

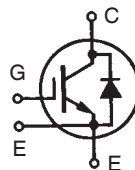
IGBT with Diode

Short Circuit SOA Capability

IXSN 80N60BD1

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

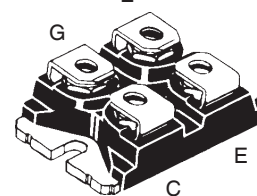
Preliminary Data Sheet



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

miniBLOC, SOT-227 B

E153432 E



E = Emitter ①, C = Collector
G = Gate, E = Emitter ②

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_{tr} 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

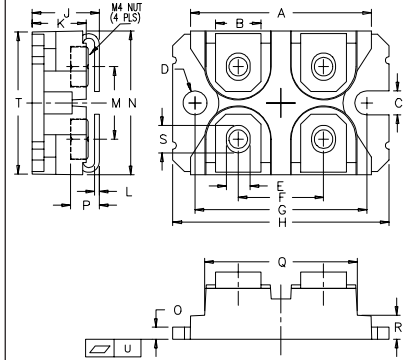
Advantages

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

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

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

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

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M4 screws (4x) supplied

Dim.	Millimeter		Inches	
	Min.	Max.	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)
Characteristic Values
($T_J = 25^\circ\text{C}$, unless otherwise specified)

Symbol	Test Conditions	typ.	max.
V_F	$I_F = 60\text{ A}$, Note 1 $T_J = 150^\circ\text{C}$		2.05 V 1.4 V
I_{RM}	$I_F = I_{C90}$, $V_{GE} = 0\text{ V}$, $-di_F/dt = 100\text{ A}/\mu\text{s}$ $V_R = 100\text{ V}$, $T_J = 100^\circ\text{C}$		8.0 A
t_{rr}	$I_F = 1\text{ A}$, $-di/dt = 50\text{ A}/\mu\text{s}$, $V_R = 30\text{ V}$	35	ns
R_{thJC}			0.85 K/W

Note: 1. Pulse test, $t \leq 300\ \mu\text{s}$, duty cycle $d \leq 2\%$

Note: 2. Remarks: Switching times may increase for

 $V_{CE}(\text{Clamp}) > 0.8 \cdot V_{CES}$, higher T_J or increased R_G

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Fig. 1. Output Characteristics @ 25 Deg. C

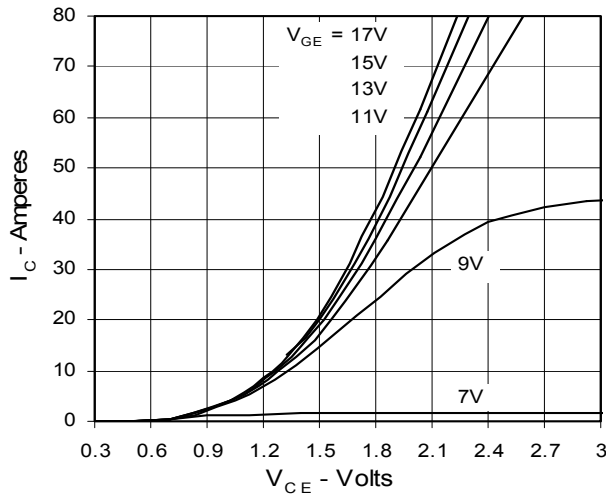


Fig. 2. Extended Output Characteristics @ 25 deg. C

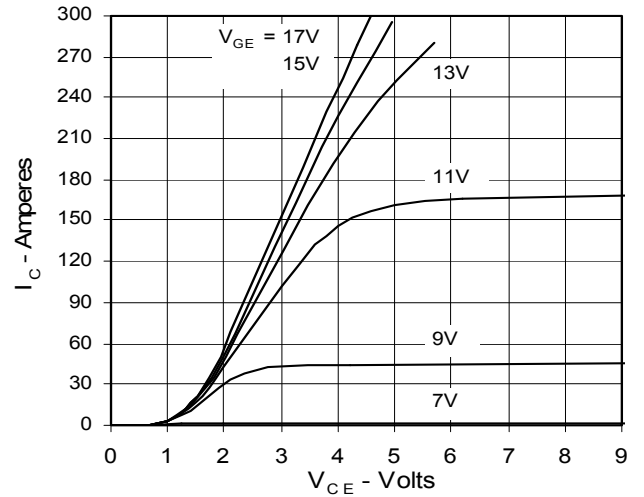


Fig. 3. Output Characteristics @ 125 Deg. C

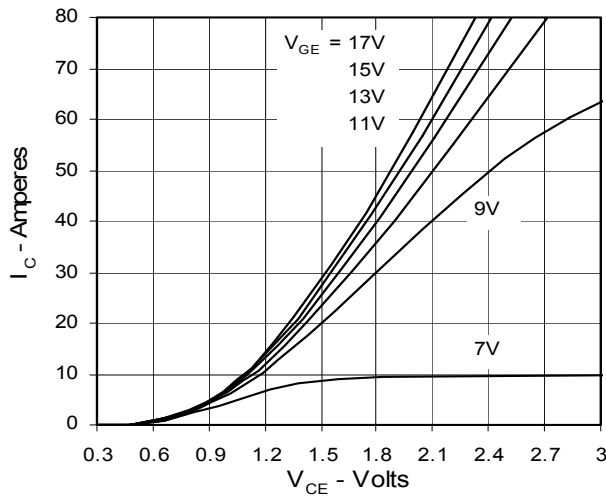


Fig. 4. Dependence of $V_{CE(sat)}$ on Temperature

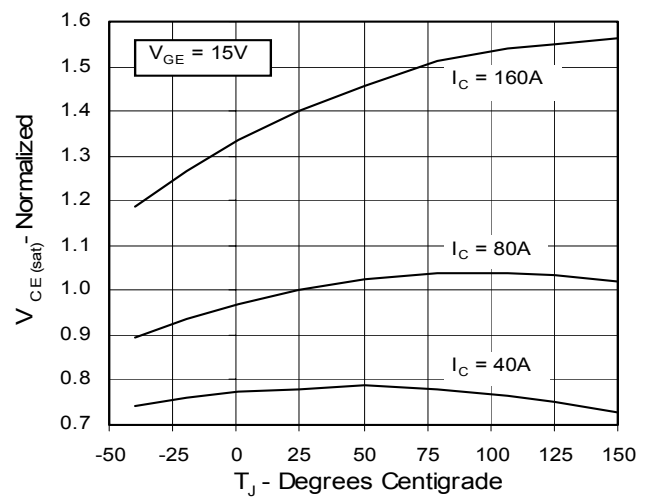


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter voltage

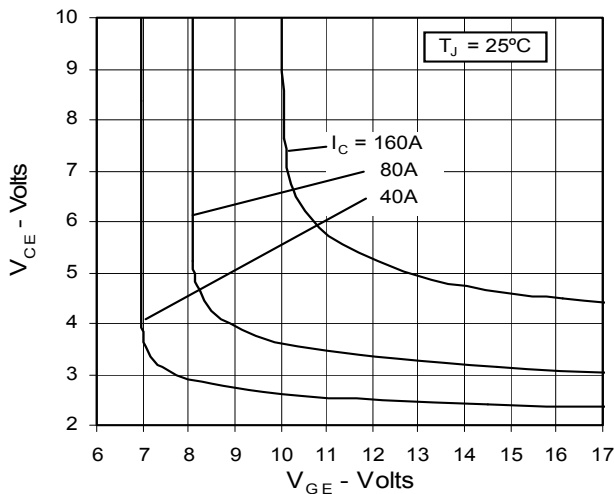


Fig. 6. Input Admittance

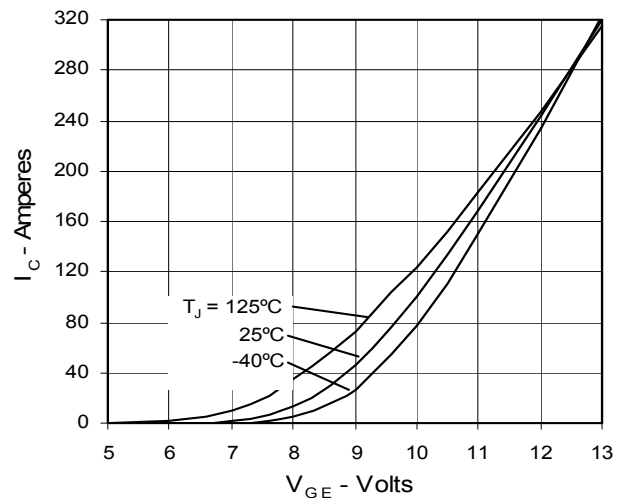


Fig. 7. Transconductance

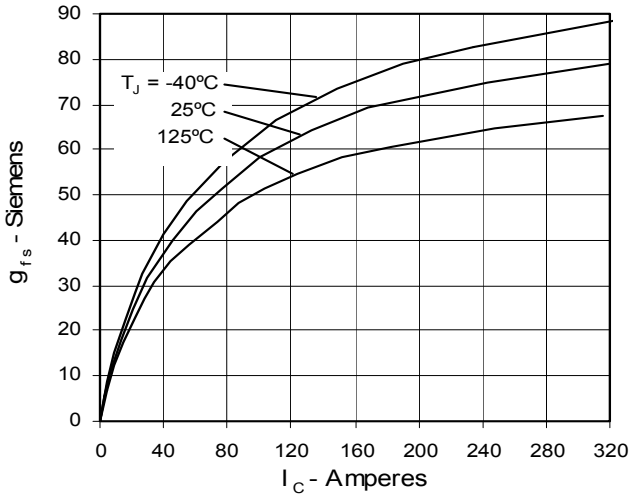


Fig. 8. Dependence of Turn-off Energy Loss on R_G

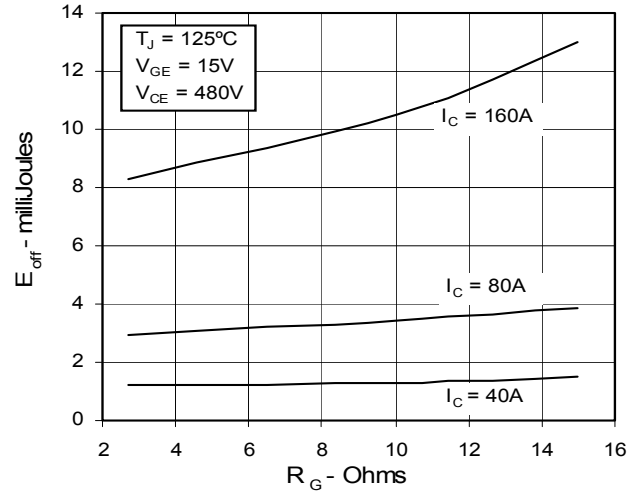


Fig. 9. Dependence of Turn-Off Energy Loss on I_C

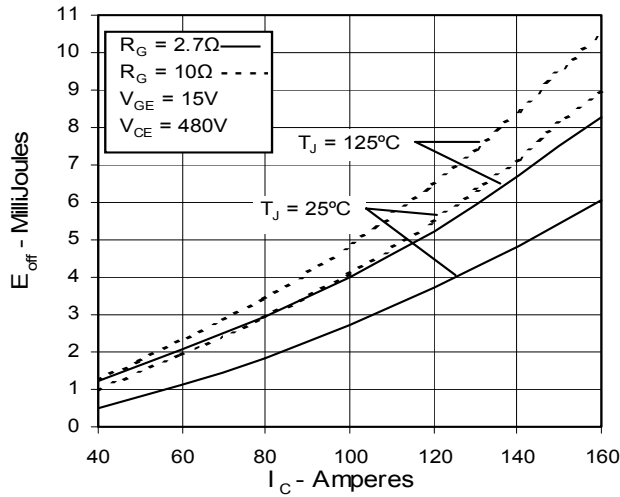


Fig. 10. Dependence of Turn-off Energy Loss on Temperature

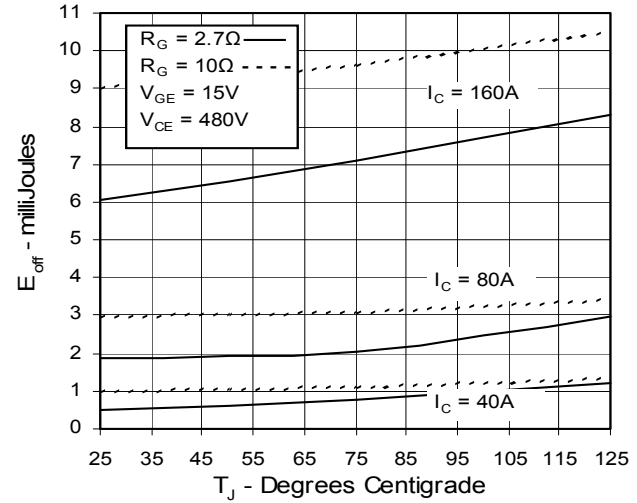


Fig. 11. Dependence of Turn-off Switching Time on R_G

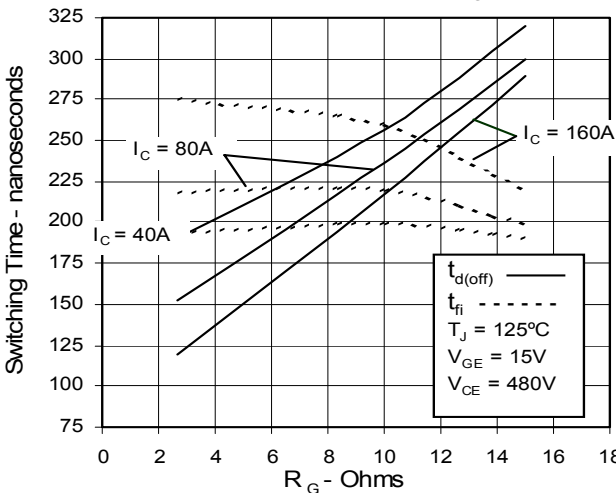
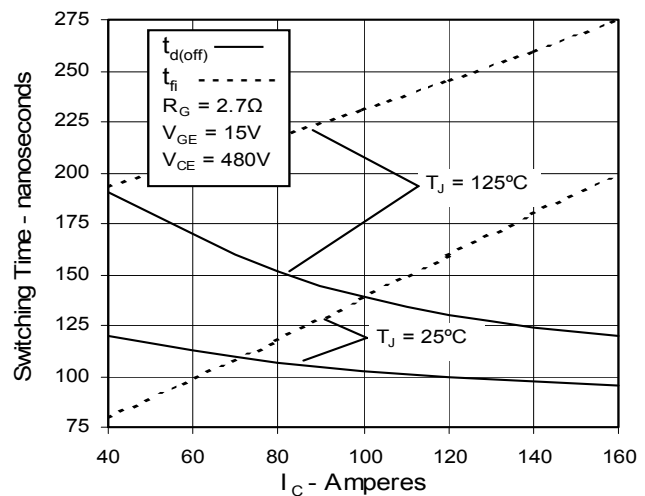


Fig. 12. Dependence of Turn-off Switching Time on I_C



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:

4,850,072	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
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

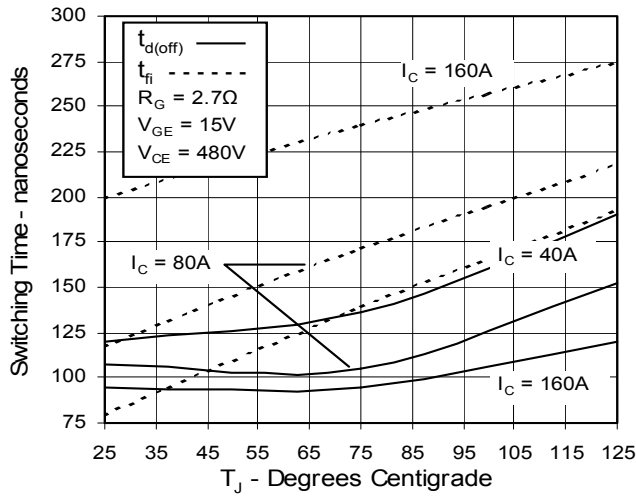


Fig. 14. Gate Charge

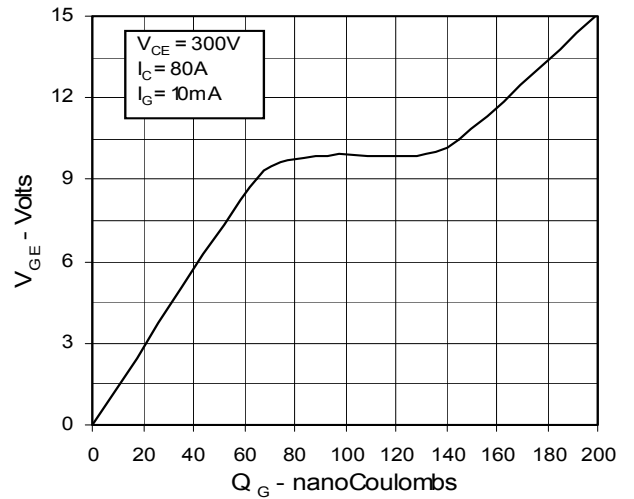


Fig. 15. Capacitance

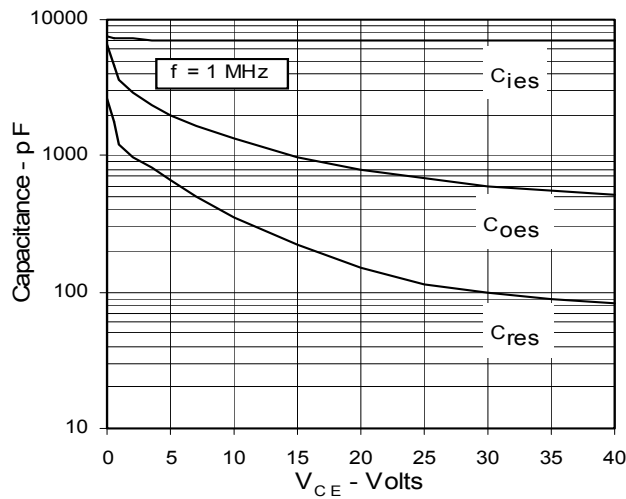
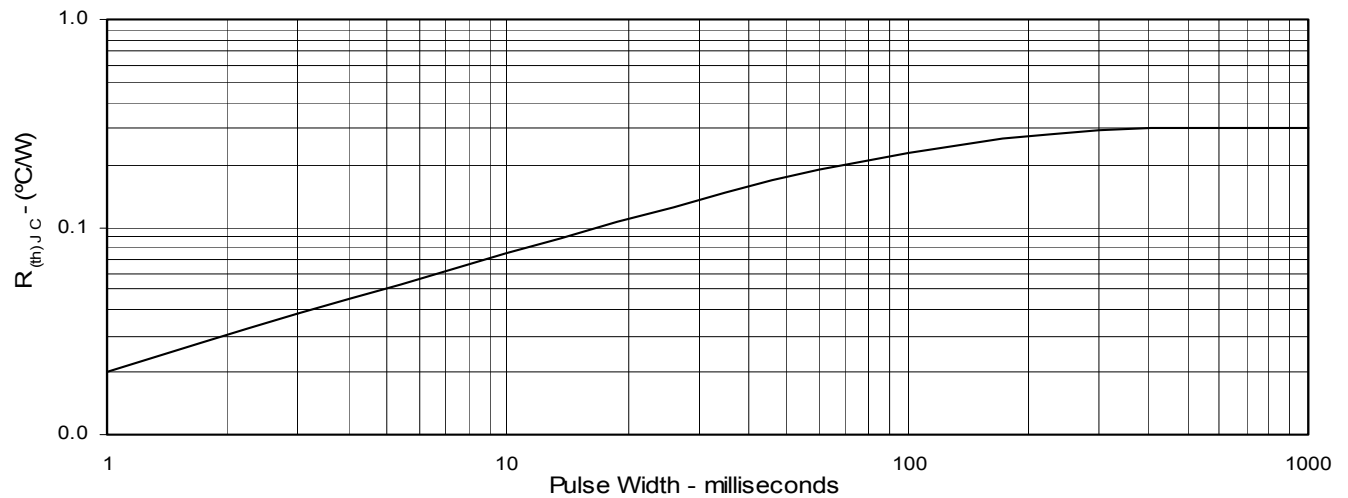


Fig. 16. Maximum Transient Thermal Resistance



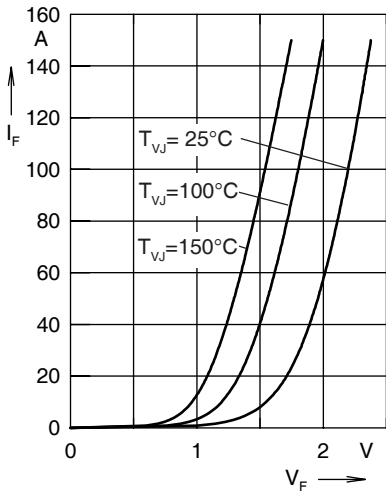


Fig. 17. Forward current I_F versus V_F

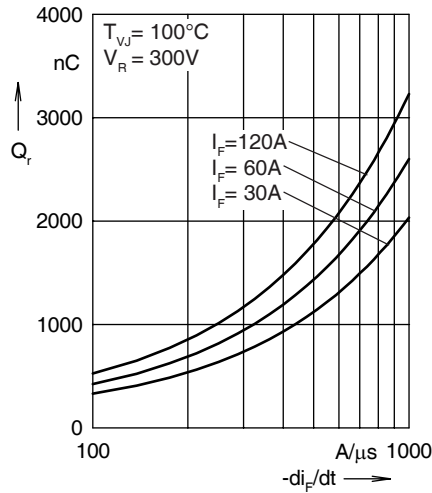


Fig. 18. Reverse recovery charge Q_r versus $-di_F/dt$

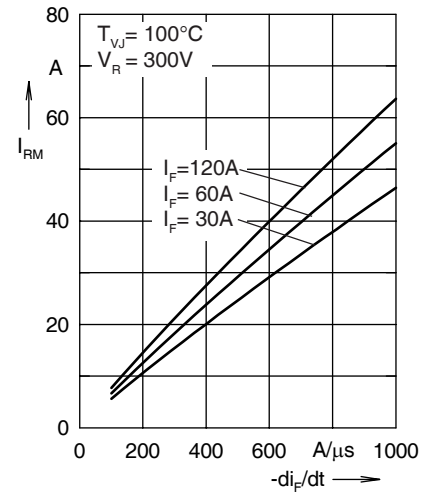


Fig. 19. Peak reverse current I_{RM} versus $-di_F/dt$

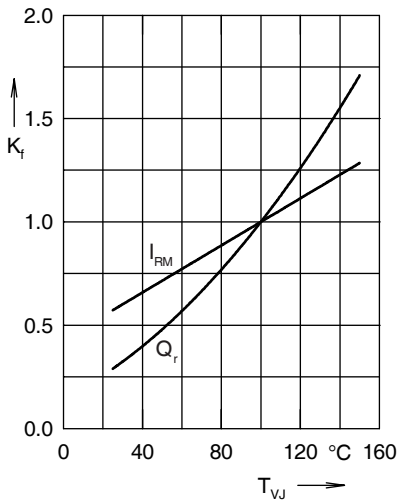


Fig. 20. Dynamic parameters Q_r , I_{RM} versus T_{VJ}

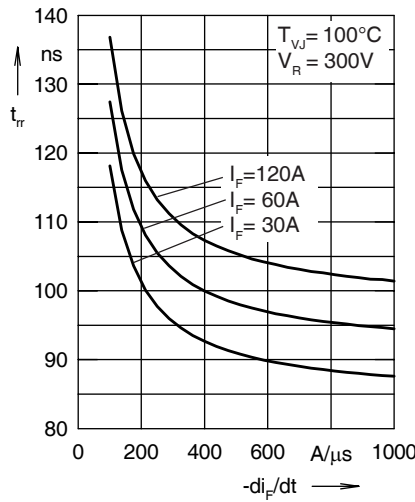


Fig. 21. Recovery time t_{tr} versus $-di_F/dt$

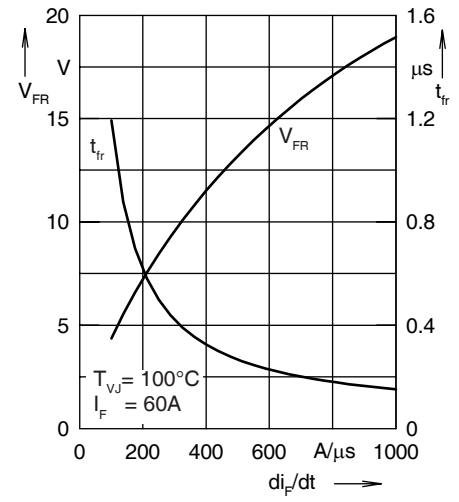


Fig. 22. Peak forward voltage V_{FR} and t_{tr} versus di_F/dt

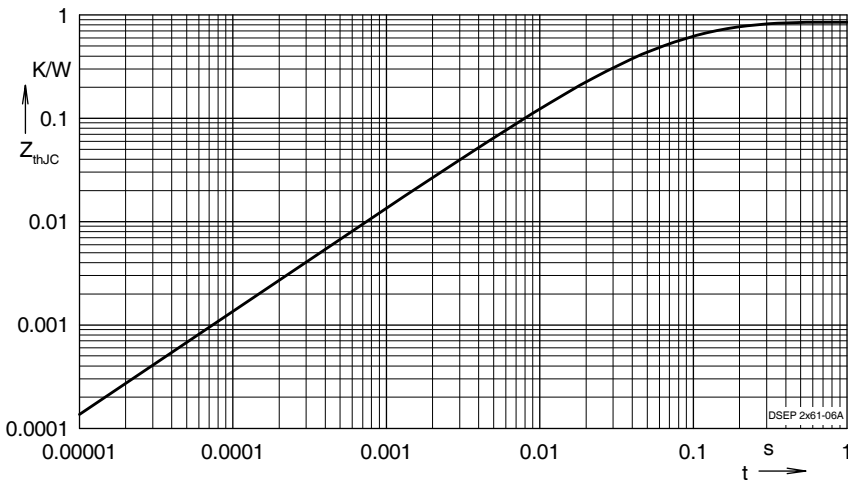


Fig. 7 Transient thermal resistance junction to case

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

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