IXYS

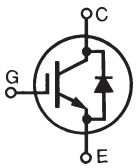
Advance Technical Information

HiPerFAST™ IGBT with Fast Diode

IXGR 32N90B2D1

V_{CES} = 900 V
I_{C25} = 47 A
$V_{CE(sat)}$ = 2.9 V
$t_{fi\,typ}$ = 150 ns

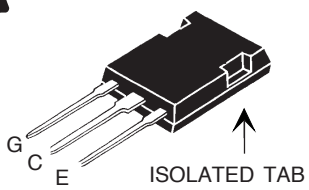
Electrically Isolated Base



Symbol	Test Conditions	Maximum Ratings	
V_{CES}	T_J = 25°C to 150°C	900	V
V_{CGR}	T_J = 25°C to 150°C; R_{GE} = 1 MΩ	900	V
V_{GES}	Continuous	±20	V
V_{GEM}	Transient	±30	V
I_{C25}	T_C = 25°C	47	A
I_{C110}	T_C = 110°C	22	A
I_{CM}	T_C = 25°C, 1 ms	200	A
SSOA (RBSOA)	V_{GE} = 15 V, T_{VJ} = 125°C, R_G = 10 Ω Clamped inductive load: V_{CL} < 600V	I_{CM} = 64	A
P_C	T_C = 25°C	160	W
T_J		-55 ... +150	°C
T_{JM}		150	°C
T_{stg}		-55 ... +150	°C
Maximum lead temperature for soldering 1.6 mm (0.062 in.) from case for 10 s		300	°C
V_{ISOL}	50/60Hz, RMS, T= I minute I_{isol} < 1mA	2500 3000	V~ V~
F_C	Mounting force	20..120/4.5..26	N/lb
Weight		5	g

Symbol	Test Conditions (T_J = 25°C unless otherwise specified)		Characteristic Values min.	typ.	max.	
$V_{GE(th)}$	I_C = 250 μA, V_{CE} = V_{GE}		3.0		5.0	V
I_{CES}	V_{CE} = V_{CES} V_{GE} = 0 V	 T_J = 150°C			300 1.5	μA mA
I_{GES}	V_{CE} = 0 V, V_{GE} = ± 20 V				±100	nA
$V_{CE(sat)}$	I_C = I_T, V_{GE} = 15 V, Note 1	 T_J = 125°C		 2.1	2.9	V V

ISOPLUS247 (IXGR)
E153432



G = Gate C = Collector
E = Emitter

Features

- Electrically isolated mounting tab
- High frequency IGBT
- High current handling capability
- MOS Gate turn-on
  - drive simplicity

Applications

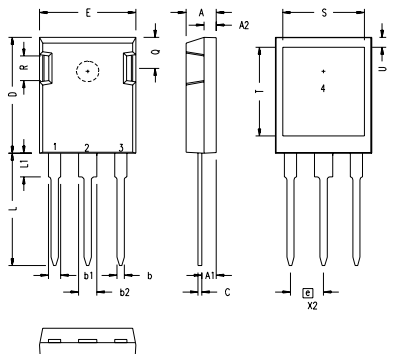
- PFC circuits
- Uninterruptible power supplies (UPS)
- Switched-mode and resonant-mode power supplies
- AC motor speed control
- DC servo and robot drives
- DC choppers

Advantages

- High power density
- Very fast switching speeds for high frequency applications

Symbol	Test Conditions (T_J = 25°C unless otherwise specified)	Characteristic Values min.	typ.	max.	
g_{fs}	$I_C = I_T$; V_{CE} = 10 V,	18	28		S
C_{ies}	V_{CE} = 25 V, V_{GE} = 0 V, f = 1 MHz		1790		pF
C_{oes}			146		pF
C_{res}			49		pF
Q_g	$I_C = I_T$, V_{GE} = 15 V, V_{CE} = 0.5 V_{CES}		89		nC
Q_{ge}			15		nC
Q_{gc}			34		nC
$t_{d(on)}$	**Inductive load, T_J = 25°C**		20		ns
t_{ri}	$I_C = I_T$, V_{GE} = 15 V		22		ns
$t_{d(off)}$	V_{CE} = 720 V, $R_G = R_{off}$ = 5 Ω		260	400	ns
t_{fi}			150		ns
E_{off}			2.2	4.5	mJ
$t_{d(on)}$	**Inductive load, T_J = 125°C**		20		ns
t_{ri}	$I_C = I_T$, V_{GE} = 15 V		22		ns
E_{on}	V_{CE} = 720 V, $R_G = R_{off}$ = 5 Ω		3.8		mJ
$t_{d(off)}$			360		ns
t_{fi}			330		ns
E_{off}			5.75		mJ
R_{thJC}				0.8	K/W
R_{thCS}			0.15		K/W

ISOPLUS247 Outline



SYM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS 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 - COLLECTOR / CATHODE
3 - EMITTER / ANODE
4 - NO CONNECTION

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

Ultrafast Diode

Symbol	Conditions	Maximum Ratings	
I_{FRMS}		60	A
I_{F110}	T_C = 110°C	22	A

Symbol	Conditions	Characteristic Values min.	typ.	max.	
V_F	I_F = 30 A			2.75	V
	T_{VJ} = 125°C		1.8		V
I_{RM}	I_F = 50 A; di_F/dt = -100 A/μs; T_{VJ} = 100°C		5.5	11.4	A
t_{rr}	V_R = 100 V; V_{GE} = 0 V		190		ns
R_{thJC}				1.1	K/W
R_{thCS}			0.15		K/W

Notes:

1. Pulse test: Pulse width < 300 μs, duty cycle < 2 %;
2. Test current I_T = 32 A.

Fig. 1. Output Characteristics @ 25 ºC

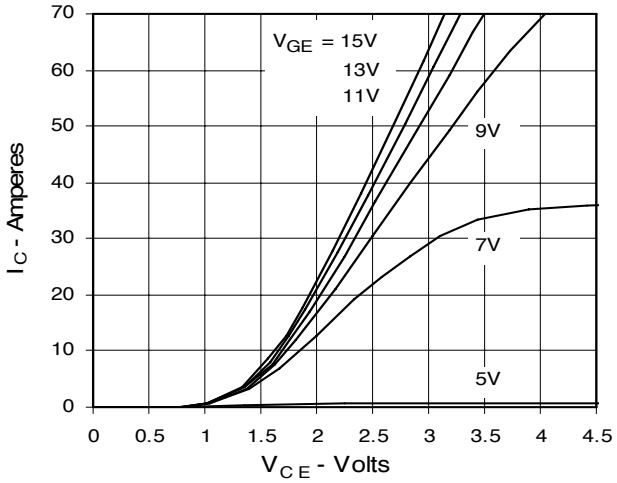


Fig. 2. Extended Output Characteristics @ 25 ºC

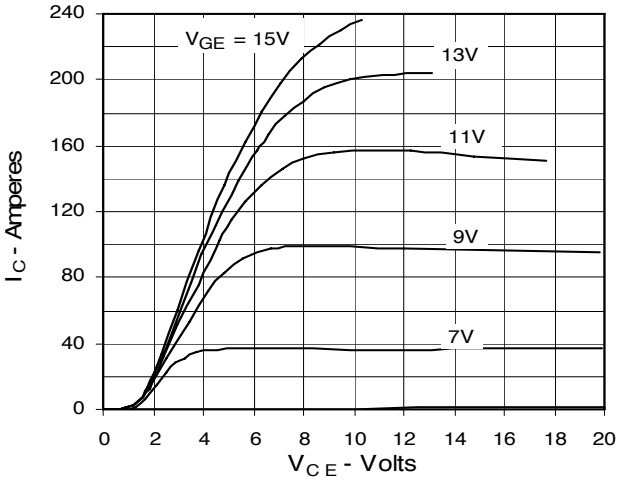


Fig. 3. Output Characteristics @ 125 ºC

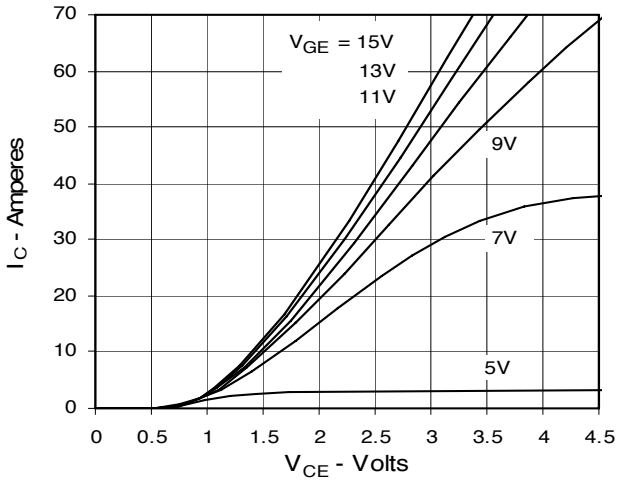


Fig. 4. Dependence of $V_{CE(sat)}$ on Temperature

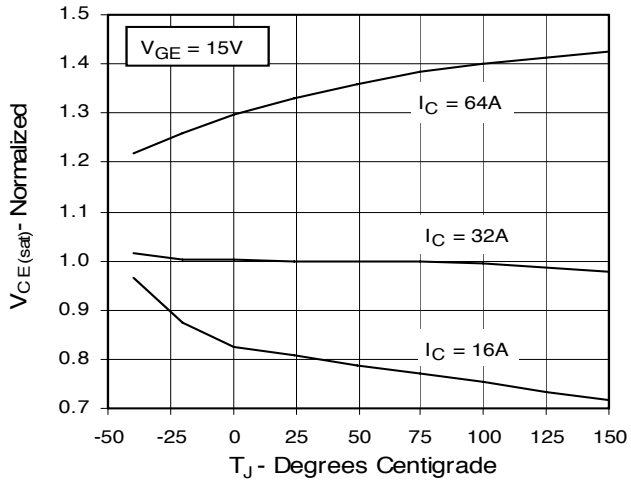


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter voltage

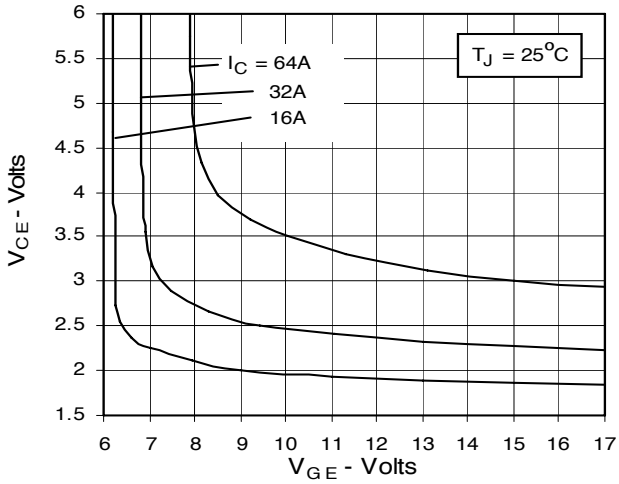


Fig. 6. Input Admittance

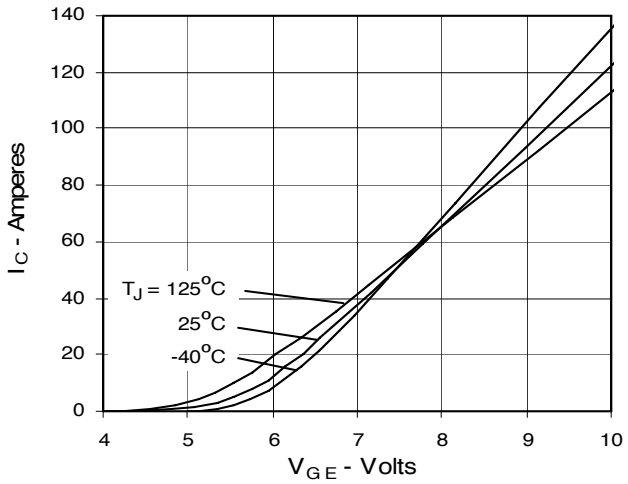


Fig. 7. Transconductance

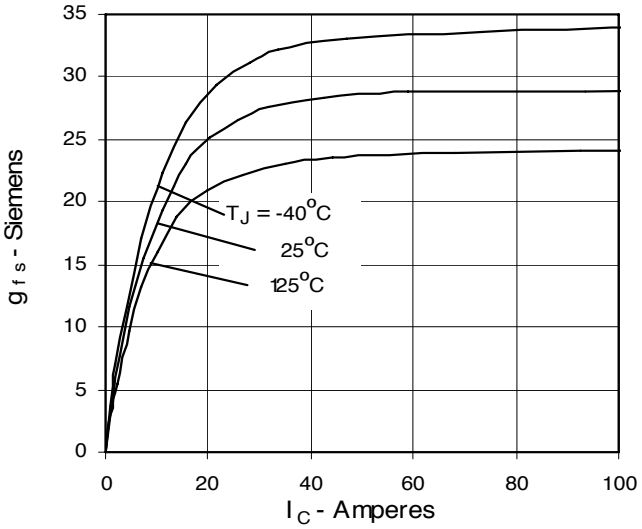


Fig. 8. Gate Charge

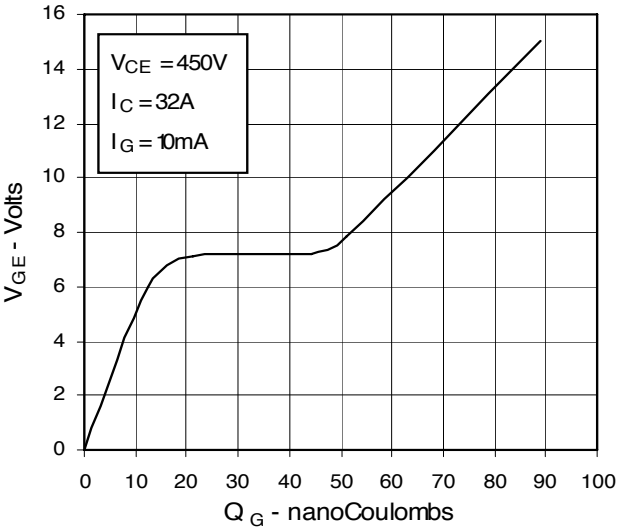


Fig. 9. Capacitance

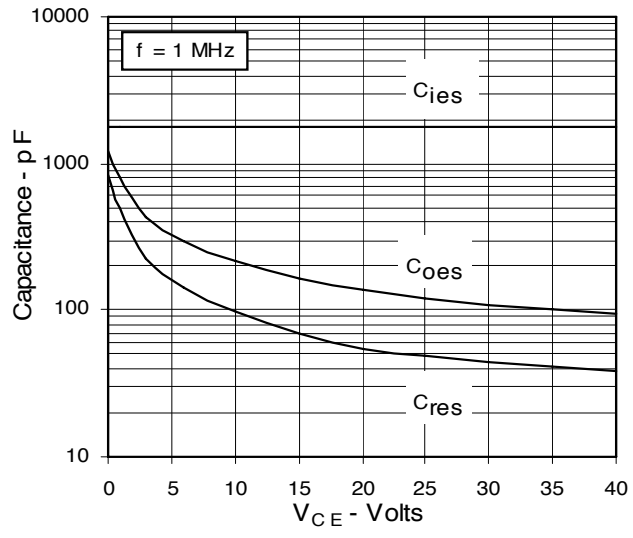


Fig. 10. Reverse-Bias Safe Operating Area

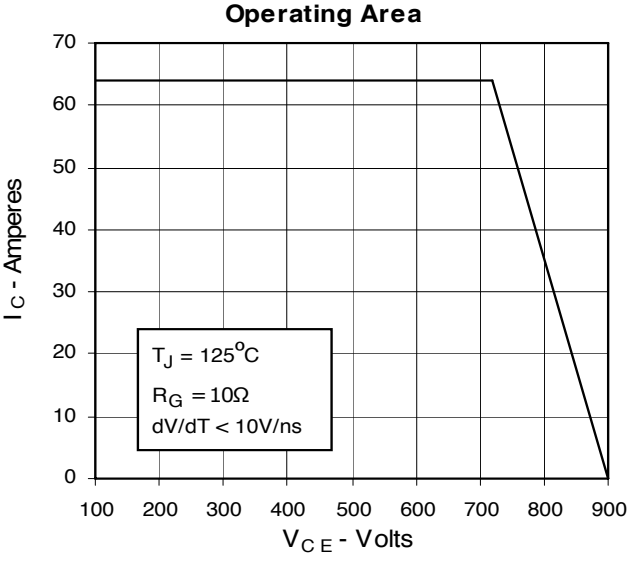


Fig. 11. Maximum Transient Thermal Resistance

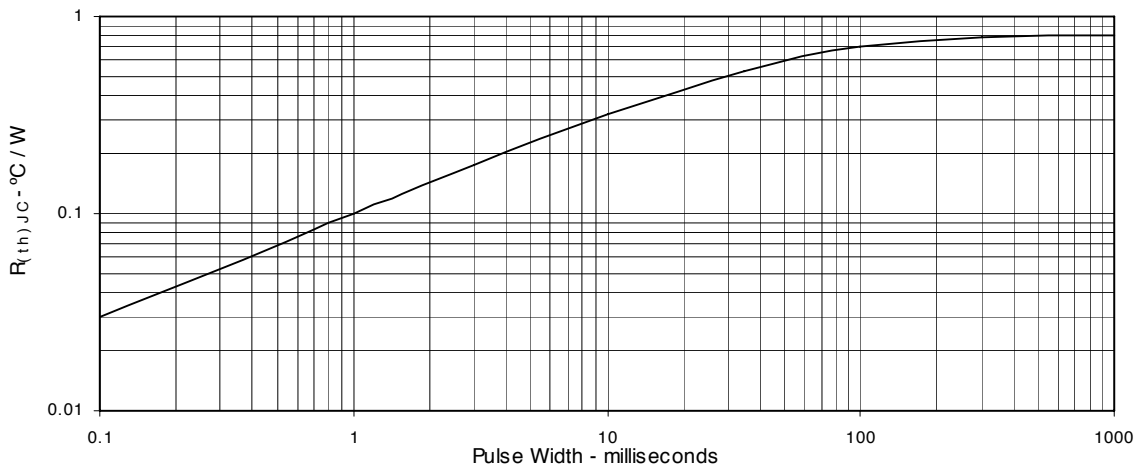


Fig. 12. Dependence of Turn-off Energy Loss on Gate Resistance

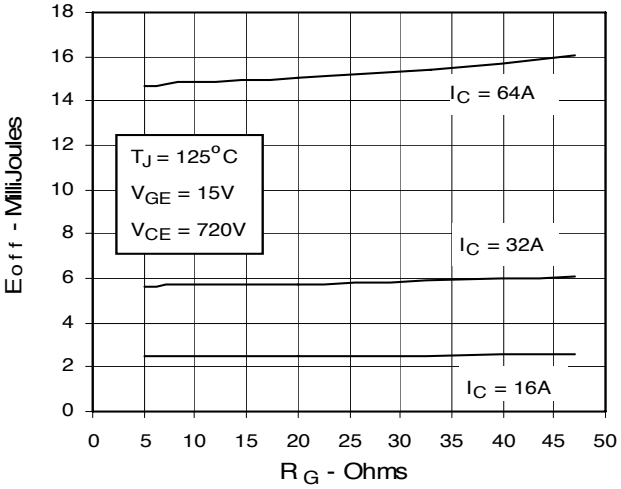


Fig. 13. Dependence of Turn-on Energy Loss on Gate Resistance

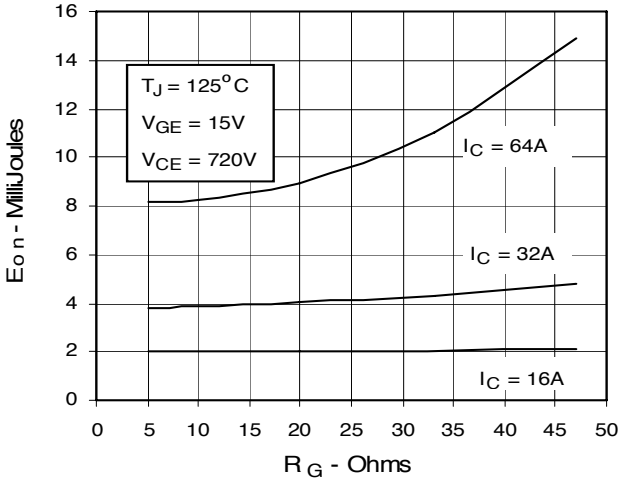


Fig. 14. Dependence of Turn-off Energy Loss on Collector Current

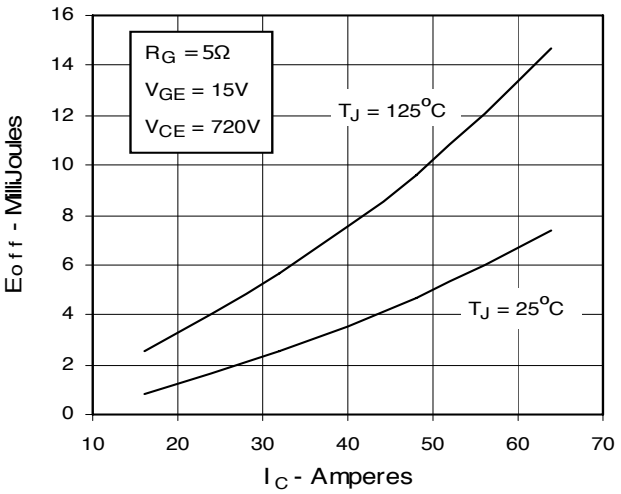


Fig. 15. Dependence of Turn-on Energy Loss on Collector Current

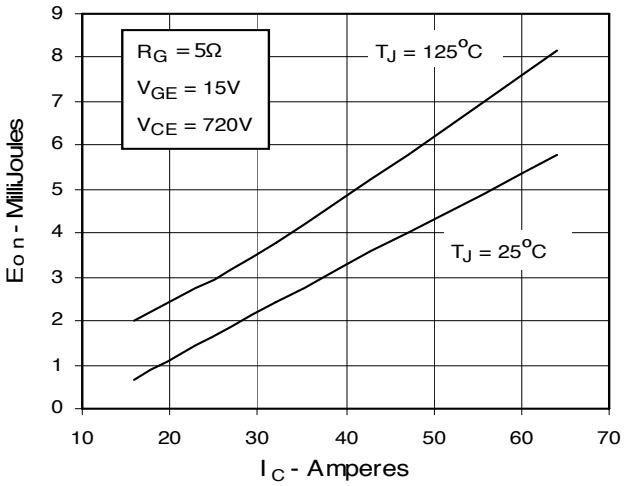


Fig. 16. Dependence of Turn-off Energy Loss on Temperature

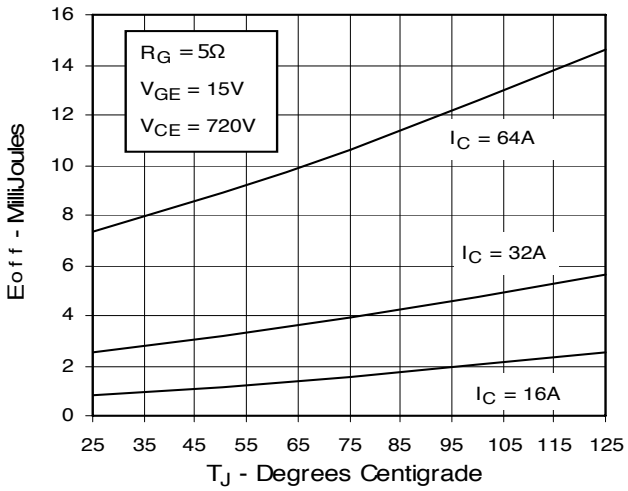


Fig. 17. Dependence of Turn-on Energy Loss on Temperature

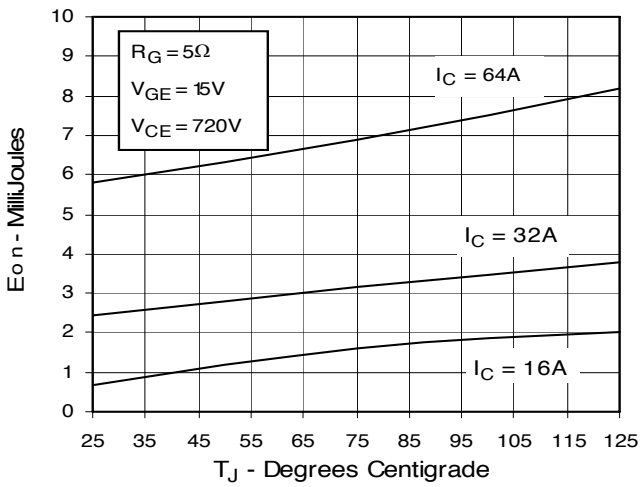


Fig. 18. Dependence of Turn-off Switching Time on Gate Resistance

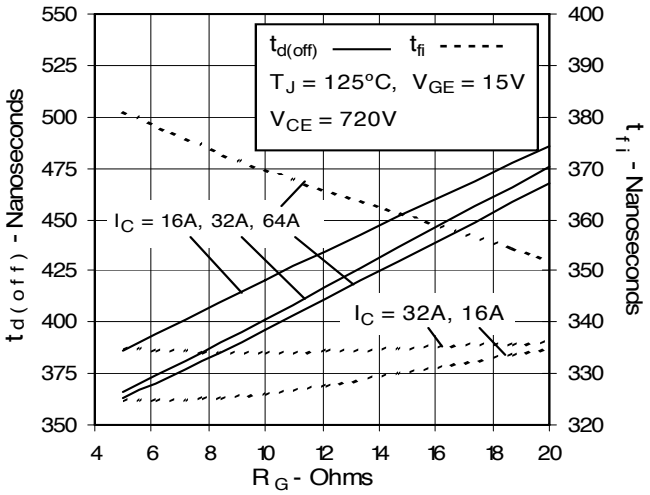


Fig. 19. Dependence of Turn-on Switching Time on Gate Resistance

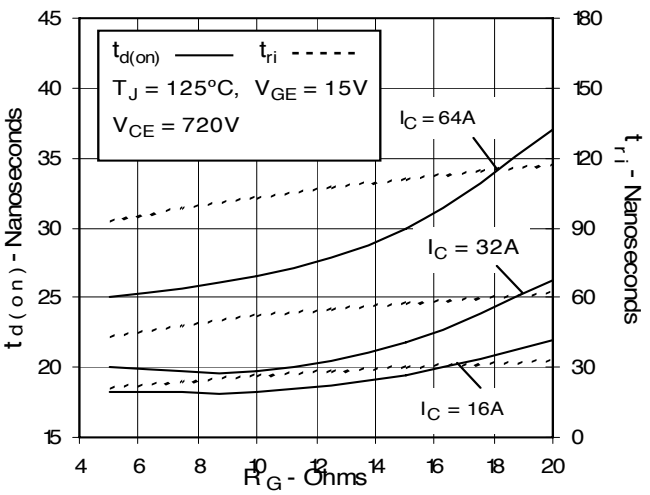


Fig. 20. Dependence of Turn-off Switching Time on Collector Current

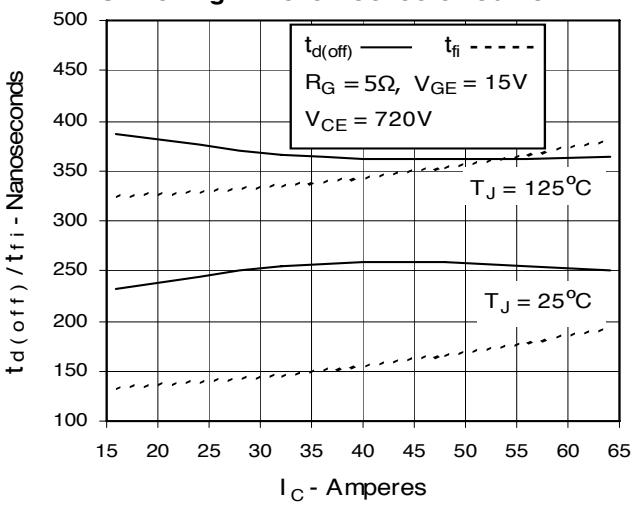


Fig. 21. Dependence of Turn-on Switching Time on Collector Current

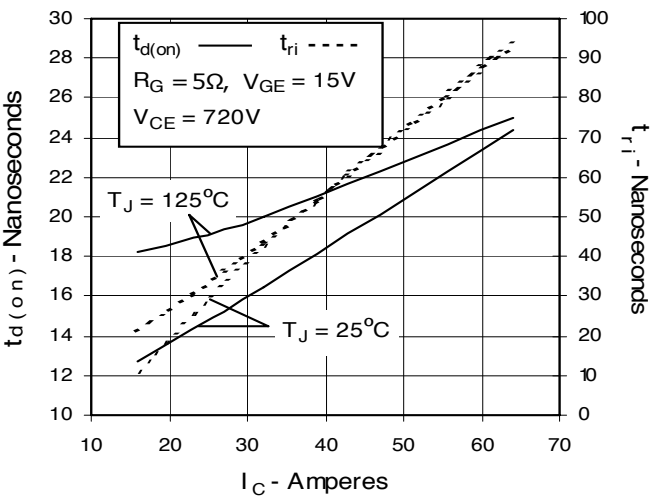


Fig. 22. Dependence of Turn-off Switching Time on Temperature

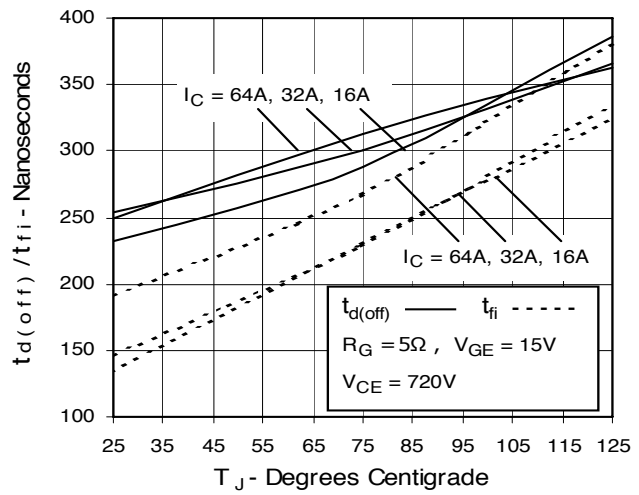
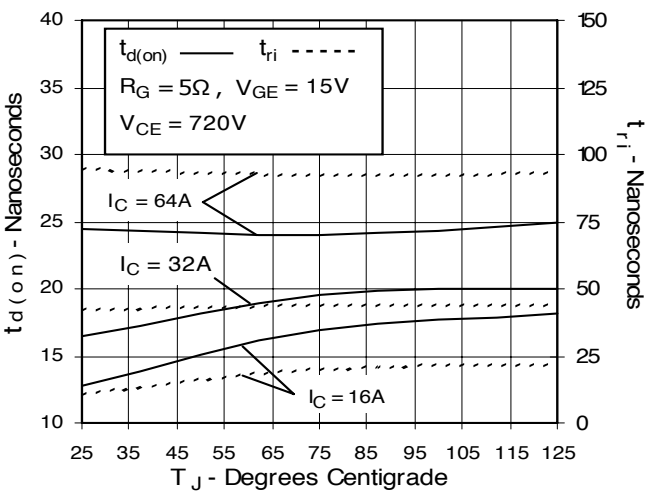


Fig. 23. Dependence of Turn-on Switching Time on Temperature



Ultrafast Diode Characteristics

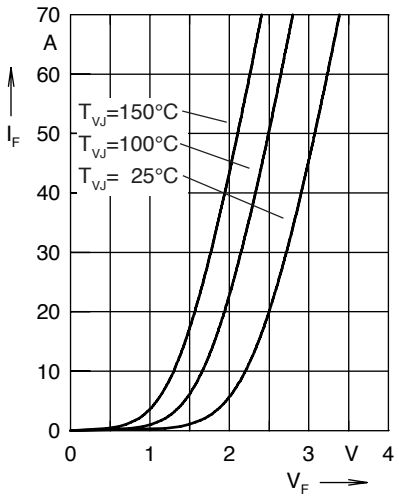


Fig. 24. Forward current I_F versus V_F

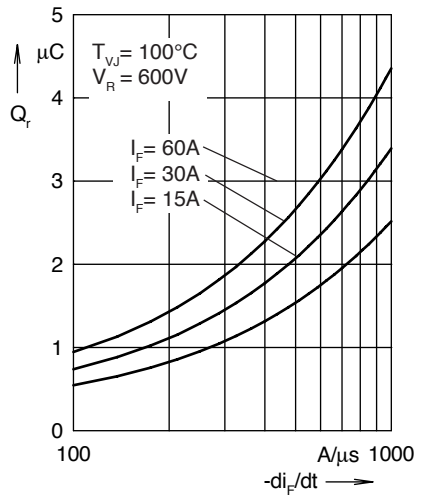


Fig. 25. Reverse recovery charge Q_r versus $-di_F/dt$

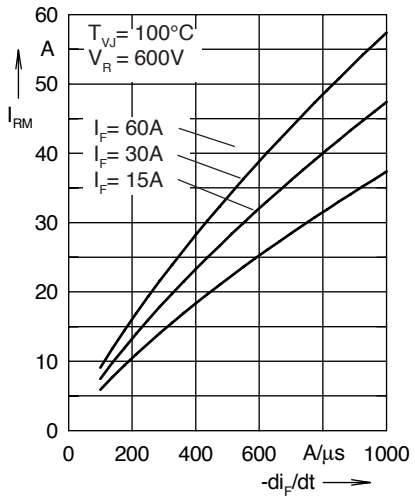


Fig. 26. Peak reverse current I_{RM} versus $-di_F/dt$

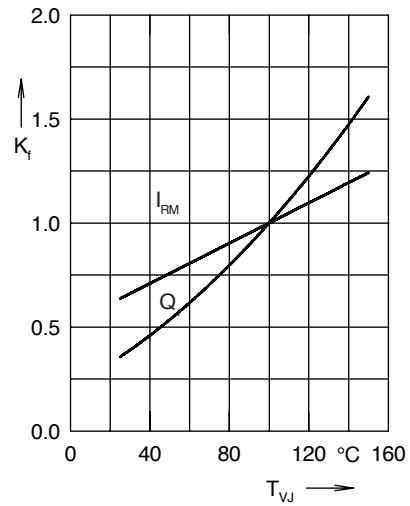


Fig. 27. Dynamic parameters Q_r, I_{RM} versus T_{VJ}

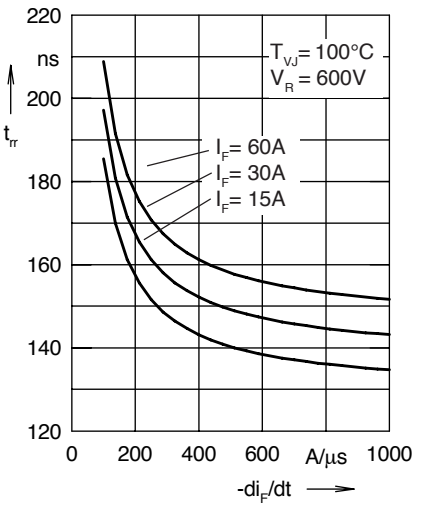


Fig. 28. Recovery time t_{rr} versus $-di_F/dt$

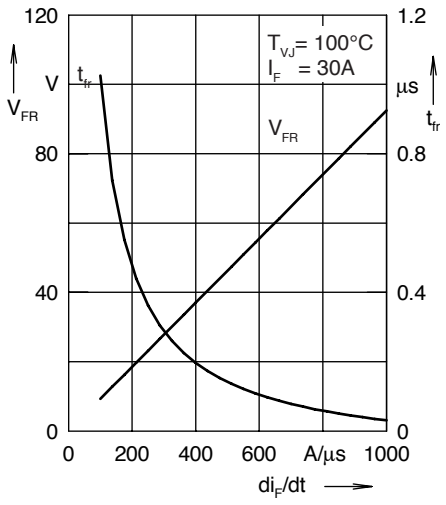


Fig. 29. Peak forward voltage V_{FR} and t_{fr} versus di_F/dt

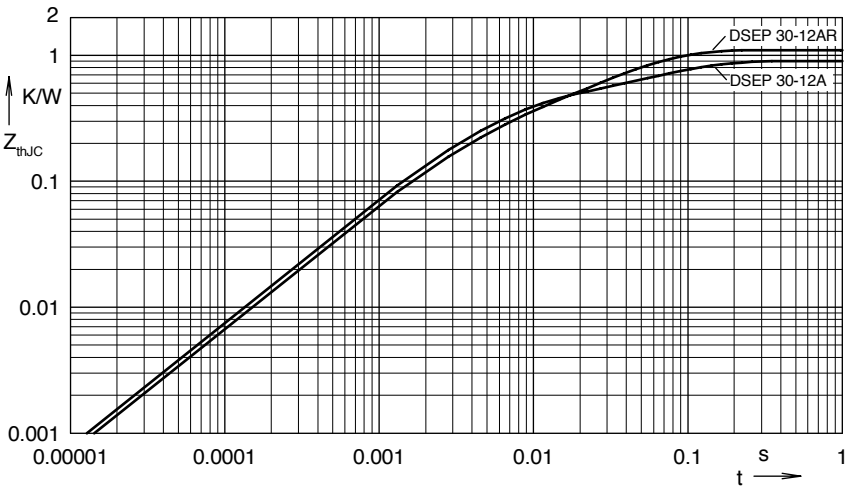


Fig. 30. Transient thermal resistance junction-to-case

Constants for Z_{thJC} calculation for non-isolated diode (DSEP 30-12A):

i	R_{thi} (K/W)	t_i (s)
1	0.465	0.0052
2	0.179	0.0003
3	0.256	0.0397

Constants for Z_{thJC} calculation for isolated diode (DSEP 30-12AR):

i	R_{thi} (K/W)	t_i (s)
1	0.368	0.0052
2	0.1417	0.0003
3	0.0295	0.0004
4	0.5604	0.0092