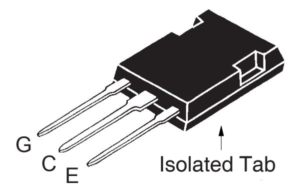


V_{CES}	=	600V
I_{C110}	=	30A
$V_{CE(sat)}$	≤	2.5V
$t_{fi(typ)}$	=	50ns

Symbol	Test Conditions	Maximum Ratings	
V_{CES}	T_J = 25°C to 150°C	600	V
V_{CGR}	T_J = 25°C to 150°C, R_{GE} = 1MΩ	600	V
V_{GES}	Continuous	±20	V
V_{GEM}	Transient	±30	V
I_{C25}	T_C = 25°C (Limited by Leads)	75	A
I_{C110}	T_C = 110°C	30	A
I_{F110}	T_C = 110°C	17	A
I_{CM}	T_C = 25°C, 1ms	260	A
I_A	T_C = 25°C	40	A
E_{AS}	T_C = 25°C	400	mJ
SSOA (RBSOA)	V_{GE} = 15V, T_{VJ} = 125°C, R_G = 3Ω Clamped Inductive Load	I_{CM} = 125 $V_{CE} \leq V_{CES}$	A
P_C	T_C = 25°C	170	W
T_J		-55 ... +150	°C
T_{JM}		150	°C
T_{stg}		-55 ... +150	°C
V_{ISOL}	50/60 Hz, RMS, t = 1minute I_{ISOL} < 1mA t = 10 s	2500 3000	V~ V~
F_C	Mounting Force	20..120/4.5..27	N/lb
T_L	Maximum Lead Temperature for Soldering	300	°C
T_{SOLD}	1.6mm (0.062 in.) from Case for 10s	260	°C
Weight		5	g

Symbol	Test Conditions (T_J = 25°C, Unless Otherwise Specified)	Characteristic Values Min.	Typ.	Max.	
$V_{GE(th)}$	I_C = 250μA, $V_{CE} = V_{GE}$	3.0		5.5	V
I_{CES}	$V_{CE} = V_{CES}$, V_{GE} = 0V T_J = 125°C			50 1	μA mA
I_{GES}	V_{CE} = 0V, V_{GE} = ±20V			±100	nA
$V_{CE(sat)}$	I_C = 40A, V_{GE} = 15V, Note 1 T_J = 125°C		2.2 1.7	2.5	V V

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 Switching Losses
- Square RBSOA
- Avalanche Rated
- Anti-Parallel Ultra Fast Diode

Advantages

- High Power Density
- Low Gate Drive Requirement

Applications

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

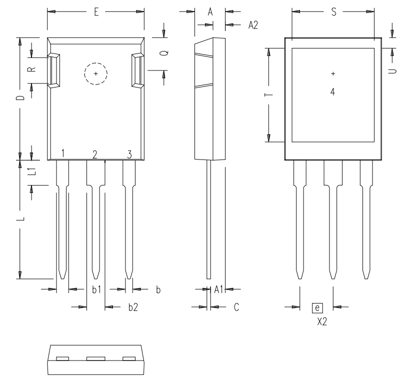
Symbol	Test Conditions (T_J = 25°C, Unless Otherwise Specified)	Min.	Typ.	Max.	
g_{fs}	I_C = 40A, V_{CE} = 10V, Note 1	23	38		S
C_{ies}	V_{CE}= 25V, V_{GE} = 0V, f = 1MHz		2810		pF
C_{oes}			230		pF
C_{res}			80		pF
Q_g	I_C = 50A, V_{GE} = 15V, V_{CE} = 0.5 • V_{CES}		115		nC
Q_{ge}			22		nC
Q_{gc}			43		nC
$t_{d(on)}$	**Inductive Load, T_J = 25°C**		21		ns
t_{ri}	I_C = 40A, V_{GE} = 15V		33		ns
E_{on}	V_{CE} = 480V, R_G = 3Ω		0.80		mJ
$t_{d(off)}$	Note 2		70	110	ns
t_{fi}			50		ns
E_{off}			0.45	0.80	mJ
$t_{d(on)}$	**Inductive Load, T_J = 125°C**		21		ns
t_{ri}	I_C = 40A, V_{GE} = 15V		33		ns
E_{on}	V_{CE} = 480V, R_G = 3Ω		1.25		mJ
$t_{d(off)}$	Note 2		112		ns
t_{fi}			86		ns
E_{off}			0.80		mJ
R_{thJC}				0.73	°C/W
R_{thCS}			0.15		°C/W

Reverse Diode (FRED)

Symbol	Test Conditions (T_J = 25°C, Unless Otherwise Specified)	Min.	Typ.	Max.	
V_F	I_F = 30A, V_{GE} = 0V, Note 1			2.8	V
	T_J = 150°C		1.6		V
I_{RM}	I_F = 30A, V_{GE} = 0V, T_J = 100°C			4	A
	$-di_F/dt$ = 100A/μs, V_R = 100V		100		ns
t_{rr}	I_F = 1A, -di/dt = 100A/μs, V_R = 30V		25		ns
R_{thJC}				1.5	°C/W

Notes:
1. Pulse test, t ≤ 300μs, duty cycle, d ≤ 2%.
2. Switching times & energy losses may increase for higher V_{CE}(Clamp), T_J or R_G.

ISOPLUS247 (IXGR) Outline



SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.190	.205	4.83	5.21
A1	.090	.100	2.29	2.54
A2	.075	.085	1.91	2.16
b	.045	.055	1.14	1.40
b1	.075	.084	1.91	2.13
b2	.115	.123	2.92	3.12
C	.024	.031	0.61	0.80
D	.819	.840	20.80	21.34
E	.620	.635	15.75	16.13
e	.215 BSC		5.45 BSC	
L	.780	.800	19.81	20.32
L1	.150	.170	3.81	4.32
Q	.220	.244	5.59	6.20
R	.170	.190	4.32	4.83
S	.520	.540	13.21	13.72
T	.620	.640	15.75	16.26
U	.065	.080	1.65	2.03

1 – GATE
2 – DRAIN (COLLECTOR)
3 – SOURCE (EMITTER)
4 – NO CONNECTION

NOTE: This drawing will meet all dimensions requirement of JEDEC outline TO-247AD except screw hole.

Fig. 1. Output Characteristics @ T_J = 25ºC

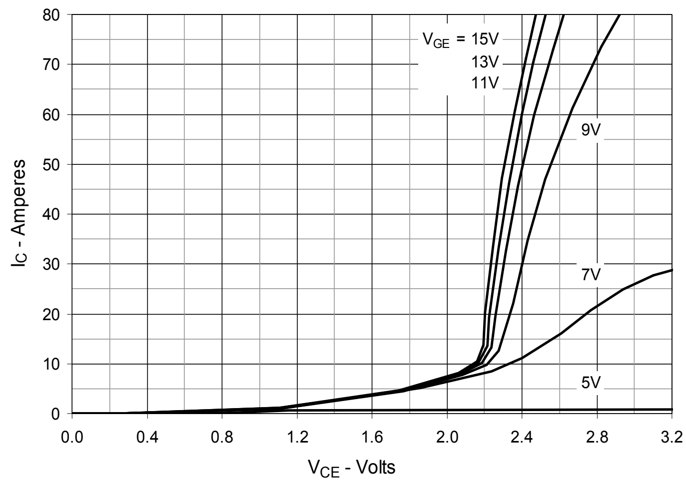


Fig. 2. Extended Output Characteristics @ T_J = 25ºC

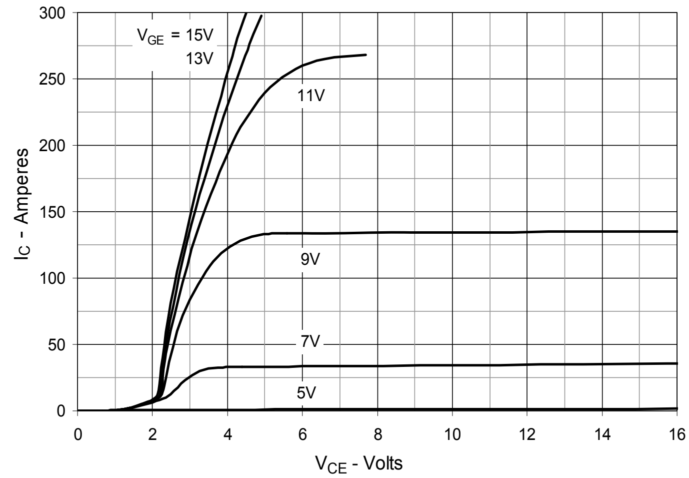


Fig. 3. Output Characteristics @ T_J = 125ºC

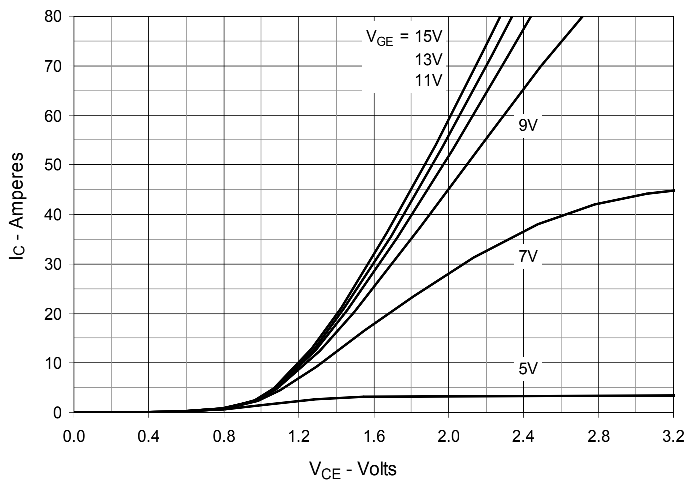


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

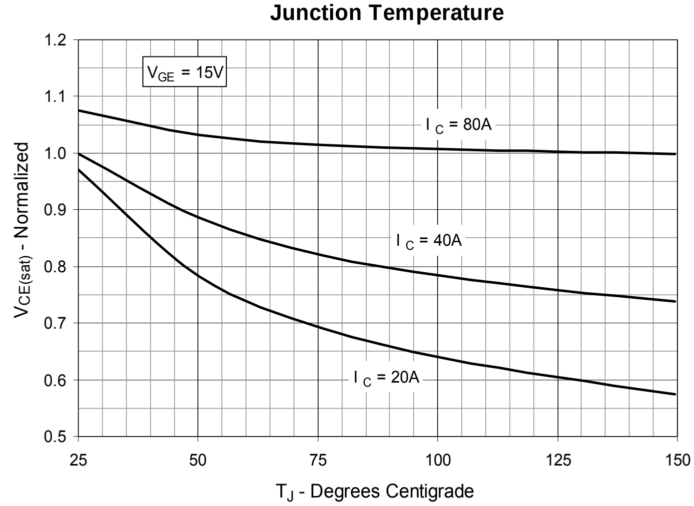


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

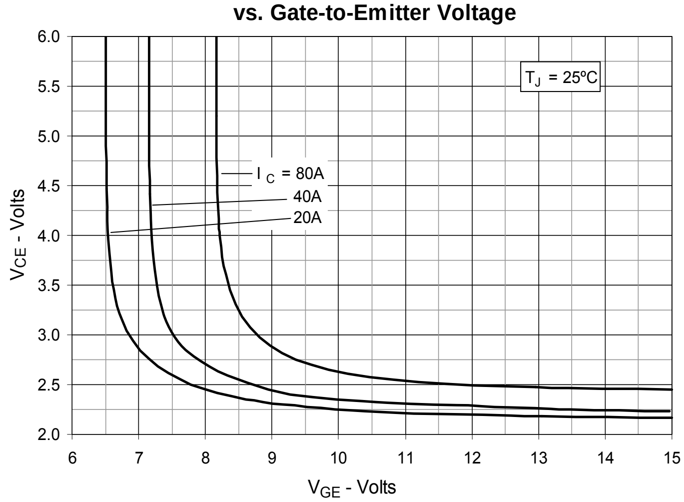
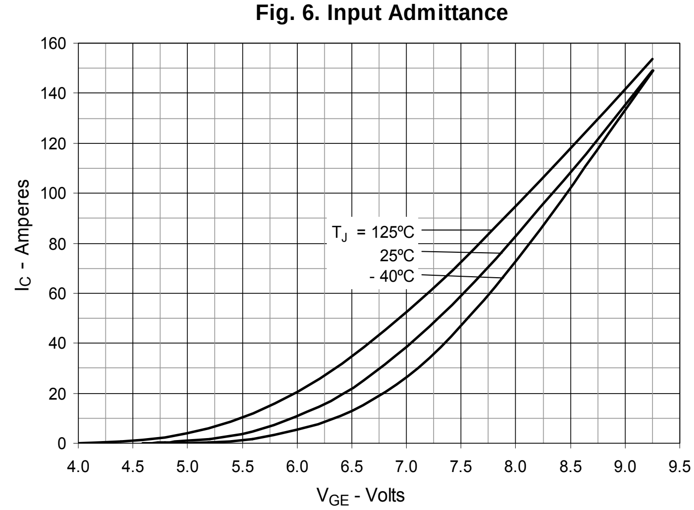


Fig. 6. Input Admittance



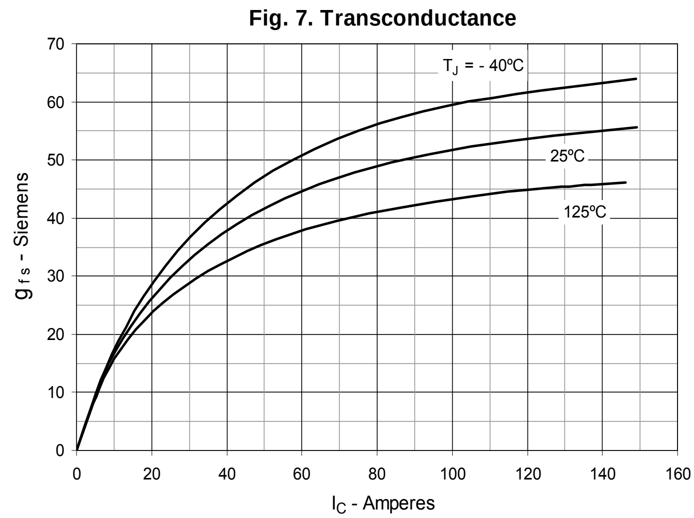


Fig. 7. Transconductance
TJ = - 40ºC
25ºC
125ºC
g f s - Siemens
IC - Amperes
0
10
20
30
40
50
60
70
0
20
40
60
80
100
120
140
160

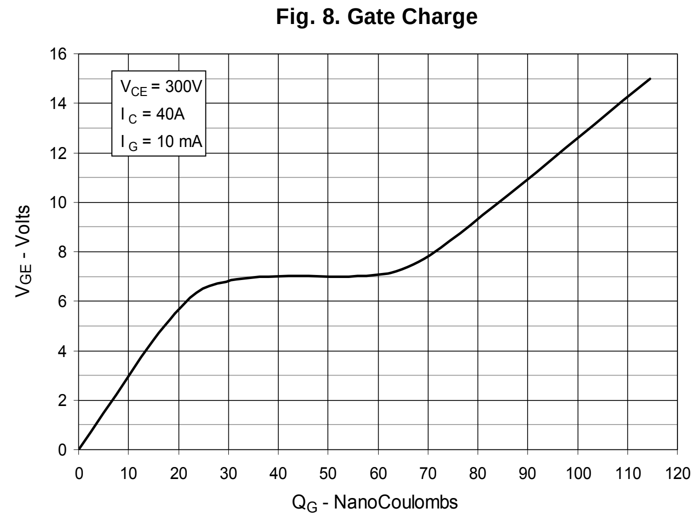


Fig. 8. Gate Charge
VCE = 300V
I C = 40A
I G = 10 mA
VGE - Volts
QG - NanoCoulombs

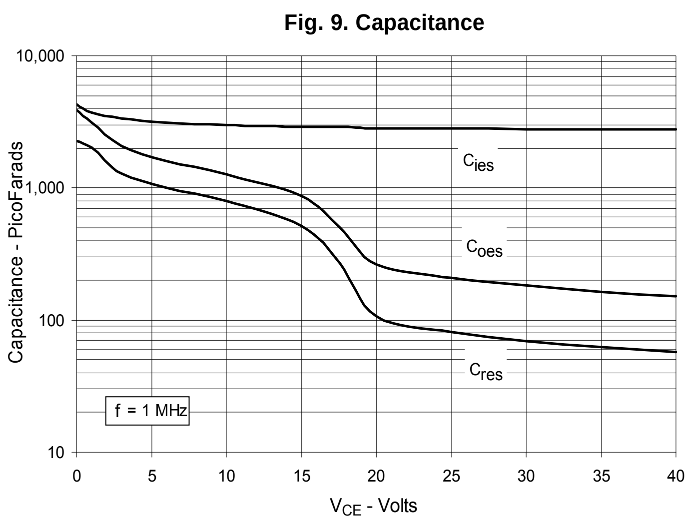


Fig. 9. Capacitance
Cies
Coes
Cres
f = 1 MHz
Capacitance - PicoFarads
VCE - Volts
10,000
1,000
100
10

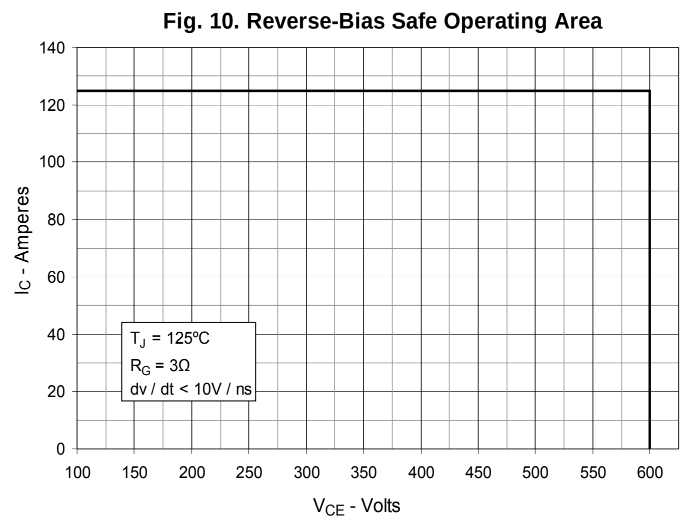


Fig. 10. Reverse-Bias Safe Operating Area
TJ = 125ºC
RG = 3Ω
dv / dt < 10V / ns
IC - Amperes
VCE - Volts

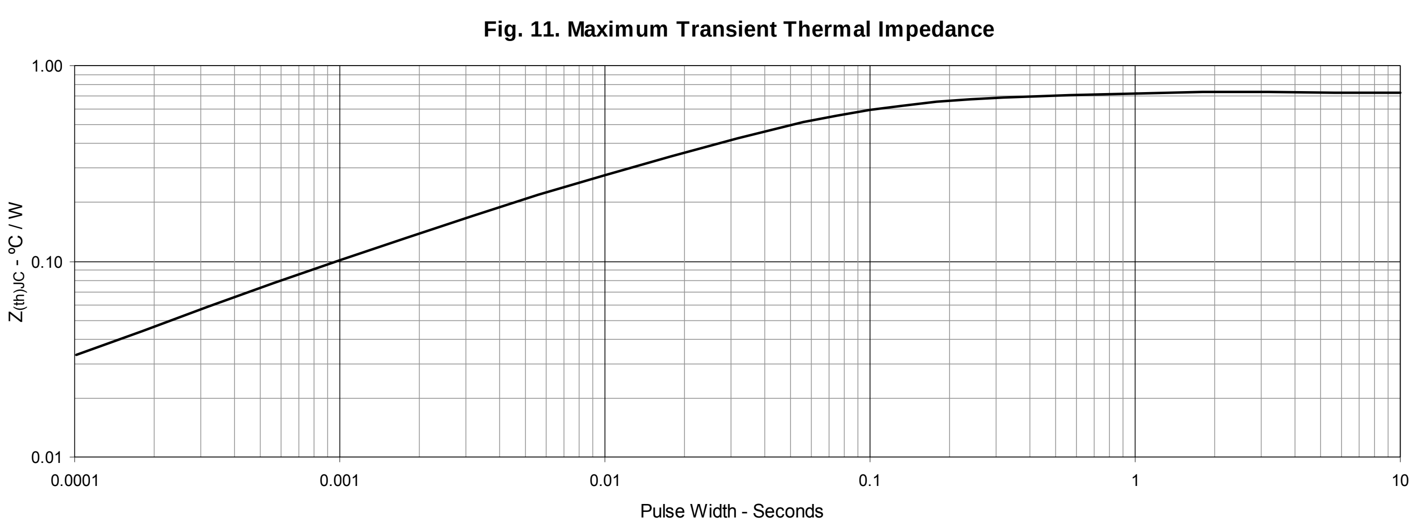


Fig. 11. Maximum Transient Thermal Impedance
Z(th)JC - ºC / W
Pulse Width - Seconds
1.00
0.10
0.01
0.0001
0.001
0.01
0.1
1
10

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

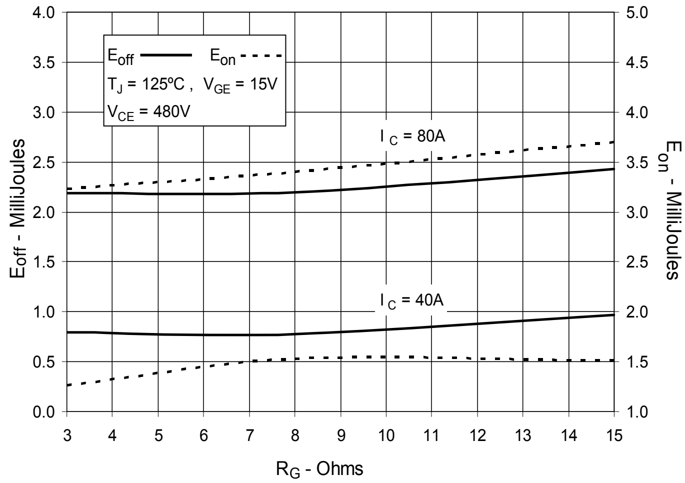


Fig. 13. Inductive Switching Energy Loss vs. Collector Current

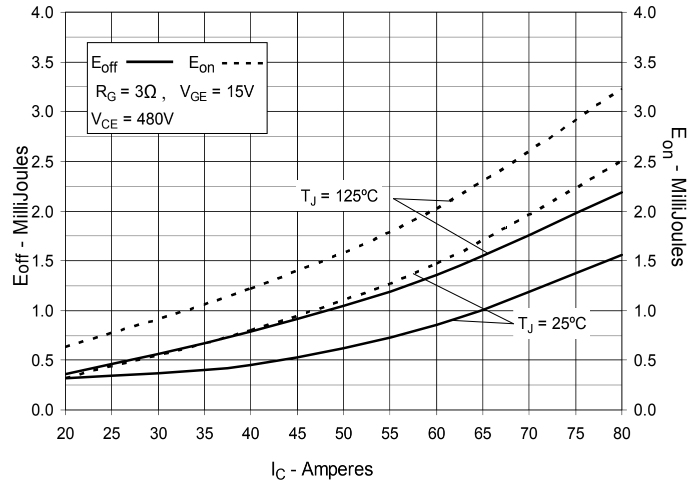


Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature

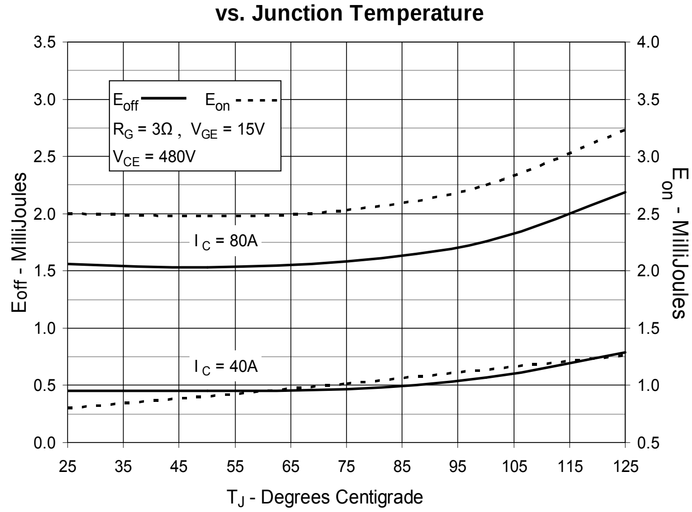


Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance

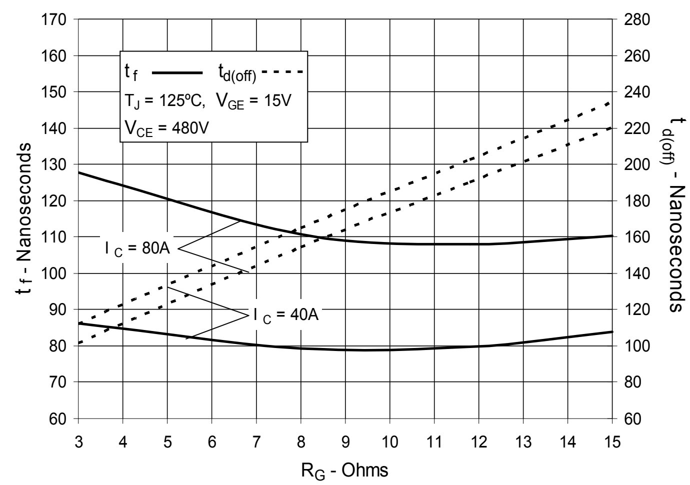


Fig. 16. Inductive Turn-off Switching Times vs. Collector Current

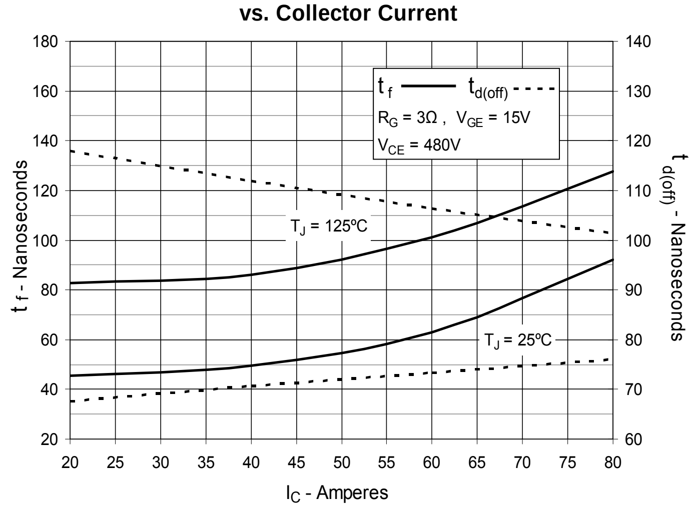


Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature

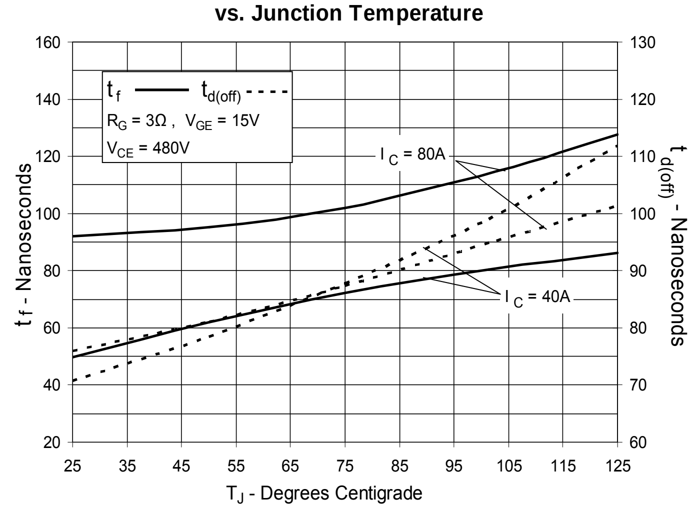


Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance

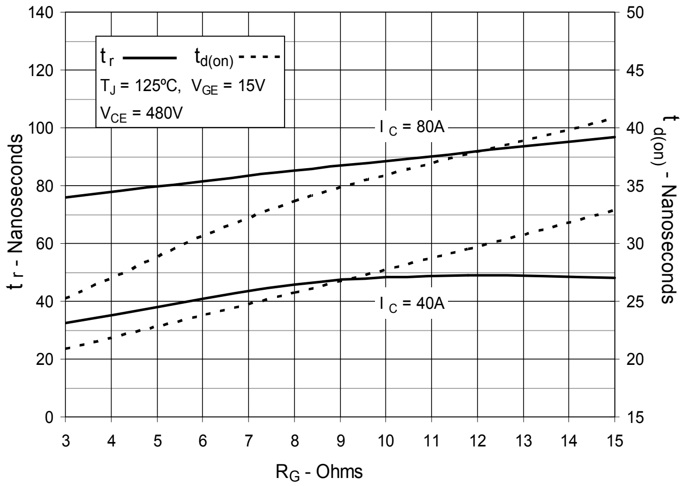


Fig. 19. Inductive Turn-on Switching Times vs. Collector Current

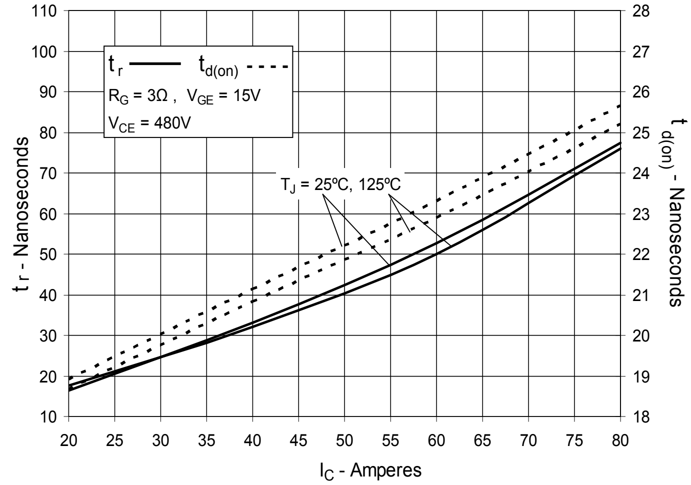
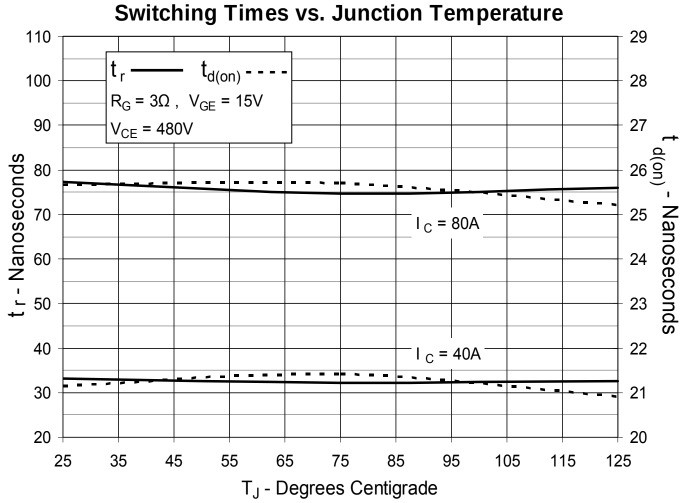


Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature



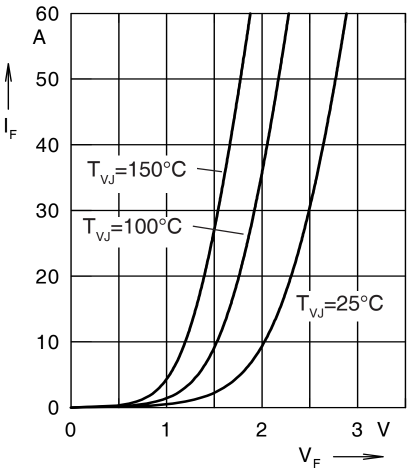


Fig. 21. Forward Current I_F Versus V_F

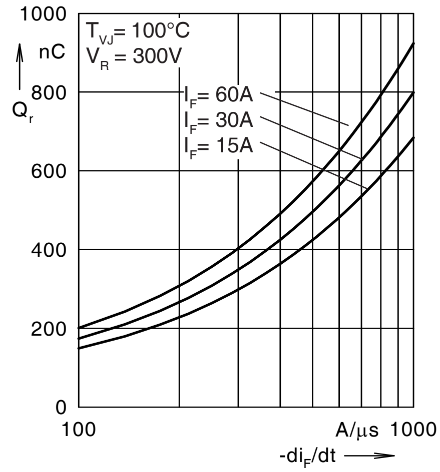


Fig. 22. Reverse Recovery Charge Q_r Versus $-di_F/dt$

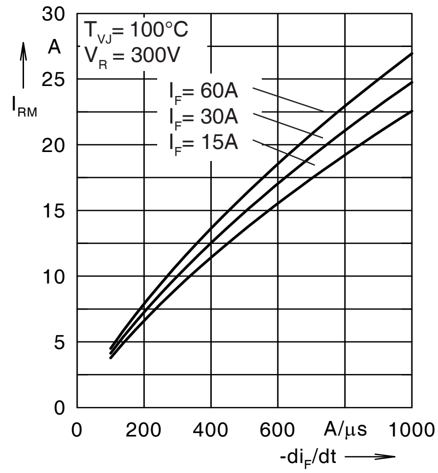


Fig. 23. Peak Reverse Current I_{RM} Versus $-di_F/dt$

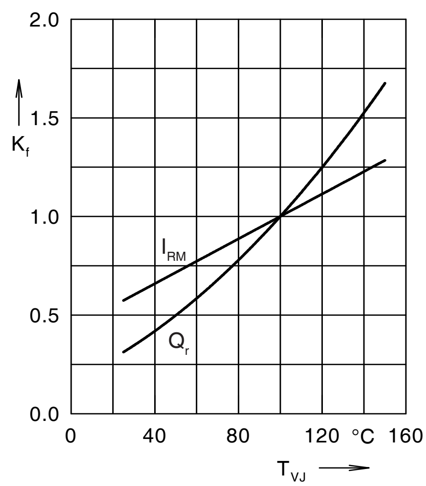


Fig. 24. Dynamic Parameters Q_r, I_{RM} Versus T_{VJ}

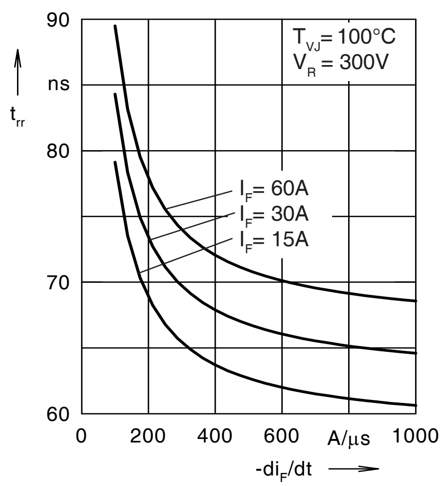


Fig. 25. Recovery Time t_{rr} Versus $-di_F/dt$

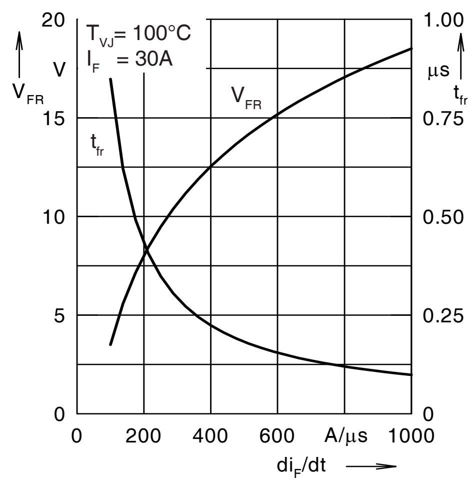


Fig. 26. Peak Forward Voltage V_{FR} and t_{fr} Versus di_F/dt

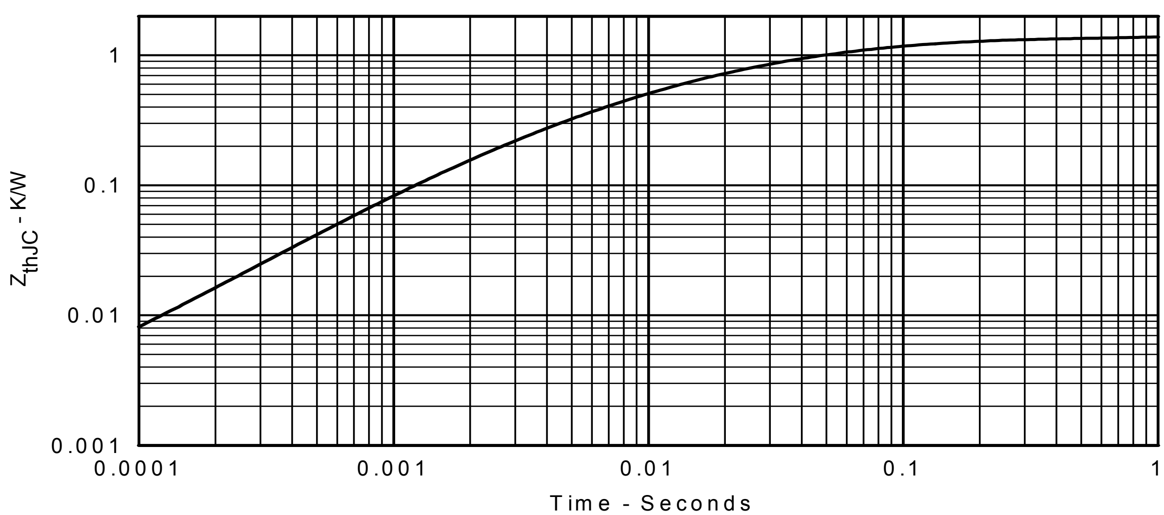


Fig. 27. Transient Thermal Resistance Impedance (for Diode)