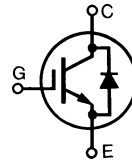


**Low  $V_{CE(sat)}$  IGBT with Diode**  
**High Speed IGBT with Diode**  
 Combi Pack

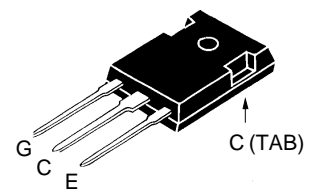
**IXGH 12N100U1**  
**IXGH 12N100AU1**

$V_{CES}$	$I_{C25}$	$V_{CE(sat)}$
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	$\pm 20$	V
$V_{GEM}$	Transient	$\pm 30$	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 ms	48	A
<b>SSOA</b> <b>(RBSOA)</b>	$V_{GE} = 15\text{ V}$ , $T_{VJ} = 125^\circ\text{C}$ , $R_G = 150\ \Omega$ 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.
<b>Weight</b>		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 Exptial Diode (FRED)
  - soft recovery with low  $I_{RM}$

**Applications**

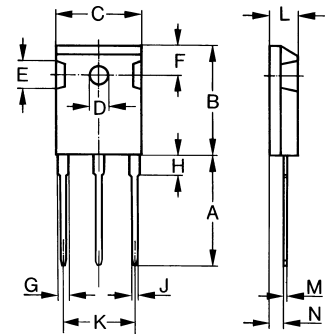
- DC choppers
- AC motor speed control
- DC servo and robot drives
- Uninterruptible power supplies (UPS)
- Switch-mode and resonant-mode power supplies

**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
$I_{CES}$	$V_{CE} = 0.8\ V_{CES}$ , $V_{GE} = 0\text{ V}$ $T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$			300 $\mu\text{A}$ 5 mA
$I_{GES}$	$V_{CE} = 0\text{ V}$ , $V_{GE} = \pm 20\text{ V}$			$\pm 100$ 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.	
$(T_J = 25^\circ\text{C}, \text{ unless otherwise specified})$					
$g_{fs}$	$I_C = I_{C90}, V_{CE} = 10\text{ V},$ Pulse test, $t \leq 300\ \mu\text{s}$ , 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	90	nC
$Q_{ge}$			8	20	nC
$Q_{gc}$			24	45	nC
$t_{d(on)}$	<b>Inductive load, <math>T_J = 25^\circ\text{C}</math></b> $I_C = I_{C90}, V_{GE} = 15\text{ V}, L = 300\ \mu\text{H}$ $V_{CE} = 800\text{ V}, R_G = R_{off} = 120\ \Omega$ 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
$t_{d(off)}$		12N100U1	850	1000	ns
$t_{fi}$		12N100AU1	800	1000	ns
$E_{off}$		12N100U1	2.5		mJ
	12N100AU1	1.5	3.0	mJ	
$t_{d(on)}$	<b>Inductive load, <math>T_J = 125^\circ\text{C}</math></b> $I_C = I_{C90}, V_{GE} = 15\text{ V}, L = 300\ \mu\text{H}$ $V_{CE} = 800\text{ V}, R_G = R_{off} = 120\ \Omega$ 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
$E_{off}$	12N100U1	950		ns	
	12N100AU1	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

Symbol	Test Conditions	Characteristic Values			
		Min.	Typ.	Max.	
$(T_J = 25^\circ\text{C}, \text{ unless otherwise specified})$					
$V_F$	$I_F = 8\text{ A}, V_{GE} = 0\text{ V},$ Pulse test, $t \leq 300\ \mu\text{s}$ , 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

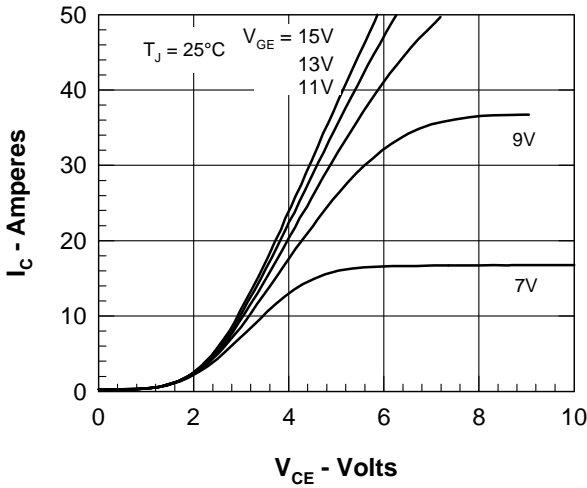


Figure 1. Saturation Voltage Characteristics

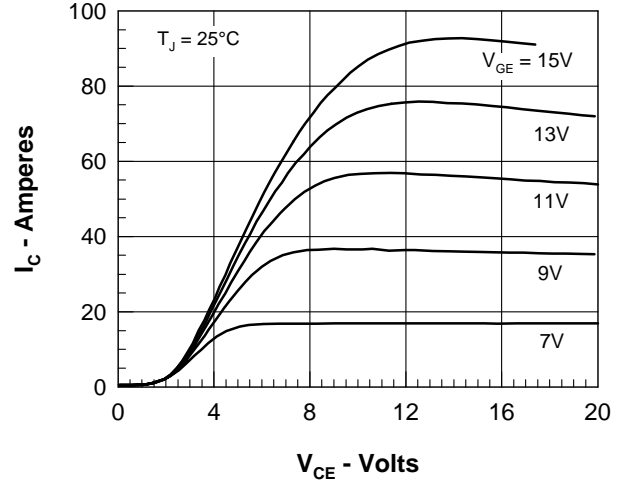


Figure 2. Extended Output Characteristics

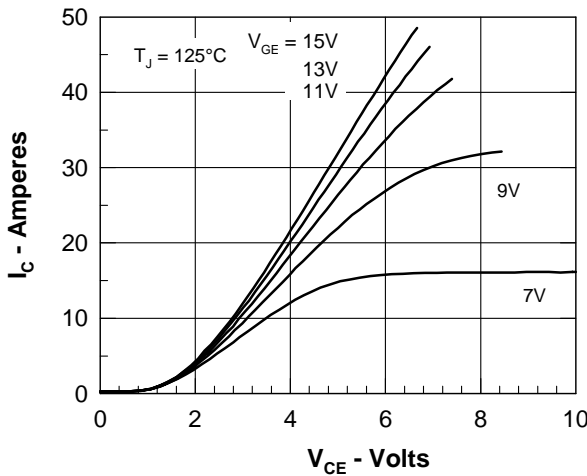


Figure 3. Saturation Voltage Characteristics

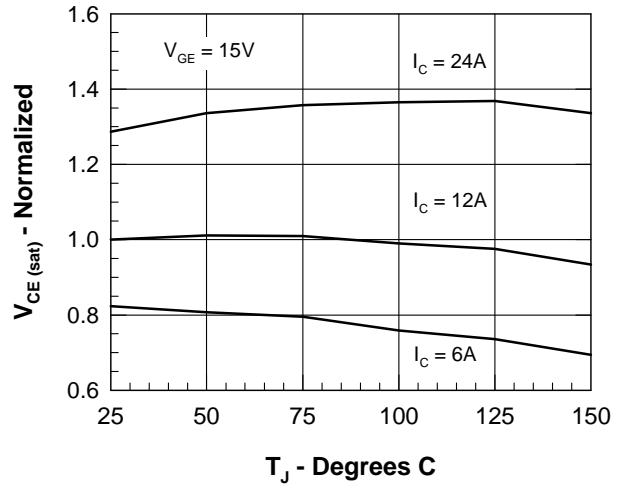


Figure 4. Temperature Dependence of  $V_{CE(sat)}$

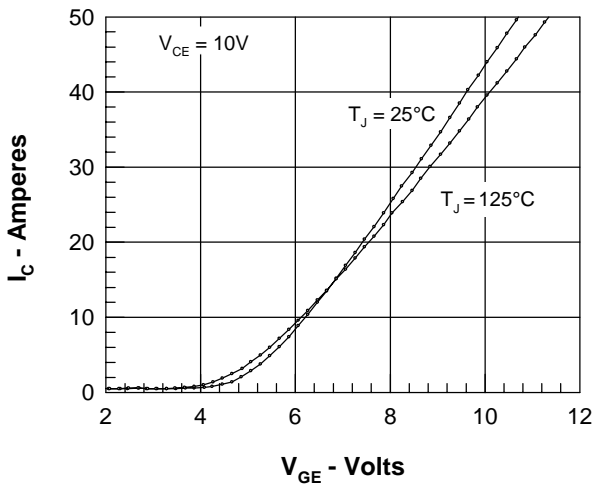


Figure 5. Admittance Curves

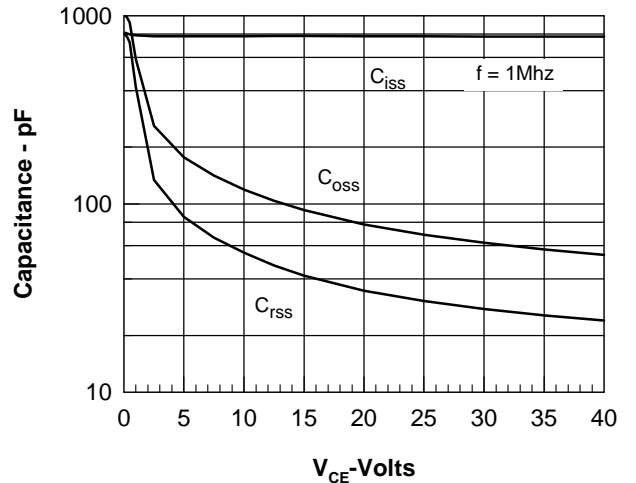


Figure 6. Capacitance Curves

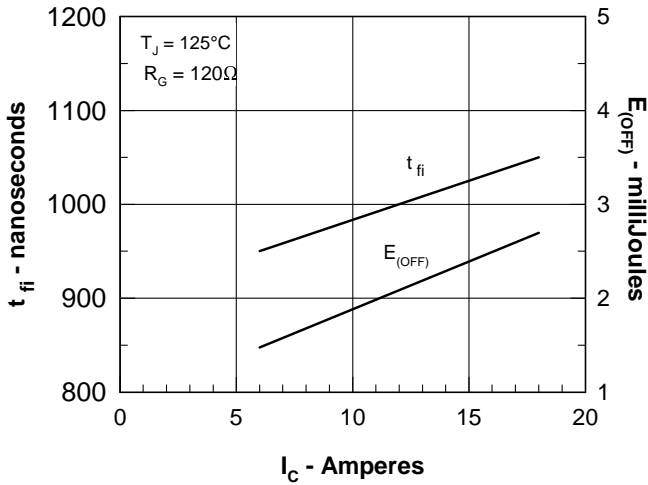


Figure 7. Dependence of  $t_{fi}$  and  $E_{OFF}$  on  $I_C$ .

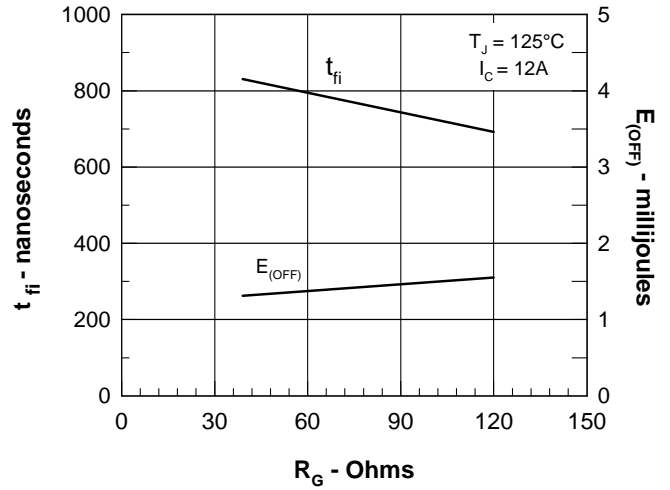


Figure 8. Dependence of  $t_{fi}$  and  $E_{OFF}$  on  $R_G$ .

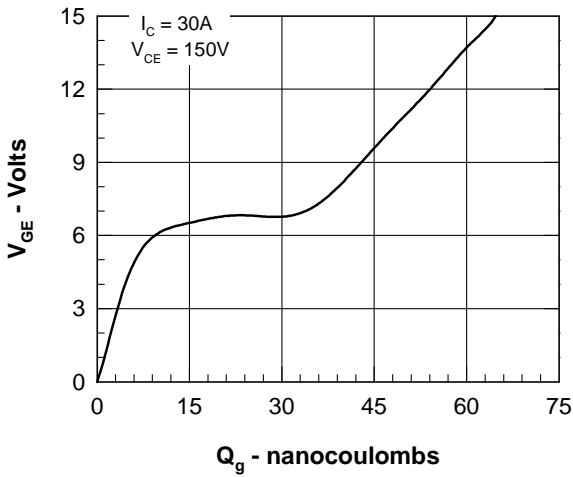


Figure 9. Gate Charge

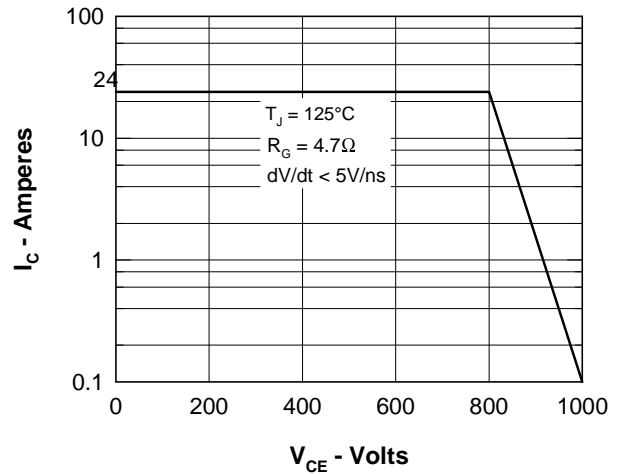


Figure 10. Turn-off Safe Operating Area

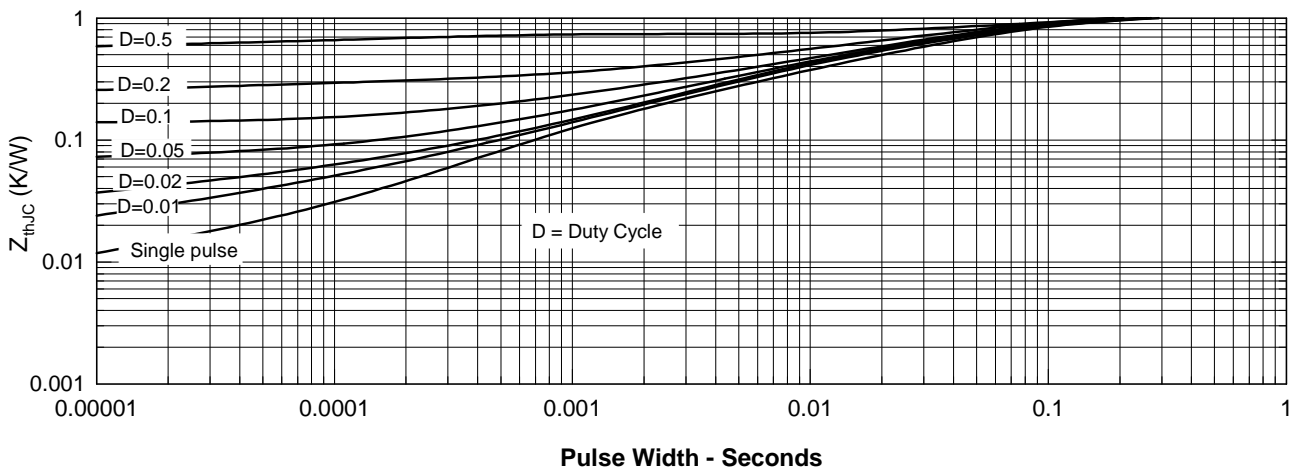


Figure 11. Transient Thermal Resistance

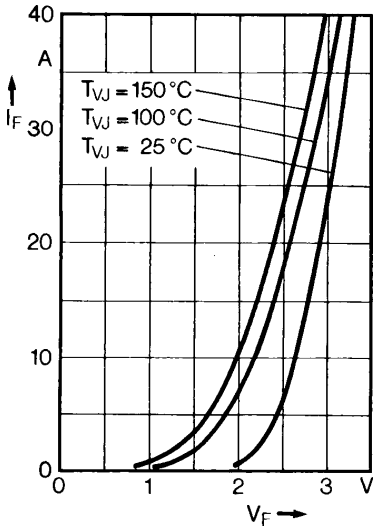


Fig. 12. Forward current versus voltage drop.

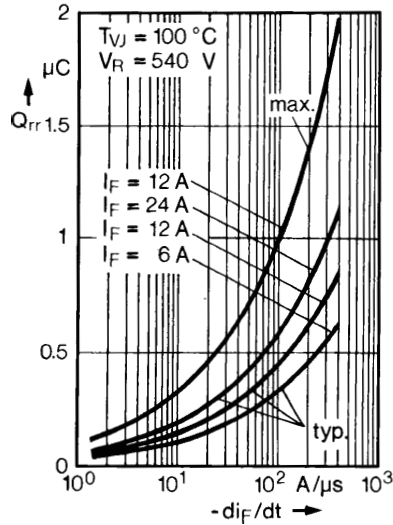


Fig. 13. Recovery charge versus  $-di_F/dt$ .

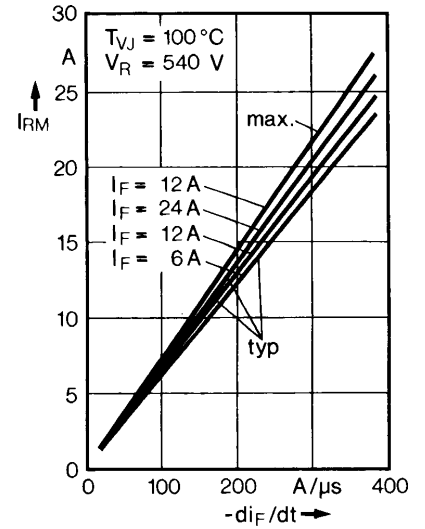


Fig. 14. Peak reverse current versus  $-di_F/dt$ .

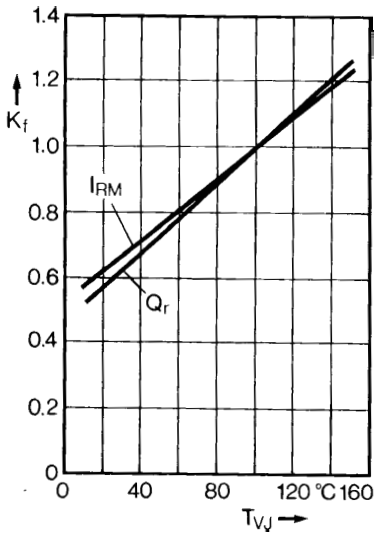


Fig. 15. Dynamic parameters versus junction temperature.

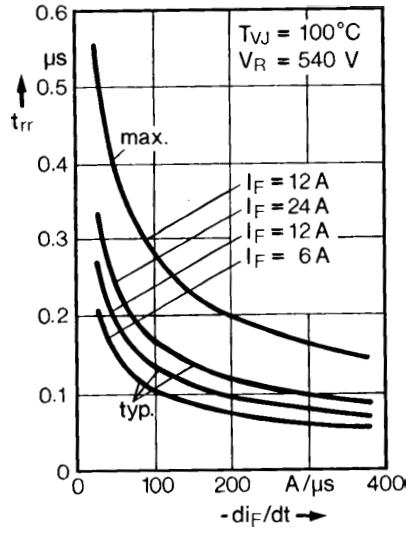


Fig. 16. Reverse recovery time versus  $-di_F/dt$ .

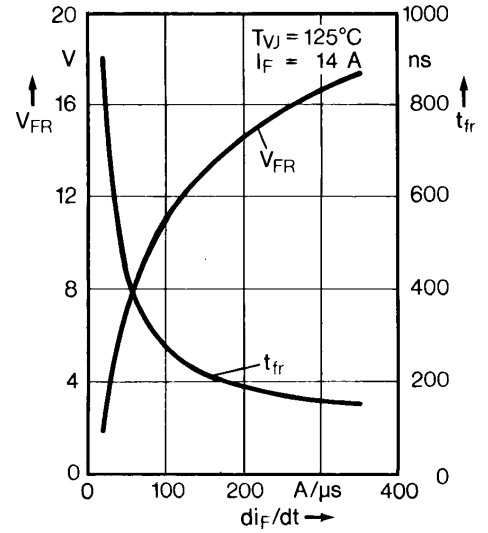


Fig. 17. Forward voltage recovery and time versus  $-di_F/dt$ .

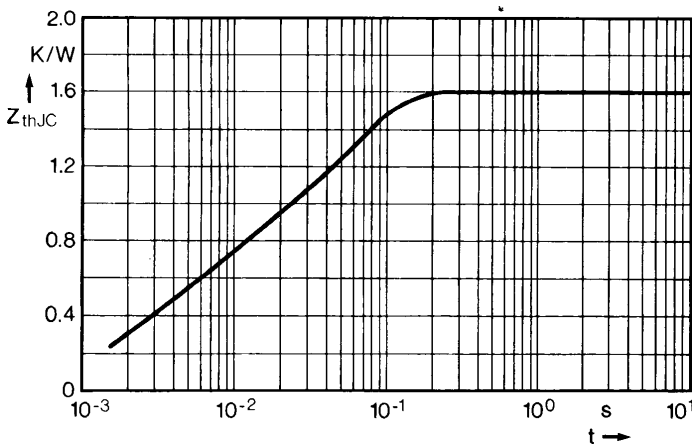


Fig. 18. Transient thermal impedance junction to case.