

IGBT Modules



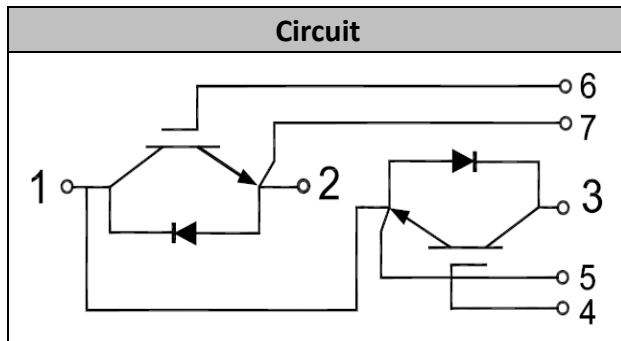
V_{CES} 1200V
 I_C 450A

Applications

- Motion/sevo control
- High frequency switching application
- UPS (Uninterruptible Power Supplies)
- Welding machine

Features

- Low $V_{ce(sat)}$ with Trench technology
- Low switching losses especially E_{off}
- $V_{ce(sat)}$ with positive temperature coefficient
- High short circuit capability(10us)
- Including ultra fast & soft recovery anti-parallel FWD
- Low inductance package
- Maximum junction temperature 175°C



● IGBT

Absolute Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Collector-Emitter Voltage	V_{CES}	$V_{GE}=0V, I_C=1mA, T_{vj}=25^{\circ}C$	1200	V
Continuous Collector Current	I_C	$T_c=100^{\circ}C$	450	A
Repetitive Peak Collector Current	I_{CRM}	$tp=1ms$	900	A
Gate-Emitter Voltage	V_{GES}	$T_{vj}=25^{\circ}C$	± 20	V
Total Power Dissipation	P_{tot}	$T_c=25^{\circ}C$ $T_{vjmax}=175^{\circ}C$	2307	W


Characteristic values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Gate-emitter Threshold Voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}$, $I_C=12mA$, $T_{vj}=25^{\circ}C$	5.2	5.8	6.4	V
Collector-Emitter Cut-off Current	I_{CES}	$V_{CE}=1200V$, $V_{GE}=0V$, $T_{vj}=25^{\circ}C$			1.0	mA
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C=450A$, $V_{GE}=15V$, $T_{vj}=25^{\circ}C$		1.90	2.35	V
		$I_C=450A$, $V_{GE}=15V$, $T_{vj}=125^{\circ}C$		2.30		
Gate Charge	Q_G			3.62		uC
Input Capacitance	C_{ies}	$V_{CE}=25V$, $V_{GE}=0V$, $f=1MHz$, $T_{vj}=25^{\circ}C$		25		nF
Reverse Transfer Capacitance	C_{res}			1.1		nF
Gate-Emitter leakage current	I_{GES}	$V_{CE}=0V$, $V_{GE}=20V$, $T_{vj}=25^{\circ}C$			400	nA
Turn-on Delay Time	$t_{d(on)}$	$I_C=450A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=1.8\Omega$ $T_{vj}=25^{\circ}C$		161		ns
Rise Time	t_r			52		ns
Turn-off Delay Time	$t_{d(off)}$			502		ns
Fall Time	t_f			96		ns
Energy Dissipation During Turn-on Time	E_{on}			23.2		mJ
Energy Dissipation During Turn-off Time	E_{off}			28.5		mJ
Turn-on Delay Time	$t_{d(on)}$	$I_C=450A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=1.8\Omega$ $T_{vj}=125^{\circ}C$		192		ns
Rise Time	t_r			63		ns
Turn-off Delay Time	$t_{d(off)}$			536		ns
Fall Time	t_f			135		ns
Energy Dissipation During Turn-on Time	E_{on}			31.5		mJ
Energy Dissipation During Turn-off Time	E_{off}			44.3		mJ
SC Data	I_{sc}	$T_p \leq 10\mu s$, $V_{GE}=15V$, $T_{vj}=150^{\circ}C$, $V_{cc}=600V$, $V_{CEM} \leq 1200V$		1800		A



● Diode

Absolute Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	$T_{vj}=25^{\circ}\text{C}$	1200	V
Continuous DC Forward Current	I_F		450	A
Repetitive Peak Forward Current	I_{FRM}	$t_p=1\text{ms}$	900	A

Characteristic values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Forward Voltage	V_F	$I_F=450\text{A}, T_{vj}=25^{\circ}\text{C}$		2.10		V
		$I_F=450\text{A}, T_{vj}=125^{\circ}\text{C}$		2.15		
Recovered Charge	Q_{rr}	$I_F=450\text{A}$		45		μC
Peak Reverse Recovery Current	I_{rr}	$V_R=600\text{V}$ $-di_F/dt=6500\text{A}/\mu\text{s}$		383		A
Reverse Recovery Energy	E_{rec}	$T_{vj}=25^{\circ}\text{C}$		21.2		mJ
Recovered Charge	Q_{rr}	$I_F=450\text{A}$		86		μC
Peak Reverse Recovery Current	I_{rr}	$V_R=600\text{V}$ $-di_F/dt=6500\text{A}/\mu\text{s}$		453		A
Reverse Recovery Energy	E_{rec}	$T_{vj}=125^{\circ}\text{C}$		37.2		mJ



● Module Characteristics

$T_C=25^{\circ}\text{C}$ unless otherwise specified

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Isolation voltage	V_{isol}	$t=1\text{min}, f=50\text{Hz}$	2500			V
Maximum Junction Temperature	T_{jmax}				175	$^{\circ}\text{C}$
Operating Junction Temperature	$T_{\text{vj op}}$		-40		150	$^{\circ}\text{C}$
Storage Temperature	T_{stg}		-40		125	$^{\circ}\text{C}$
Thermal Resistance Junction-to Case	$R_{\theta \text{ JC}}$	per IGBT			0.065	K/W
		per Diode			0.13	
Thermal Resistance Case-to Sink	$R_{\theta \text{ CS}}$	Conductive grease applied		0.033		K/W
Module Electrodes Torque	M_t	Recommended(M6)	3.0		5.0	N·m
Module-to-Sink Torque	M_s	Recommended(M6)	3.0		5.0	N·m
Weight of Module	G			315		g

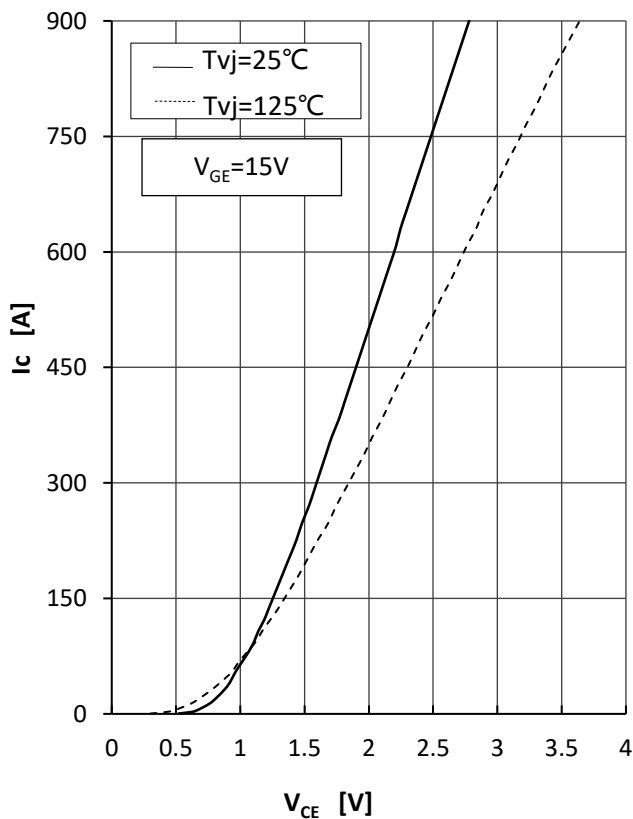


Fig1.IGBT Output Characteristics

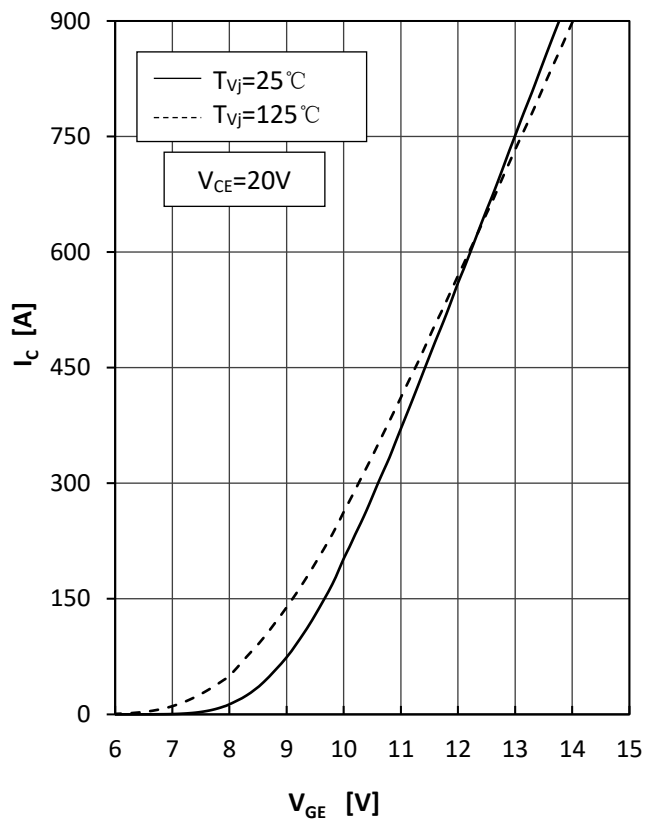


Fig2.IGBT Transfer Characteristics

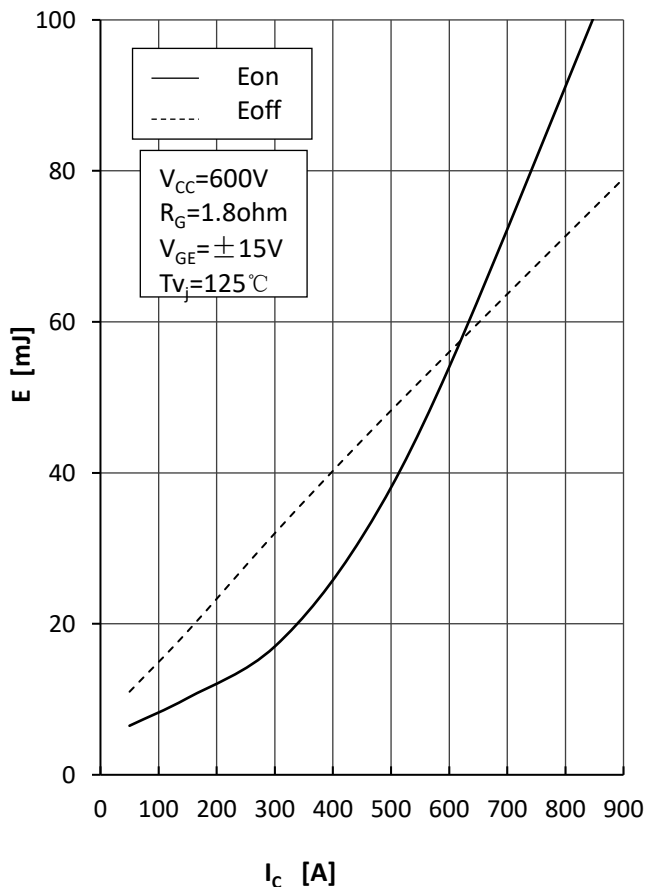


Fig3.IGBT Switching Loss vs.Ic

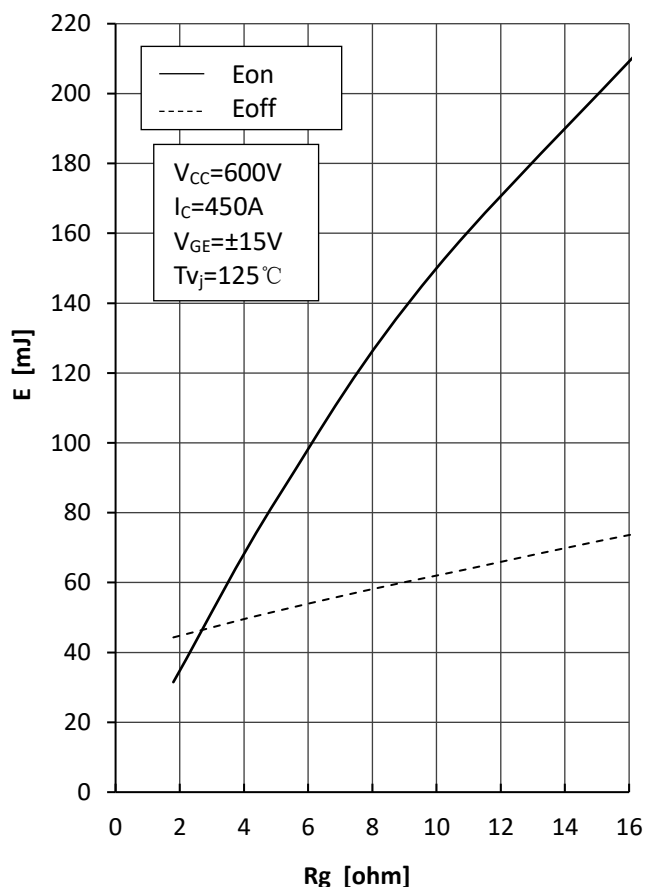
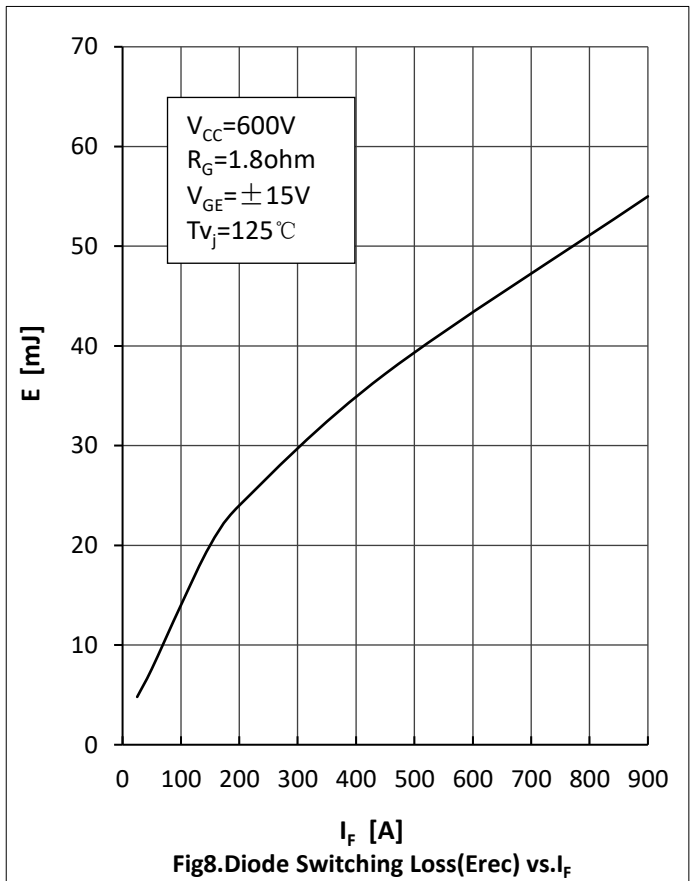
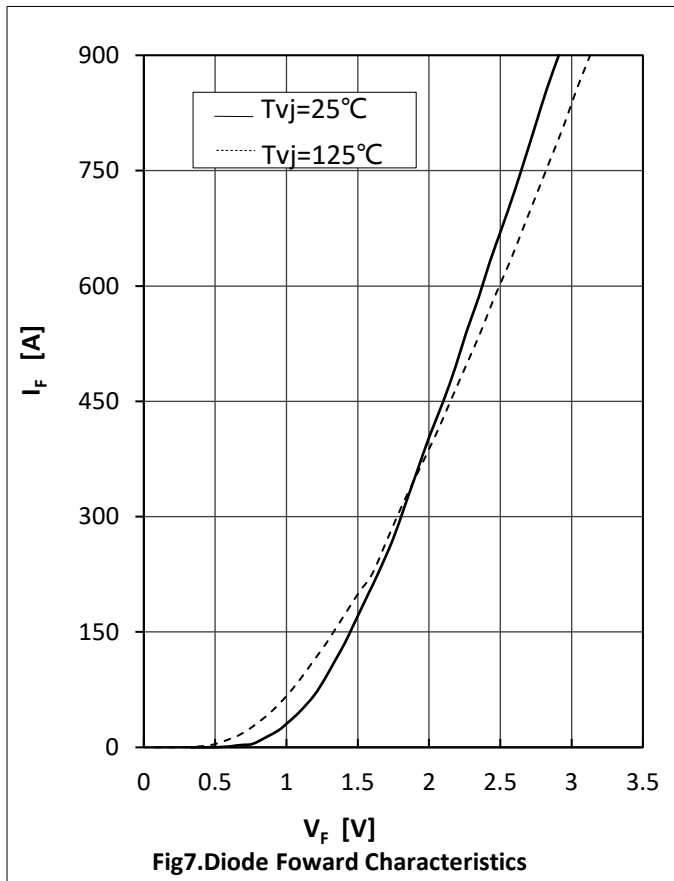
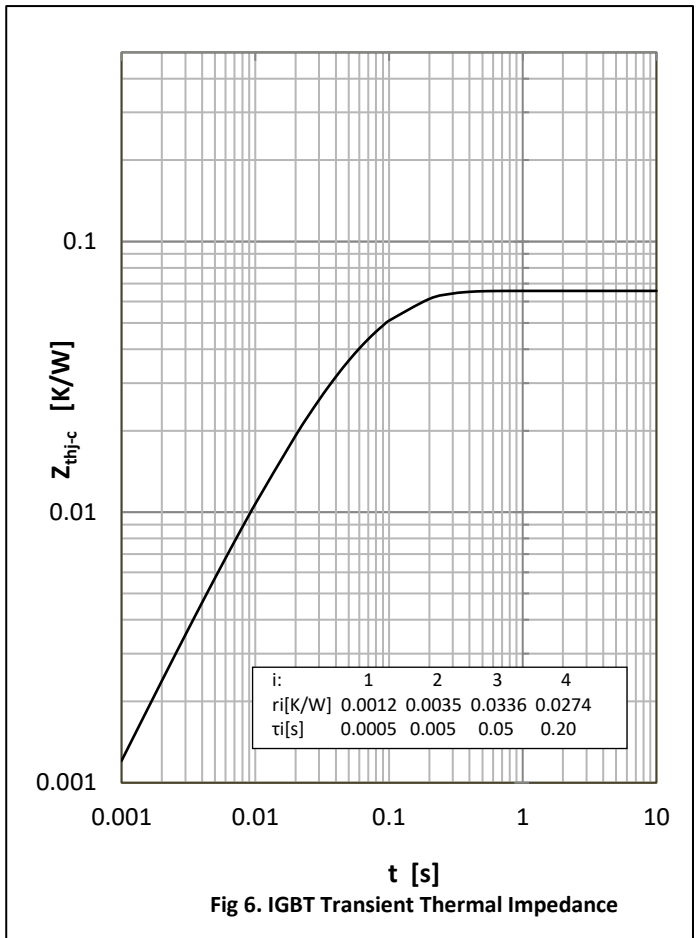
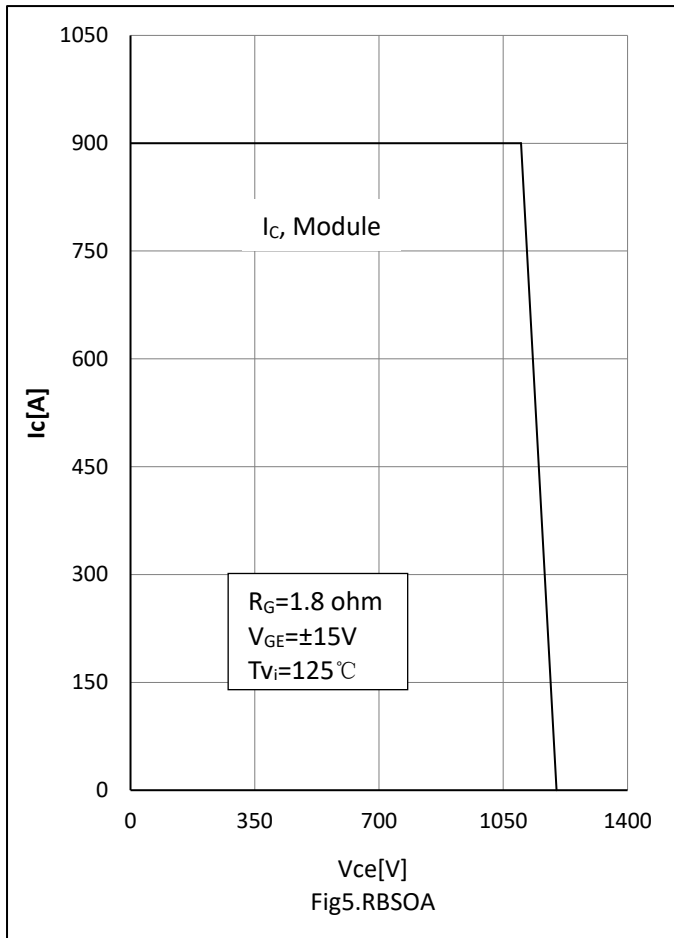


Fig4.IGBT Switching Loss vs.Rg



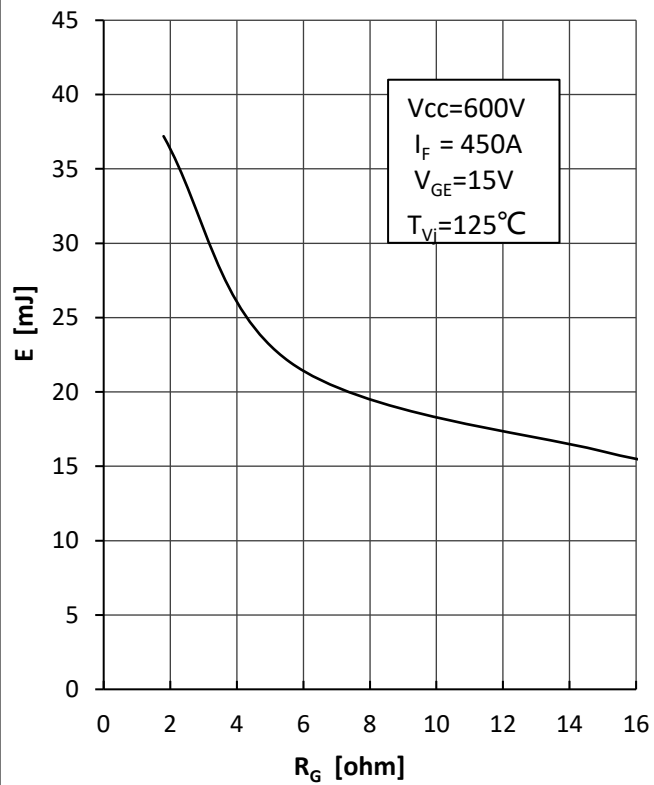


Fig9.Diode Switching Loss(E_{rec}) vs. R_g

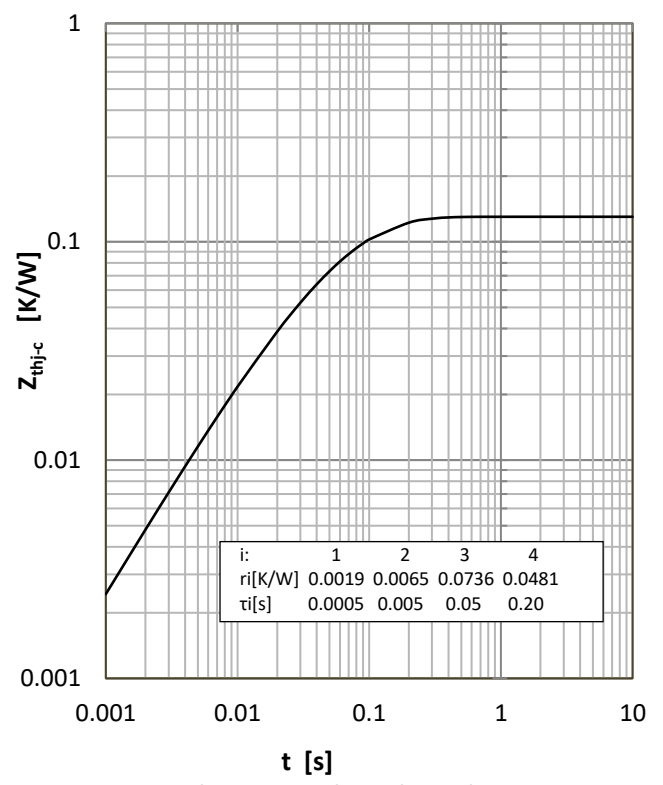


Fig10.Diode Transient Thermal Impedance

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