IXYS

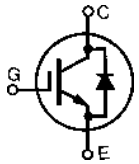
HiPerFAST™ IGBT with Diode

Combi Pack

V_{CES}	I_{C25}	$V_{CE(sat)}$	t_{fi}
500 V	75 A	2.3 V	100ns
600 V	75 A	2.5 V	120ns

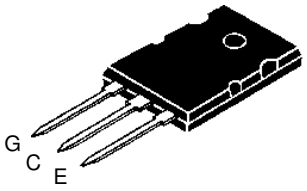
IXGK 50N50BU1
IXGK 50N60BU1

Preliminary data



Symbol	Test Conditions	Maximum Ratings 50N50	50N60	
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	±20	V
V_{GEM}	Transient	±30	±30	V
I_{C25}	T_C = 25°C	75	75	A
I_{C90}	T_C = 90°C	50	50	A
I_{CM}	T_C = 25°C, 1 ms	200	200	A
SSOA (RBSOA)	V_{GE}= 15 V, T_{VJ} = 125°C, R_G = 10 Ω Clamped inductive load, L = 30 μH	I_{CM} = 100 @ 0.8 V_{CES}		A
P_C	T_C = 25°C	300	300	W
T_J		-55 ... +150		°C
T_{JM}		150		°C
T_{stg}		-55 ... +150		°C
M_d	Mounting torque (M4)	0.9/6		Nm/lb.in.
Weight		10		g
Maximum lead temperature for soldering 1.6 mm (0.062 in.) from case for 10 s		300		°C

TO-264 AA



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

Features

- International standard package JEDEC TO-264 AA
- High frequency 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

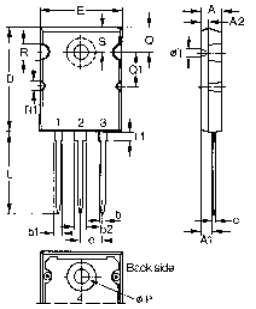
Advantages

- Space savings (two devices in one package)
- Easy to mount with 1 screw (isolated mounting screw hole)
- Reduces assembly time and cost
- High power density

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	50N50	500			V
		50N60	600			V
$V_{GE(th)}$	I_C = 500 μA, V_{CE} = V_{GE}		2.5		5.5	V
I_{CES}	V_{CE} = 0.8 • V_{CES}	T_J = 25°C			250	μA
	V_{GE} = 0 V	T_J = 125°C			15	mA
I_{GES}	V_{CE} = 0 V, V_{GE} = ±20 V				±100	nA
$V_{CE(sat)}$	I_C = I_{C90}, V_{GE} = 15 V	50N50BU1			2.3	V
		50N60BU1			2.5	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 V, Pulse test, t ≤ 300 μs, duty cycle ≤ 2 % Remarks: Add capacitance from IXGH50N60B (DS95585B)		25	35		S
Q_g	$I_C = I_{C90}$, V_{GE} = 15 V, V_{CE} = 0.5 V_{CES}			200		nC
Q_{ge}				50		nC
Q_{gc}				70		nC
$t_{d(on)}$	**Inductive load, T_J = 25°C**			50		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}, $R_G = R_{off}$ = 2.7 Ω			110		ns
t_{fi}	Remarks: Switching times may increase	50N50		80	150	ns
	for V_{CE} (Clamp) > 0.8 • V_{CES}, higher T_J or	50N60		150		ns
E_{off}	increased R_G	50N50		1.8		mJ
		50N60			3.0	mJ
$t_{d(on)}$	**Inductive load, T_J = 125°C**			50		ns
t_{ri}	$I_C = I_{C90}$, V_{GE} = 15 V, L = 100 μH			60		ns
E_{on}	V_{CE} = 0.8 V_{CES}, $R_G = R_{off}$ = 2.7 Ω			3		mJ
$t_{d(off)}$	Remarks: Switching times may increase			200		ns
t_{fi}	for V_{CE} (Clamp) > 0.8 • V_{CES}, higher T_J or	50N50		100		ns
	increased R_G	50N60		250		
E_{off}		50N50		2.6		mJ
		50N60		4.2		mJ
R_{thJC}					0.42	K/W
R_{thCK}				0.15		K/W

TO-264 AA Outline



Dim.	Millimeter Min.	Max.	Inches Min.	Max.
A	4.82	5.13	.190	.202
A1	2.54	2.89	.100	.114
A2	2.00	2.10	.079	.083
b	1.12	1.42	.044	.056
b1	2.39	2.69	.094	.106
b2	2.90	3.09	.114	.122
c	0.53	0.83	.021	.033
D	25.91	26.16	1.020	1.030
E	19.81	19.96	.780	.786
e	5.46 BSC		.215 BSC	
J	0.00	0.25	.000	.010
K	0.00	0.25	.000	.010
L	20.32	20.83	.800	.820
L1	2.29	2.59	.090	.102
P	3.17	3.66	.125	.144
Q	6.07	6.27	.239	.247
Q1	8.38	8.69	.330	.342
R	3.81	4.32	.150	.170
R1	1.78	2.29	.070	.090
S	6.04	6.30	.238	.248
T	1.57	1.83	.062	.072

Reverse Diode (FRED)

Symbol	Test Conditions		Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
V_F	$I_F = I_{C90}$, V_{GE} = 0 V, Pulse test, t ≤ 300 μs, duty cycle d ≤ 2 %				1.7	V
I_{RM}	$I_F = I_{C90}$, V_{GE} = 0 V, -di_F/dt = 480 A/μs			19	33	A
t_{rr}	V_R = 360 V	T_J = 125°C		175		ns
	I_F = 1 A; -di/dt = 200 A/μs; V_R = 30 V	T_J = 25°C		35	50	ns
R_{thJC}					0.75	K/W

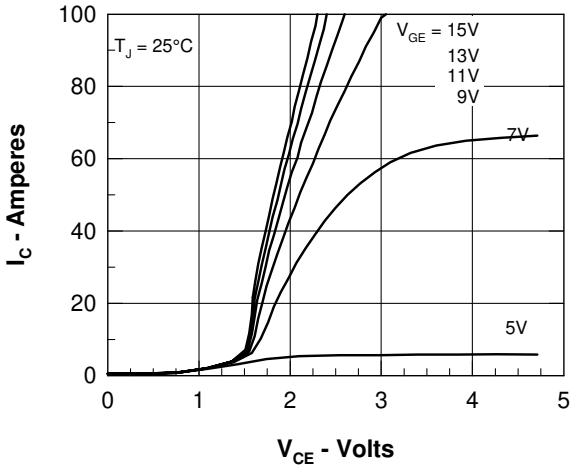


Figure 1. Saturation Voltage Characteristics

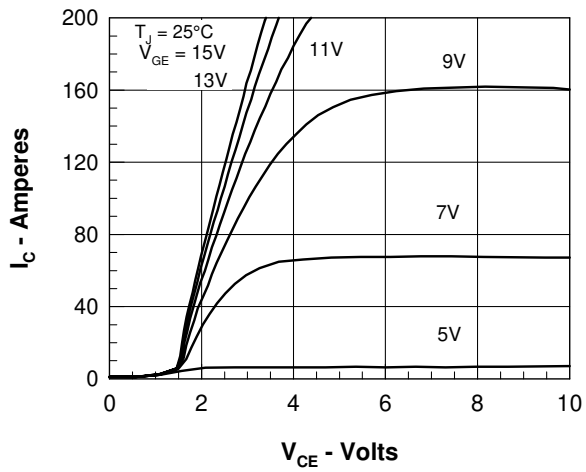


Figure 2. Extended Output Characteristics

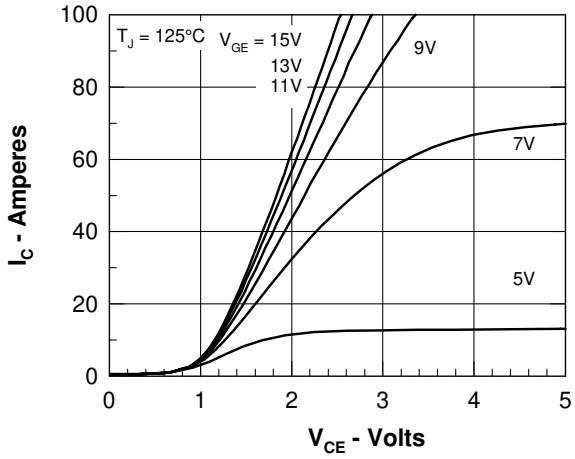


Figure 3. Saturation Voltage Characteristics

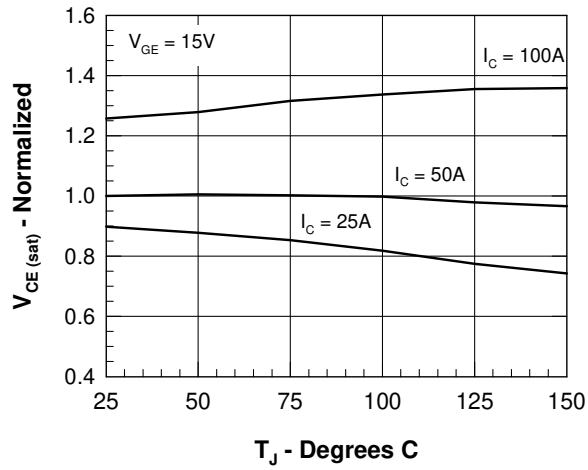


Figure 4. Temperature Dependence of $V_{CE(sat)}$

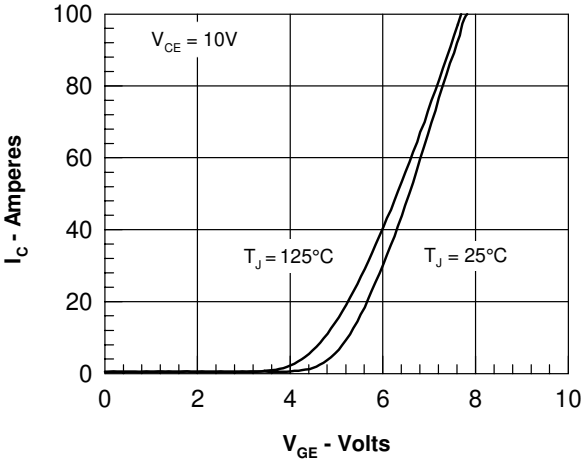


Figure 5. Admittance Curves

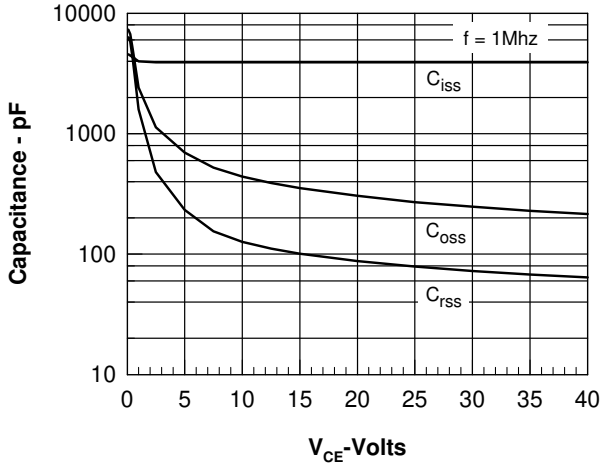


Figure 6. Capacitance Curves

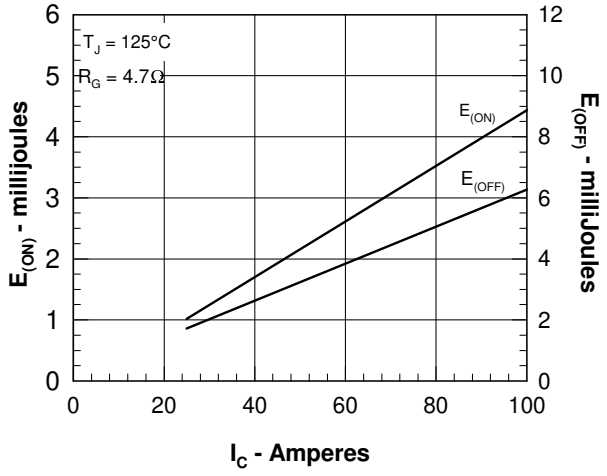


Figure 7. Dependence of E_{ON} and E_{OFF} on I_C.

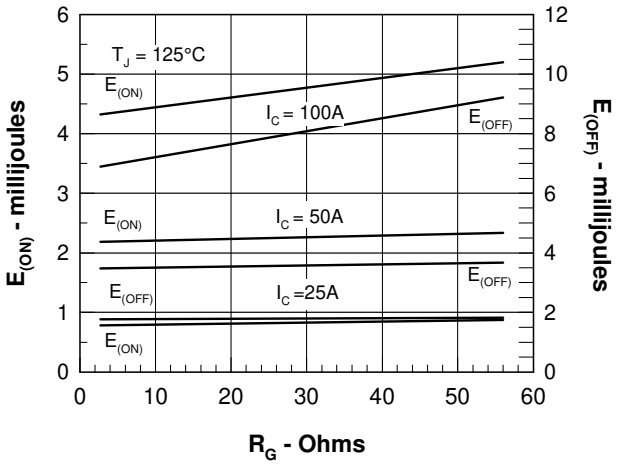


Figure 8. Dependence of E_{ON} and E_{OFF} on R_G.

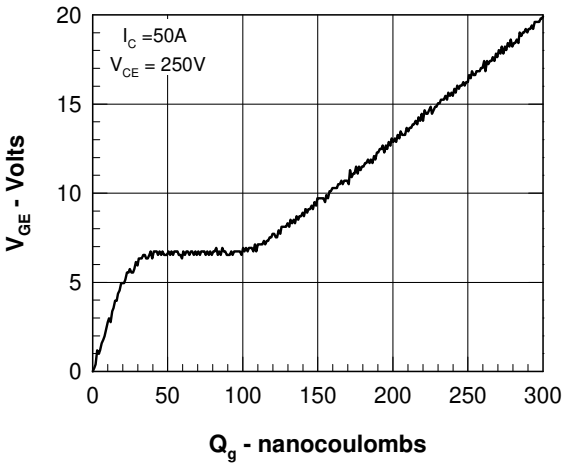


Figure 9. Gate Charge

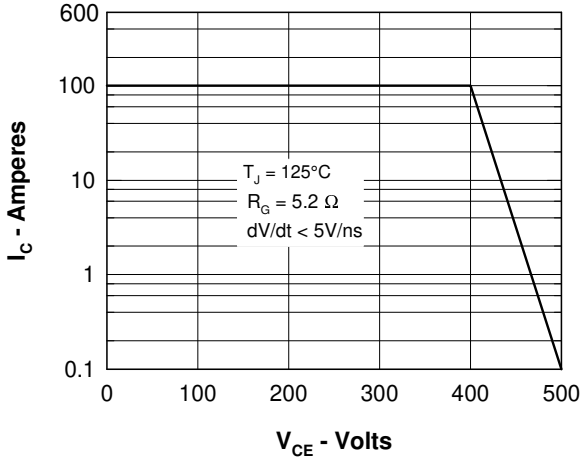


Figure 10. Turn-off Safe Operating Area

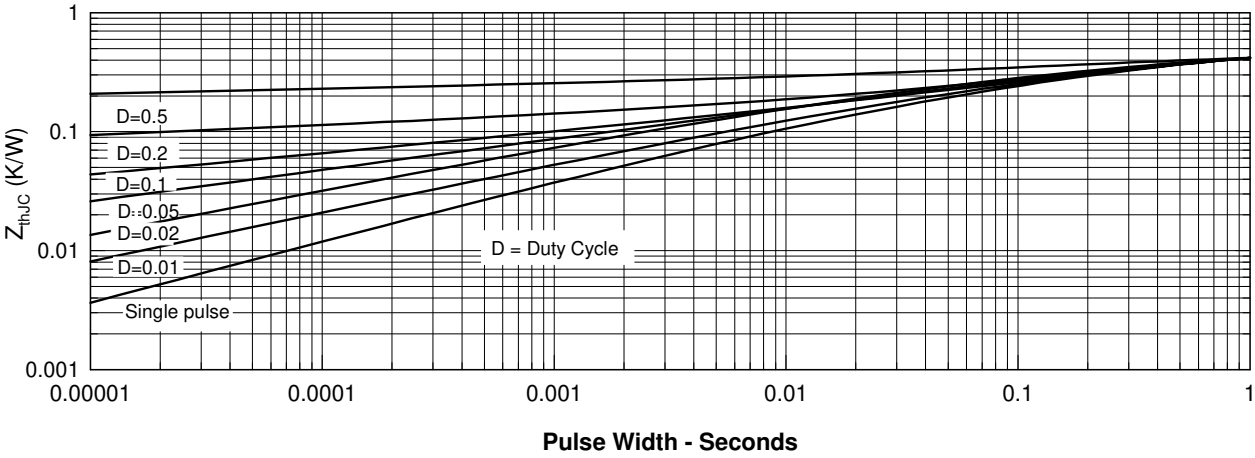


Figure 11. IGBT Transient Thermal Resistance

Fig. 12. Maximum Forward Voltage Drop

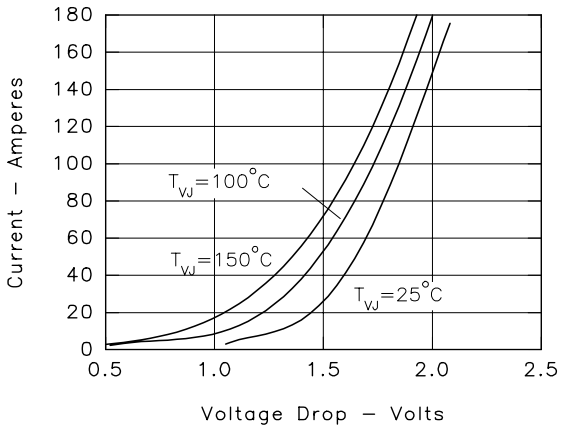


Fig. 13. Peak Forward Voltage V_{FR} and Forward Recovery Time t_{FR}.

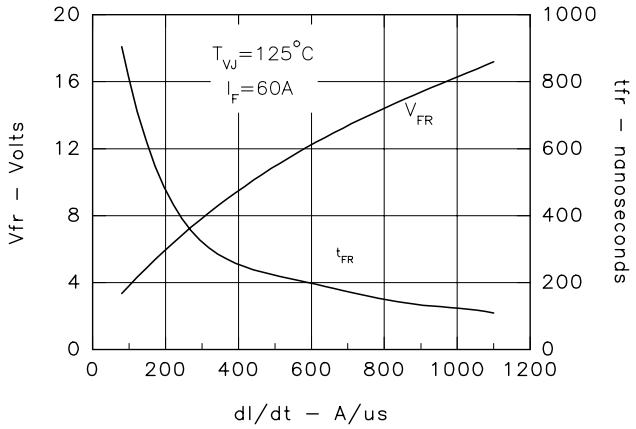


Fig. 14. Junction Temperature Dependence of I_{RM} and Q_R.

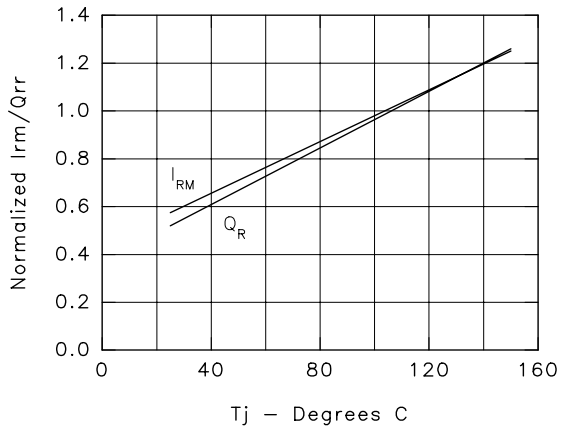


Fig. 15. Maximum Reverse Recovery Charge

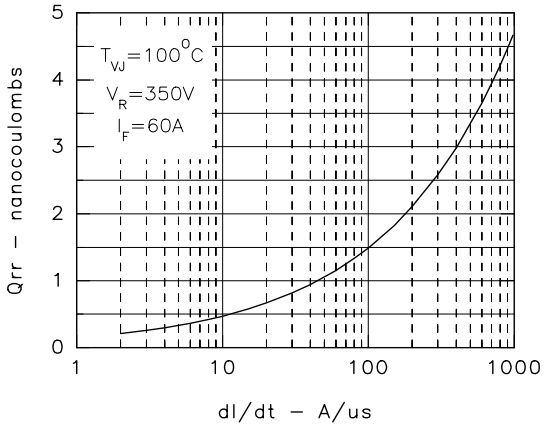


Figure 16. Peak Reverse Recovery Current.

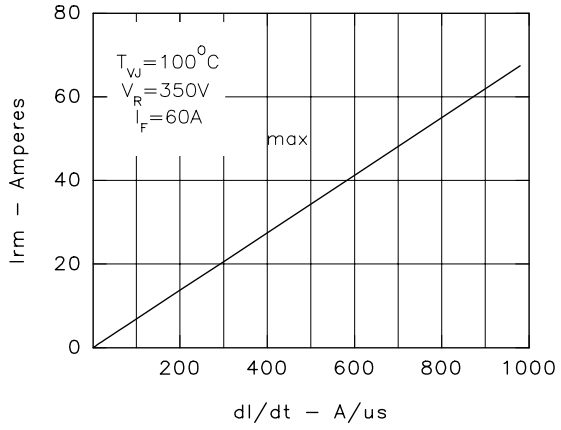
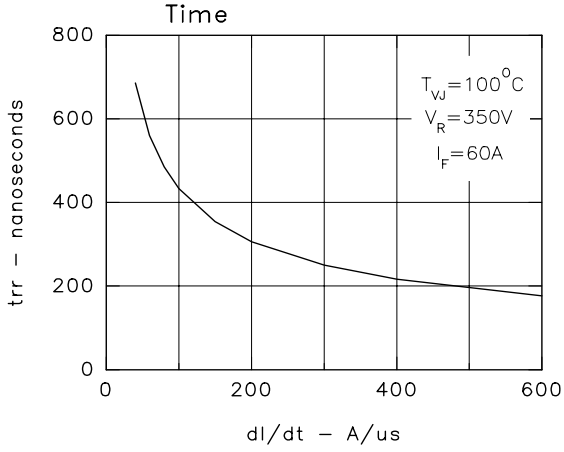


Fig. 17. Maximum Reverse Recovery Time



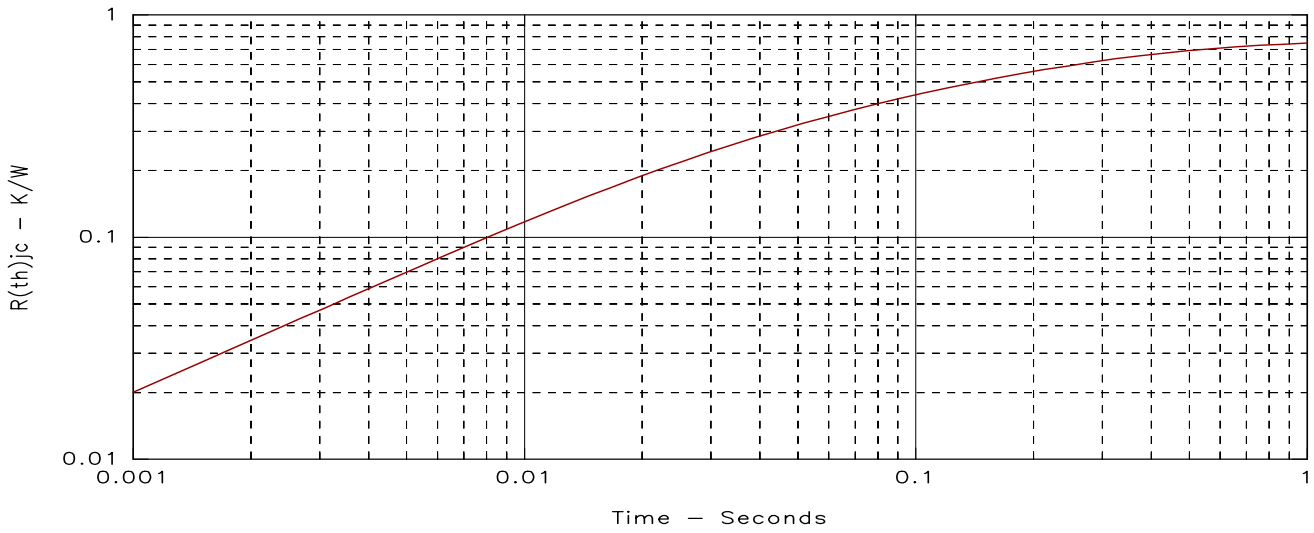


Fig. 18. Diode transient thermal resistance junction-to-case.