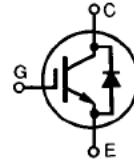
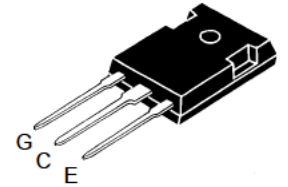


Low $V_{CE(sat)}$ IGBT with Diode
High speed IGBT with Diode
Combi Packs

	V_{CES}	I_{C25}	$V_{CE(sat)}$
IXGH10N60U1	600 V	20 A	2.5 V
IXGH10N60AU1	600 V	20 A	3.0 V



TO-247 AD



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

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}	$T_C = 25^\circ\text{C}$	20	A
I_{C90}	$T_C = 90^\circ\text{C}$	10	A
I_{CM}	$T_C = 25^\circ\text{C}$, 1 ms	40	A
SSOA (RBSOA)	$V_{GE} = 15\text{ V}$, $T_{VJ} = 125^\circ\text{C}$, $R_G = 150\ \Omega$ Clamped inductive load, $L = 300\ \mu\text{H}$	$I_{CM} = 20$ @ $0.8\ V_{CES}$	A
P_C	$T_C = 25^\circ\text{C}$	100	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 (M3)	1.13/10	Nm/lb.in.
Weight		6	g
Maximum lead temperature for soldering 1.6 mm (0.062 in.) from case for 10 s		300	$^\circ\text{C}$

Features

- International standard package JEDEC TO-247 AD
- IGBT and anti-parallel FRED in one package
- 2nd generation HDMOS™ process
- Low $V_{CE(sat)}$
 - for low 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

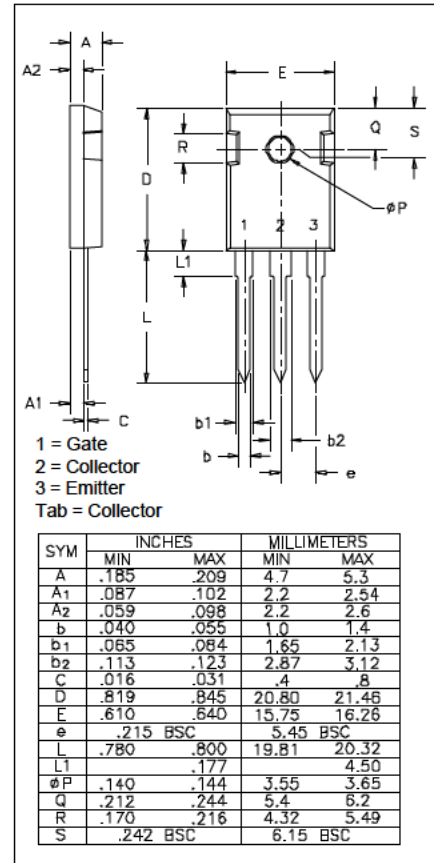
Advantages

- Space savings (two devices in one package)
- Easy to mount with 1 screw (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
$V_{GE(th)}$	$I_C = 500\ \mu\text{A}$, $V_{CE} = V_{GE}$	2.5		5.5 V
I_{CES}	$V_{CE} = 0.8 \cdot V_{CES}$ $V_{GE} = 0\text{ V}$			$T_J = 25^\circ\text{C}$: 260 μA $T_J = 125^\circ\text{C}$: 2.5 mA
I_{GES}	$V_{CE} = 0\text{ V}$, $V_{GE} = \pm 20\text{ V}$			$\pm 100\text{ nA}$
$V_{CE(sat)}$	$I_C = I_{C90}$, $V_{GE} = 15\text{ V}$			10N60U1: 2.5 V 10N60AU1: 3.0 V

Symbol	Test Conditions	Characteristic Values ($T_J = 25^\circ\text{C}$, 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 $\leq 2\%$	4	8	S
C_{ies} C_{oes} C_{res}	$V_{CE} = 25\text{ V}$, $V_{GE} = 0\text{ V}$, $f = 1\text{ MHz}$		750	pF
			125	pF
			30	pF
Q_g Q_{ge} Q_{gc}	$I_C = I_{C90}$, $V_{GE} = 15\text{ V}$, $V_{CE} = 0.5 V_{CES}$		50	nC
			15	nC
			25	nC
$t_{d(on)}$ t_{ri} E_{on} $t_{d(off)}$ t_{fi} E_{off}	Inductive load, $T_J = 25^\circ\text{C}$ $I_C = I_{C90}$, $V_{GE} = 15\text{ V}$, $L = 100\ \mu\text{H}$ $V_{CE} = 0.8 V_{CES}$, $R_G = R_{off} = 150\ \Omega$ Switching times may increase for $V_{CE}(\text{Clamp}) > 0.8 \cdot V_{CES}$, higher T_J or increased R_G		100	ns
			200	ns
			0.4	mJ
			600	ns
		10N60AU1	300	ns
		10N60AU1	0.6	mJ
$t_{d(on)}$ t_{ri} E_{on} $t_{d(off)}$ t_{fi} E_{off}	Inductive load, $T_J = 125^\circ\text{C}$ $I_C = I_{C90}$, $V_{GE} = 15\text{ V}$, $L = 100\ \mu\text{H}$ $V_{CE} = 0.8 V_{CES}$, $R_G = R_{off} = 150\ \Omega$ Switching times may increase for $V_{CE}(\text{Clamp}) > 0.8 \cdot V_{CES}$, higher T_J or increased R_G		100	ns
			200	ns
			1	mJ
			900	1500 ns
		10N60U1	570	2000 ns
		10N60AU1	360	600 ns
	10N60U1	2.0	mJ	
	10N60AU1	1.2	mJ	
R_{thJC} R_{thCK}			1.25	K/W
		0.25		K/W

TO-247 AD Outline



Reverse Diode (FRED)

Symbol	Test Conditions	Characteristic Values ($T_J = 25^\circ\text{C}$, 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 $d \leq 2\%$			1.75 V
I_{RM} t_{tr}	$I_F = I_{C90}$, $V_{GE} = 0\text{ V}$, $-di_F/dt = 64\text{ A}/\mu\text{s}$ $V_R = 360\text{ V}$ $T_J = 100^\circ\text{C}$ $I_F = 1\text{ A}$; $-di_F/dt = 50\text{ A}/\mu\text{s}$; $V_R = 30\text{ V}$ $T_J = 25^\circ\text{C}$		2.5	A
			165	ns
		35	50	ns
R_{thJC}				2.5 K/W

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: 4,835,592 4,881,106 5,017,508 5,049,961 5,187,117 5,486,715
4,850,072 4,931,844 5,034,796 5,063,307 5,237,481 5,381,025

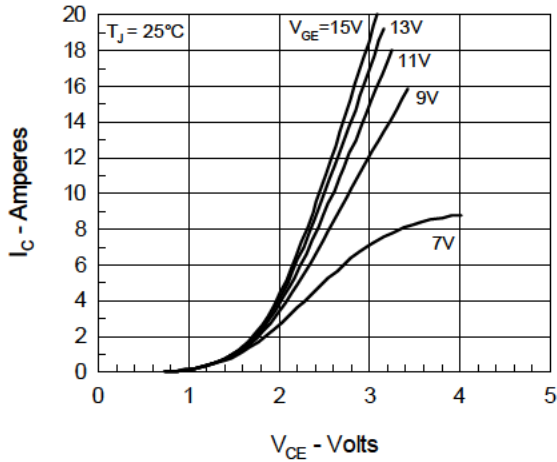
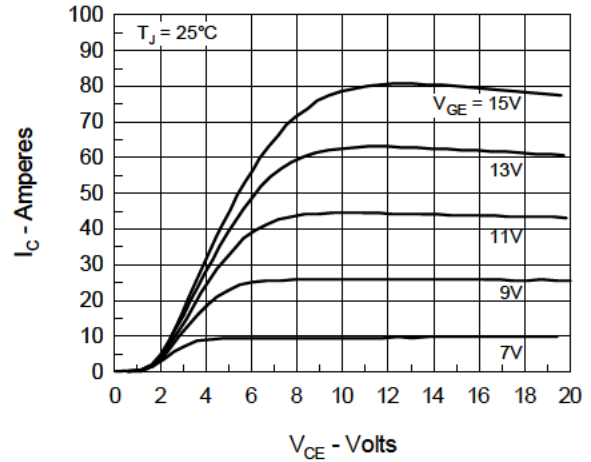
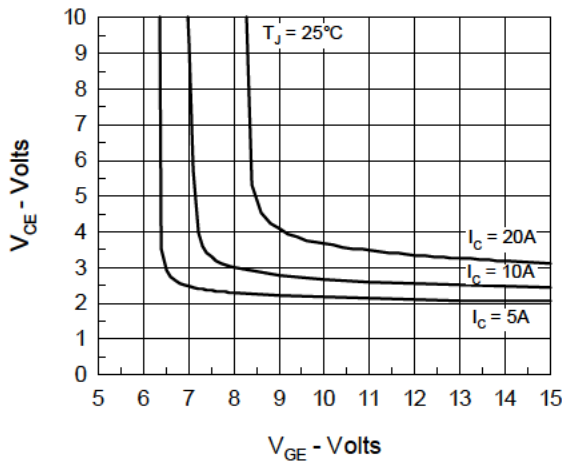
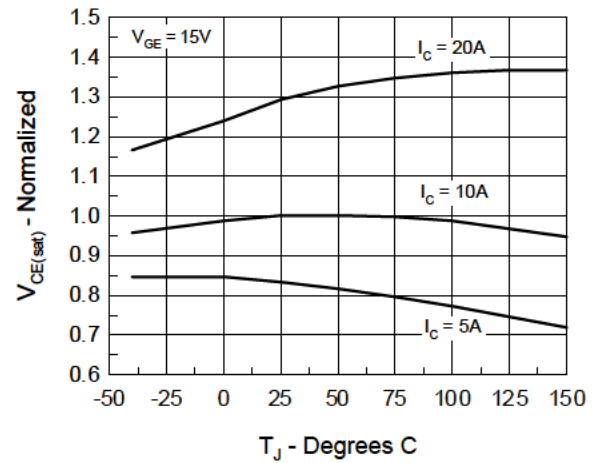
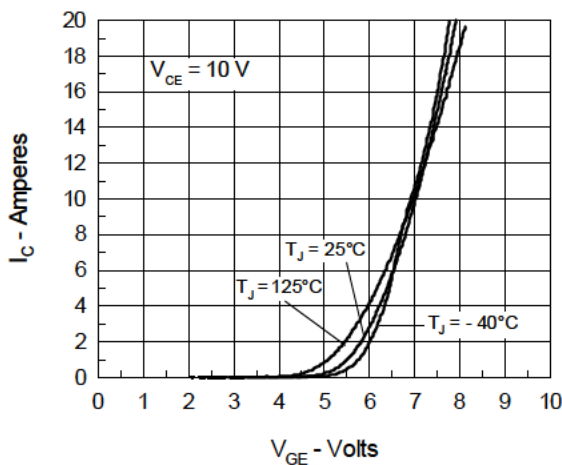
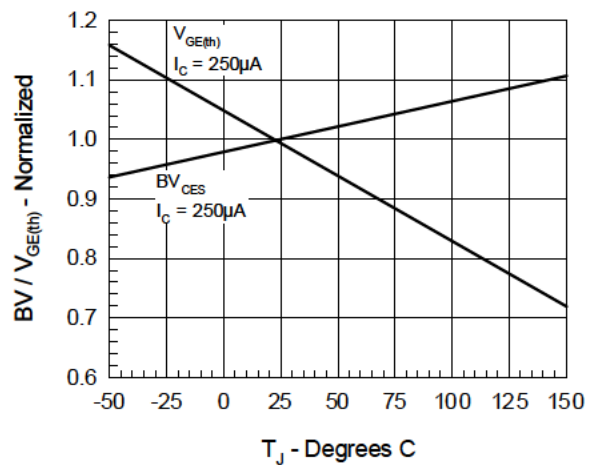
Fig. 1 Saturation Characteristics

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 Gate Charge

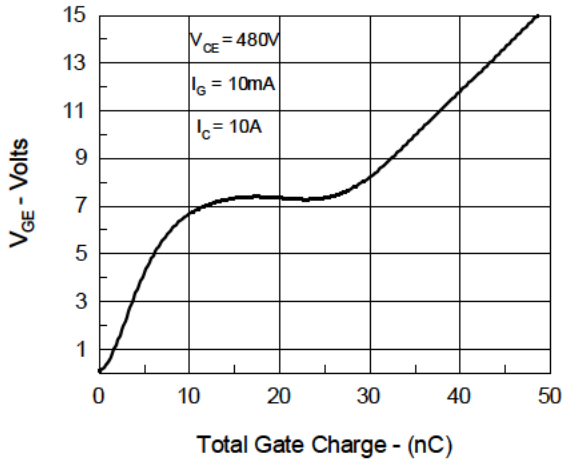


Fig.8 Turn-Off Safe Operating Area

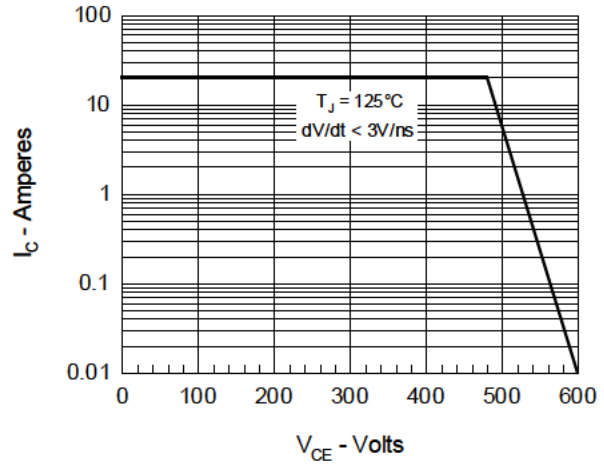


Fig.9 Capacitance Curves

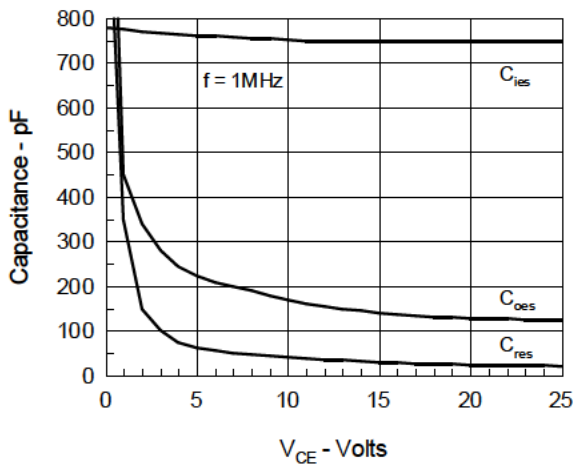
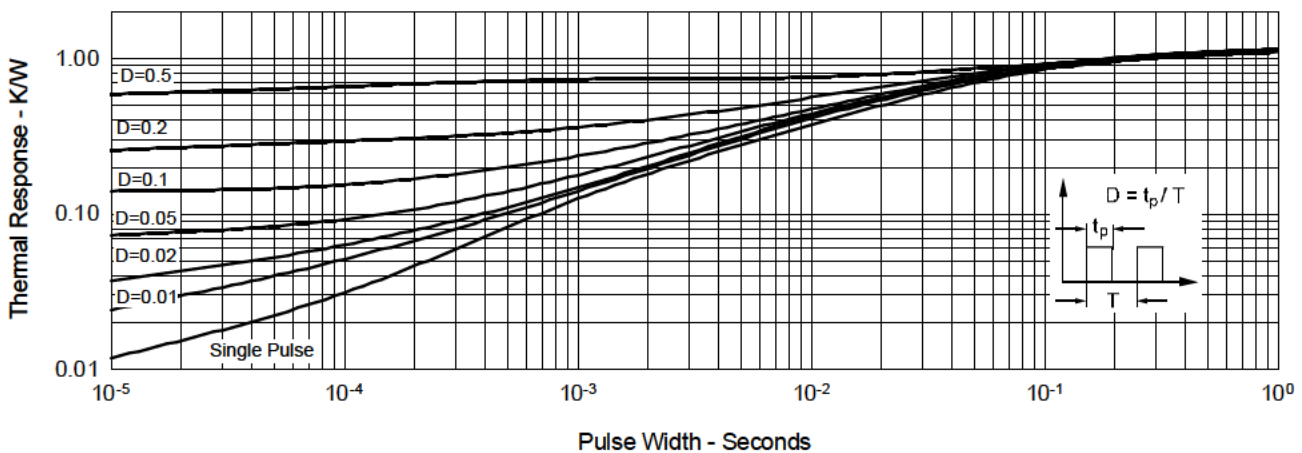


Fig.10 Transient Thermal Impedance



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4,850,072 4,931,844 5,034,796 5,063,307 5,237,481 5,381,025

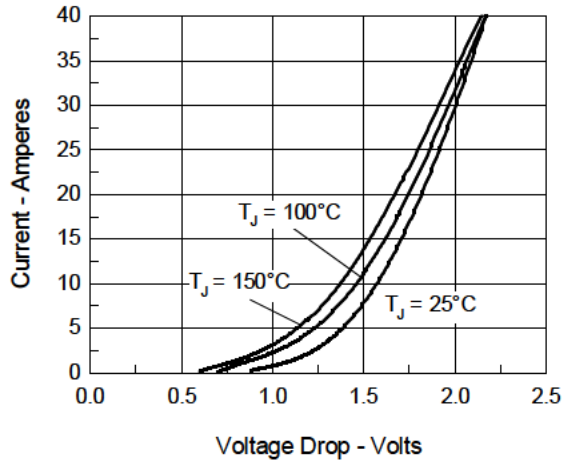
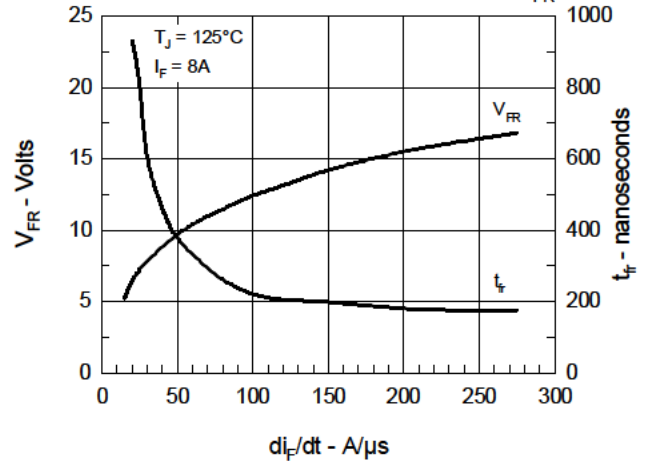
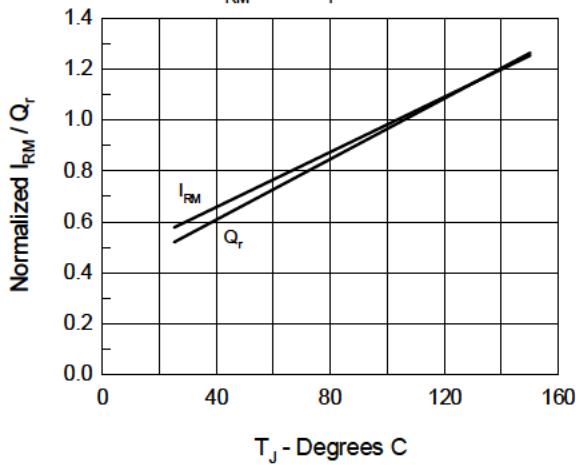
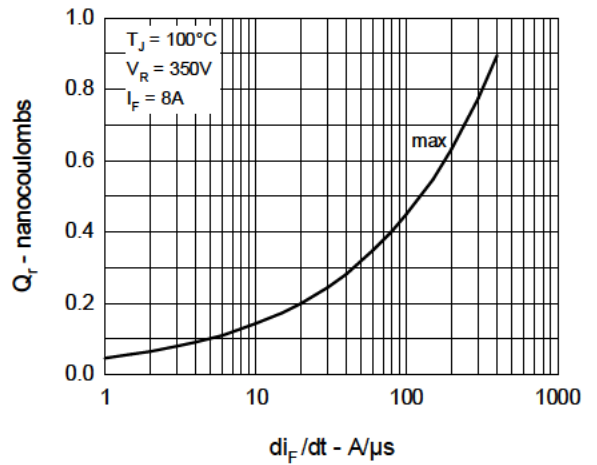
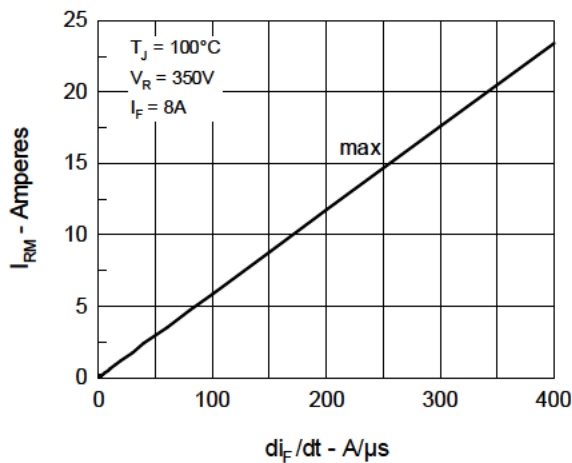
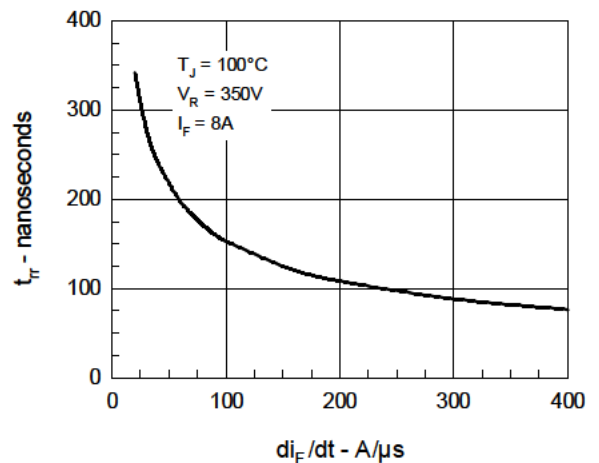
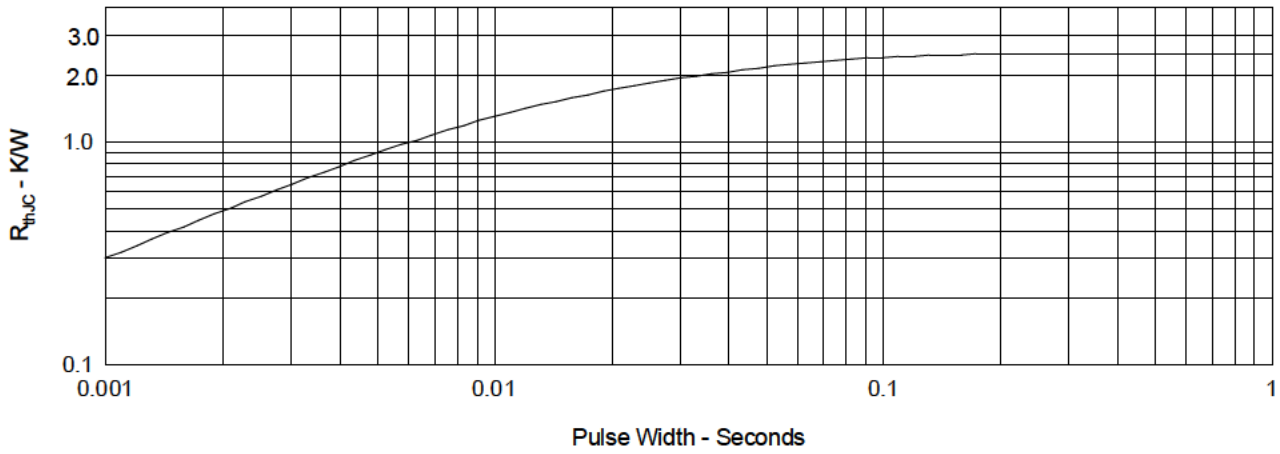
Fig.11 Maximum Forward Voltage Drop

Fig.12 Peak Forward Voltage V_{FR} and Forward Recovery Time t_{FR}

Fig.13 Junction Temperature Dependence off I_{RM} and Q_r

Fig.14 Reverse Recovery Charge

Fig.15 Peak Reverse Recovery Current

Fig.16 Reverse Recovery Time


Fig.17 Diode Transient Thermal resistance junction to case



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