



IGBT Modules

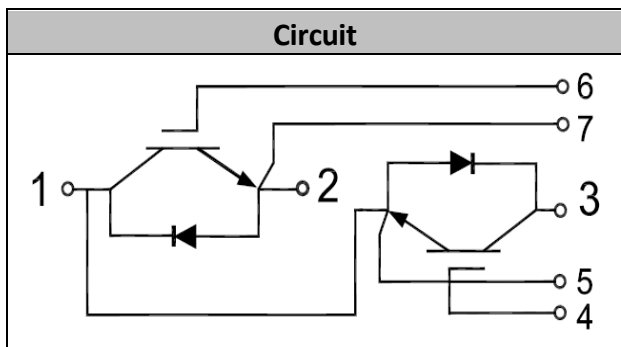
V_{CES} 650V
 I_c 150A

Applications

- Inverter for motor drive
- AC and DC servo drive amplifier
- UPS (Uninterruptible Power Supplies)
- Soft switching welding machine

Features

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



● IGBT

Absolute Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Collector-Emitter Voltage	V_{CES}	$V_{GE}=0V, I_c=4mA, T_{vj}=25^{\circ}C$	650	V
Continuous Collector Current	I_c	$T_c=100^{\circ}C$	150	A
Repetitive Peak Collector Current	I_{CRM}	$t_p=1ms$	300	A
Gate-Emitter Voltage	V_{GES}	$T_{vj}=25^{\circ}C$	± 20	V
Total Power Dissipation	P_{tot}	$T_c=25^{\circ}C$ $T_{vjmax}=175^{\circ}C$	468	W


Characteristic values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Gate-emitter Threshold Voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}$, $I_C=2.4mA$, $T_{vj}=25^{\circ}C$	5.0	5.8	6.5	V
Collector-Emitter Cut-off Current	I_{CES}	$V_{CE}=650V$, $V_{GE}=0V$, $T_{vj}=25^{\circ}C$			1.0	mA
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C=150A$, $V_{GE}=15V$, $T_{vj}=25^{\circ}C$		1.55	1.80	V
		$I_C=150A$, $V_{GE}=15V$, $T_{vj}=125^{\circ}C$		1.70		
		$I_C=150A$, $V_{GE}=15V$, $T_{vj}=150^{\circ}C$		1.75		
Input Capacitance	C_{ies}	$V_{CE}=25V$, $V_{GE}=0V$, $f=1MHz$, $T_{vj}=25^{\circ}C$		9.7		nF
Reverse Transfer Capacitance	C_{res}			0.45		nF
Internal Gate Resistance	R_{gint}			2.0		Ω
Gate-Emitter leakage current	I_{GES}	$V_{CE}=0V$, $V_{GE}=20V$, $T_{vj}=25^{\circ}C$			400	nA
Turn-on Delay Time	$t_{d(on)}$	$I_C=150A$ $V_{CE}=300V$ $V_{GE}=\pm 15V$ $R_G=3.3\Omega$ $T_{vj}=25^{\circ}C$		184		ns
Rise Time	t_r			49		ns
Turn-off Delay Time	$t_{d(off)}$			312		ns
Fall Time	t_f			90		ns
Energy Dissipation During Turn-on Time	E_{on}			1.05		mJ
Energy Dissipation During Turn-off Time	E_{off}			3.72		mJ
Turn-on Delay Time	$t_{d(on)}$	$I_C=150A$ $V_{CE}=300V$ $V_{GE}=\pm 15V$ $R_G=3.3\Omega$ $T_{vj}=125^{\circ}C$		200		ns
Rise Time	t_r			65		ns
Turn-off Delay Time	$t_{d(off)}$			384		ns
Fall Time	t_f			120		ns
Energy Dissipation During Turn-on Time	E_{on}			1.57		mJ
Energy Dissipation During Turn-off Time	E_{off}			5.17		mJ
Turn-on Delay Time	$t_{d(on)}$	$I_C=150A$ $V_{CE}=300V$ $V_{GE}=\pm 15V$ $R_G=3.3\Omega$ $T_{vj}=150^{\circ}C$		207		ns
Rise Time	t_r			73		ns
Turn-off Delay Time	$t_{d(off)}$			405		ns
Fall Time	t_f			138		ns
Energy Dissipation During Turn-on Time	E_{on}			1.88		mJ
Energy Dissipation During Turn-off Time	E_{off}			5.68		mJ
SC Data	I_{sc}	$t_p \leq 6\mu s$, $V_{GE}=15V$, $T_{vj}=150^{\circ}C$, $V_{cc}=300V$, $V_{CEM} \leq 650V$		750		A



● Diode

Absolute Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	$T_{vj}=25^{\circ}\text{C}$	650	V
Continuous DC Forward Current	I_F		150	A
Repetitive Peak Forward Current	I_{FRM}	$t_p=1\text{ms}$	300	A
I^2t -value	I^2t	$V_R=0\text{V}, t_p=10\text{ms}, T_{vj}=125^{\circ}\text{C}$	2050	A^2s
		$V_R=0\text{V}, t_p=10\text{ms}, T_{vj}=150^{\circ}\text{C}$	1950	

Characteristic values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Forward Voltage	V_F	$I_F=150\text{A}, T_{vj}=25^{\circ}\text{C}$		1.55		V
		$I_F=150\text{A}, T_{vj}=125^{\circ}\text{C}$		1.45		
		$I_F=150\text{A}, T_{vj}=150^{\circ}\text{C}$		1.40		
Recovered Charge	Q_{rr}	$I_F=150\text{A}$		2.44		μC
Peak Reverse Recovery Current	I_{rr}	$V_R=300\text{V}$ $-di_F/dt=2200\text{A}/\mu\text{s}$		70		A
Reverse Recovery Energy	E_{rec}	$T_{vj}=25^{\circ}\text{C}$		0.85		mJ
Recovered Charge	Q_{rr}	$I_F=150\text{A}$		3.24		μC
Peak Reverse Recovery Current	I_{rr}	$V_R=300\text{V}$ $-di_F/dt=2200\text{A}/\mu\text{s}$		102		A
Reverse Recovery Energy	E_{rec}	$T_{vj}=125^{\circ}\text{C}$		1.32		mJ
Recovered Charge	Q_{rr}	$I_F=150\text{A}$		3.61		μC
Peak Reverse Recovery Current	I_{rr}	$V_R=300\text{V}$ $-di_F/dt=2200\text{A}/\mu\text{s}$		123		A
Reverse Recovery Energy	E_{rec}	$T_{vj}=150^{\circ}\text{C}$		1.51		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			0.32	K/W
		per Diode			0.50	
Thermal Resistance Case-to Sink	$R_{\theta\text{CS}}$	Conductive grease applied		0.15		K/W
Comparative Tracking Index	CTI			>200		
Module Electrodes Torque	M_t	Recommended(M5)	3.0		5.0	N·m
Module-to-Sink Torque	M_s	Recommended(M6)	3.0		5.0	N·m
Weight of Module	G			150		g

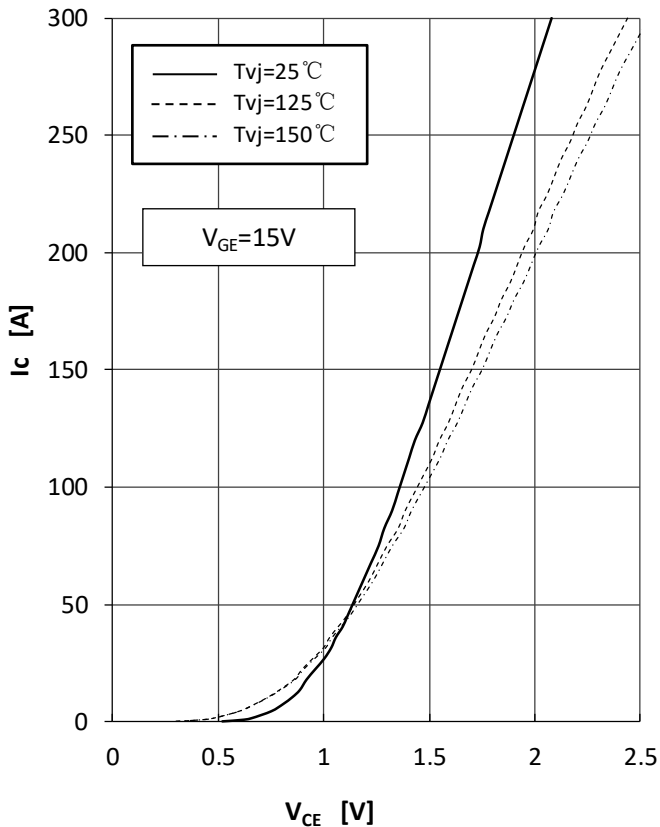


Fig1.IGBT Output Characteristics

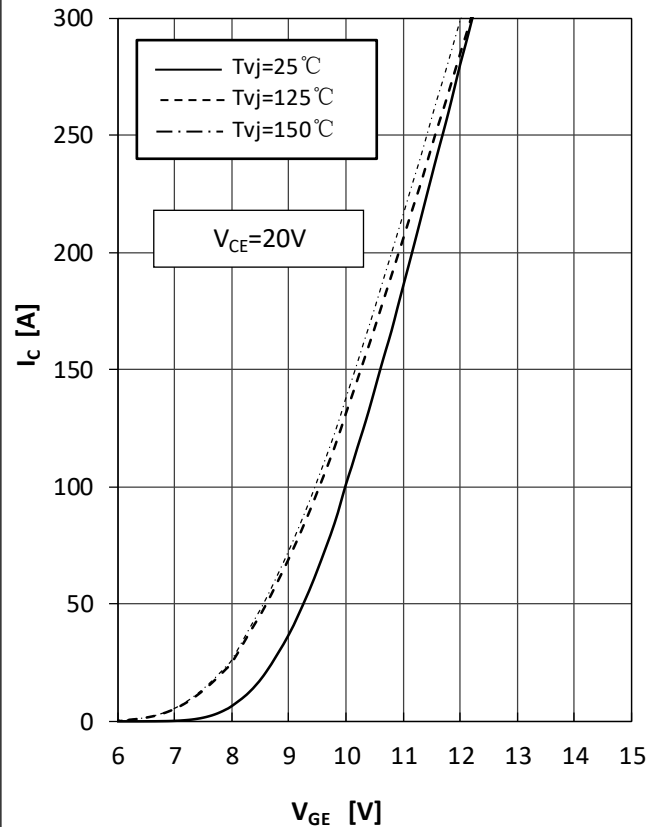


Fig2.IGBT Transfer Characteristics

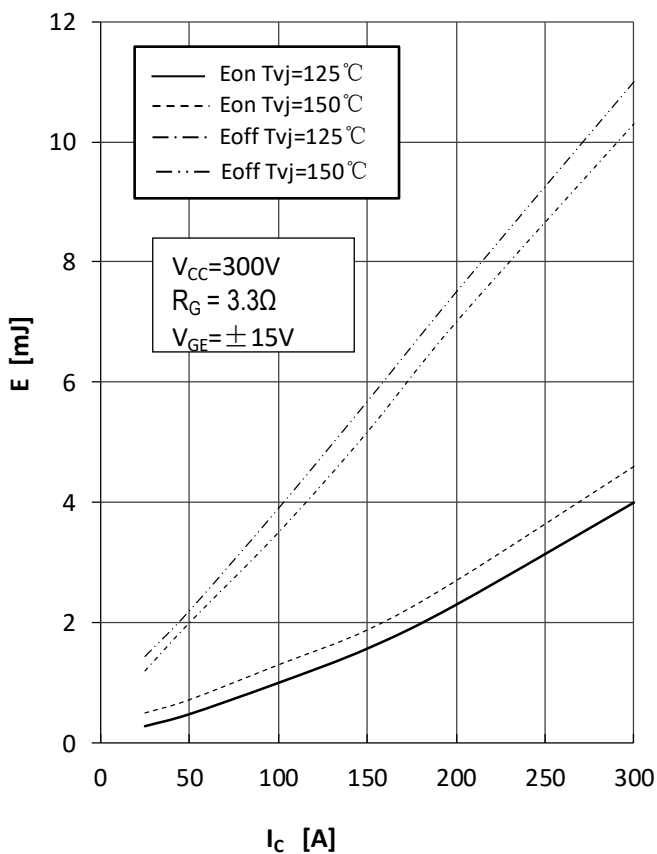


Fig3.IGBT Switching Loss vs.Ic

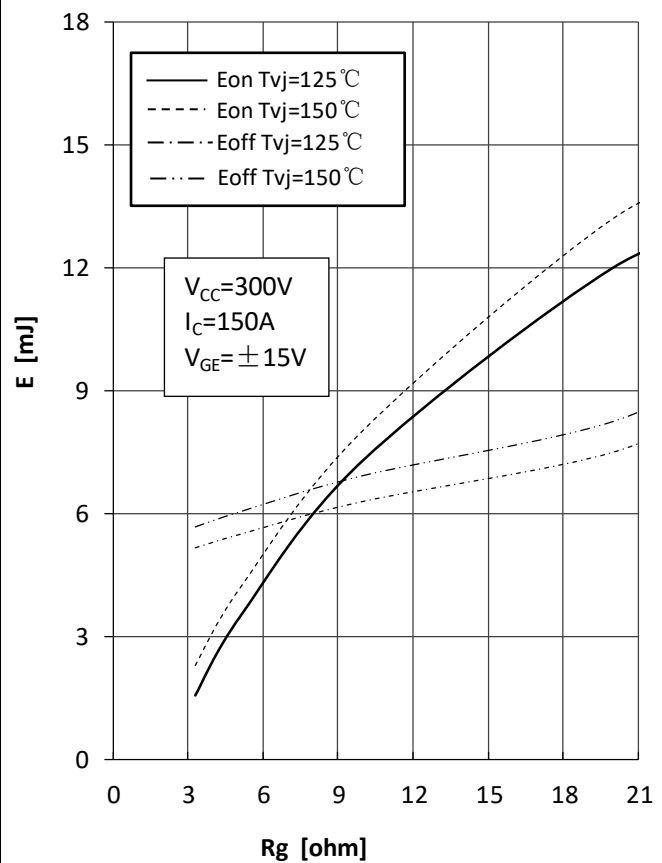
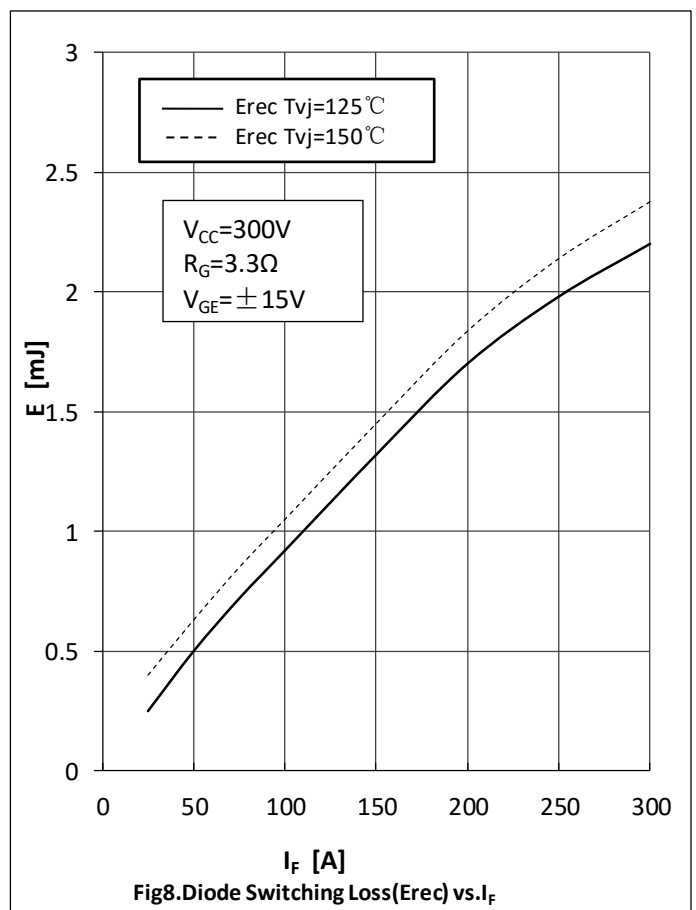
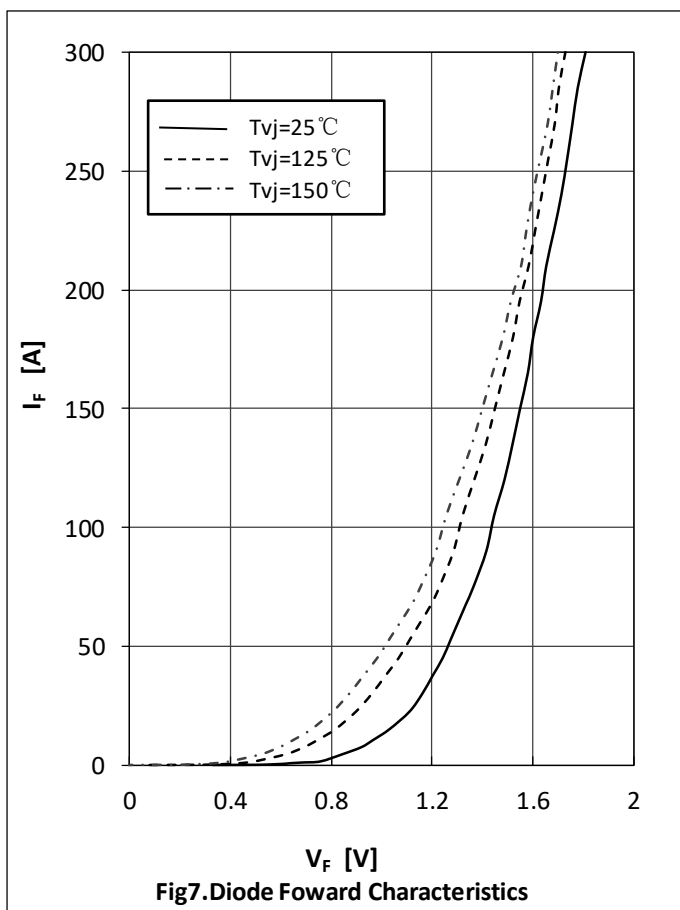
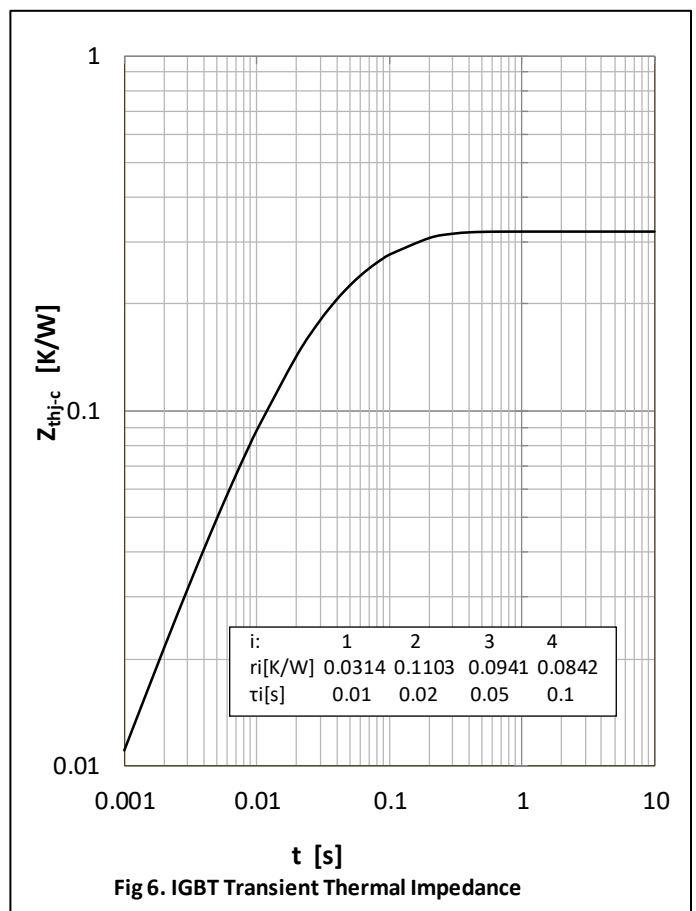
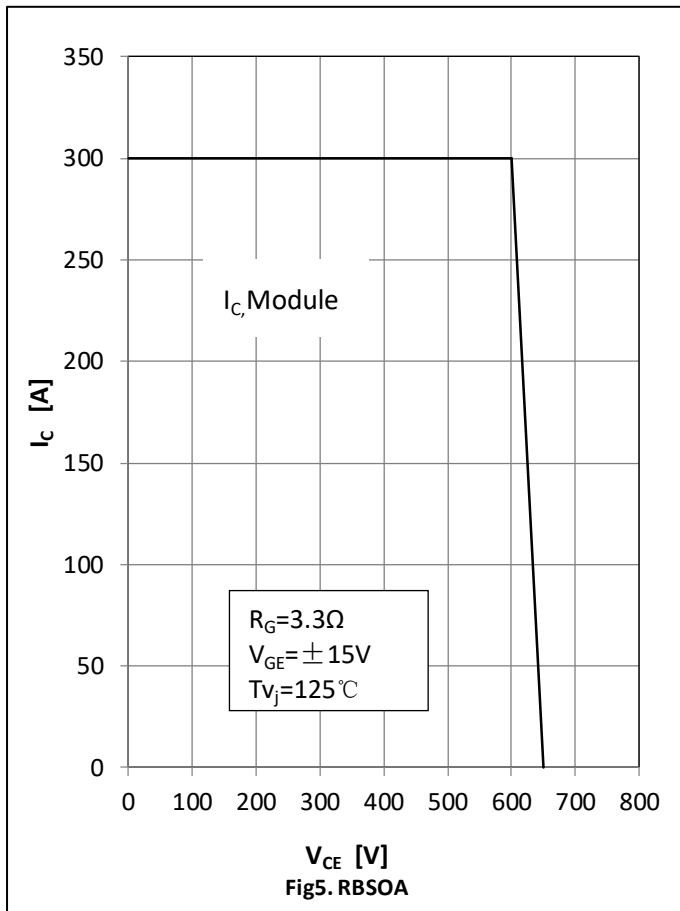
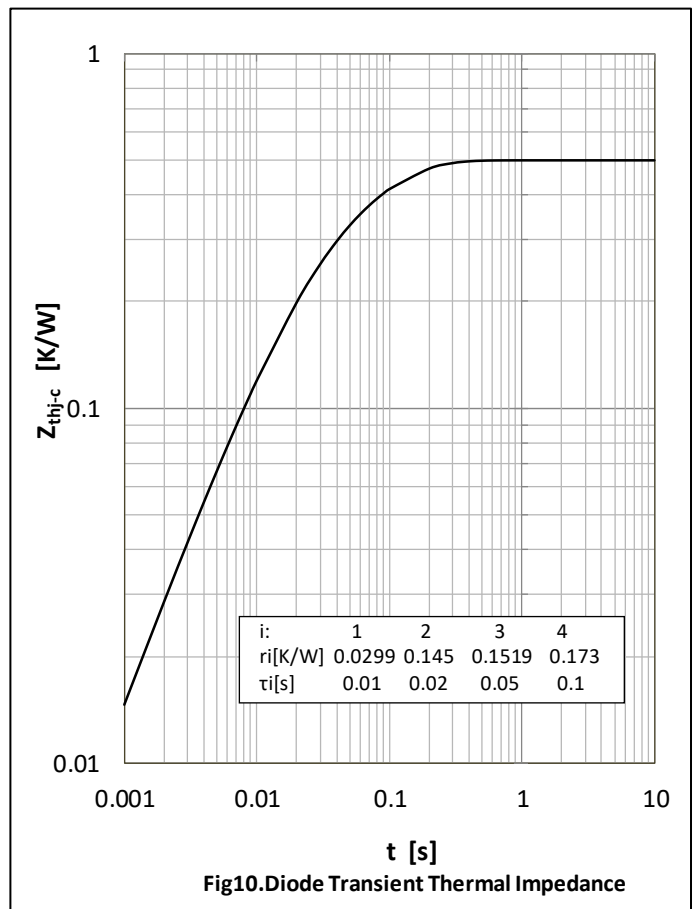
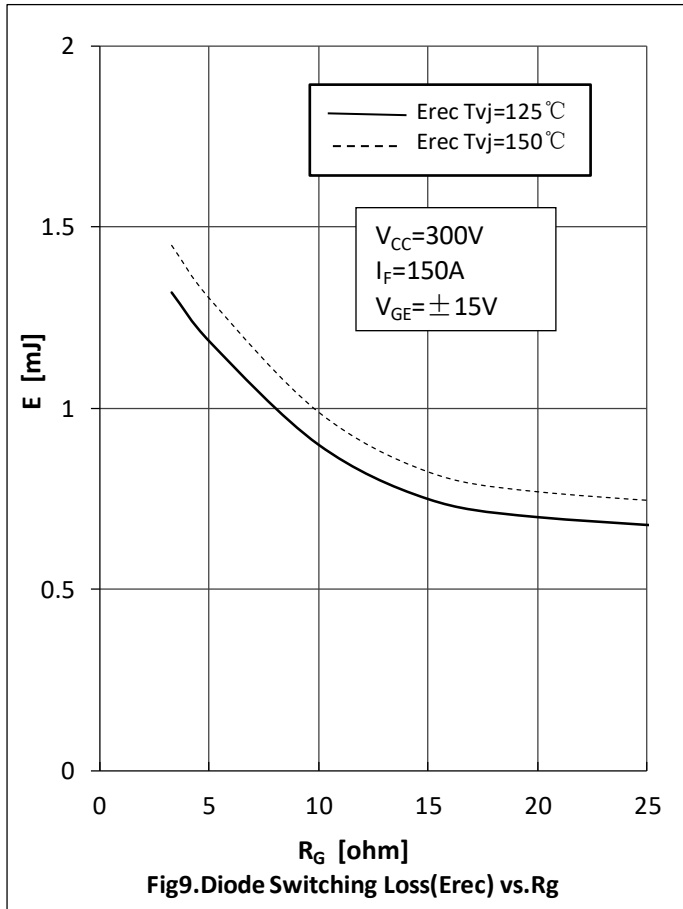


Fig4.IGBT Switching Loss vs.Rg





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