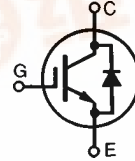




HiPerFAST™ IGBT with Diode Combi Pack

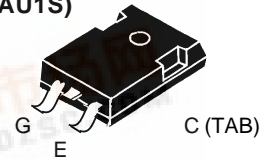
IXGH 24N60AU1
IXGH 24N60AU1S

$V_{CES} = 600\text{ V}$
 $I_{C25} = 48\text{ A}$
 $V_{CE(sat)} = 2.7\text{ V}$
 $t_{fi} = 275\text{ ns}$

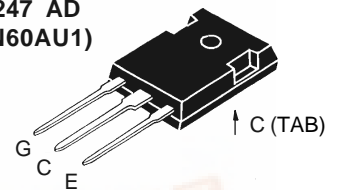


Symbol	Test Conditions	Maximum Ratings	
V_{CES}	$T_J = 25^\circ\text{C}$ to 150°C	600	V
V_{CGR}	$T_J = 25^\circ\text{C}$ to 150°C ; $R_{GE} = 1\text{ M}\Omega$	600	V
V_{GES}	Continuous	± 20	V
V_{GEM}	Transient	± 30	V
I_{C25}	$T_C = 25^\circ\text{C}$	48	A
I_{C90}	$T_C = 90^\circ\text{C}$	24	A
I_{CM}	$T_C = 25^\circ\text{C}$, 1 ms	96	A
SSOA (RBSOA)	$V_{GE} = 15\text{ V}$, $T_{VJ} = 125^\circ\text{C}$, $R_G = 22\ \Omega$ Clamped inductive load, $L = 100\ \mu\text{H}$	$I_{CM} = 48$ @ $0.8\ V_{CES}$	A
P_c	$T_C = 25^\circ\text{C}$	150	W
T_J		-55 ... +150	$^\circ\text{C}$
T_{JM}		150	$^\circ\text{C}$
T_{stg}		-55 ... +150	$^\circ\text{C}$
Maximum Lead and Tab temperature for soldering 1.6 mm (0.062 in.) from case for 10 s		300	$^\circ\text{C}$
M_d	Mounting torque, TO-247 AD	1.13/10	Nm/lb.in.
Weight	TO-247 SMD	4	g
	TO-247 AD	6	g

**TO-247 SMD
(24N60AU1S)**



**TO-247 AD
(24N60AU1)**



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

Features

- International standard packages JEDEC TO-247 SMD surface mountable and JEDEC TO-247 AD
- IGBT and anti-parallel FRED in one package
- 2nd generation HDMOS™ process
- Low $V_{CE(sat)}$
 - for minimum on-state conduction losses
- MOS Gate turn-on
 - drive simplicity
- Fast Recovery Epitaxial Diode (FRED)
 - soft recovery with low I_{RM}

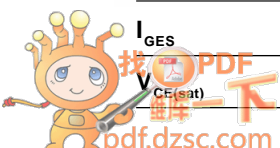
Applications

- 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 (two devices in one package)
- Easy to mount with 1 screw, TO-247 (isolated mounting screw hole)
- Reduces assembly time and cost

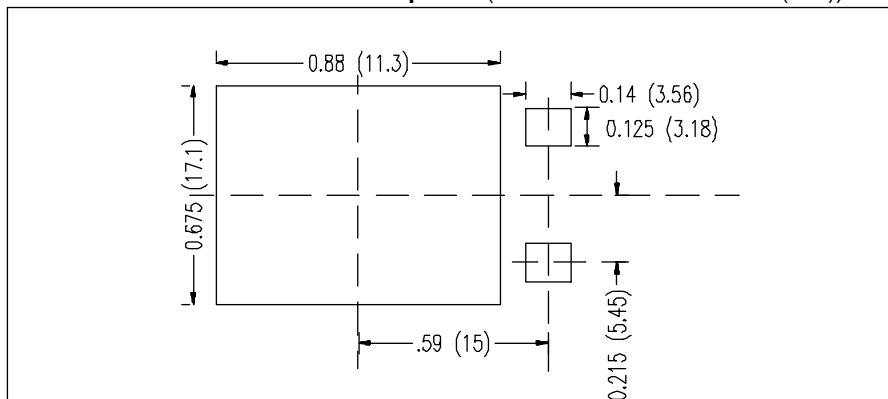
Symbol	Test Conditions	Characteristic Values ($T_J = 25^\circ\text{C}$, unless otherwise specified)		
		min.	typ.	max.
BV_{CES}	$I_C = 750\ \mu\text{A}$, $V_{GE} = 0\text{ V}$	600		V
$V_{GE(th)}$	$I_C = 250\ \mu\text{A}$, $V_{CE} = V_{GE}$	2.5		5.5 V
I_{CES}	$V_{CE} = 0.8 \cdot V_{CES}$ $V_{GE} = 0\text{ V}$	$T_J = 25^\circ\text{C}$		500 μA
		$T_J = 125^\circ\text{C}$		8 mA
I_{GES}	$V_{CE} = 0\text{ V}$, $V_{GE} = \pm 20\text{ V}$			$\pm 100\text{ nA}$
$V_{CE(sat)}$	$I_C = I_{C90}$, $V_{GE} = 15\text{ V}$			2.7 V



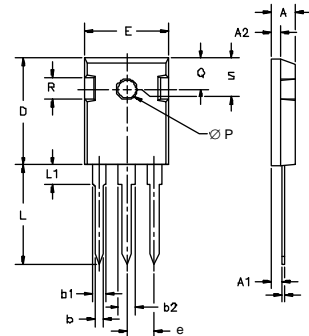
Symbol	Test Conditions	Characteristic Values		
		(T _J = 25°C, unless otherwise specified)		
		min.	typ.	max.
g_{fs}	$I_C = I_{C90}$; $V_{CE} = 10\text{ V}$, Pulse test, $t \leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$	9	13	S
C_{ies} C_{oes} C_{res}	$V_{CE} = 25\text{ V}$, $V_{GE} = 0\text{ V}$, $f = 1\text{ MHz}$		1500	pF
			175	pF
			40	pF
Q_g Q_{ge} Q_{gc}	$I_C = I_{C90}$, $V_{GE} = 15\text{ V}$, $V_{CE} = 0.5 V_{CES}$		90	nC
			11	nC
			30	nC
$t_{d(on)}$ t_{ri} E_{on} $t_{d(off)}$ t_{fi} E_{off}	Inductive load, T_J = 25°C $I_C = I_{C90}$, $V_{GE} = 15\text{ V}$, $L = 100\ \mu\text{H}$, $V_{CE} = 0.8 V_{CES}$, $R_G = R_{off} = 10\ \Omega$ Remarks: Switching times may increase for V_{CE} (Clamp) > 0.8 • V _{CES} , higher T _J or increased R _G	25		ns
		15		ns
		0.6		mJ
		150	200	ns
		110		ns
		1.5		mJ
$t_{d(on)}$ t_{ri} E_{on} $t_{d(off)}$ t_{fi} E_{off}	Inductive load, T_J = 125°C $I_C = I_{C90}$, $V_{GE} = 15\text{ V}$, $L = 100\ \mu\text{H}$, $V_{CE} = 0.8 V_{CES}$, $R_G = R_{off} = 10\ \Omega$ Remarks: Switching times may increase for V_{CE} (Clamp) > 0.8 • V _{CES} , higher T _J or increased R _G	25		ns
		15		ns
		0.8		mJ
		250		ns
		400		ns
		2.3		mJ
R_{thJC} R_{thCK}		0.25		0.83 K/W K/W

Symbol	Test Conditions	Characteristic Values		
		(T _J = 25°C, unless otherwise specified)		
		min.	typ.	max.
V_F	$I_F = I_{C90}$, $V_{GE} = 0\text{ V}$, Pulse test, $t \leq 300\ \mu\text{s}$, duty cycle $d \leq 2\%$			1.6 V
I_{RM} t_{rr}	$I_F = I_{C90}$, $V_{GE} = 0\text{ V}$, $-di_F/dt = 240\text{ A}/\mu\text{s}$ $V_R = 360\text{ V}$ T _J = 125°C $I_F = 1\text{ A}$; $-di/dt = 100\text{ A}/\mu\text{s}$; $V_R = 30\text{ V}$ T _J = 25°C		10	15 A
			150	ns
			35	50 ns
R_{thJC}				1 K/W

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

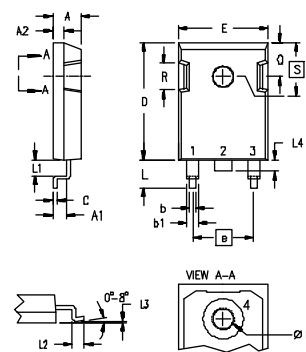


TO-247 AD Outline



Dim.	Millimeter		Inches	
	Min.	Max.	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
L ₁		4.50		.177
∅P	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



- Gate
- Collector
- Emitter
- Collector

Dim.	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	4.83	5.21	.190	.205
A ₁	2.29	2.54	.090	.100
A ₂	1.91	2.16	.075	.085
b	1.14	1.40	.045	.055
b ₁	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
L ₁	2.70	2.90	.106	.114
L ₂	2.10	2.30	.083	.091
L ₃	0.00	0.10	.00	.004
L ₄	1.90	2.10	.075	.083
∅P	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 Characteristics

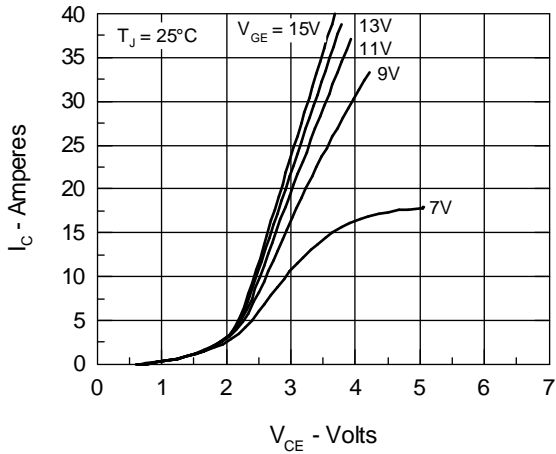


Fig. 2 Output Characteristics

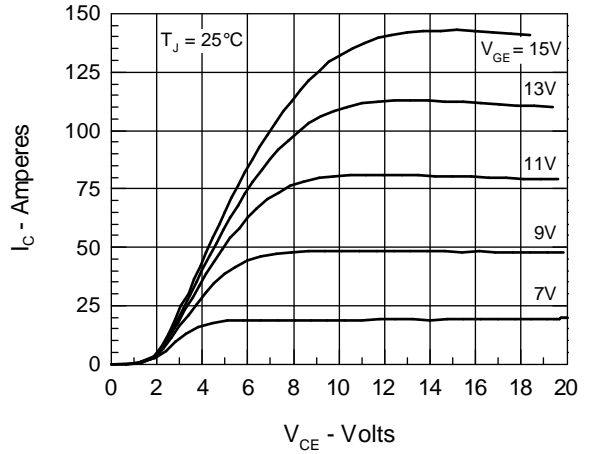


Fig. 3 Collector-Emitter Voltage vs. Gate-Emitter Voltage

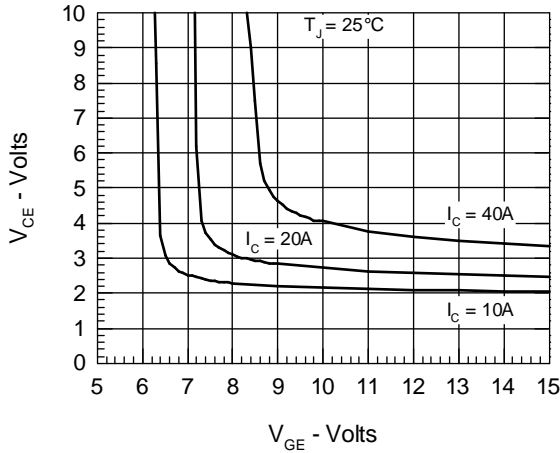


Fig. 4 Temperature Dependence of Output Saturation Voltage

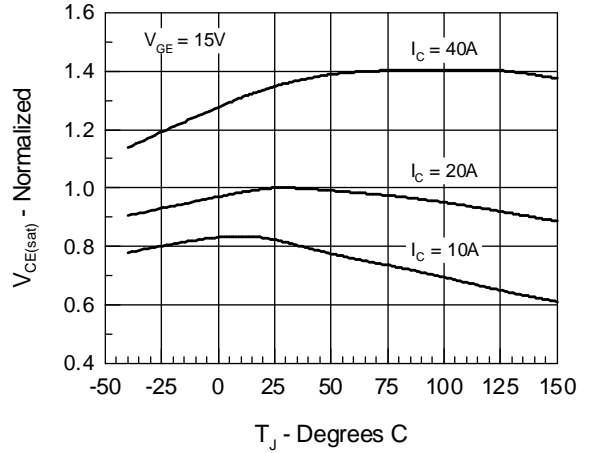


Fig. 5 Input Admittance

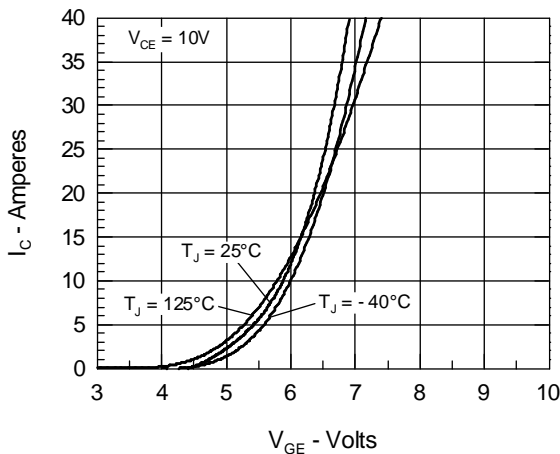


Fig. 6 Temperature Dependence of Breakdown and Threshold Voltage

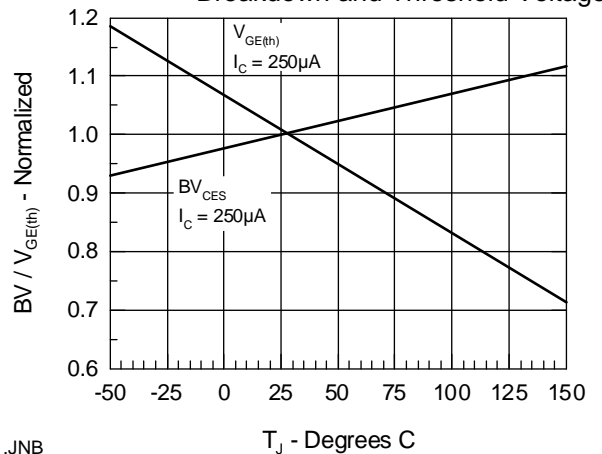


Fig.7 Turn-Off Energy per Pulse and Fall Time on Collector Current

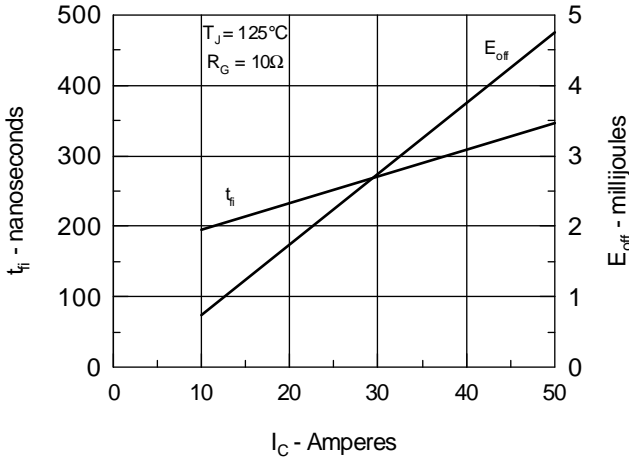


Fig.8 Dependence of Turn-Off Energy Per Pulse and Fall Time on R_G

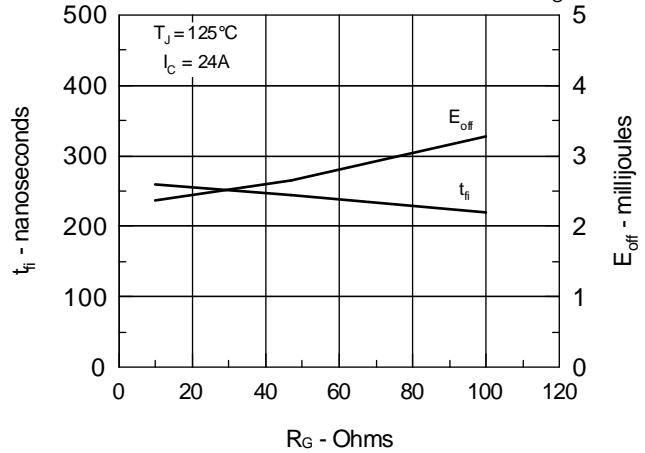


Fig.9 Gate Charge Characteristic Curve

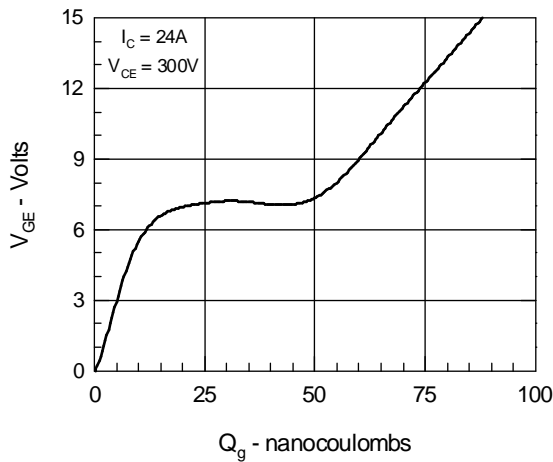


Fig.10 Turn-Off Safe Operating Area

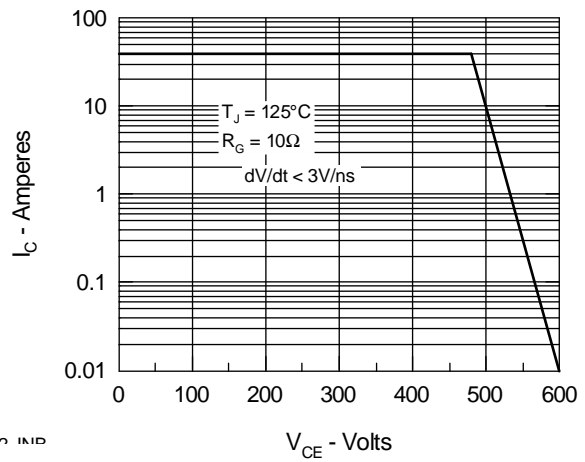


Fig.11 Transient Thermal Impedance

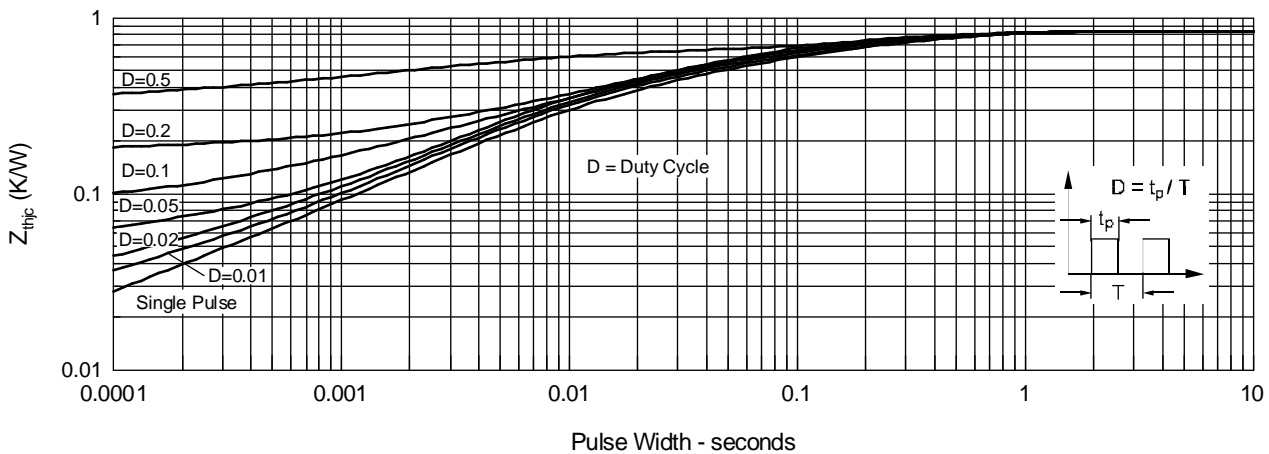


Fig.12 Maximum Forward Voltage Drop

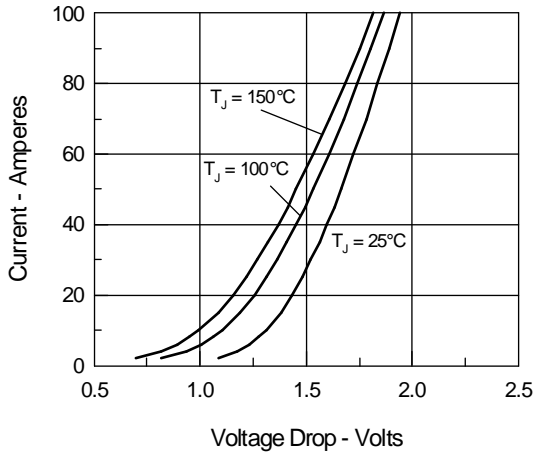
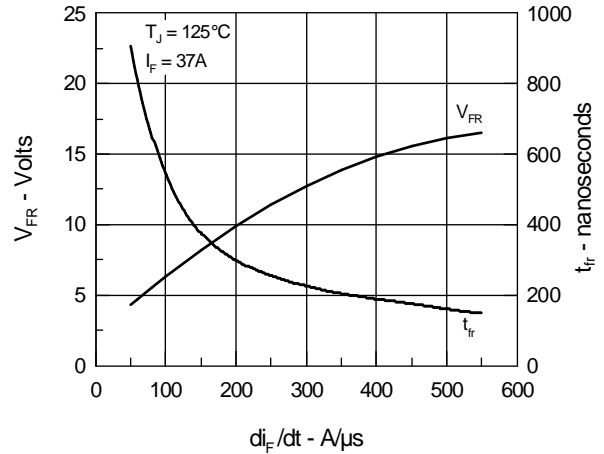
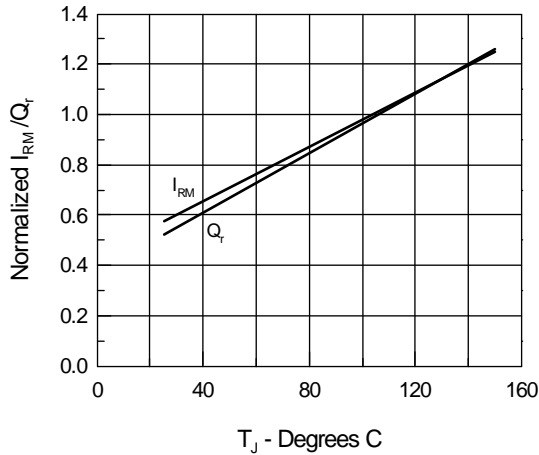

 Fig.13 Peak Forward Voltage V_{FR} and Forward Recovery Time t_{FR}

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


Fig.15 Reverse Recovery Charge

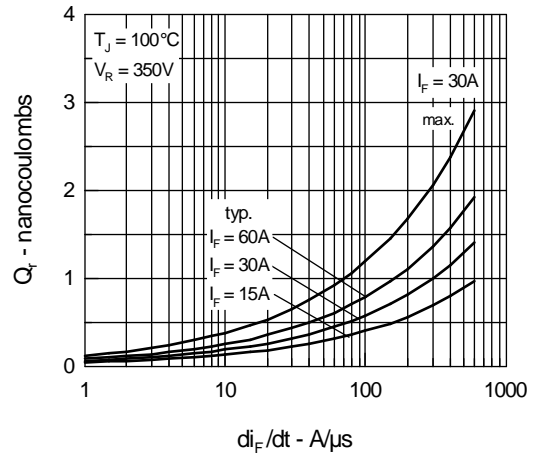


Fig.16 Peak Reverse Recovery Current

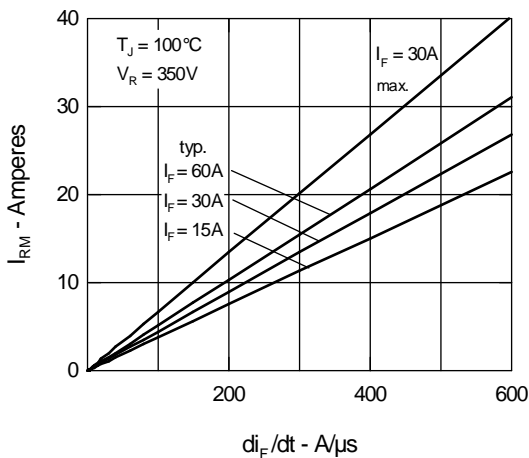


Fig.17 Reverse Recovery Time

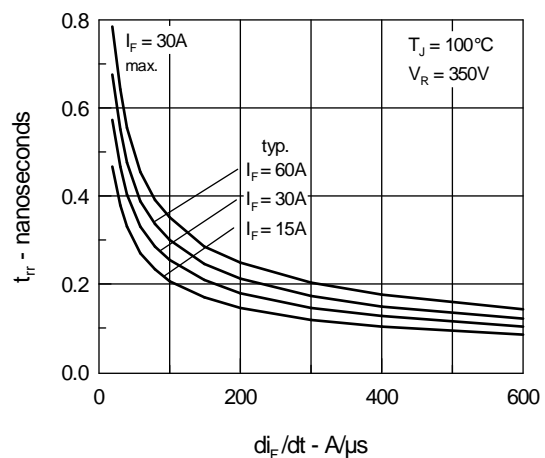


Fig.17 Diode Transient Thermal resistance junction to case

