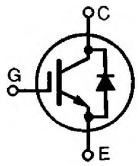
IXYS

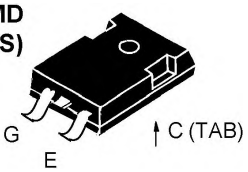
Preliminary data

HiPerFAST™ IGBT with Diode
Combi Pack

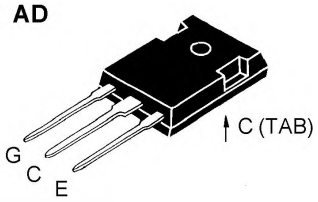
	V_{CES}	$I_{C(25)}$	$V_{CE(sat)}$	t_{fi}
IXGH24N50BU1	500 V	48 A	2.3 V	80 ns
IXGH24N60BU1	600 V	48 A	2.5 V	80 ns



TO-247 SMD (24NBU1S)**



TO-247 AD



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

Symbol	Test Conditions	Maximum Ratings		
		24N50	24N60	
V_{CES}	T_J = 25°C to 150°C	500	600	V
V_{CGR}	T_J = 25°C to 150°C; R_{GE} = 1 MΩ	500	600	V
V_{GES}	Continuous		±20	V
V_{GEM}	Transient		±30	V
I_{C25}	T_C = 25°C		48	A
I_{C90}	T_C = 90°C		24	A
I_{CM}	T_C = 25°C, 1 ms		96	A
SSOA (RBSOA)	V_{GE} = 15 V, T_{VJ} = 125°C, R_G = 22 Ω Clamped inductive load, L = 100 µH		I_{CM} = 48 @ 0.8 V_{CES}	A
P_C	T_C = 25°C		150	W
T_J			-55 ... +150	°C
T_{JM}			150	°C
T_{stg}			-55 ... +150	°C
Maximum Lead and Tab temperature for soldering 1.6 mm (0.062 in.) from case for 10 s			300	°C
M_d	Mounting torque		1.13/10	Nm/lb.in.
Weight			6	g

Symbol	Test Conditions		Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
BV_{CES}	I_C = 750 µA, V_{GE} = 0 V	24N50	500			V
		24N60	600			V
$V_{GE(th)}$	I_C = 250 µA, V_{CE} = V_{GE}		2.5		5.5	V
I_{CES}	V_{CE} = 0.8 • V_{CES}	T_J = 25°C			500	µA
	V_{GE} = 0 V	T_J = 125°C			8	mA
I_{GES}	V_{CE} = 0 V, V_{GE} = ±20 V				±100	nA
$V_{CE(sat)}$	I_C = I_{C90}, V_{GE} = 15 V	24N50			2.3	V
$V_{CE(sat)}$	I_C = I_{C90}, V_{GE} = 15 V	24N60			2.5	V

Features

- International standard packages JEDEC TO-247 SMD surface mountable and JEDEC TO-247 AD
- High frequency IGBT and antiparallel FRED in one package
- High current handling capability
- 3rd generation HDMOS™ process
- MOS Gate turn-on
  - drive simplicity

Applications

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

Advantages

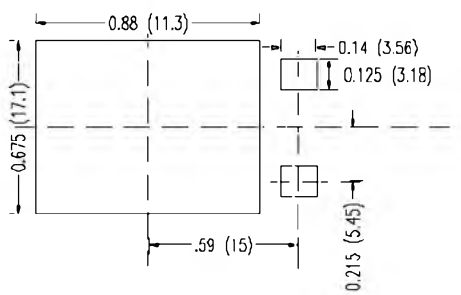
- Space savings (two devices in one package)
- High power density
- Suitable for surface mounting
- Switching speed for high frequency applications
- Easy to mount with 1 screw (insulated mounting screw hole)

Symbol	Test Conditions (T$_J$ = 25°C, unless otherwise specified)		min.	typ.	max.	
g_{fs}	$I_C = I_{C90}$; V_{CE} = 10 V, Pulse test, t ≤ 300 µs, duty cycle ≤ 2 %		9	13		S
C_{ies}	V_{CE} = 25 V, V_{GE} = 0 V, f = 1 MHz			1500		pF
C_{oes}				175		pF
C_{res}				40		pF
Q_g	$I_C = I_{C90}$, V_{GE} = 15 V, V_{CE} = 0.5 V_{CES}		11	90	120	nC
Q_{ge}				15	nC	
Q_{gc}				30	40	nC
$t_{d(on)}$	**Inductive load, T$_J$ = 25°C**			25		ns
t_{ri}	$I_C = I_{C90}$, V_{GE} = 15 V, L = 100 µH,			15		ns
E_{on}	V_{CE} = 0.8 V_{CES}, $R_G = R_{off}$ = 10 Ω			0.6		mJ
$t_{d(off)}$	**Remarks: Switching times may**			150	200	ns
t_{fi}	increase for V_{CE} (Clamp) > 0.8 • V_{CES},			80	150	ns
E_{off}	higher T$_J$ or increased R_G	24N50BU1		0.62		mJ
		24N60BU1		0.8		mJ
$t_{d(on)}$	**Inductive load, T$_J$ = 125°C**			25		ns
t_{ri}	$I_C = I_{C90}$, V_{GE} = 15 V, L = 100 µH			15		ns
E_{on}	V_{CE} = 0.8 V_{CES}, $R_G = R_{off}$ = 10 Ω			0.8		mJ
$t_{d(off)}$	Remarks: Switching times may			250		ns
t_{fi}	increase for V_{CE} (Clamp) > 0.8 • V_{CES},			100		ns
E_{off}	higher T$_J$ or increased R_G	24N50BU1		0.9		mJ
		24N60BU1		1.4		mJ
R_{thJC}					0.83	K/W
R_{thCK}				0.25		K/W

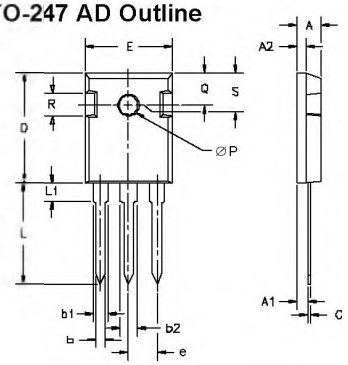
Reverse Diode (FRED) **Characteristic Values** (T$_J$ = 25°C, unless otherwise specified)

Symbol	Test Conditions		min.	typ.	max.	
V_F	$I_F = I_{C90}$, V_{GE} = 0 V, Pulse test, t ≤ 300 µs, duty cycle d ≤ 2 %				1.6	V
I_{RM}	$I_F = I_{C90}$, V_{GE} = 0 V, -di$_F$/dt = 240 A/µs			10	15	A
t_{rr}	V_R = 360 V	T$_J$ = 125°C		150		ns
	I_F = 1 A; -di/dt = 100 A/µs; V_R = 30 V	T$_J$ = 25°C		35	50	ns
R_{thJC}					1	K/W

Min. Recommended Footprint (Dimensions in inches and (mm))

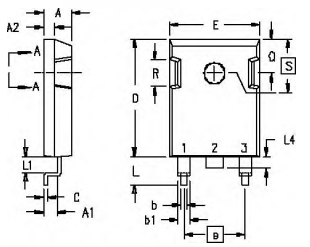


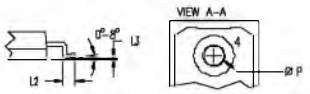
TO-247 AD Outline



Dim.	Millimeter Min.	Max.	Inches Min.	Max.
A	4.7	5.3	.185	.209
A_1	2.2	2.54	.087	.102
A_2	2.2	2.6	.059	.098
b	1.0	1.4	.040	.055
b_1	1.65	2.13	.065	.084
b_2	2.87	3.12	.113	.123
C	.4	.8	.016	.031
D	20.80	21.46	.819	.845
E	15.75	16.26	.610	.640
e	5.20	5.72	0.205	0.225
L	19.81	20.32	.780	.800
L1		4.50		.177
ØP	3.55	3.65	.140	.144
Q	5.89	6.40	0.232	0.252
R	4.32	5.49	.170	.216
S	6.15 BSC		242 BSC	

TO-247 SMD Outline





1. Gate 3. Emitter
2. Collector 4. Collector

Dim.	Millimeter Min.	Max.	Inches Min.	Max.
A	4.83	5.21	.190	.205
A1	2.29	2.54	.090	.100
A2	1.91	2.16	.075	.085
b	1.14	1.40	.045	.055
b1	1.91	2.13	.075	.084
C	0.61	0.80	.024	.031
D	20.80	21.34	.819	.840
E	15.75	16.13	.620	.635
e	5.45	BSC	.215	BSC
L	4.90	5.10	.193	.201
L1	2.70	2.90	.106	.114
L2	2.10	2.30	.083	.091
L3	0.00	0.10	.00	.004
L4	1.90	2.10	.075	.083
ØP	3.55	3.65	.140	.144
Q	5.59	6.20	.220	.244
R	4.32	4.83	.170	.190
S	6.15	BSC	.242	BSC

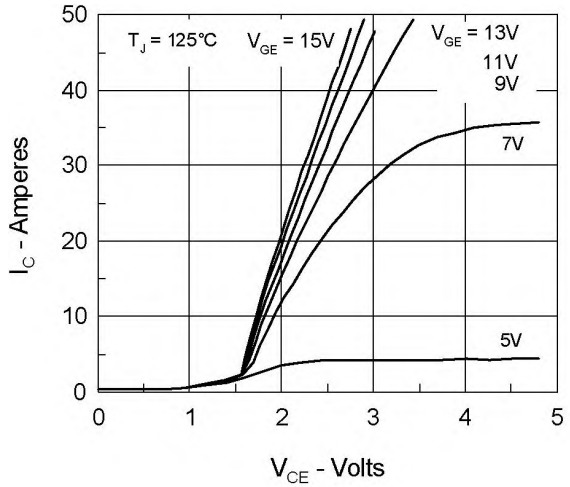


Fig. 1. Saturation Voltage Characteristics

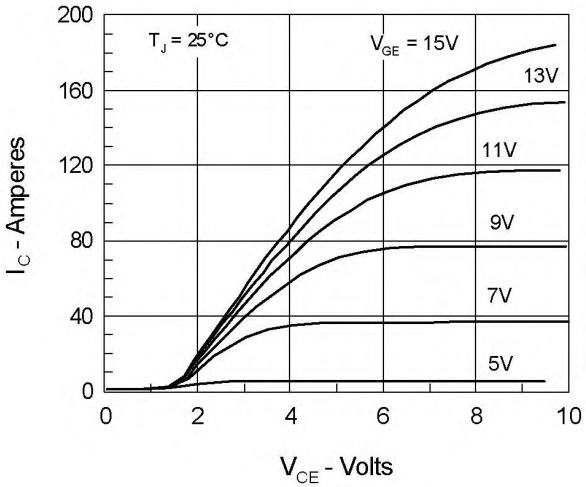


Fig. 2. Extended Output Characteristics

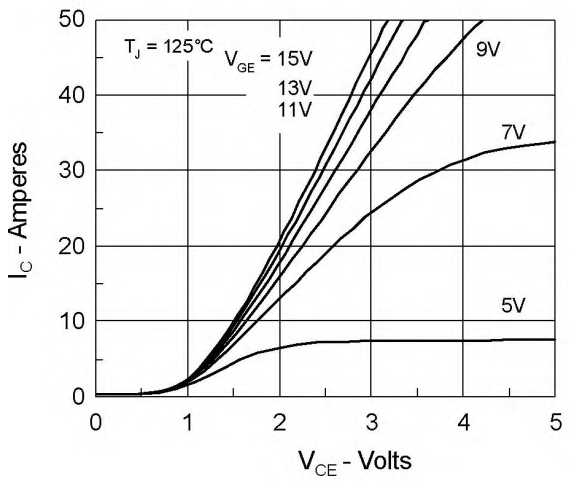


Fig. 3. Saturation Voltage Characteristics

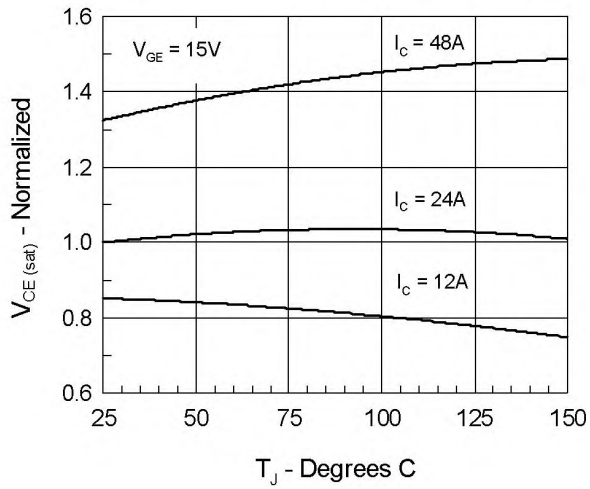


Fig. 4. Temperature Dependence of $V_{CE(sat)}$

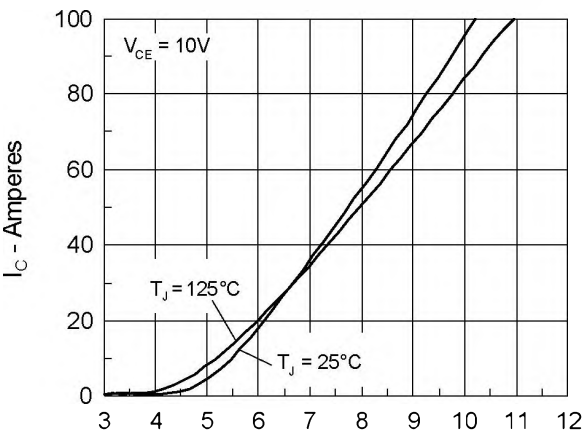


Fig. 5. Admittance Curves

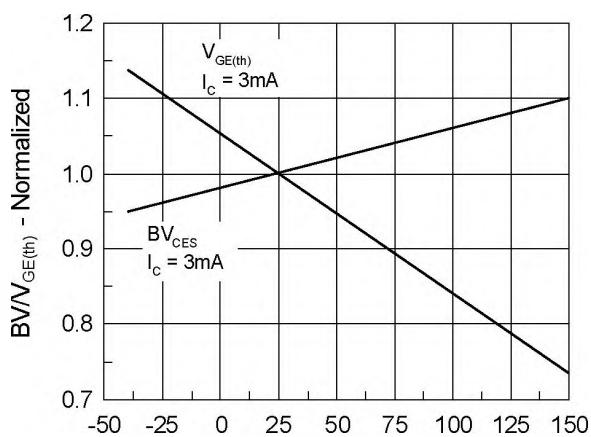


Fig. 6. Temperature Dependence of BV_{DSS} & $V_{GE(th)}$

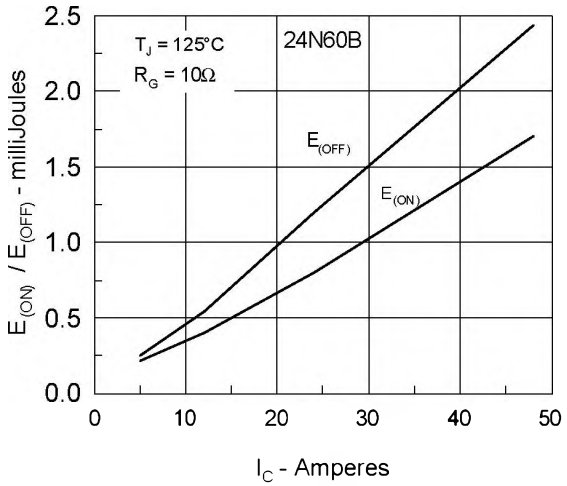


Fig. 7. Dependence of tfi and E_{OFF} on I_C.

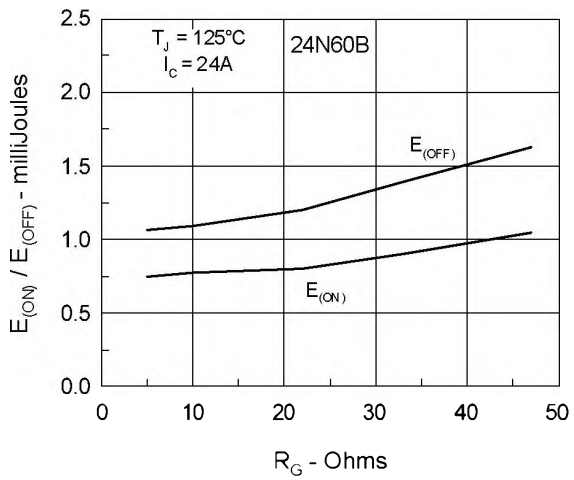


Fig. 8. Dependence of tfi and E_{OFF} on R_G.

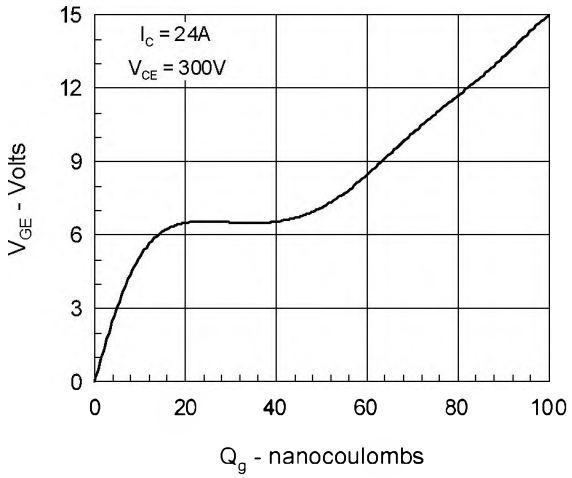


Fig. 9. Gate Charge

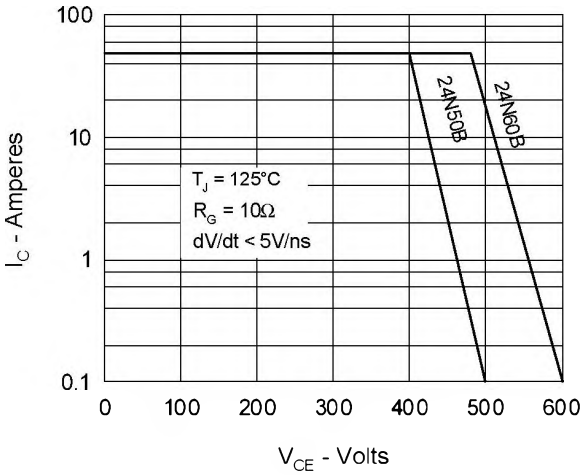


Fig. 10. Turn-off Safe Operating Area

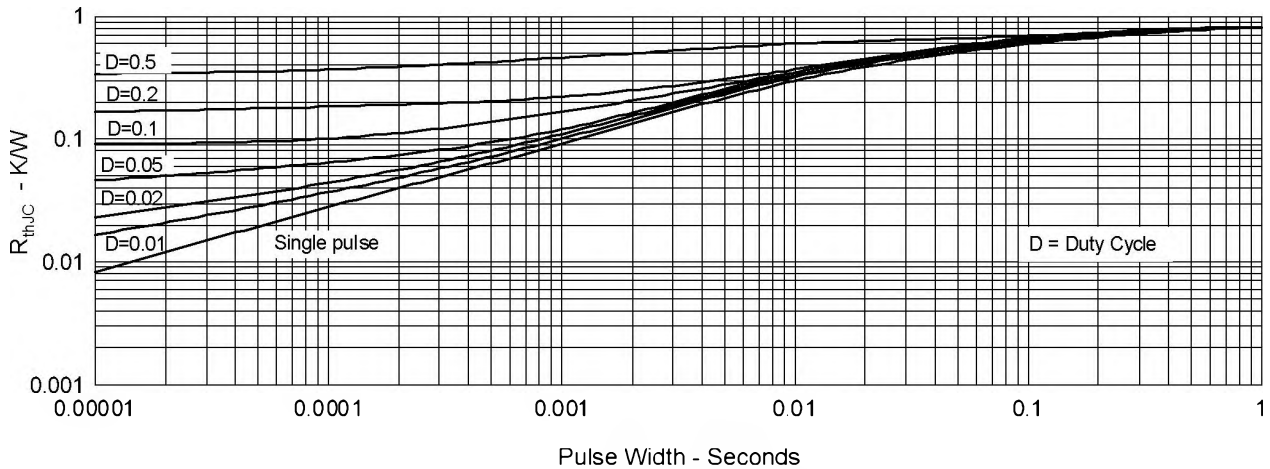


Fig. 11. Transient Thermal Resistance

Fig.12 Maximum Forward Voltage Drop

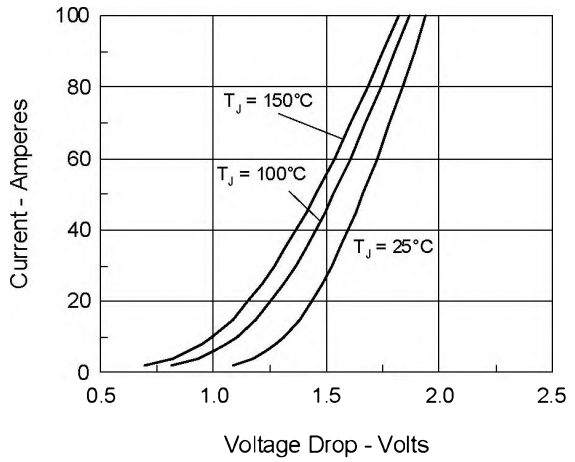


Fig.13 Peak Forward Voltage V_{FR} and Forward Recovery Time t_{FR}

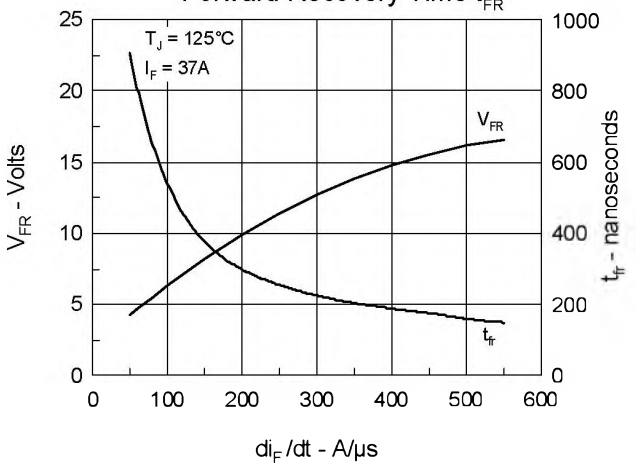


Fig.14 Junction Temperature Dependence off I_{RM} and Q_r

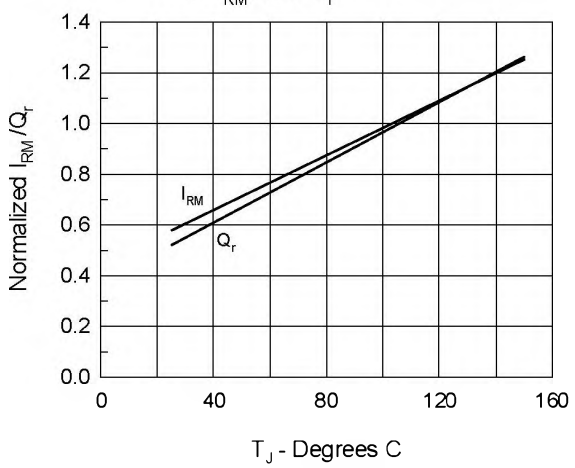


Fig.15 Reverse Recovery Chargee

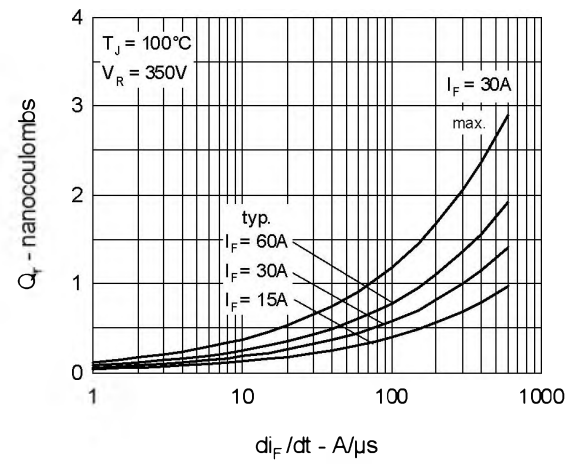


Fig.16 Peak Reverse Recovery Current

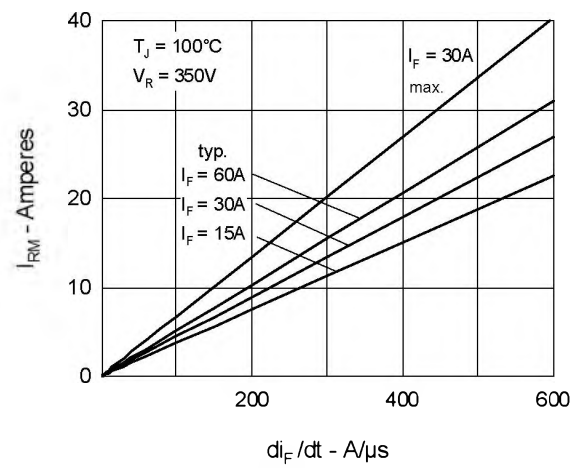


Fig.17 Reverse Recovery Time

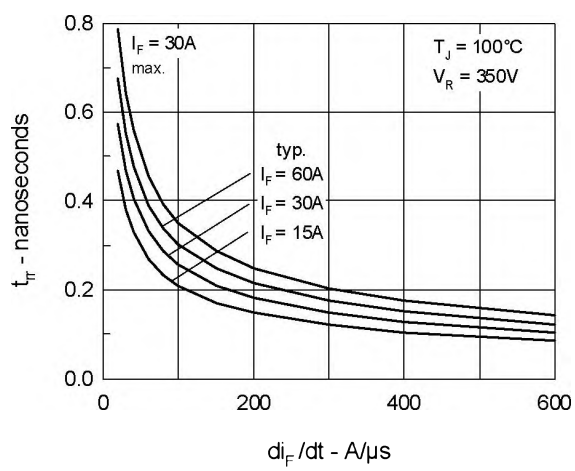


Fig.17 Diode Transient Thermal resistance junction to case