

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CES}	600	V
Gate-Emitter Voltage	V_{GES}	± 20	V
Continuous Collector Current	$T_C = 25\text{ }^\circ\text{C}$		

Electrical Characteristics of the IGBT $T_{vj}=25^{\circ}\text{C}$, unless otherwise noted

Parameter	Symbol	Test condition	Min.	Typ.	Max.	Unit
OFF						
Collector Emitter Breakdown Voltage	BV_{CES}	$V_{GE} = 0V, I_C = 1mA$	600	--	--	V
Zero Gate Voltage Collector Current	I_{CES}	$V_{CE} = 600V, V_{GE} = 0V$	--	--	1	mA
Gate Emitter Leakage Current	I_{GES}	$V_{CE} = 0V, V_{GE} = \pm 20V$	--	--	± 250	nA
Integrated Gate Resistance	$R_{G(int)}$	$f = 1MHz, \text{Open Collector}$	--	3.1	--	
ON						
Gate Emitter Threshold Voltage	$V_{GE(TH)}$	$V_{GE} = V_{CE}, I_C = 30mA$	4.5	6.0	7.5	V
Collector Emitter Saturation Voltage	$V_{CE(SAT)}$	$V_{GE} = 15V, I_C = 30A, T_{vj} = 25^{\circ}\text{C}$	--	1.60	2.10	V
		$V_{GE} = 15V, I_C = 30A, T_{vj} = 125^{\circ}\text{C}$	--	1.85	--	V
		$V_{GE} = 15V, I_C = 30A, T_{vj} = 175^{\circ}\text{C}$	--	1.96	--	V
DYNAMIC						
Input Capacitance	C_{IES}	$V_{CE} = 30V$ $V_{GE} = 0V$ $f = 1MHz$	--	1907	--	pF
Output Capacitance	C_{OES}		--	98	--	pF
Reverse Transfer Capacitance	C_{RES}		--	65	--	pF
Total Gate Charge	Q_g	$V_{CC} = 400V, I_C = 30A$ $V_{GE} = 15V$	--	89	134	nC
Gate-Emitter Charge	Q_{ge}		--	10	15	nC
Gate-Collector Charge	Q_{gc}		--	46	69	nC
SWITCHING (Note 3)						
Turn-On Delay Time	$t_{d(on)}$	$V_{CC} = 400V, I_C = 15A$ $R_G = 5\ \Omega, V_{GE} = 15V$ Inductive Load, $T_{vj} = 25^{\circ}\text{C}$	--	16	--	ns
Rise Time	t_r		--	15	--	ns
Turn-Off Delay Time	$t_{d(off)}$		--	108	--	ns
Fall Time	t_f		--	17	--	ns
Turn-On Switching Loss	E_{ON}		--	0.32	--	mJ
Turn-Off Switching Loss	E_{OFF}		--	0.15	--	mJ
Total Switching Loss	E_{TS}		--	0.47	--	mJ
Turn-On Delay Time	$t_{d(on)}$	$V_{CC} = 400V, I_C = 30A$ $R_G = 5\ \Omega, V_{GE} = 15V$ Inductive Load, $T_{vj} = 25^{\circ}\text{C}$	--	18	--	ns
Rise Time	t_r		--	29	--	ns
Turn-Off Delay Time	$t_{d(off)}$		--	93	--	ns
Fall Time	t_f		--	27	--	ns
Turn-On Switching Loss	E_{ON}		--	0.82	1.24	mJ
Turn-Off Switching Loss	E_{OFF}		--	0.33	0.49	mJ
Total Switching Loss	E_{TS}		--	1.15	1.73	mJ

Parameter	Symbol	Test condition	Min.	Typ.	Max.	Unit
SWITCHING (Note 3)						
Turn-On Delay Time	$t_{d(on)}$	$V_{CC} = 400V, I_C = 15A$ $R_G = 5 \Omega, V_{GE} = 15V$ Inductive Load, $T_{vj} = 175^\circ C$	--	20	--	ns
Rise Time	t_r		--	14	--	ns
Turn-Off Delay Time	$t_{d(off)}$		--	141	--	ns
Fall Time	t_f		--	91	--	ns
Turn-On Switching Loss	E_{ON}		--	0.59	--	mJ
Turn-Off Switching Loss	E_{OFF}		--	0.38	--	mJ
Total Switching Loss	E_{TS}		--	0.97	--	mJ
Turn-On Delay Time	$t_{d(on)}$	$V_{CC} = 400V, I_C = 30A$ $R_G = 5 \Omega, V_{GE} = 15V$ Inductive Load, $T_{vj} = 175^\circ C$	--	22	--	ns
Rise Time	t_r		--	30	--	ns
Turn-Off Delay Time	$t_{d(off)}$		--	119	--	ns
Fall Time	t_f		--	94	--	ns
Turn-On Switching Loss	E_{ON}		--	1.27	1.90	mJ
Turn-Off Switching Loss	E_{OFF}		--	0.67	1.01	mJ
Total Switching Loss			99.2 377.47 Tm0 g0 G[(E)] T1.55 493.03 Tm0 g0 G .1 85/Lang (en-US) >B D99.2 3770			

Electrical Characteristics of the DIODE $T_{vj}=25^{\circ}\text{C}$, unless otherwise noted

Parameter	Symbol	Test condition	Min.	Typ.	Max.	Unit
Diode Forward Voltage	V_{FM}	$I_F = 15\text{A}, T_{vj} = 25^{\circ}\text{C}$	--	1.90	--	V
		$I_F = 15\text{A}, T_{vj} = 125^{\circ}\text{C}$	--	1.69	--	V
		$I_F = 15\text{A}, T_{vj} = 175^{\circ}\text{C}$	--	1.58	--	V
		$I_F = 30\text{A}, T_{vj} = 25^{\circ}\text{C}$	--	2.40	--	V
		$I_F = 30\text{A}, T_{vj} = 125^{\circ}\text{C}$	--	2.25	--	V
		$I_F = 30\text{A}, T_{vj} = 175^{\circ}\text{C}$	--	2.21	--	V
Reverse Recovery Time	t_{rr}	$I_F = 15\text{A},$ $di/dt = 200\text{A}/\mu\text{s},$ $T_{vj} = 25^{\circ}\text{C}$	--	50	--	ns
Reverse Recovery Current	I_{rr}		--	4.8	--	A
Reverse Recovery Charge	Q_{rr}		--	143	--	nC
Reverse Recovery Time	t_{rr}	$I_F = 15\text{A},$ $di/dt = 200\text{A}/\mu\text{s},$ $T_{vj} = 175^{\circ}\text{C}$	--	121	--	ns
Reverse Recovery Current	I_{rr}		--	10.0	--	A
Reverse Recovery Charge	Q_{rr}		--	695	--	nC
Reverse Recovery Time	t_{rr}	$I_F = 30\text{A},$ $di/dt = 200\text{A}/\mu\text{s},$ $T_{vj} = 25^{\circ}\text{C}$	--	52	--	ns
Reverse Recovery Current	I_{rr}		--	4.9	--	A
Reverse Recovery Charge	Q_{rr}		--	165	--	nC
Reverse Recovery Time	t_{rr}	$I_F = 30\text{A},$ $di/dt = 200\text{A}/\mu\text{s},$ $T_{vj} = 175^{\circ}\text{C}$	--	157	--	ns
Reverse Recovery Current	I_{rr}		--	10.7	--	A
Reverse Recovery Charge	Q_{rr}		--	950	--	nC

IGBT Characteristics

Fig. 1 IGBT Output Characteristics

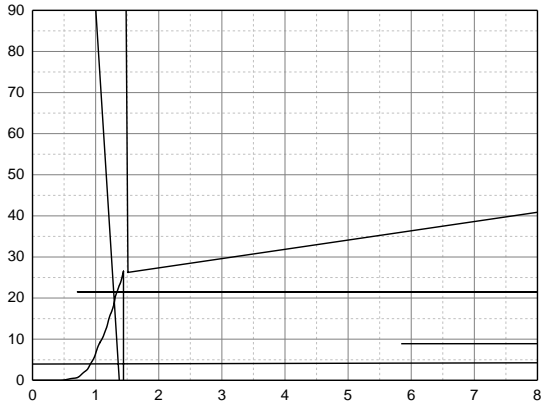


Fig. 2 IGBT Output Characteristics

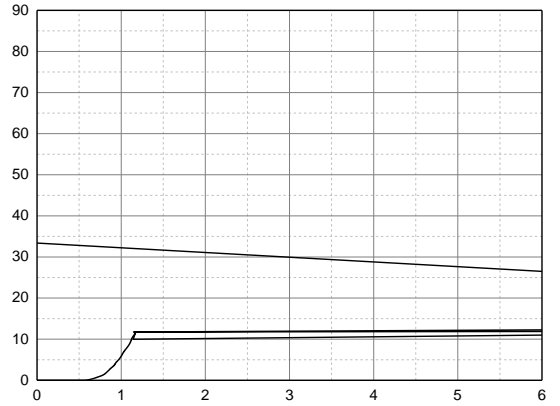


Fig. 3 IGBT Saturation Voltage vs. Junction Temperature

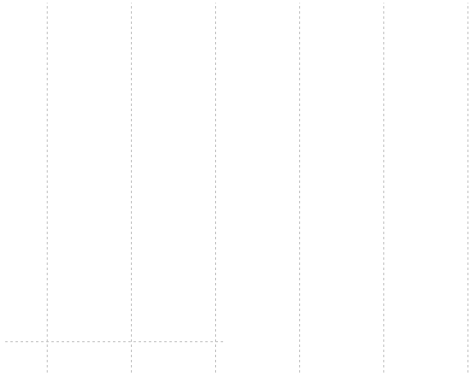


Fig. 4 IGBT Saturation Voltage vs. Gate Bias

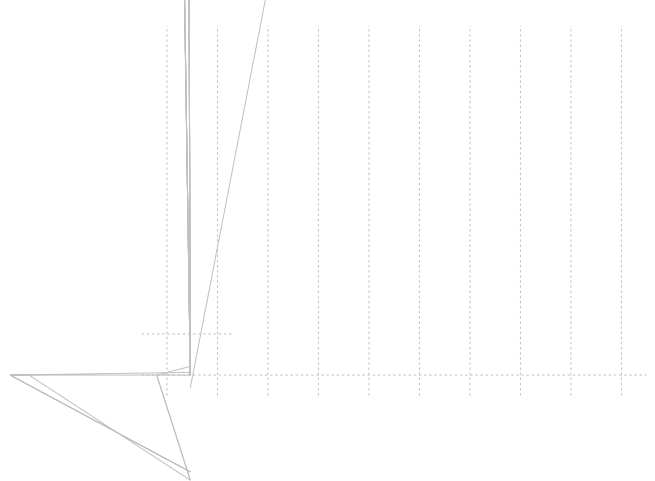


Fig. 5 IGBT Saturation Voltage vs. Gate Bias

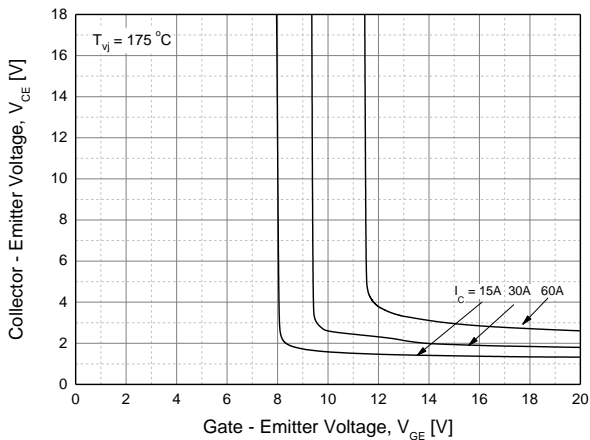
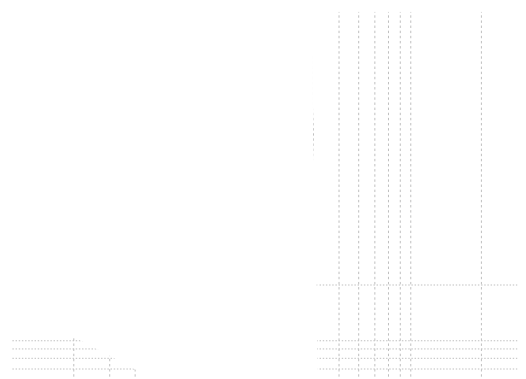


Fig. 6 IGBT Capacitance Characteristics



IGBT Characteristics

Fig. 7 Turn-on Time vs. Gate Resistor

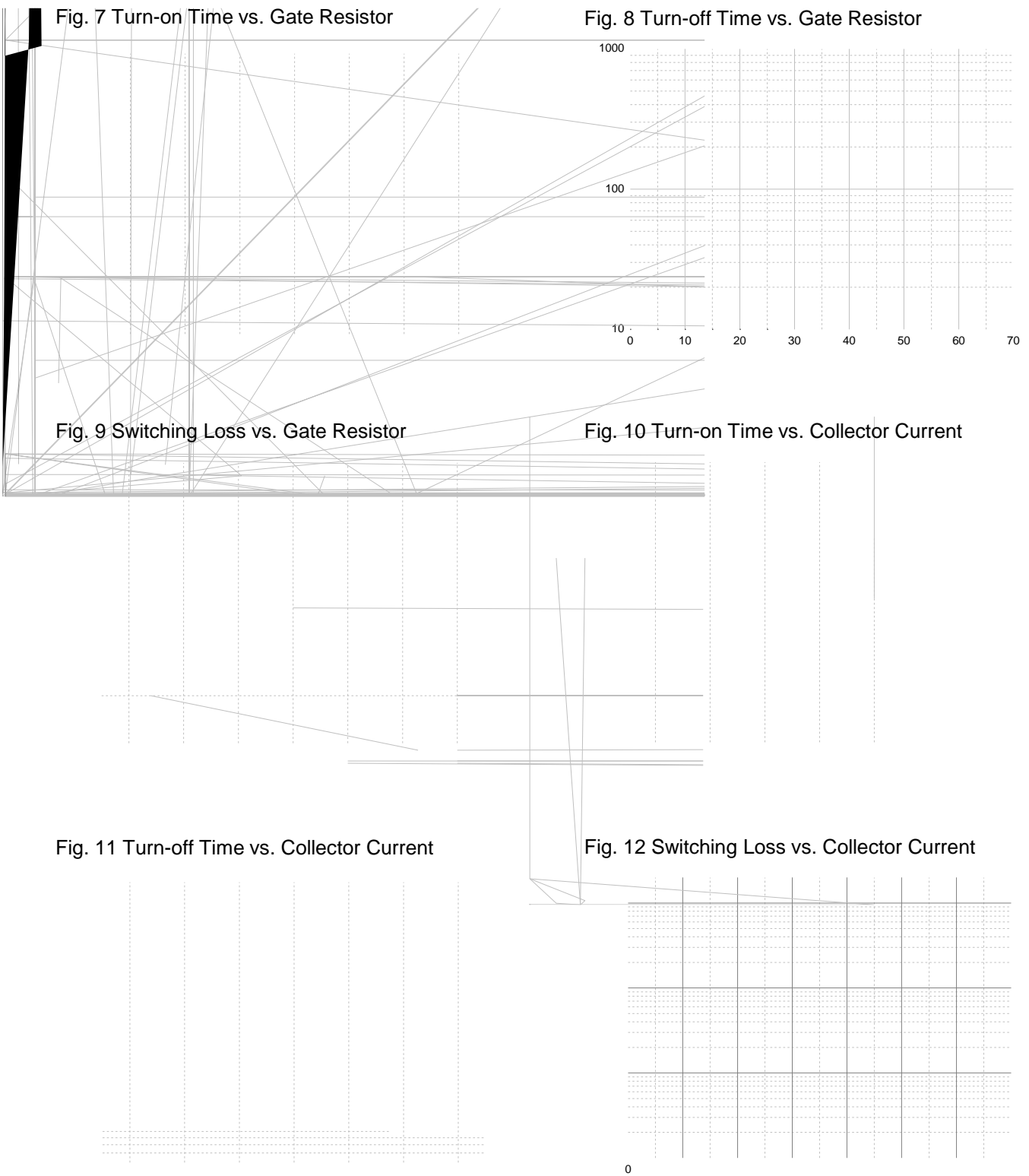
Fig. 8 Turn-off Time vs. Gate Resistor

Fig. 9 Switching Loss vs. Gate Resistor

Fig. 10 Turn-on Time vs. Collector Current

Fig. 11 Turn-off Time vs. Collector Current

Fig. 12 Switching Loss vs. Collector Current



IGBT Characteristics

Fig. 13 Gate Charge Characteristics



Fig. 14 SOA

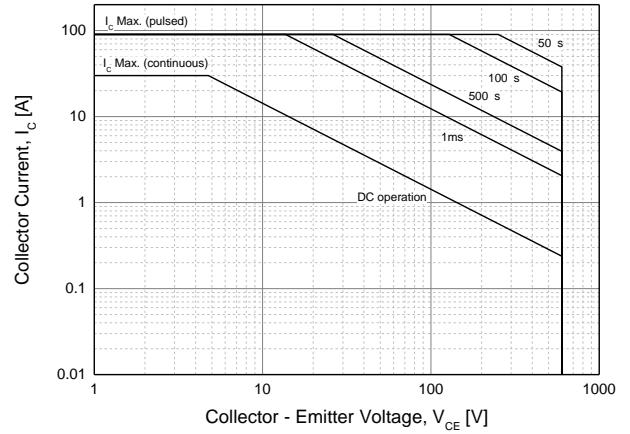


Fig. 15 RBSOA

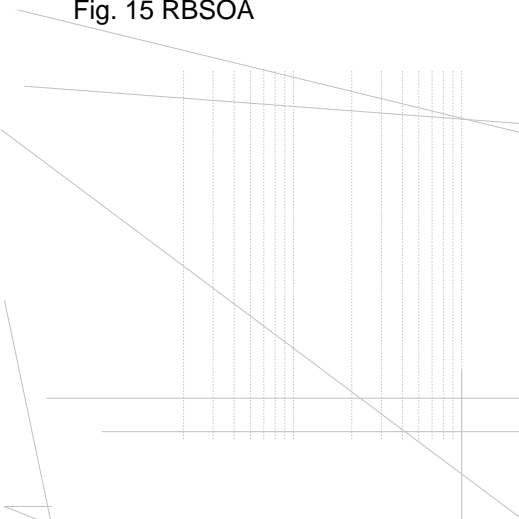


Fig. 16 Transient Thermal Impedance of IGBT

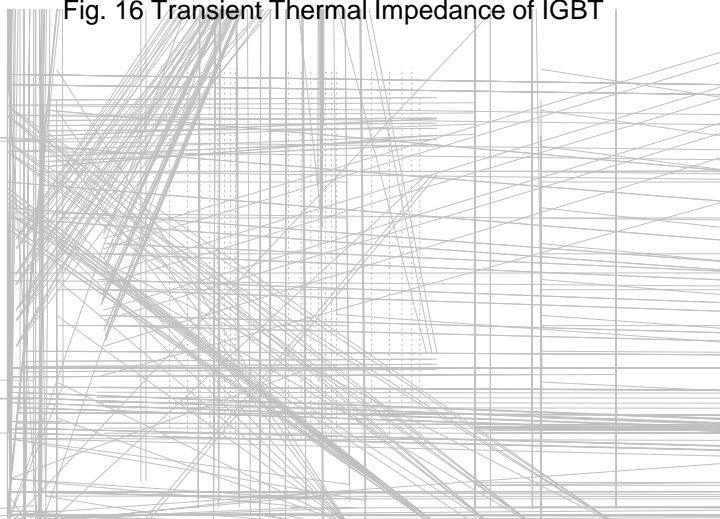
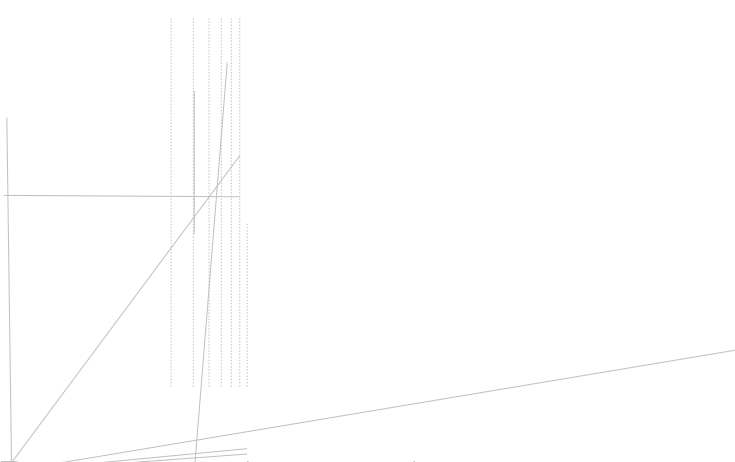


Fig. 17 Load Current vs. Frequency



DIODE Characteristics

Fig. 18 Diode Conduction Characteristics

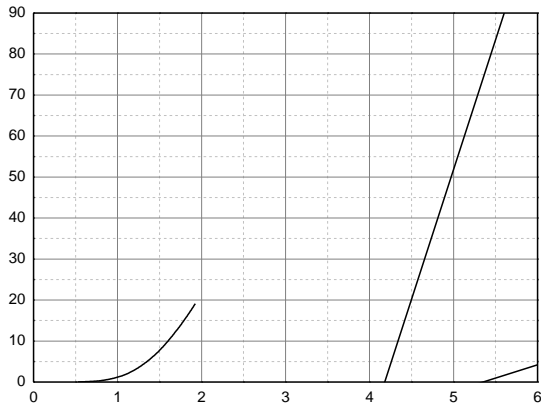


Fig. 19 Reverse Recovery Current vs. Forward Current

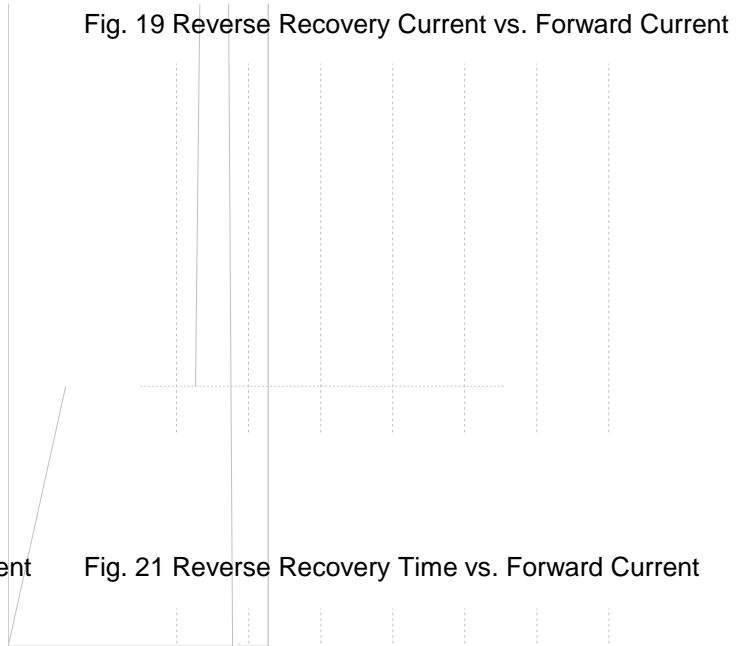


Fig. 20 Reverse Recovery Charge vs. Forward Current

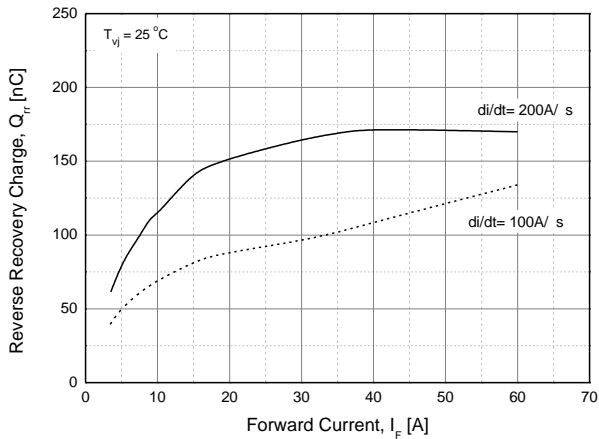
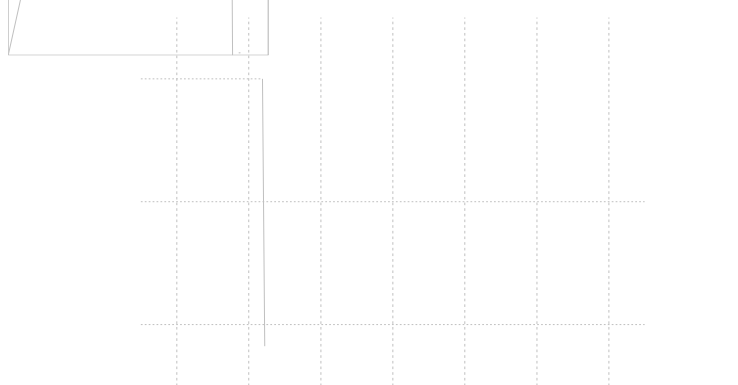


Fig. 21 Reverse Recovery Time vs. Forward Current



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