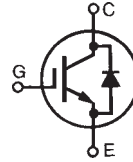


High Voltage IGBT with Diode

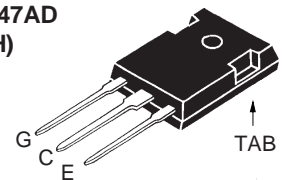
IXGH 28N120BD1
IXGT 28N120BD1

$V_{CES} = 1200 \text{ V}$
 $I_{C25} = 50 \text{ A}$
 $V_{CE(sat)} = 3.5 \text{ V}$
 $t_{fi(typ)} = 160 \text{ ns}$

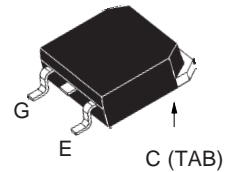


Symbol	Test Conditions	Maximum Ratings	
V_{CES}	$T_J = 25^\circ\text{C to } 150^\circ\text{C}$	1200	V
V_{CGR}	$T_J = 25^\circ\text{C to } 150^\circ\text{C}; R_{GE} = 1 \text{ M}\Omega$	1200	V
V_{GES}	Continuous	± 20	V
V_{GEM}	Transient	± 30	V
I_{C25}	$T_C = 25^\circ\text{C}$	50	A
I_{C110}	$T_C = 110^\circ\text{C}$	28	A
I_{CM}	$T_C = 25^\circ\text{C}, 1 \text{ ms}$	150	A
SSOA (RBSOA)	$V_{GE} = 15 \text{ V}, T_J = 125^\circ\text{C}, R_G = 10 \Omega$ Clamped inductive load	$I_{CM} = 120$ @ $0.8 V_{CES}$	A
P_C	$T_C = 25^\circ\text{C}$	250	W
T_J		-55 ... +150	$^\circ\text{C}$
T_{JM}		150	$^\circ\text{C}$
T_{stg}		-55 ... +150	$^\circ\text{C}$
M_d	Mounting torque (TO-247)	1.13/10	Nm/lb.in.
Maximum lead temperature for soldering 1.6 mm (0.062 in.) from case for 10 s		300	$^\circ\text{C}$
Maximum tab temperature soldering SMD devices for 10s		260	$^\circ\text{C}$
Weight	TO-247AD/TO-268	6/4	g

TO-247AD (IXGH)



TO-268 (IXGT)



G = Gate C = Collector
E = Emitter TAB = Collector

Features

- International standard packages: JEDEC TO-247AD & TO-268
- IGBT and anti-parallel FRED for resonant power supplies
 - Induction heating
 - Rice cookers
- MOS Gate turn-on
 - drive simplicity
- Fast Recovery Expitaxial Diode (FRED)
 - soft recovery with low I_{RM}

Advantages

- Saves space (two devices in one package)
- Easy to mount with 1 screw (isolated mounting screw hole)
- Reduces assembly time and cost

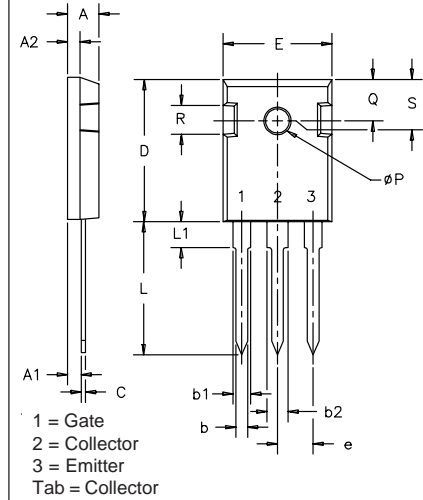
Symbol	Test Conditions	Characteristic Values ($T_J = 25^\circ\text{C}$, unless otherwise specified)		
		min.	typ.	max.
$V_{GE(th)}$	$I_C = 250 \mu\text{A}, V_{CE} = V_{GE}$	2.5		5.0 V
I_{CES}	$V_{CE} = V_{CES}$ $V_{GE} = 0 \text{ V}$	$T = 25^\circ\text{C}$		50 μA
		$T = 125^\circ\text{C}$		250 μA
I_{GES}	$V_{CE} = 0 \text{ V}, V_{GE} = \pm 20 \text{ V}$			$\pm 100 \text{ nA}$
$V_{CE(sat)}$	$I_C = 28 \text{ A}, V_{GE} = 15 \text{ V}$ Note 2	$T = 125^\circ\text{C}$	2.9	3.5 V
			2.8	

Symbol	Test Conditions	Characteristic Values ($T_J = 25^\circ\text{C}$, unless otherwise specified)		
		min.	typ.	max.
g_{fs}	$I_C = 28\text{A}; V_{CE} = 10\text{V}$, Note 2.	15	23	S
C_{ies}	$V_{CE} = 25\text{V}; V_{GE} = 0\text{V}; f = 1\text{MHz}$		1700	pF
C_{oes}		130	pF	
C_{res}		45	pF	
Q_g	$I_C = 28\text{A}; V_{GE} = 15\text{V}; V_{CE} = 0.5 V_{CES}$		92	nC
Q_{ge}		13	nC	
Q_{gc}		35	nC	
$t_{d(on)}$	Inductive load, $T_J = 25^\circ\text{C}$		30	ns
t_{ri}	$I_C = 28\text{A}; V_{GE} = 15\text{V}$		20	ns
$t_{d(off)}$	$V_{CE} = 0.8 V_{CES}; R_G = R_{off} = 5\ \Omega$ Note 1.	210	280	ns
t_{fi}		170	320	ns
E_{off}		2.2	5.0	mJ
$t_{d(on)}$	Inductive load, $T_J = 125^\circ\text{C}$		35	ns
t_{ri}	$I_C = 28\text{A}; V_{GE} = 15\text{V}$		28	ns
E_{on}	$V_{CE} = 0.8 V_{CES}; R_G = R_{off} = 5\ \Omega$		1.4	mJ
$t_{d(off)}$	Note 1	250		ns
t_{fi}		340		ns
E_{off}		4.6		mJ
R_{thJC} R_{thCK}	(TO-247)		0.25	0.5 K/W K/W

Symbol	Test Conditions	Characteristic Values ($T_J = 25^\circ\text{C}$, unless otherwise specified)		
		min.	typ.	max.
V_F	$I_F = 10\text{A}; V_{GE} = 0\text{V}$ $I_F = 10\text{A}; V_{GE} = 0\text{V}; T_J = 125^\circ\text{C}$			2.95 V 2.0 V
I_F	$T_C = 90^\circ\text{C}$			10 A
I_{RM}	$I_F = 10\text{A}; -di_F/dt = 400\text{A}/\mu\text{s}; V_R = 600\text{V}$		14	A
t_{rr}	$V_{GE} = 0\text{V}; T_J = 125^\circ\text{C}$		120	ns
t_{rr}	$I_F = 1\text{A}; -di_F/dt = 100\text{A}/\mu\text{s}; V_R = 30\text{V}; V_{GE} = 0\text{V}$		40	ns
R_{thJC}				2.5 K/W

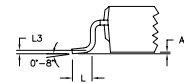
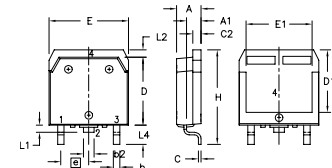
- Notes:
- Switching times may increase for $V_{CE}(\text{Clamp}) > 0.8 \cdot V_{CES}$, higher T_J or increased R_G .
 - Pulse test, $t \leq 300\ \mu\text{s}$, duty cycle $d \leq 2\%$

TO-247 AD Outline



SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.185	.209	4.7	5.3
A1	.087	.102	2.2	2.54
A2	.059	.098	2.2	2.6
b	.040	.055	1.0	1.4
b1	.065	.084	1.65	2.13
b2	.113	.123	2.87	3.12
C	.016	.031	.4	.8
D	.819	.845	20.80	21.46
E	.610	.640	15.75	16.26
e	.215 BSC		5.45 BSC	
L	.780	.800	19.81	20.32
L1	.177		4.50	
ϕP	.140	.144	3.55	3.65
Q	.212	.244	5.4	6.2
R	.170	.216	4.32	5.49
S	.242 BSC		6.15 BSC	

TO-268 Outline



Dim.	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	4.9	5.1	.193	.201
A1	2.7	2.9	.106	.114
A2	.02	.25	.001	.010
b	1.15	1.45	.045	.057
b2	1.9	2.1	.075	.083
C	.4	.65	.016	.026
D	13.80	14.00	.543	.551
E	15.85	16.05	.624	.632
E1	13.3	13.6	.524	.535
e	5.45 BSC		.215 BSC	
H	18.70	19.10	.736	.752
L	2.40	2.70	.094	.106
L1	1.20	1.40	.047	.055
L2	1.00	1.15	.039	.045
L3	0.25 BSC		.010 BSC	
L4	3.80	4.10	.150	.161

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

Fig. 1. Output Characteristics
@ 25 °C

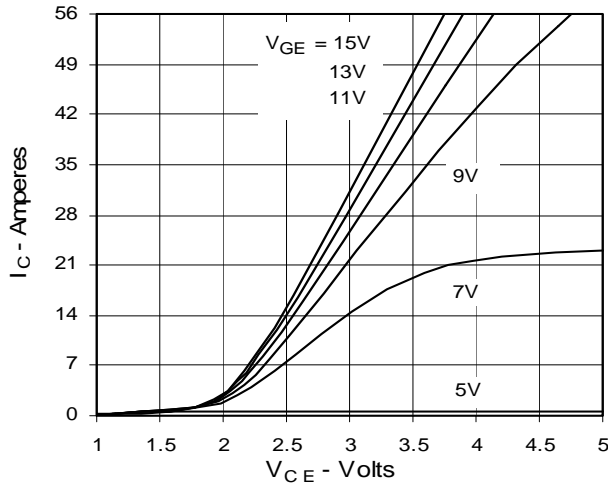


Fig. 2. Extended Output Characteristics
@ 25 °C

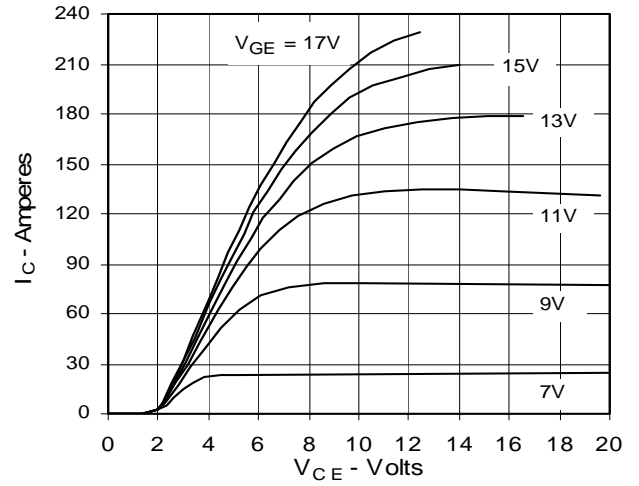


Fig. 3. Output Characteristics
@ 125 °C

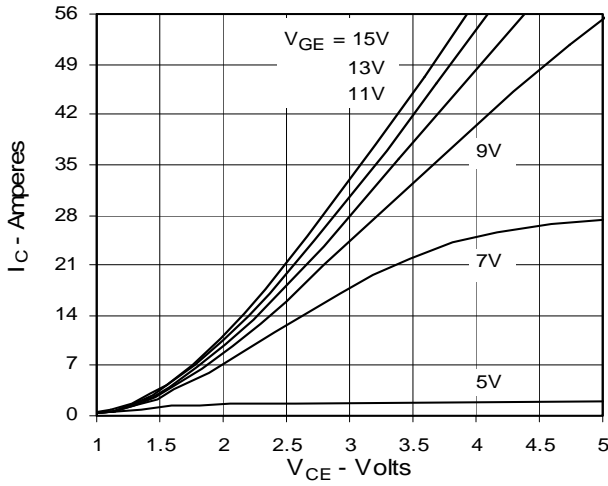


Fig. 4. Dependence of $V_{CE(sat)}$ on Temperature

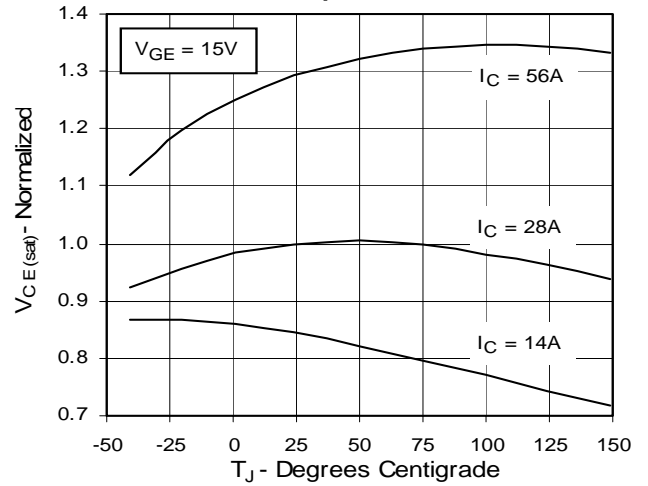


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter voltage

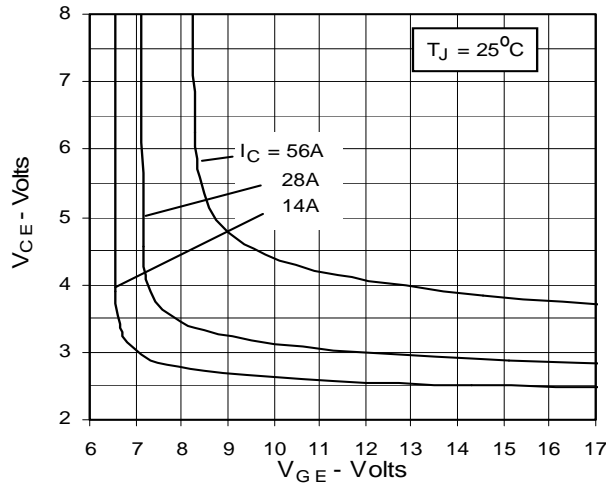


Fig. 6. Input Admittance

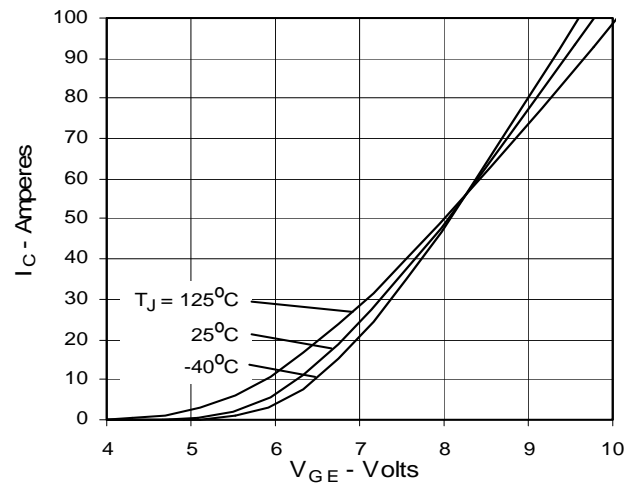


Fig. 7. Transconductance

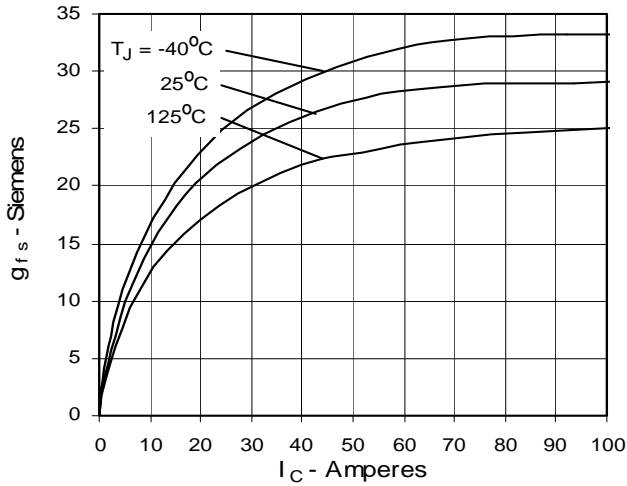


Fig. 8. Dependence of Turn-off Energy Loss on R_G

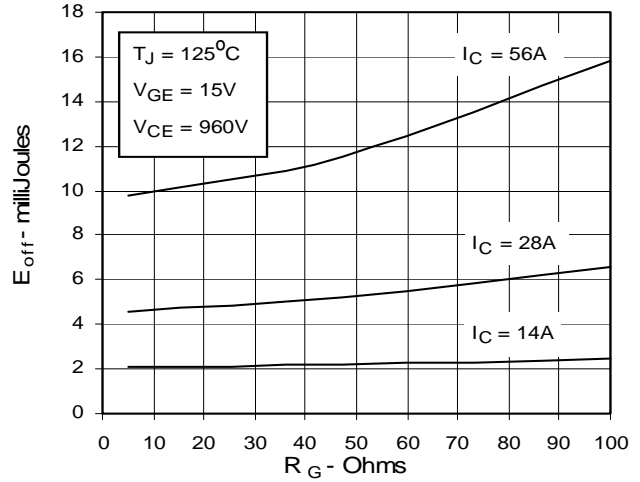


Fig. 9. Dependence of Turn-Off Energy Loss on I_C

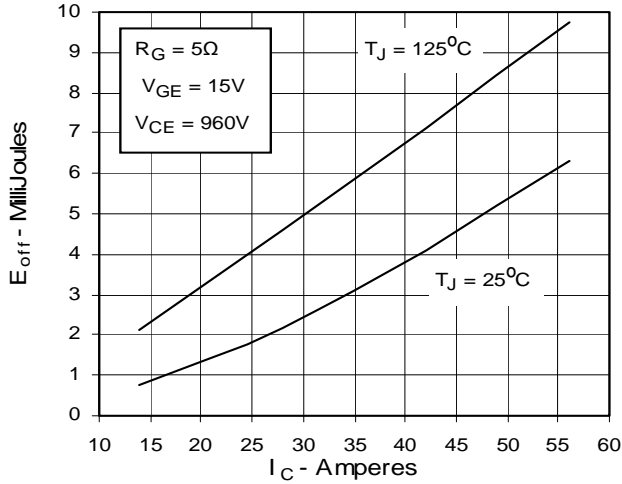


Fig. 10. Dependence of Turn-off Energy Loss on Temperature

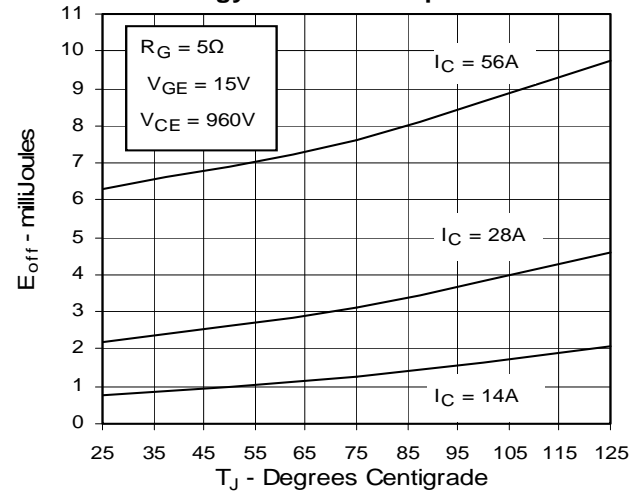


Fig. 11. Dependence of Turn-off Switching Time on R_G

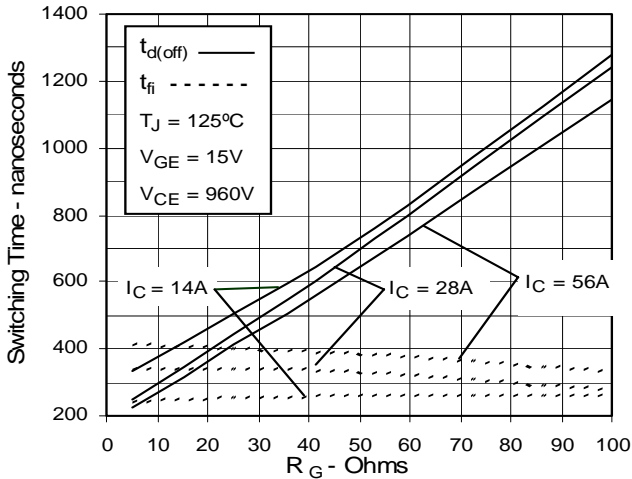
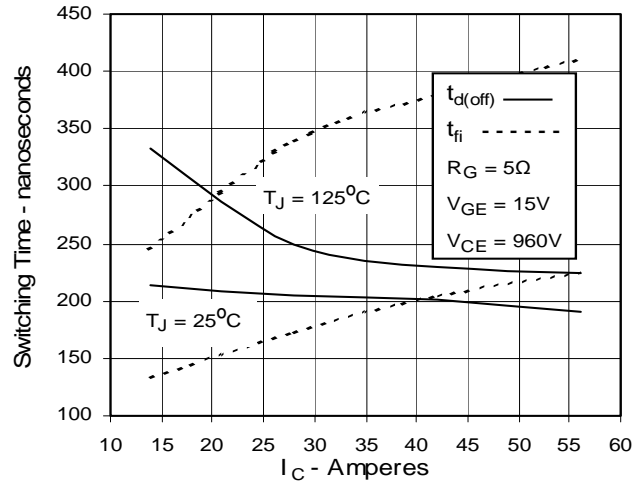


Fig. 12. Dependence of Turn-off Switching Time on I_C



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IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:

4,835,592	4,881,106	5,017,508	5,049,961	5,187,117	5,381,025	6,162,665	6,306,728 B1	6,534,343	6,683,344
4,850,072	4,931,844	5,034,796	5,063,307	5,237,481	5,486,715	6,259,123 B1	6,404,065 B1	6,583,505	6,710,405 B2

Fig. 13. Dependence of Turn-off Switching Time on Temperature

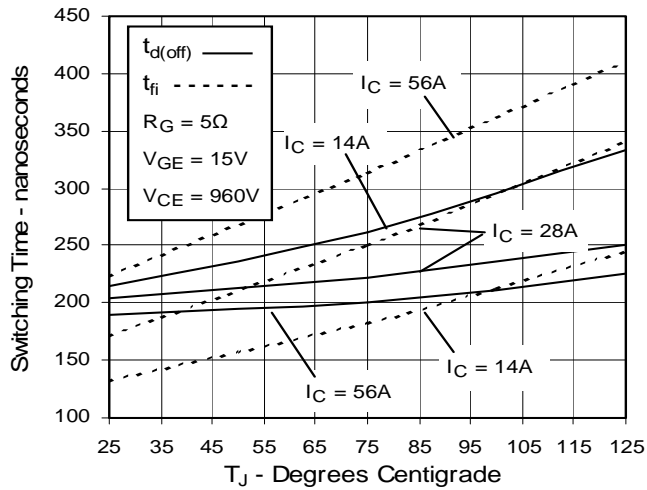


Fig. 14. Gate Charge

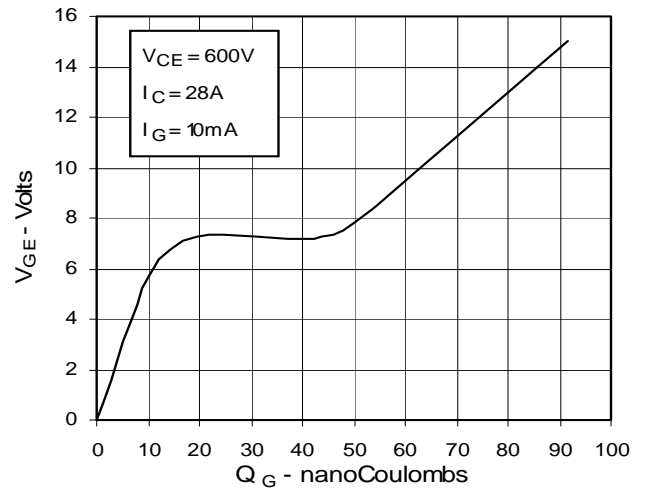


Fig. 15. Capacitance

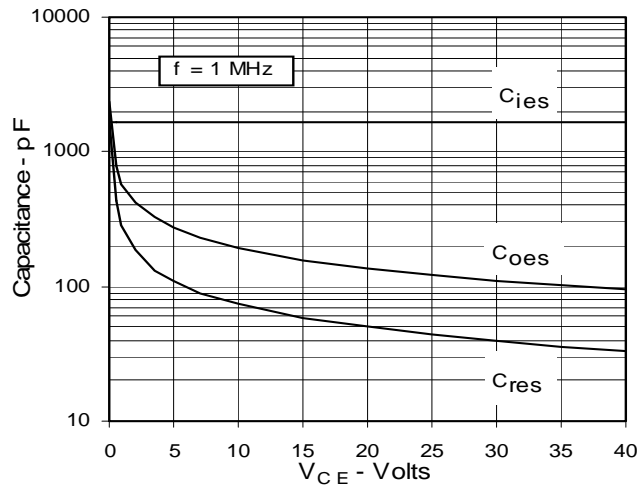


Fig. 16. Reverse-Bias Safe Operating Area

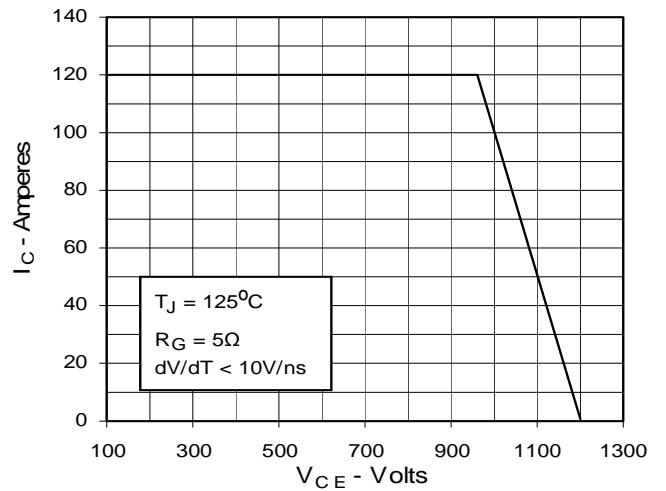
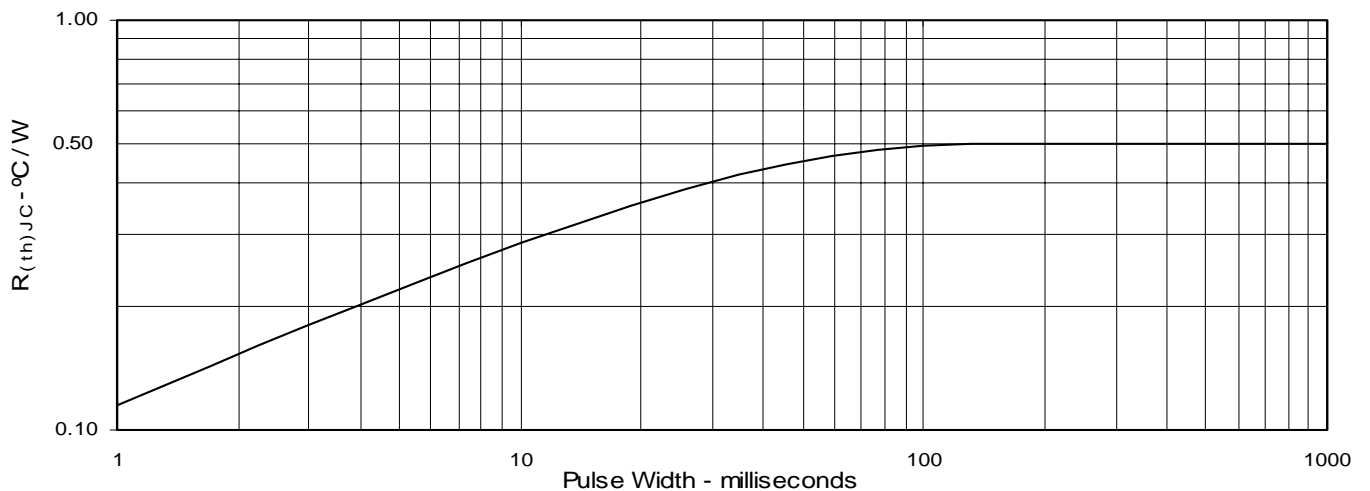


Fig. 17. Maximum Transient Thermal Resistance



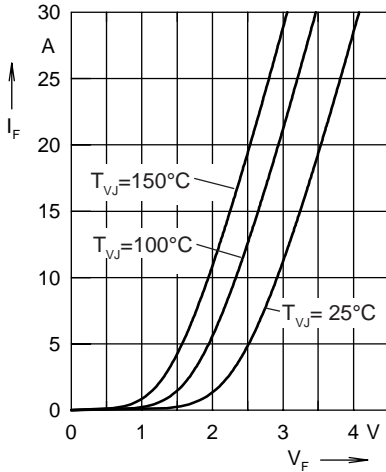


Fig. 18. Forward current I_F versus V_F

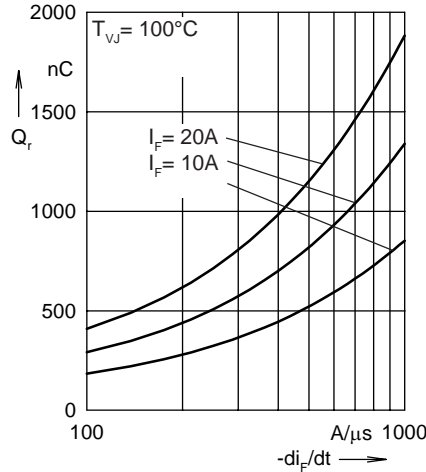


Fig. 19. Reverse recovery charge Q_r

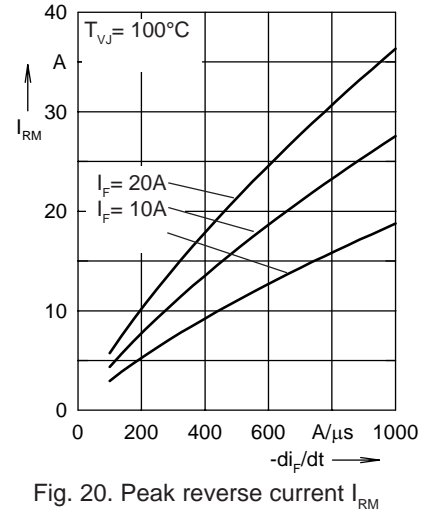


Fig. 20. Peak reverse current I_{RM}

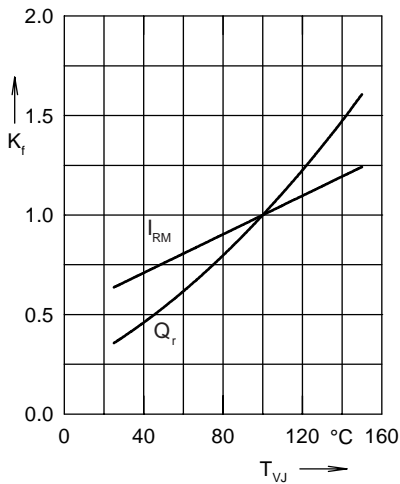


Fig. 21. Dynamic parameters Q_r , I_{RM}

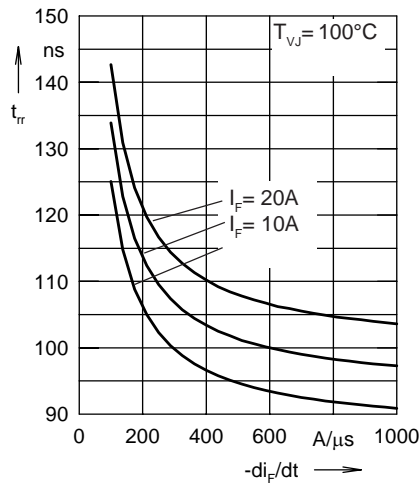


Fig. 22. Recovery time t_{tr} versus $-di_F/dt$

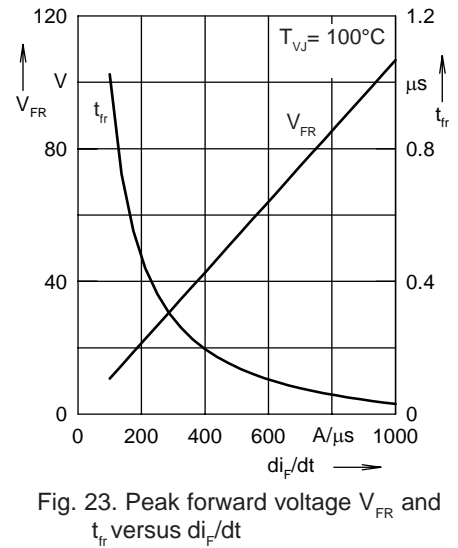


Fig. 23. Peak forward voltage V_{FR} and t_{tr} versus di_F/dt

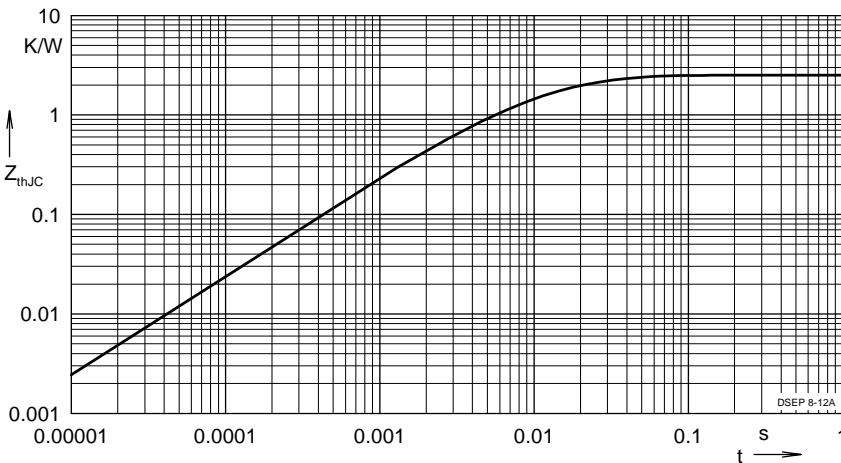


Fig. 24. Transient thermal resistance junction to case

Constants for Z_{thJC} calculation:

i	R_{thi} (K/W)	t_i (s)
1	1.449	0.0052
2	0.558	0.0003

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[IKP20N60TXKSA1](#) [IHW20N65R5XKSA1](#)