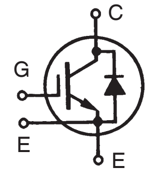
IGBT with Diode

Short Circuit SOA Capability

IXSN 80N60BD1

V_{CES} = 600 V
I_{C25} = 160 A
$V_{CE(sat)}$ = 2.5 V
t_{fi} = 180 ns

Preliminary Data Sheet

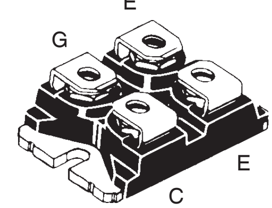


Symbol	Test Conditions	Maximum Ratings	
V_{CES}	T_J = 25°C to 150°C	600	V
V_{CGR}	T_J = 25°C to 150°C; R_{GE} = 1 MΩ	600	A
V_{GES}	Continuous	±20	V
V_{GEM}	Transient	±30	V
I_{C25}	T_C = 25°C (Silicon chip capability)	160	A
I_L	Lead current limit (RMS)	100	A
I_{C90}	T_C = 90°C	80	A
I_{CM}	T_C = 25°C, 1 ms	300	A
SSOA (RBSOA)	V_{GE}= 15 V, T_{VJ} = 125°C, R_G = 5 Ω Clamped inductive load	I_{CM} = 160 @ 0.8 V_{CES}	A
t_{SC} **(SCSOA)**	V_{GE}= 15 V, V_{CE} = 360 V, T_J = 125°C R_G = 22 Ω, non repetitive	10	µs
P_C	T_C = 25°C	420	W
V_{ISOL}	50/60 Hz t = 1 min I_{ISOL} ≤ 1 mA t = 1 s	2500 3000	V~ V~
T_J		-55 ... +150	°C
T_{JM}		150	°C
T_{stg}		-55 ... +150	°C
M_d	Mounting torque	0.4/6	Nm/lb.in.
Weight		30	g

Symbol	Test Conditions		Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
BV_{CES}	I_C = 500 µA, V_{GE} = 0 V		600			V
$V_{GE(th)}$	I_C = 8 mA, V_{CE} = V_{GE}		4		8	V
I_{CES}	V_{CE} = V_{CES} V_{GE} = 0 V	T_J = 25°C T_J = 125°C			200 2	µA mA
I_{GES}	V_{CE} = 0 V, V_{GE} = ±20 V				±200	nA
$V_{CE(sat)}$	I_C = I_{C90}, V_{GE} = 15 V; Note 1				2.5	V

miniBLOC, SOT-227 B

E153432



E = Emitter ①, C = Collector
G = Gate, E = Emitter ①

① Either Emitter terminal can be used as Main or Kelvin Emitter

Features

- International standard package
- Aluminium-nitride isolation
  - high power dissipation
- Isolation voltage 3000 V~
- UL registered E 153432
- Low $V_{CE(sat)}$
  - for minimum on-state conduction losses
- Fast Recovery Epitaxial Diode
  - short t_{rr} and I_{RM}
- Low collector-to-case capacitance (< 60 pF)
  - reduced RFI
- Low package inductance (< 10 nH)
  - easy to drive and to protect

Applications

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

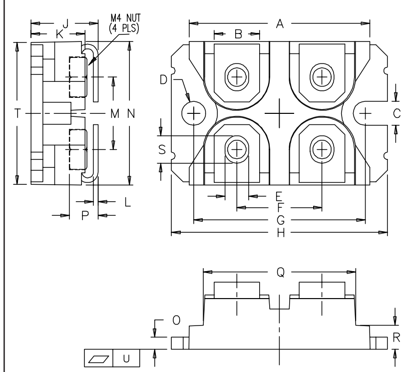
Advantages

- Space savings
- Easy to mount with 2 screws
- High power density

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

Symbol	Test Conditions	Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
g_{fs}	I_C = 60 A; V_{CE} = 10 V, Note1	52			S
C_{ies}	V_{CE} = 25 V, V_{GE} = 0 V, f = 1 MHz		6600		pF
C_{oes}			720		pF
C_{res}			196		pF
Q_g	$I_C = I_{C90}$, V_{GE} = 15 V, $V_{CE} = 0.5\ V_{CES}$		200		nC
Q_{ge}			70		nC
Q_{gc}			60		nC
$t_{d(on)}$	**Inductive load, T_J = 25°C**		60		ns
t_{ri}	$I_C = I_{C90}$, V_{GE} = 15 V, L = 100 µH,		50		ns
$t_{d(off)}$	$V_{CE} = 0.8\ V_{CES}$, R_G = 2.7 Ω		140	280	ns
t_{fi}	Note 2		120	200	ns
E_{off}			1.8	3.5	mJ
$t_{d(on)}$	**Inductive load, T_J = 125°C**		60		ns
t_{ri}	$I_C = I_{C90}$, V_{GE} = 15 V, L = 100 µH		60		ns
E_{on}	$V_{CE} = 0.8\ V_{CES}$, R_G = 2.7 Ω		4.8		mJ
$t_{d(off)}$	Note 2		190		ns
t_{fi}			160		ns
E_{off}			3.3		mJ
R_{thJC}				0.30	K/W
R_{thCK}			0.05		K/W

miniBLOC, SOT-227 B



M4 screws (4x) supplied

Dim.	Millimeter Min.	Max.	Inches Min.	Max.
A	31.50	31.88	1.240	1.255
B	7.80	8.20	0.307	0.323
C	4.09	4.29	0.161	0.169
D	4.09	4.29	0.161	0.169
E	4.09	4.29	0.161	0.169
F	14.91	15.11	0.587	0.595
G	30.12	30.30	1.186	1.193
H	38.00	38.23	1.496	1.505
J	11.68	12.22	0.460	0.481
K	8.92	9.60	0.351	0.378
L	0.76	0.84	0.030	0.033
M	12.60	12.85	0.496	0.506
N	25.15	25.42	0.990	1.001
O	1.98	2.13	0.078	0.084
P	4.95	5.97	0.195	0.235
Q	26.54	26.90	1.045	1.059
R	3.94	4.42	0.155	0.174
S	4.72	4.85	0.186	0.191
T	24.59	25.07	0.968	0.987
U	-0.05	0.1	-0.002	0.004

Reverse Diode (FRED)

Symbol	Test Conditions	Characteristic Values (T_J = 25°C, unless otherwise specified) typ.	max.	
V_F	I_F = 60 A, Note 1		2.05	V
	T_J = 150°C		1.4	V
I_{RM}	$I_F = I_{C90}$, V_{GE} = 0 V, $-di_F/dt$ = 100 A/µs; V_R = 100 V, T_J = 100°C		8.0	A
t_{rr}	I_F = 1 A, -di/dt = 50 A/µs, V_R = 30 V	35		ns
R_{thJC}			0.85	K/W

Note: 1. Pulse test, t ≤ 300 µs, duty cycle d ≤ 2%
Note: 2. Remarks: Switching times may increase for V_{CE} (Clamp) > 0.8 • V_{CES}, higher T_J or increased R_G

Fig. 1. Output Characteristics @ 25 Deg. C

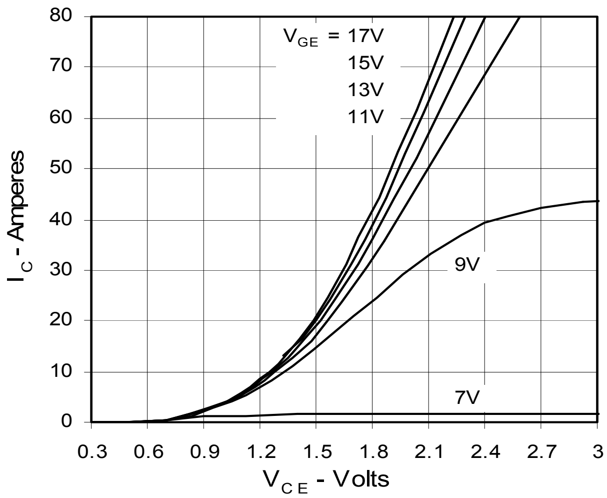


Fig. 2. Extended Output Characteristics @ 25 deg. C

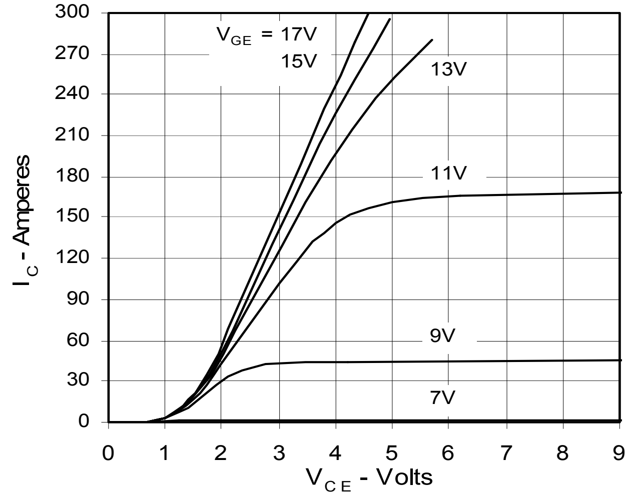


Fig. 3. Output Characteristics @ 125 Deg. C

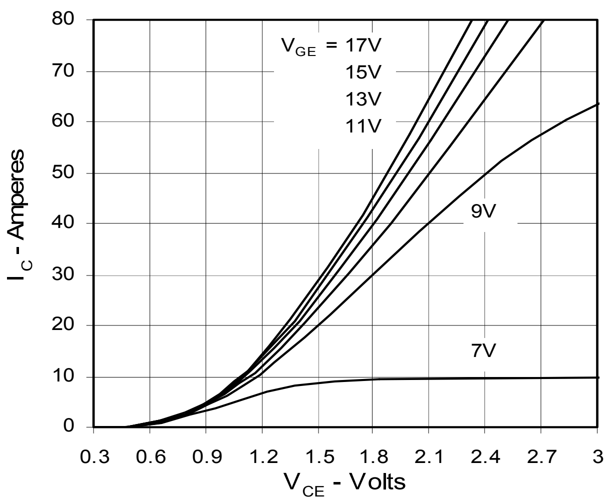


Fig. 4. Dependence of $V_{CE(sat)}$ on Temperature

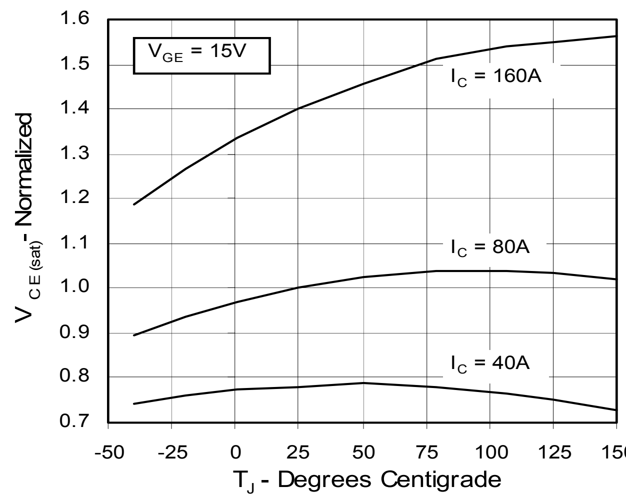


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emiiter voltage

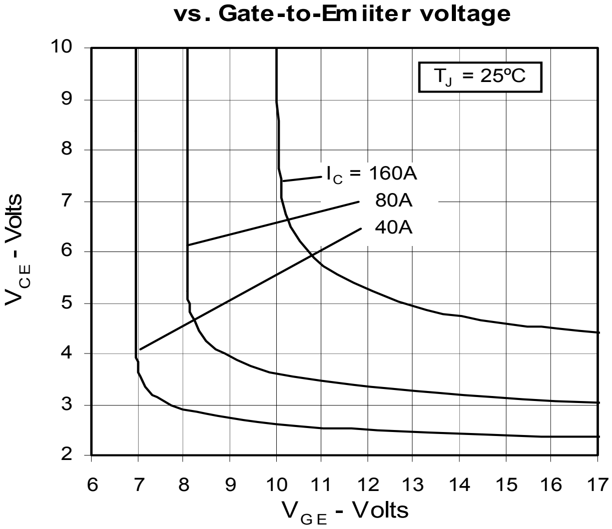


Fig. 6. Input Admittance

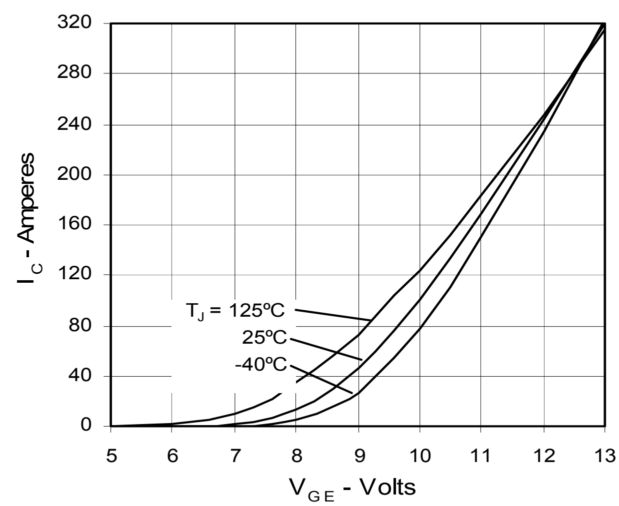


Fig. 7. Transconductance

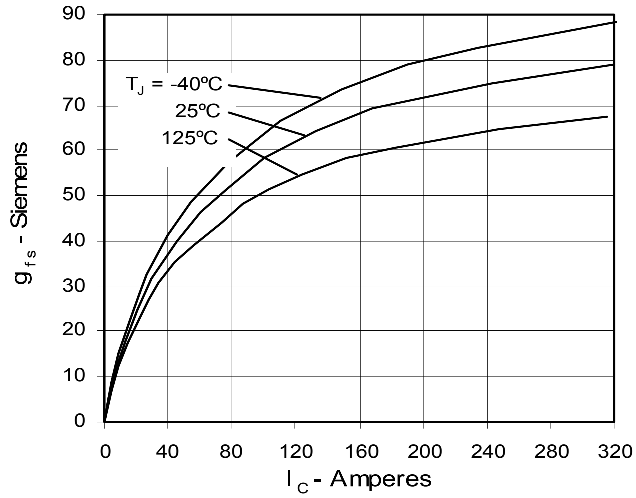


Fig. 8. Dependence of Turn-off Energy Loss on R_G

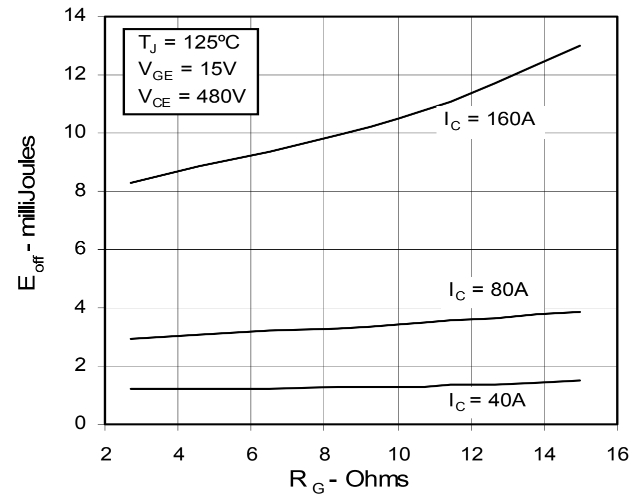


Fig. 9. Dependence of Turn-Off Energy Loss on I_C

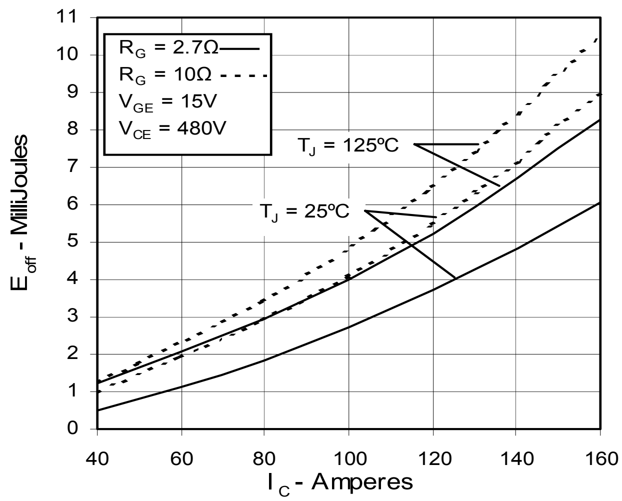


Fig. 10. Dependence of Turn-off Energy Loss on Temperature

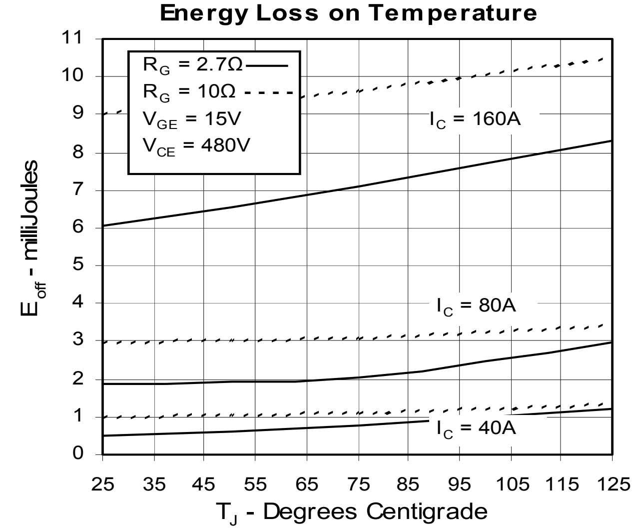


Fig. 11. Dependence of Turn-off Switching Time on R_G

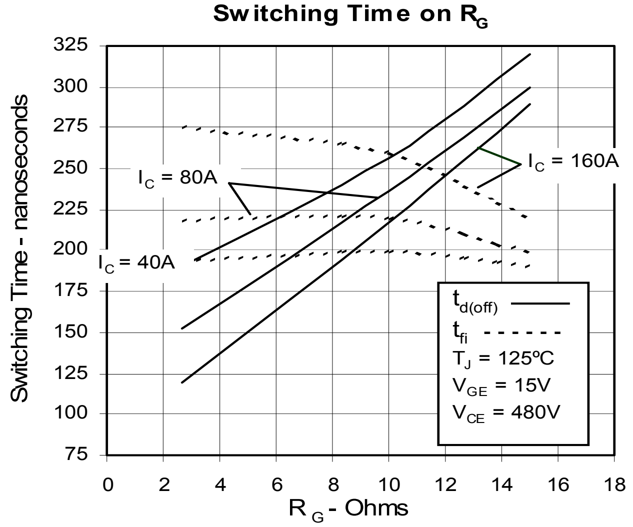
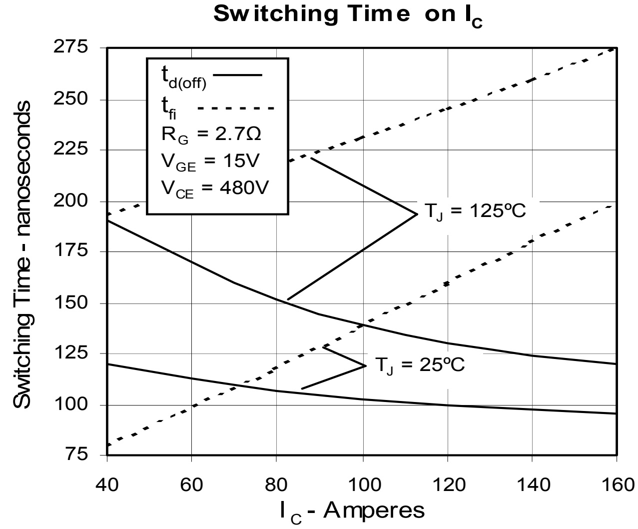


Fig. 12. Dependence of Turn-off Switching Time on I_C



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

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

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

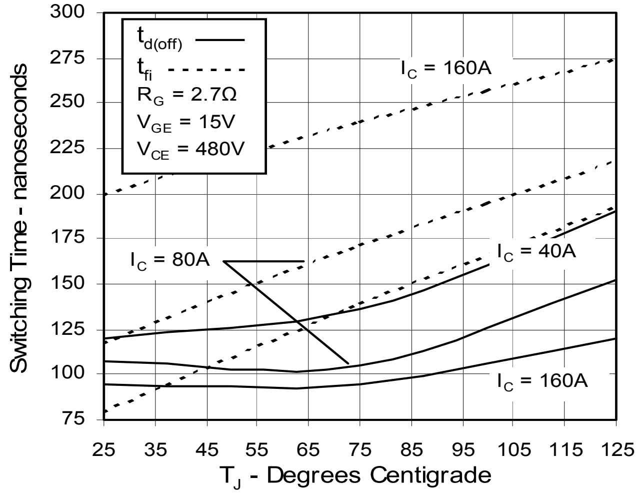


Fig. 14. Gate Charge

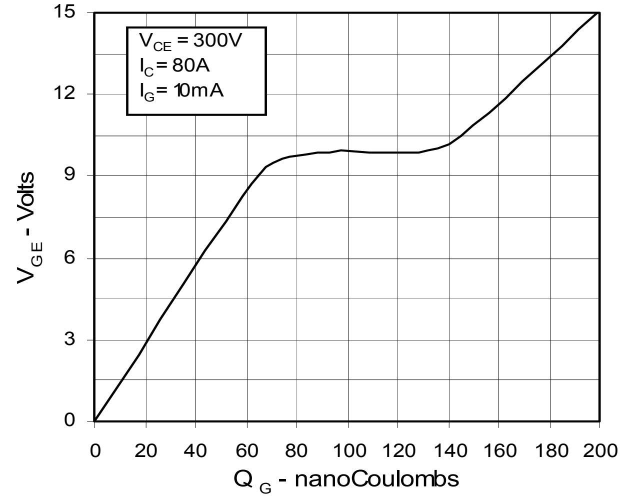


Fig. 15. Capacitance

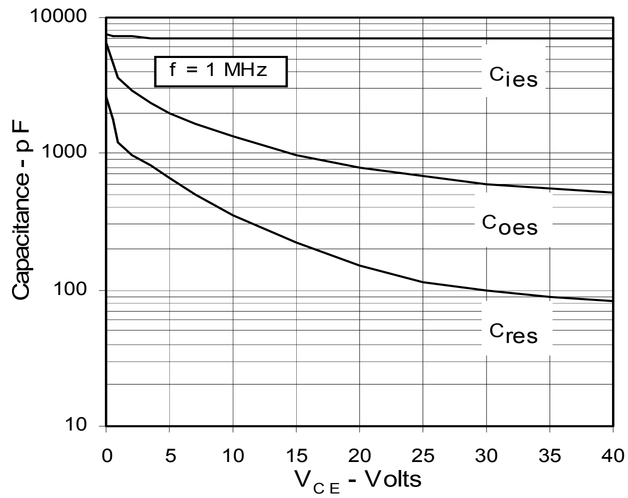
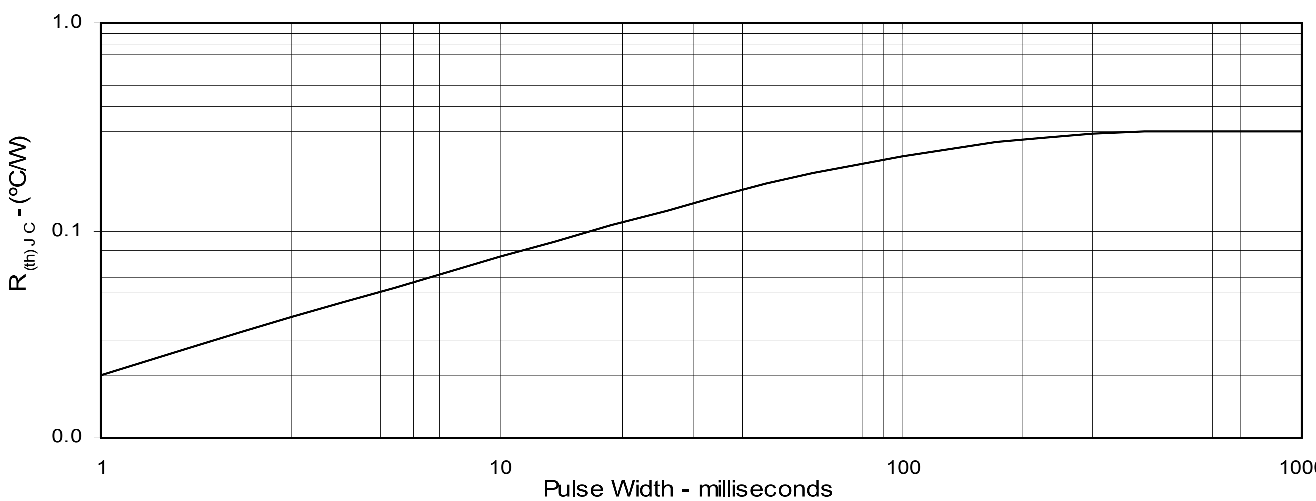


Fig. 16. Maximum Transient Thermal Resistance



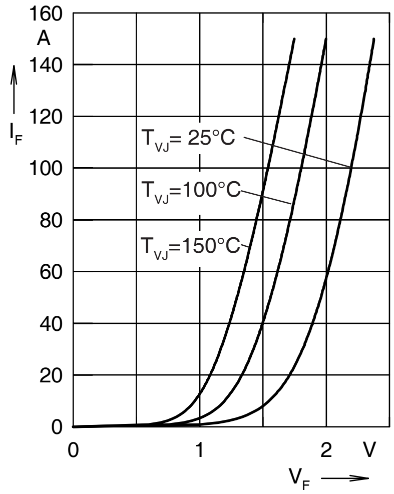


Fig. 17. Forward current I_F versus V_F

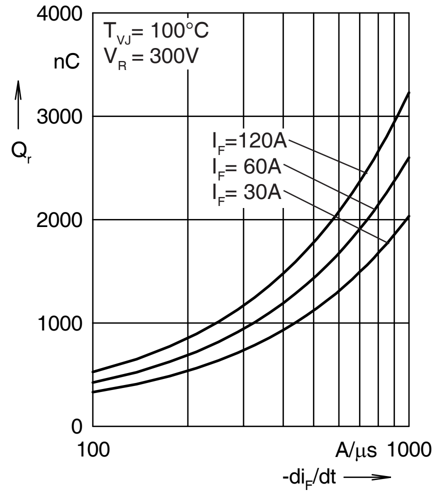


Fig. 18. Reverse recovery charge Q_r versus $-di_F/dt$

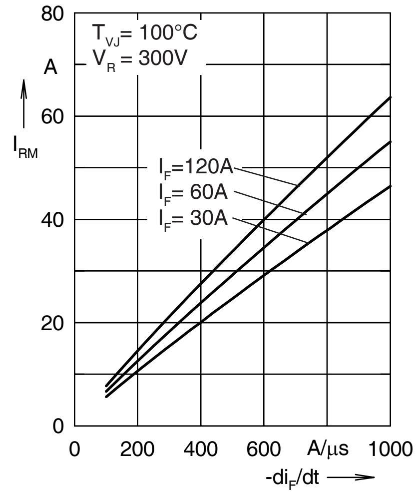


Fig. 19. Peak reverse current I_{RM} versus $-di_F/dt$

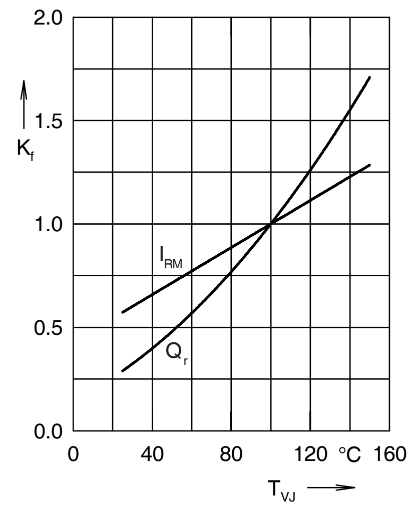


Fig. 20. Dynamic parameters Q_r, I_{RM} versus T_{VJ}

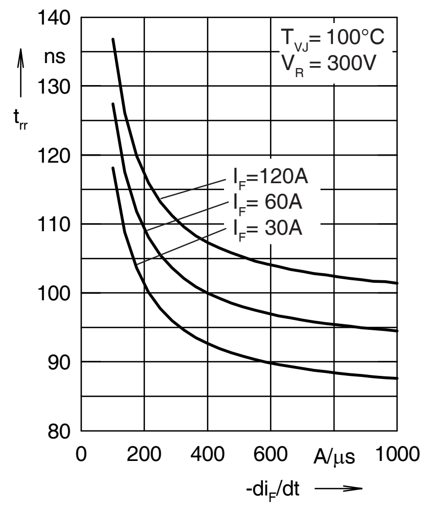


Fig. 21. Recovery time t_{rr} versus $-di_F/dt$

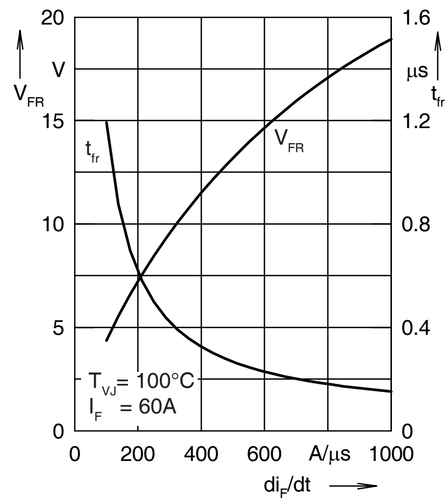


Fig. 22. Peak forward voltage V_{FR} and t_{fr} versus di_F/dt

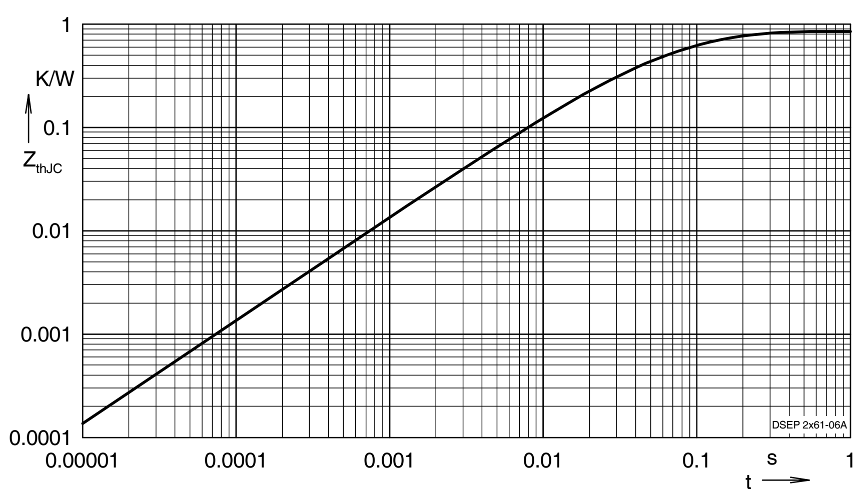


Fig. 7 Transient thermal resistance junction to case

Constants for Z_{thJC} calculation:

i	R_{thi} (K/W)	t_i (s)
1	0.3073	0.0055
2	0.3533	0.0092
3	0.0887	0.0007
4	0.1008	0.0399