

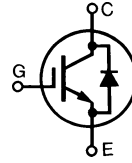
Low $V_{CE(sat)}$ IGBT with Diode

High Speed IGBT with Diode

Combi Pack

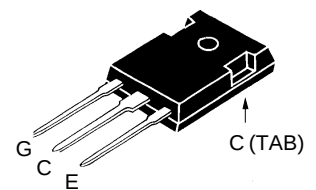
IXGH 12N100U1
IXGH 12N100AU1

V_{CES}	I_{C25}	$V_{CE(sat)}$
1000 V	24 A	3.5 V
1000 V	24 A	4.0 V



Symbol	Test Conditions	Maximum Ratings	
V_{CES}	$T_J = 25^\circ\text{C to } 150^\circ\text{C}$	1000	V
V_{CGR}	$T_J = 25^\circ\text{C to } 150^\circ\text{C}; R_{GE} = 1\text{ M}\Omega$	1000	V
V_{GES}	Continuous	± 20	V
V_{GEM}	Transient	± 30	V
I_{C25}	$T_C = 25^\circ\text{C}$	24	A
I_{C90}	$T_C = 90^\circ\text{C}$	12	A
I_{CM}	$T_C = 25^\circ\text{C}, 1\text{ ms}$	48	A
SSOA (RBSOA)	$V_{GE} = 15\text{ V}, T_{VJ} = 125^\circ\text{C}, R_G = 150\ \Omega$ Clamped inductive load, $L = 300\ \mu\text{H}$	$I_{CM} = 24$ @ $0.8\ V_{CES}$	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 with screw 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	$^\circ\text{C}$

TO-247AD



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

Features

- International standard packages JEDEC TO-247
- IGBT with antiparallel FRED in one package
- HDMOS™ process
- Low $V_{CE(sat)}$
 - for minimum on-state conduction losses
- MOS Gate turn-on
 - drive simplicity
- Fast Recovery Exptaxial Diode (FRED)
 - soft recovery with low I_{RM}

Applications

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

Advantages

- Easy to mount with one screw
- Reduces assembly time and cost
- Space savings (two devices in one package)

Symbol	Test Conditions ($T_J = 25^\circ\text{C}$, unless otherwise specified)	Characteristic Values		
		Min.	Typ.	Max.
BV_{CES}	$I_C = 3\text{ mA}, V_{GE} = 0\text{ V}$ BV_{CES} temperature coefficient	1000	0.072	V %/K
$V_{GE(th)}$	$I_C = 500\ \mu\text{A}, V_{GE} = V_{GE}$ $V_{GE(th)}$ temperature coefficient	2.5	-0.192	V %/K
I_{CES}	$V_{CE} = 0.8, V_{CES}$ $T_J = 25^\circ\text{C}$ $V_{GE} = 0\text{ V}$ $T_J = 125^\circ\text{C}$			300 μA 5 mA
I_{GES}	$V_{CE} = 0\text{ V}, V_{GE} = \pm 20\text{ V}$			$\pm 100\text{ nA}$
$V_{CE(sat)}$	$I_C = I_{CE90}, V_{GE} = 15$	12N100U1 12N100AU1		3.5 V 4.0 V

Symbol	Test Conditions	Characteristic Values		
		Min.	Typ.	Max.
g_{fs}	$I_C = I_{C90}$; $V_{CE} = 10\text{ V}$, Pulse test, $t \leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$	6	10	S
C_{ies}	$V_{CE} = 25\text{ V}$, $V_{GE} = 0\text{ V}$, $f = 1\text{ MHz}$		750	pF
C_{oes}			120	pF
C_{res}			30	pF
Q_g	$I_C = I_{C90}$, $V_{GE} = 15\text{ V}$, $V_{CE} = 0.5 V_{CES}$		65	nC
Q_{ge}			8	nC
Q_{gc}			24	nC
$t_{d(on)}$	Inductive load, $T_J = 25^\circ\text{C}$ $I_C = I_{C90}$, $V_{GE} = 15\text{ V}$, $L = 300\text{ }\mu\text{H}$ $V_{CE} = 800\text{ V}$, $R_G = R_{off} = 120\text{ }\Omega$ Remarks: Switching times may increase for $V_{CE}(\text{Clamp}) > 0.8 V_{CES}$, higher T_J or increased R_G		100	ns
t_{ri}			200	ns
$t_{d(off)}$			850	1000
t_{fi}		12N100U1	800	1000
E_{off}		12N100AU1	500	700
		12N100U1	2.5	mJ
		12N100AU1	1.5	3.0
$t_{d(on)}$	Inductive load, $T_J = 125^\circ\text{C}$ $I_C = I_{C90}$, $V_{GE} = 15\text{ V}$, $L = 300\text{ }\mu\text{H}$ $V_{CE} = 800\text{ V}$, $R_G = R_{off} = 120\text{ }\Omega$ Remarks: Switching times may increase for $V_{CE}(\text{Clamp}) > 0.8 V_{CES}$, higher T_J or increased R_G		100	ns
t_{ri}			200	ns
$E_{(on)}$			1.1	mJ
$t_{d(off)}$		12N100U1	900	ns
t_{fi}		12N100AU1	1250	ns
		12N100U1	950	ns
E_{off}		12N100U1	3.5	mJ
		12N100AU1	2.2	mJ
R_{thJC}				1.25 K/W
R_{thCK}			0.25	K/W

TO-247 AD (IXGH) Outline



Dim.	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	19.81	20.32	0.780	0.800
B	20.80	21.46	0.819	0.845
C	15.75	16.26	0.610	0.640
D	3.55	3.65	0.140	0.144
E	4.32	5.49	0.170	0.216
F	5.4	6.2	0.212	0.244
G	1.65	2.13	0.065	0.084
H	-	4.5	-	0.177
J	1.0	1.4	0.040	0.055
K	10.8	11.0	0.426	0.433
L	4.7	5.3	0.185	0.209
M	0.4	0.8	0.016	0.031
N	1.5	2.49	0.087	0.102

Reverse Diode (FRED)		Characteristic Values		
Symbol	Test Conditions	Min.	Typ.	Max.
V_F	$I_F = 8\text{ A}$, $V_{GE} = 0\text{ V}$, Pulse test, $t \leq 300\text{ }\mu\text{s}$, duty cycle $d \leq 2\%$			2.75 V
I_{RM}	$I_F = I_{C90}$, $V_{GE} = 0\text{ V}$, $-di_F/dt = 100\text{ A}/\mu\text{s}$		6.5	A
t_{rr}	$V_R = 540\text{ V}$, $T_J = 125^\circ\text{C}$		120	ns
	$I_F = 1\text{ A}$, $-di_F/dt = 50\text{ A}/\mu\text{s}$, $V_R = 30\text{ V}$, $T_J = 25^\circ\text{C}$		50	60 ns
R_{thJC}				2.5 K/W

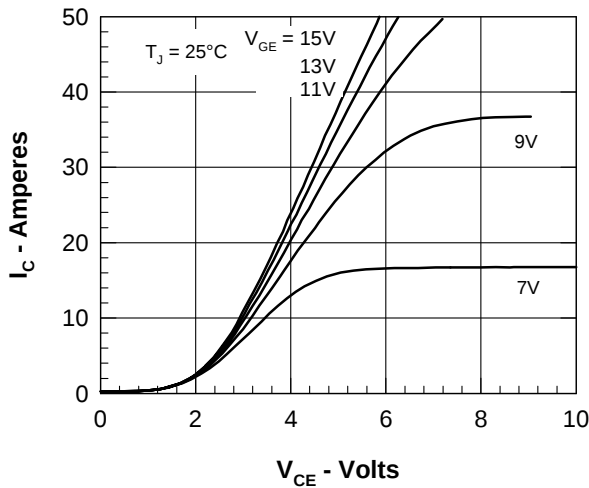


Figure 1. Saturation Voltage Characteristics

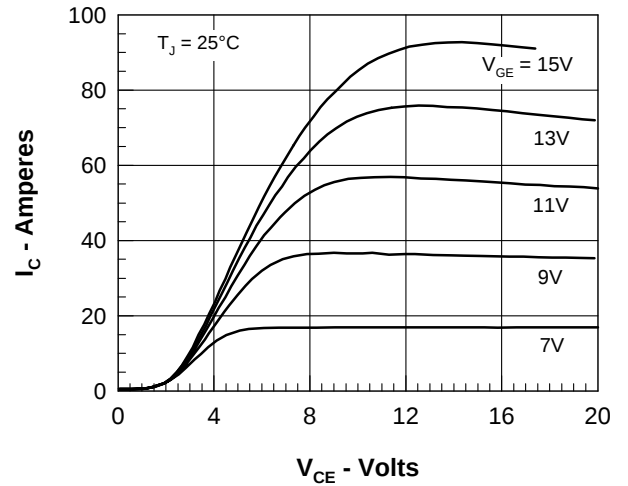


Figure 2. Extended Output Characteristics

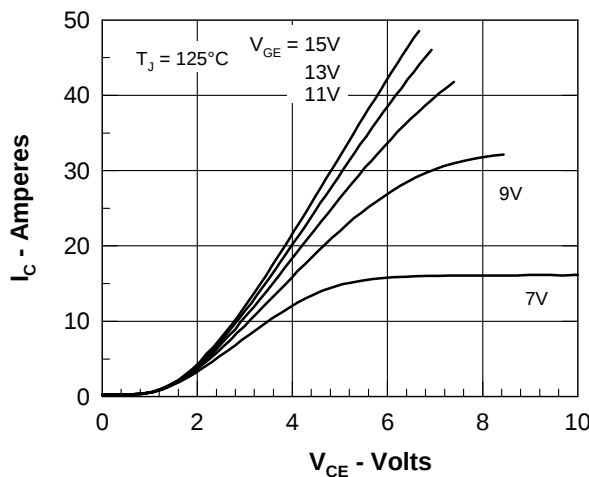


Figure 3. Saturation Voltage Characteristics

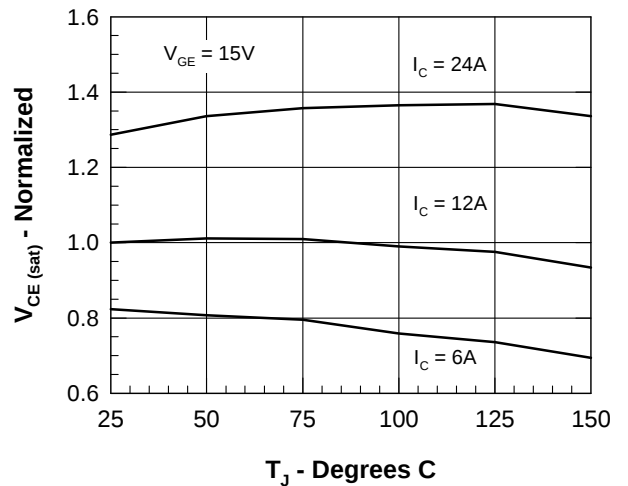
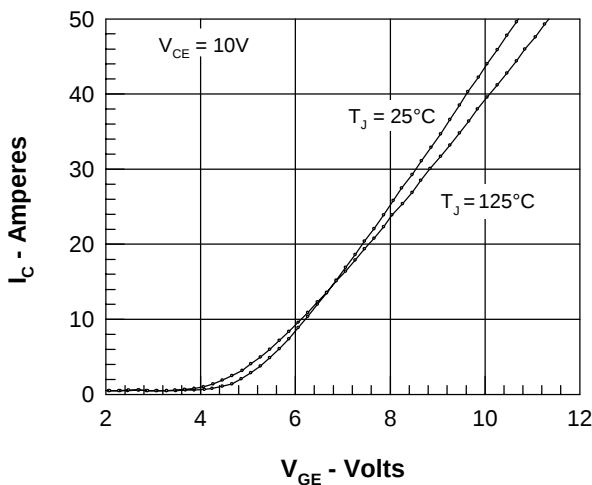

Figure 4. Temperature Dependence of $V_{CE(sat)}$


Figure 5. Admittance Curves

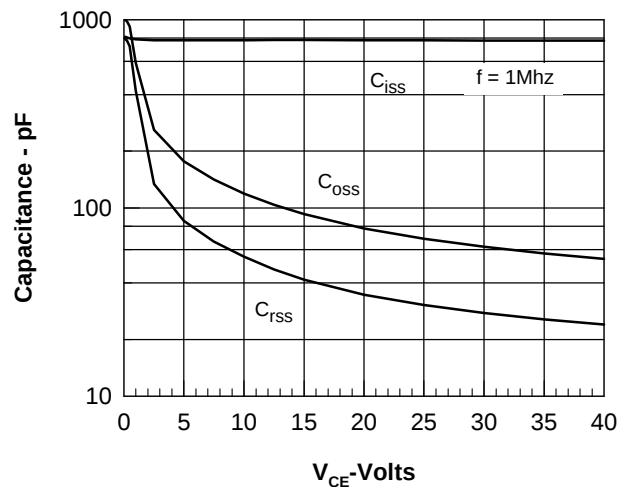


Figure 6. Capacitance Curves

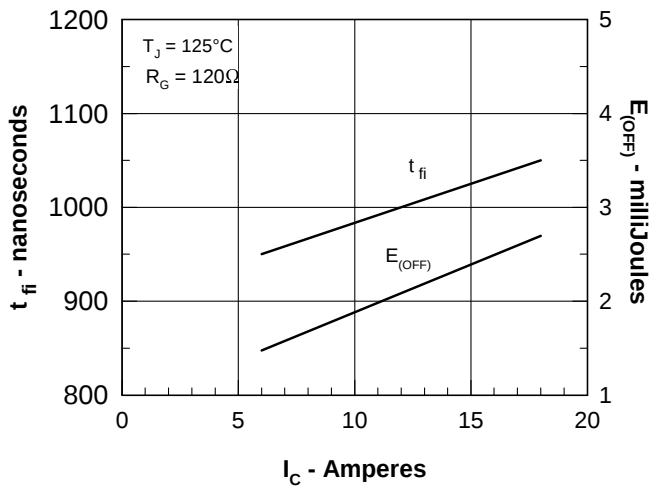


Figure 7. Dependence of t_{fi} and E_{OFF} on I_C .

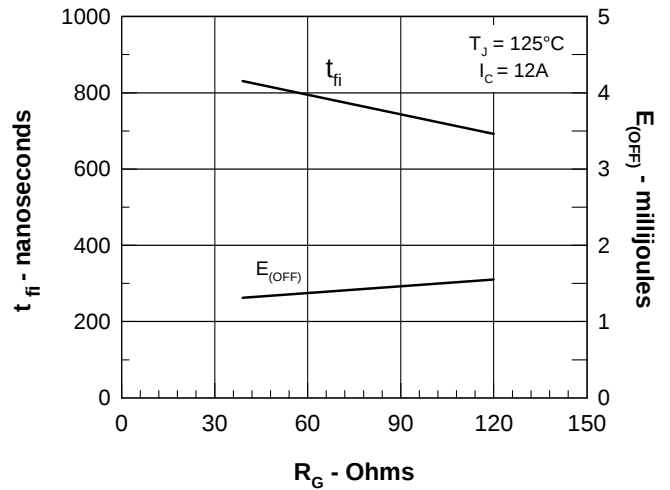


Figure 8. Dependence of t_{fi} and E_{OFF} on R_G .

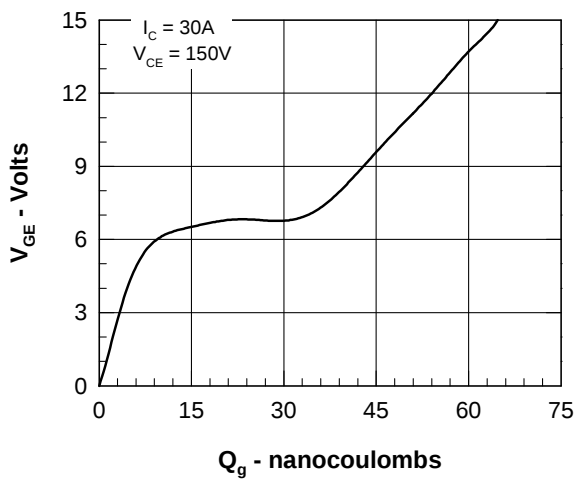


Figure 9. Gate Charge

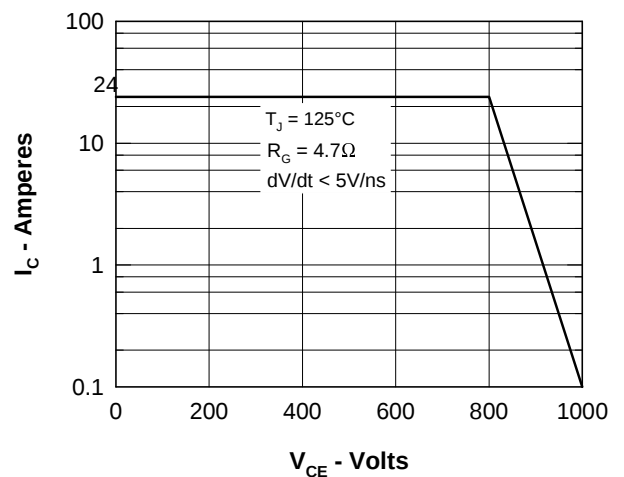


Figure 10. Turn-off Safe Operating Area

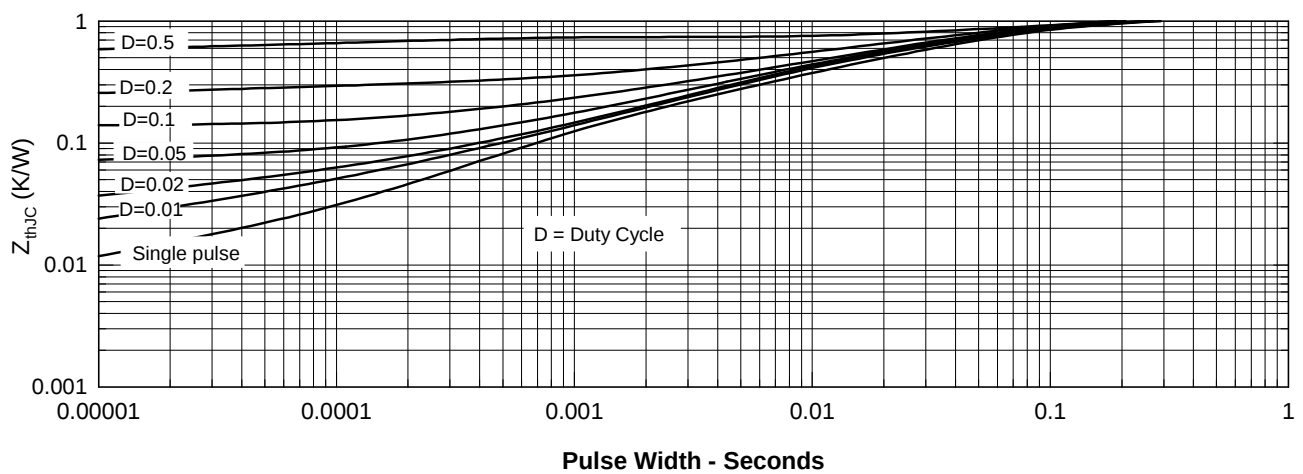


Figure 11. Transient Thermal Resistance

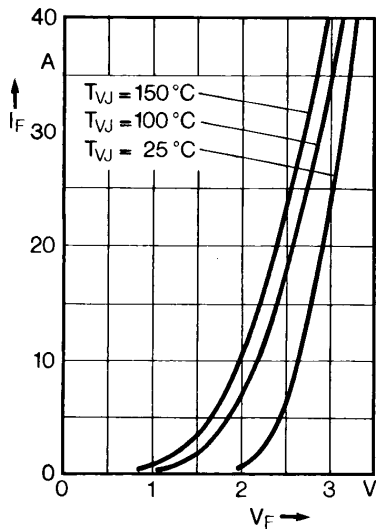


Fig. 12. Forward current versus voltage drop.

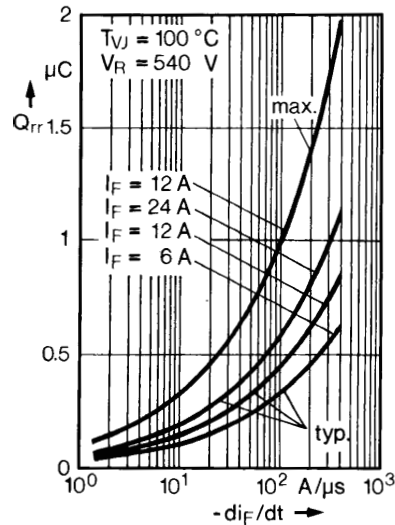


Fig. 13. Recovery charge versus $-di_F/dt$.

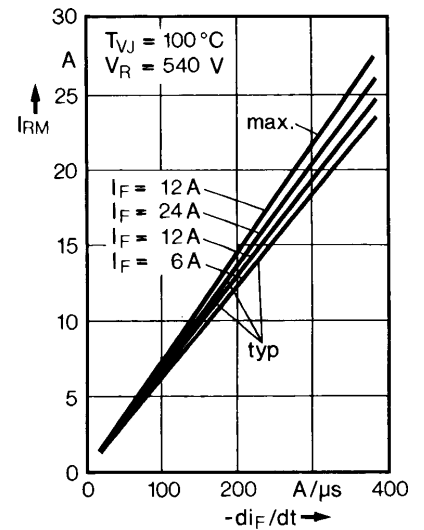


Fig. 14. Peak reverse current versus $-di_F/dt$.

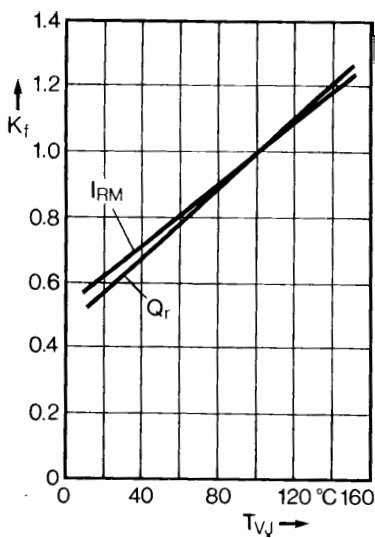


Fig. 15. Dynamic parameters versus junction temperature.

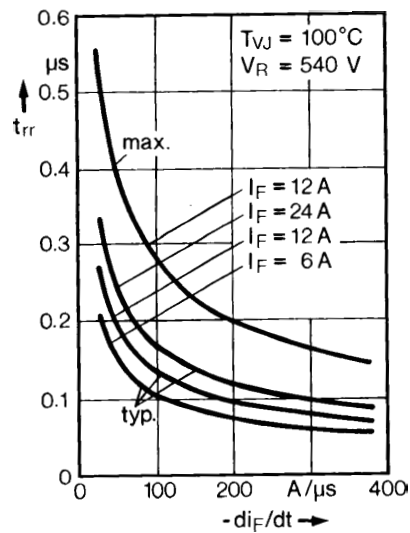


Fig. 16. Reverse recovery time . versus $-di_F/dt$

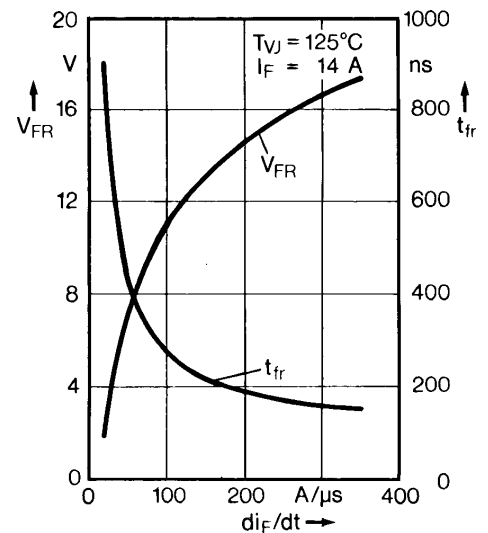


Fig. 17. Forward voltage recovery and time versus $-di_F/dt$.

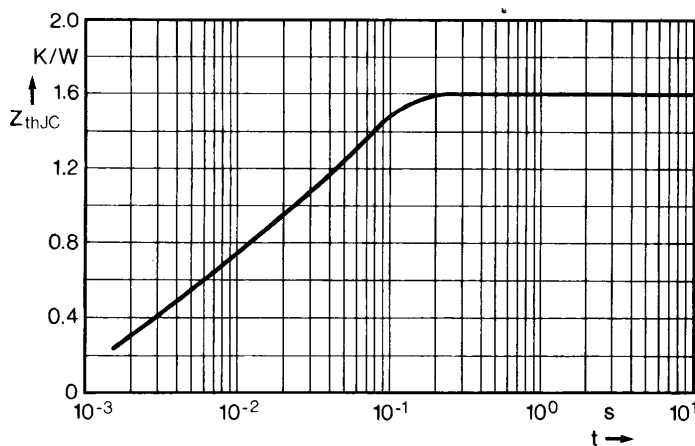


Fig. 18. Transient thermal impedance junction to case.