IXYS

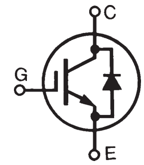
Advance Technical Information

HiPerFAST™ IGBT with Fast Diode

IXGR 32N90B2D1

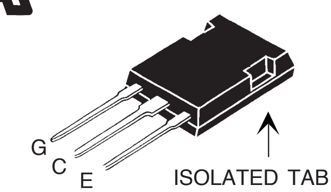
Electrically Isolated Base

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



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

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

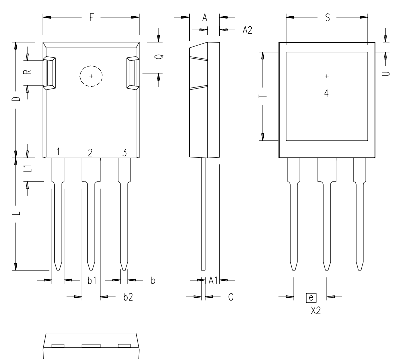
Advantages

- 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.	
$V_{GE(th)}$	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

Symbol	Test Conditions (Characteristic Values, $T_J = 25^oC$ unless otherwise specified)	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, $T_J = 25^oC$**		20		ns
t_{ri}	$I_C = I_T$, $V_{GE} = 15$ V		22		ns
$t_{d(off)}$	$V_{CE} = 720$ V, $R_G = R_{off} = 5\ \Omega$		260	400	ns
t_{fi}			150		ns
E_{off}			2.2	4.5	mJ
$t_{d(on)}$	**Inductive load, $T_J = 125^oC$**		20		ns
t_{ri}	$I_C = I_T$, $V_{GE} = 15$ V		22		ns
E_{on}	$V_{CE} = 720$ V, $R_G = R_{off} = 5\ \Omega$		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}	$T_C = 110^oC$	22	A

Symbol	Conditions (Characteristic Values)	min.	typ.	max.	
V_F	$I_F = 30$ A			2.75	V
	$T_{VJ} = 125^oC$		1.8		V
I_{RM}	$I_F = 50$ A; $di_F/dt = -100$ A/μs; $T_{VJ} = 100^oC$		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

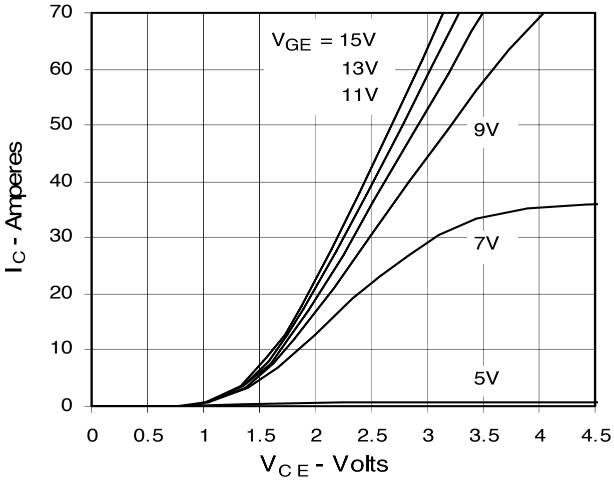


Fig. 2. Extended Output Characteristics @ 25 ºC

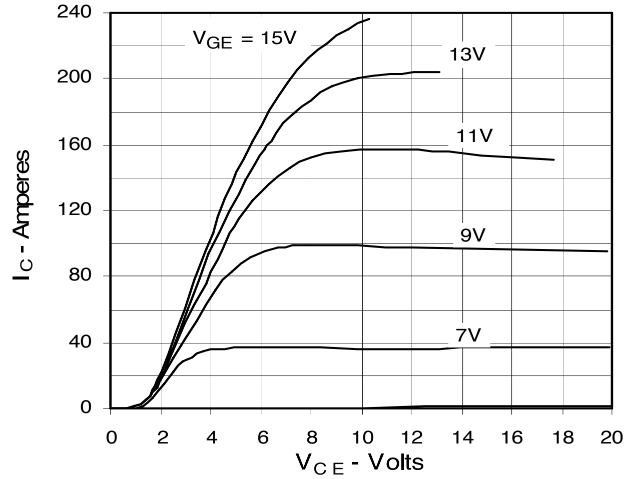


Fig. 3. Output Characteristics @ 125 ºC

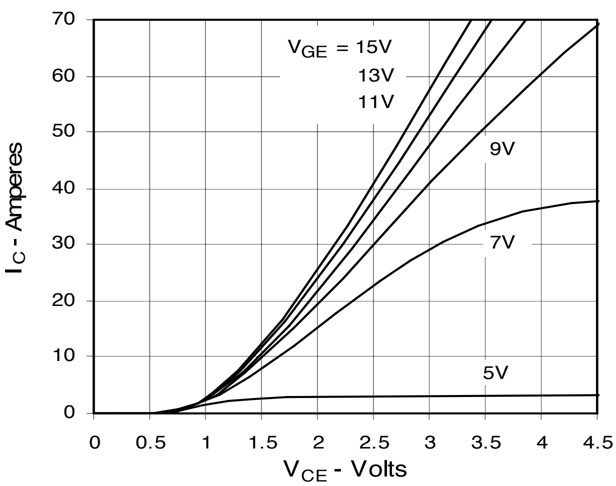


Fig. 4. Dependence of $V_{CE(sat)}$ on Temperature

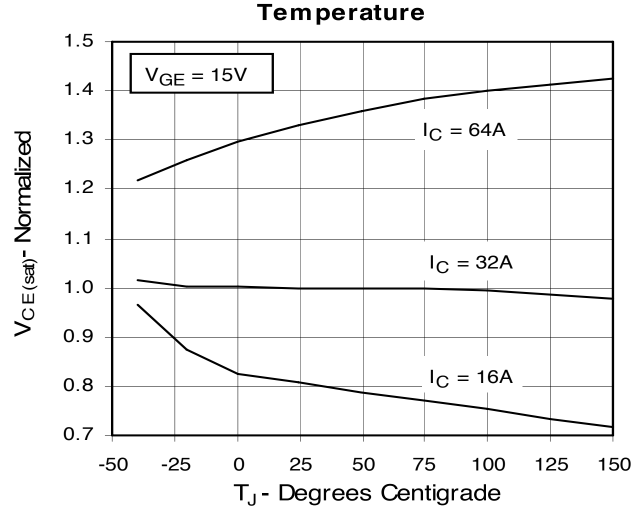


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter voltage

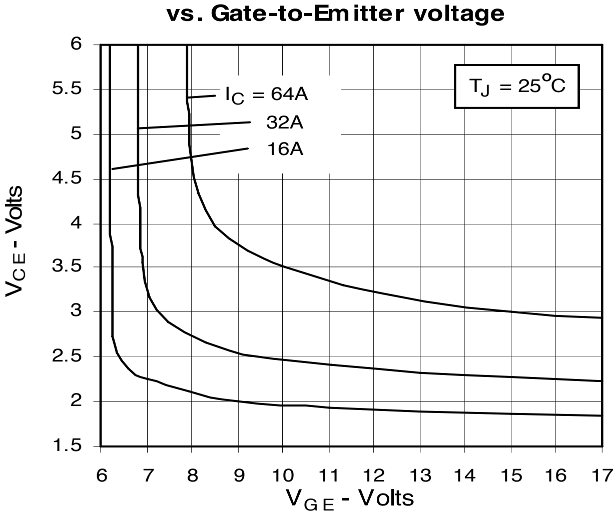


Fig. 6. Input Admittance

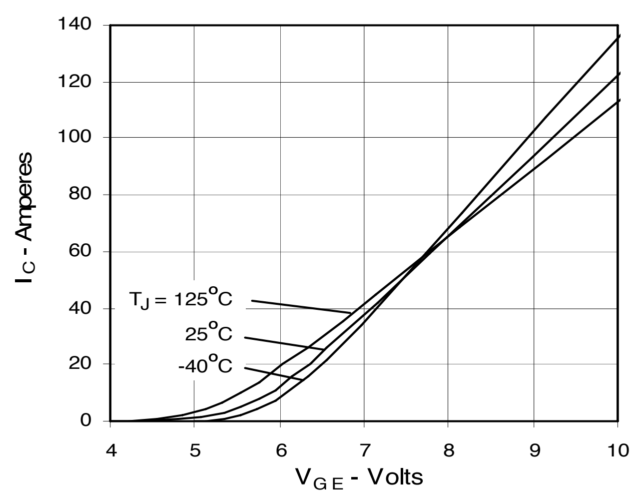


Fig. 7. Transconductance

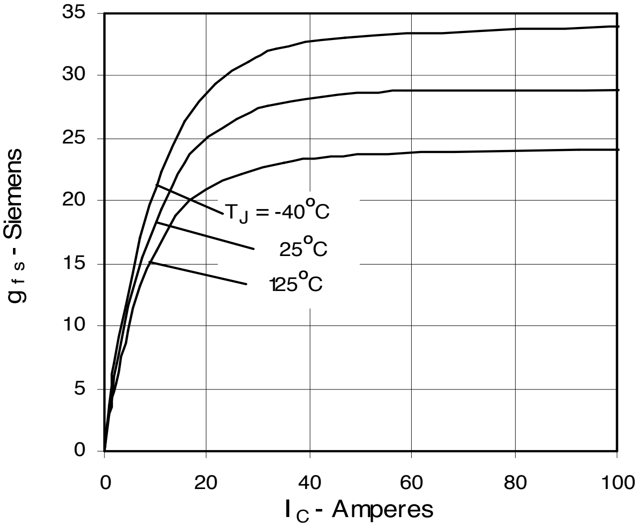


Fig. 8. Gate Charge

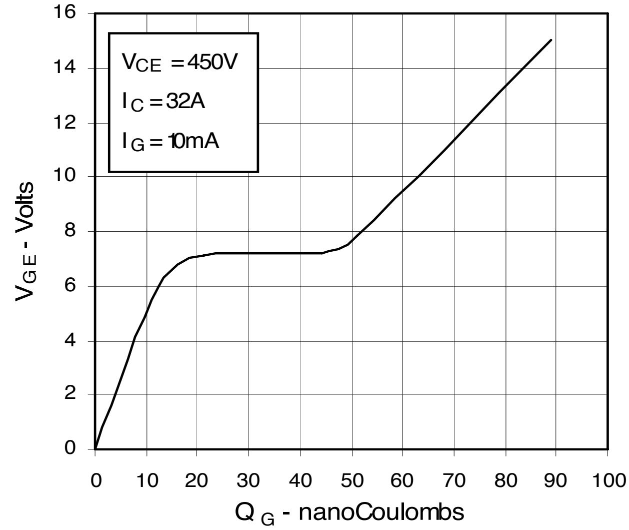


Fig. 9. Capacitance

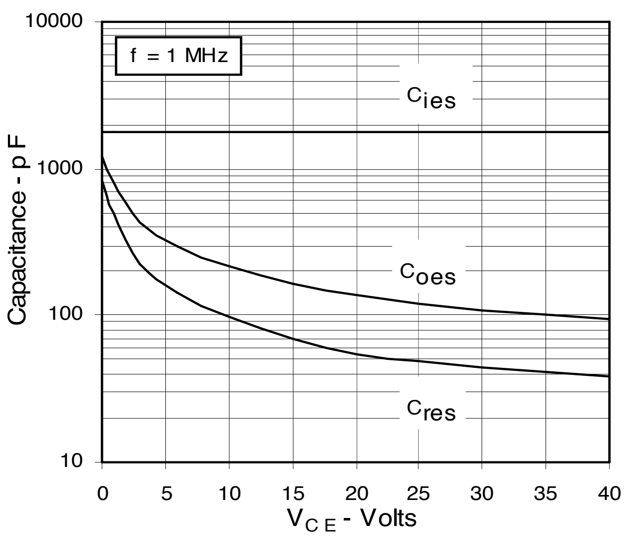


Fig. 10. Reverse-Bias Safe Operating Area

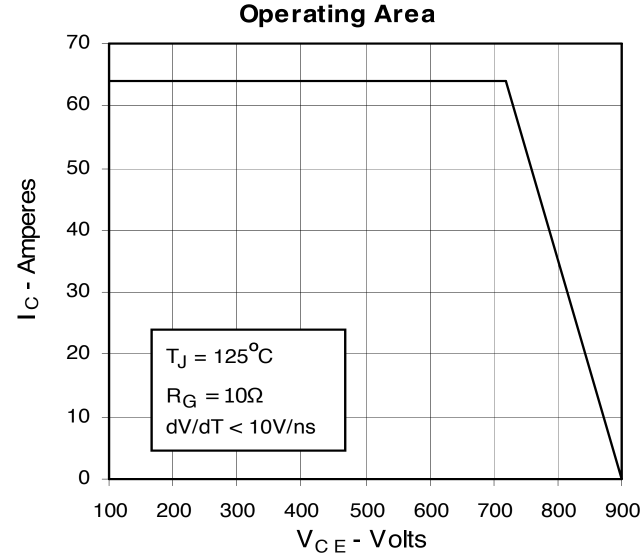
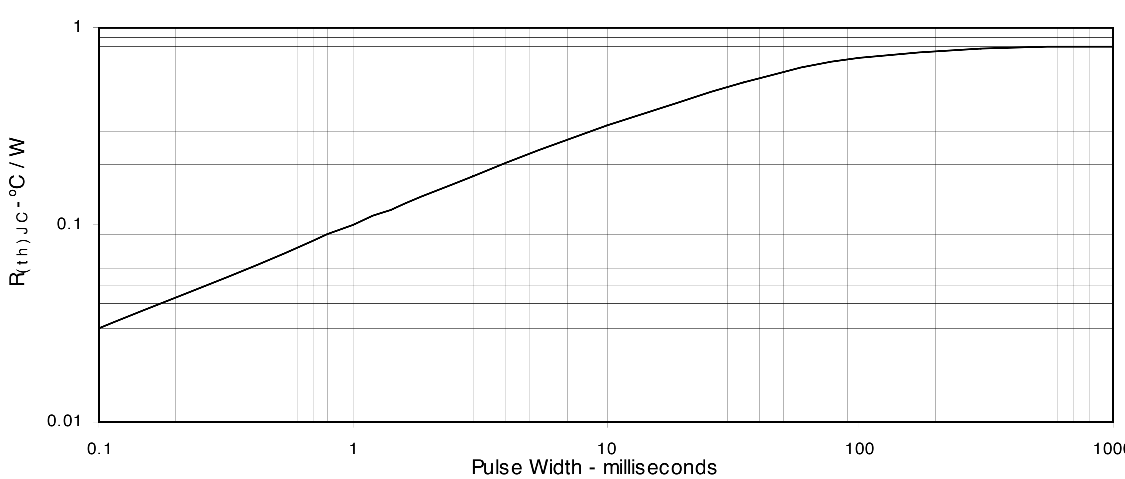


Fig. 11. Maximum Transient Thermal Resistance



IXYS reserves the right to change limits, test conditions, and dimensions.

IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:	4,835,592	4,931,844	5,049,961	5,237,481	6,162,665	6,404,065 B1	6,683,344	6,727,585
	4,850,072	5,017,508	5,063,307	5,381,025	6,259,123 B1	6,534,343	6,710,405B2	6,759,692
	4,881,106	5,034,796	5,187,117	5,486,715	6,306,728 B1	6,583,505	6,710,463	6771478 B2

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

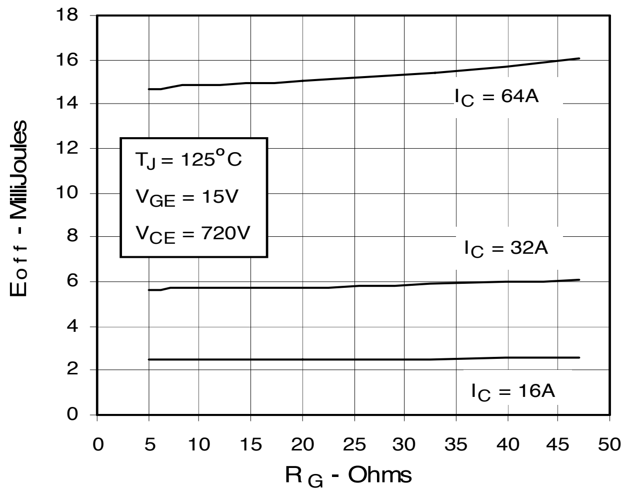


Fig. 13. Dependence of Turn-on Energy Loss on Gate Resistance

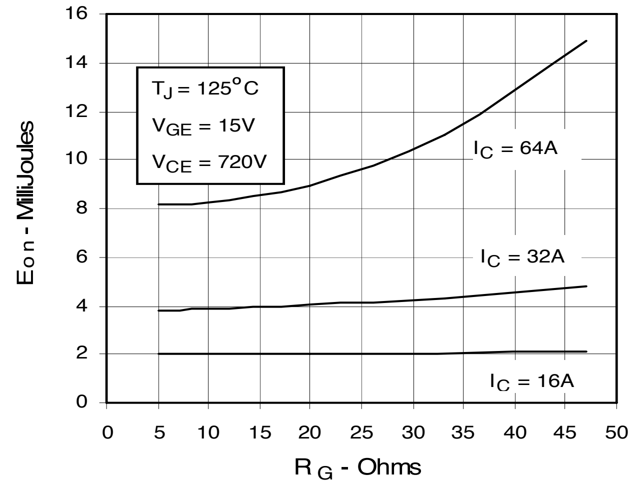


Fig. 14. Dependence of Turn-off Energy Loss on Collector Current

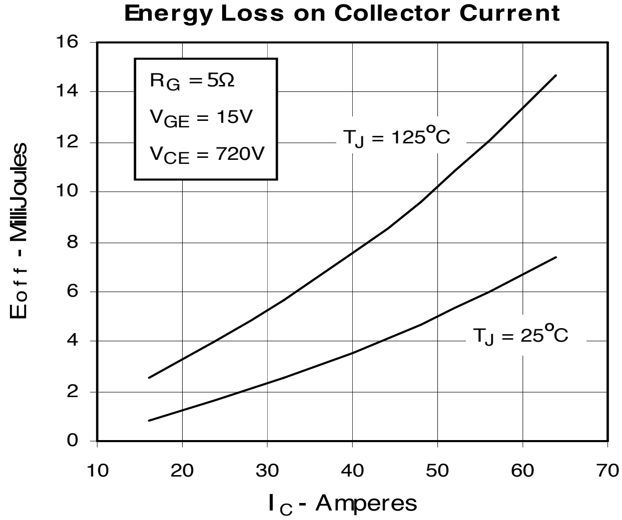


Fig. 15. Dependence of Turn-on Energy Loss on Collector Current

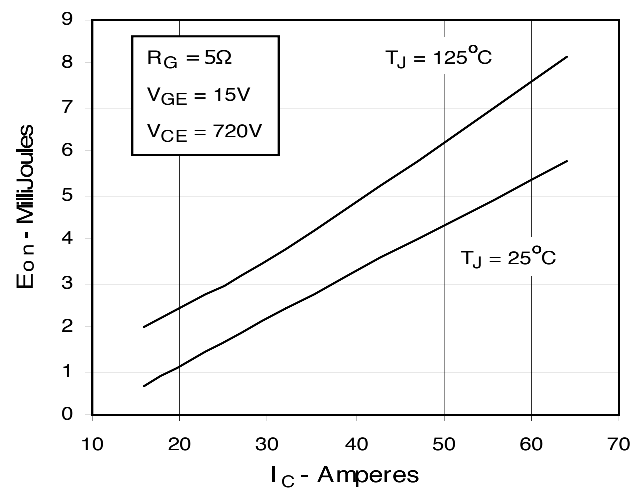


Fig. 16. Dependence of Turn-off Energy Loss on Temperature

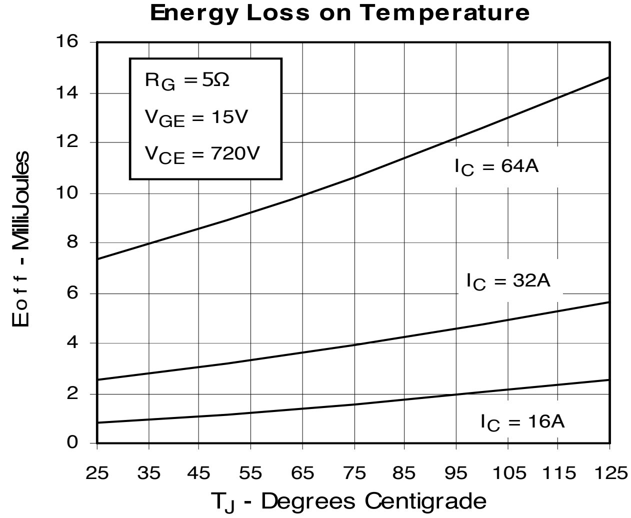


Fig. 17. Dependence of Turn-on Energy Loss on Temperature

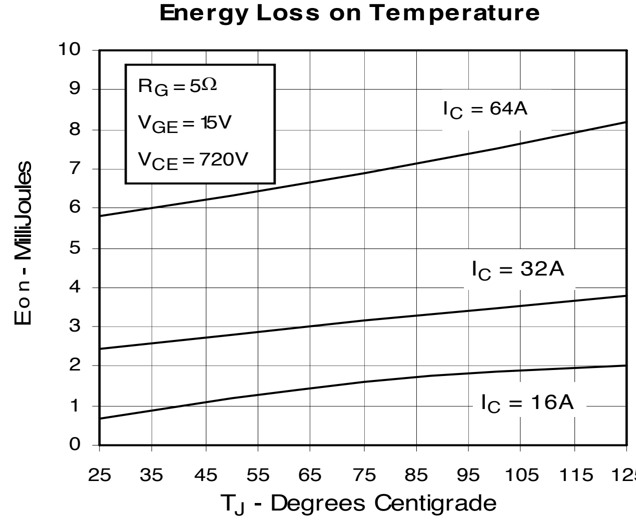


Fig. 18. Dependence of Turn-off Switching Time on Gate Resistance

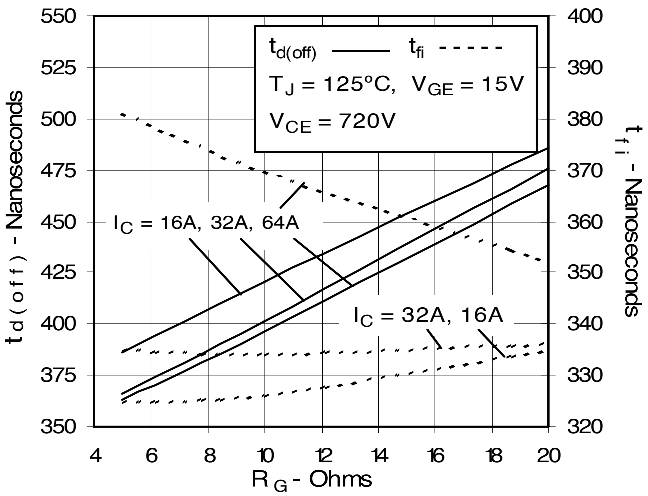


Fig. 19. Dependence of Turn-on Switching Time on Gate Resistance

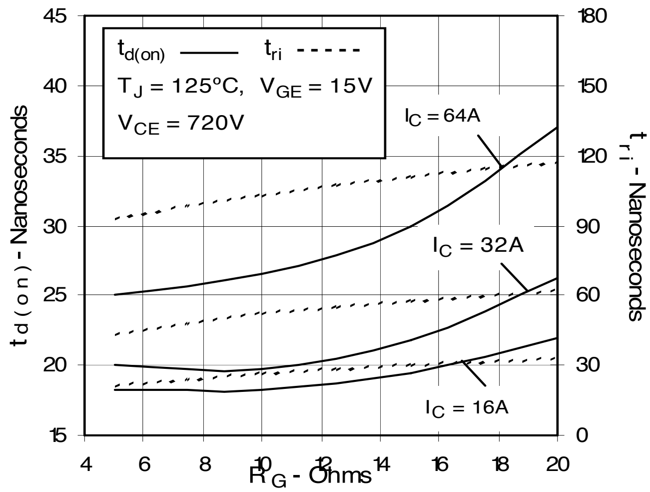


Fig. 20. Dependence of Turn-off Switching Time on Collector Current

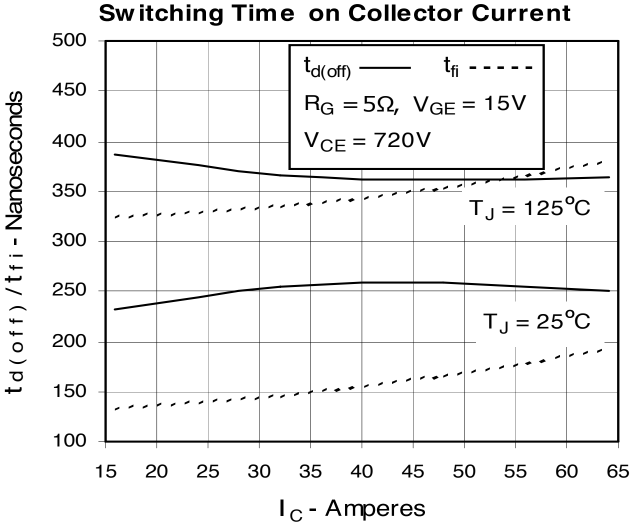


Fig. 21. Dependence of Turn-on Switching Time on Collector Current

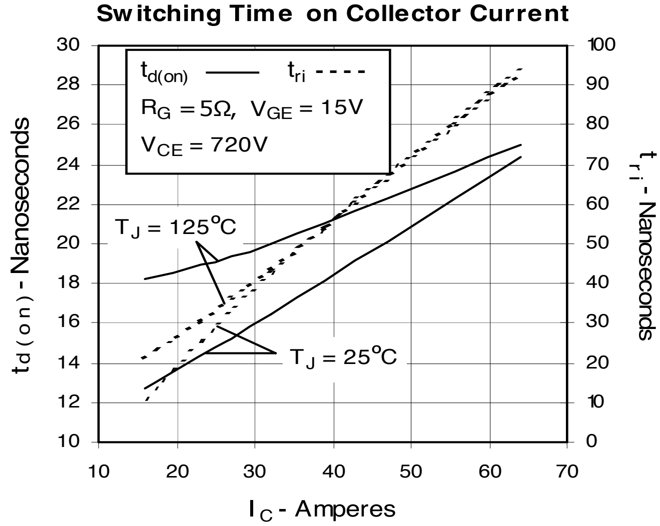


Fig. 22. Dependence of Turn-off Switching Time on Temperature

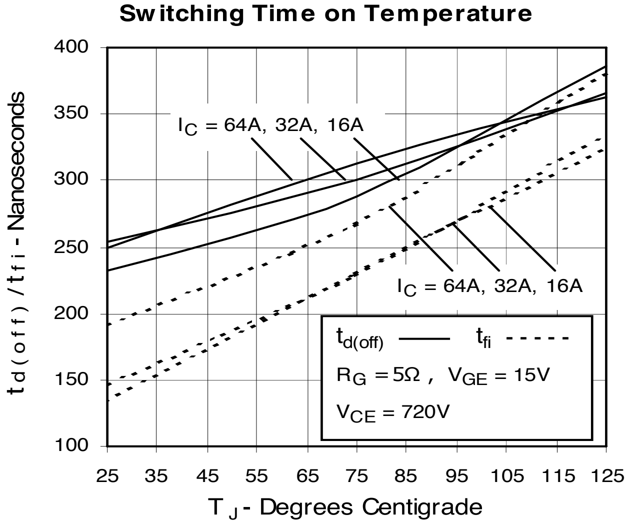
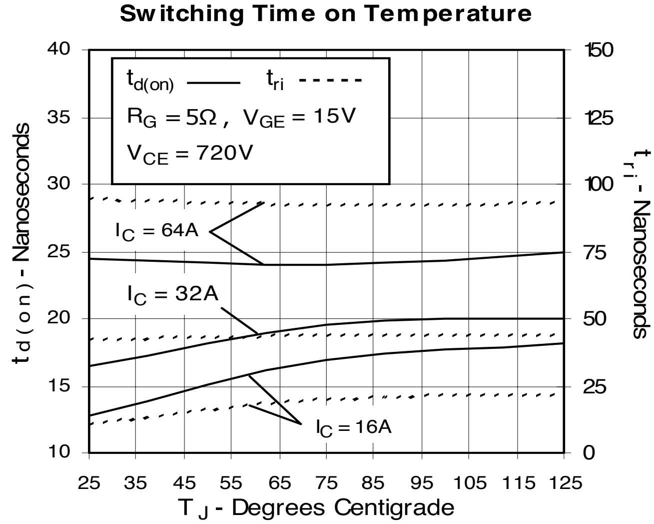


Fig. 23. Dependence of Turn-on Switching Time on Temperature



Ultrafast Diode Characteristics

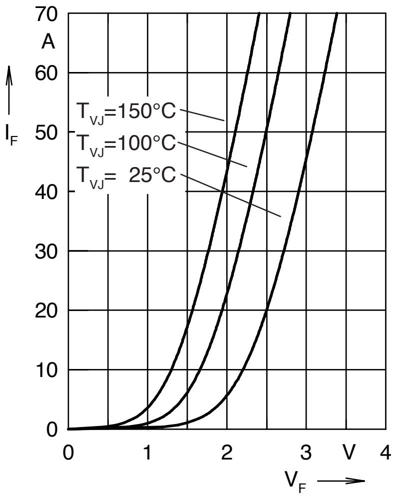


Fig. 24. Forward current I_F versus V_F

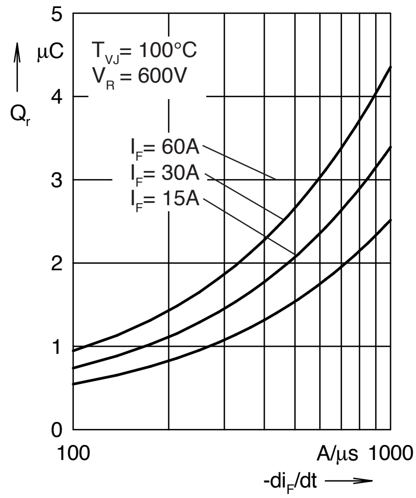


Fig. 25. Reverse recovery charge Q_r versus $-di_F/dt$

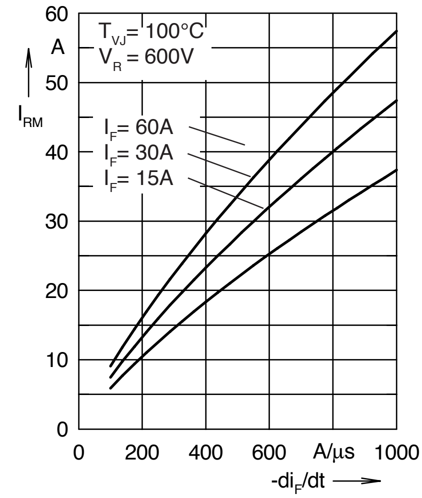


Fig. 26. Peak reverse current I_{RM} versus $-di_F/dt$

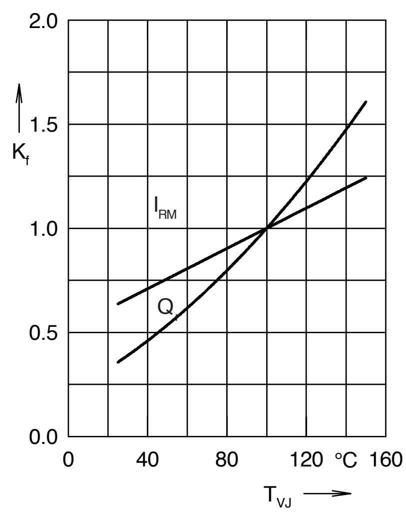


Fig. 27. Dynamic parameters Q_r, I_{RM} versus T_{VJ}

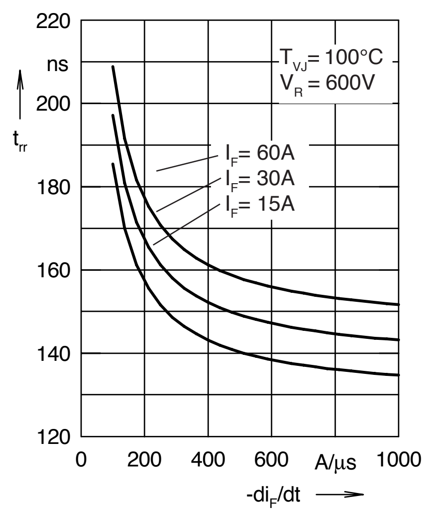


Fig. 28. Recovery time t_{rr} versus $-di_F/dt$

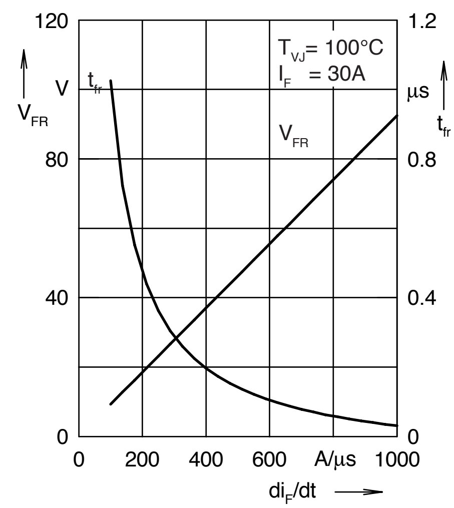


Fig. 29. Peak forward voltage V_{FR} and t_{fr} versus di_F/dt

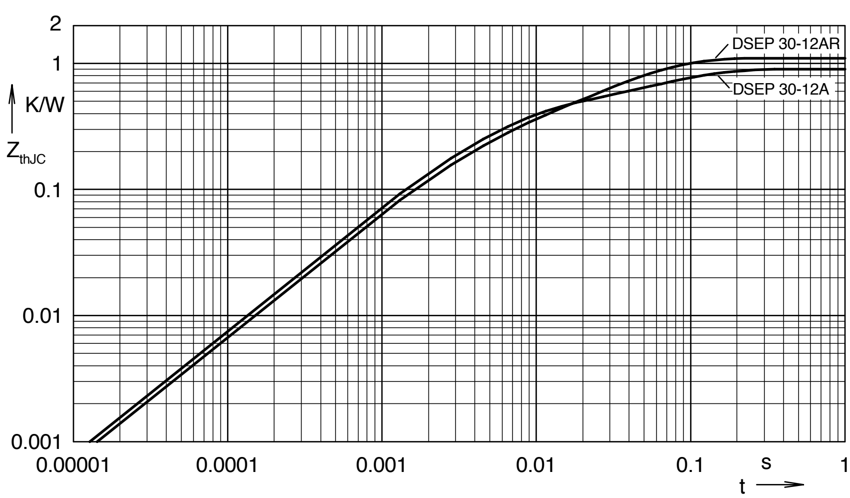


Fig. 30. Transient thermal resistance junction-to-case

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

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