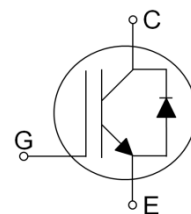## Features

1100V Field Stop Trench Technology
High Speed Switching
Low Conduction Loss
Positive Temperature Coefficient
Easy Parallel Operation
RoHS Compliant
JEDEC Qualification

Applications

Induction Heating, Soft switching application

Device	Package	Marking	Remark
TGAN40N110FD	TO-3PN	TGAN40N110FD	RoHS

Absolute Maximum Ratings

Parameter		Symbol	Value	Unit
Collector-Emitter Voltage		V_{CES}	1100	V
Gate-Emitter Voltage		V_{GES}	25	V
Continuous Collector Current	$T_C = 25\ ℃$	I_C	80	A
	$T_C = 100\ ℃$		40	A
Pulsed Collector Current (Note 1)		I_{CM}	120	A
Diode Continuous Forward Current	$T_C = 100\ ℃$	I_F	40	A
Power Dissipation	$T_C = 25\ ℃$	P_D	338	W
	$T_C = 100\ ℃$		135	W
Operating Junction Temperature		T_{vj}	-55 ~ 150	℃
Storage Temperature Range		T_{STG}	-55 ~ 150	℃
Maximum lead temperature for soldering purposes,		T_L	300	℃

Thermal Characteristics

Parameter	Symbol	Value	Unit
Maximum Thermal resistance, Junction-to-Case	R_{JC} (IGBT)	0.37	℃/W
Maximum Thermal resistance, Junction-to-Case	R_{JC} (DIODE)	1.59	℃/W
Maximum Thermal resistance, Junction-to-Ambient	R_{JA}	40	℃/W

Electrical Characteristics of the IGBT $T_{vj}=25$, unless otherwise noted

Parameter	Symbol	Test condition	Min.	Typ.	Max.	Unit
OFF						
Collector　Emitter Breakdown Voltage	BV_{CES}	$V_{GE} = 0V$, $I_C = 1mA$	1100	--	--	V
Zero Gate Voltage Collector Current	I_{CES}	$V_{CE} = 1100V$, $V_{GE} = 0V$	--	--	1	mA
Gate　Emitter Leakage Current	I_{GES}	$V_{CE} = 0V$, $V_{GE} = \pm 25V$	--	--	± 500	nA
ON						
Gate　Emitter Threshold Voltage	$V_{GE(TH)}$	$V_{GE} = V_{CE}$, $I_C = 40mA$	3.5	5.5	7.5	V
Collector　Emitter Saturation Voltage	$V_{CE(SAT)}$	$V_{GE} = 15V$, $I_C = 40A$, $T_{vj} = 25\,℃$	--	2.0	2.5	V
		$V_{GE} = 15V$, $I_C = 40A$, $T_{vj} = 150\,℃$	--	2.4	--	V
DYNAMIC						
Input Capacitance	C_{IES}	$V_{CE} = 30V$, $V_{GE} = 0V$ $f = 1MHz$	--	4550	--	pF
Output Capacitance	C_{OES}		--	110	--	pF
Reverse Transfer Capacitance	C_{RES}		--	75	--	pF
SWITCHING [Note 2]						
Turn-On Delay Time	$t_{d(on)}$	$V_{CC} = 600V$, $I_C = 40A$ $R_G = 10$, $V_{GE} = 15V$ Inductive Load, $T_{vj} = 25\,℃$	--	45	--	ns
Rise Time	t_r		--	75	--	ns
Turn-Off Delay Time	$t_{d(off)}$		--	210	--	ns
Fall Time	t_f		--	40	60	ns
Turn-On Switching Loss	E_{ON}		--	6.0	9.0	mJ
Turn-Off Switching Loss	E_{OFF}		--	1.2	1.8	mJ
Total Switching Loss	E_{TS}		--	7.2	10.8	mJ
Turn-On Delay Time	$t_{d(on)}$	$V_{CC} = 600V$, $I_C = 40A$ $R_G = 10$, $V_{GE} = 15V$ Inductive Load, $T_{vj} = 150\,℃$	--	40	--	ns
Rise Time	t_r		--	65	--	ns
Turn-Off Delay Time	$t_{d(off)}$		--	230	--	ns
Fall Time	t_f		--	115	--	ns
Turn-On Switching Loss	E_{ON}		--	6.1	9.1	mJ
Turn-Off Switching Loss	E_{OFF}		--	1.9	2.8	mJ
Total Switching Loss	E_{TS}		--	8.0	11.9	mJ
Total Gate Charge	Q_g	$V_{CC} = 600V$, $I_C = 40A$ $V_{GE} = 15V$	--	210	310	nC
Gate-Emitter Charge	Q_{ge}		--	30	45	nC
Gate-Collector Charge	Q_{gc}		--	95	140	nC

Not subject to production test　verified by design/characterization

Electrical Characteristics of the DIODE T_{vj}=25 , unless otherwise noted

Parameter	Symbol	Test condition	Min.	Typ.	Max.	Unit
Diode Forward Voltage	V_{FM}	I_F = 40A, T_{vj} = 25 ℃	--	2.3	--	V
		I_F = 40A, T_{vj} = 150 ℃	--	2.5	--	V
Reverse Recovery Time	t_{rr}	I_F = 40A, di/dt = 200A/μs, T_{vj} = 25 ℃	--	300	--	ns
Reverse Recovery Current	I_{rr}		--	30	--	A
Reverse Recovery Charge	Q_{rr}		--	5300	--	nC
Reverse Recovery Time	t_{rr}	I_F = 40A, di/dt = 200A/μs, T_{vj} = 150 ℃	--	380	--	ns
Reverse Recovery Current	I_{rr}		--	40	--	A
Reverse Recovery Charge	Q_{rr}		--	7540	--	nC

IGBT Characteristics

Fig. 1 IGBT Output Characteristics
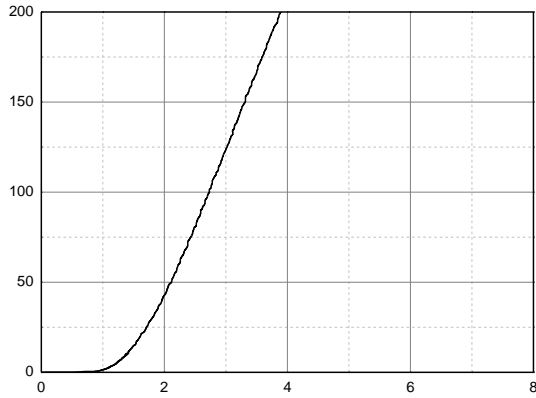
Fig. 2 IGBT Output Characteristics
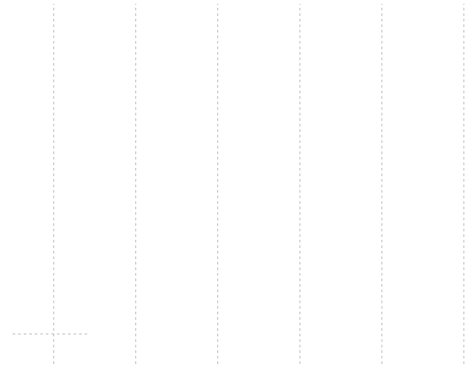
Fig. 3 IGBT Saturation Voltage
vs. Junction Temperature

Fig. 4 IGBT Saturation Voltage vs. Gate Bias

$T_{vj} = 25\ ^{\circ}C$

Collector - Emitter Voltage, V_{CE} [V]

I_C = 20A 40A 80A

Gate - Emitter Voltage, V_{GE} [V]
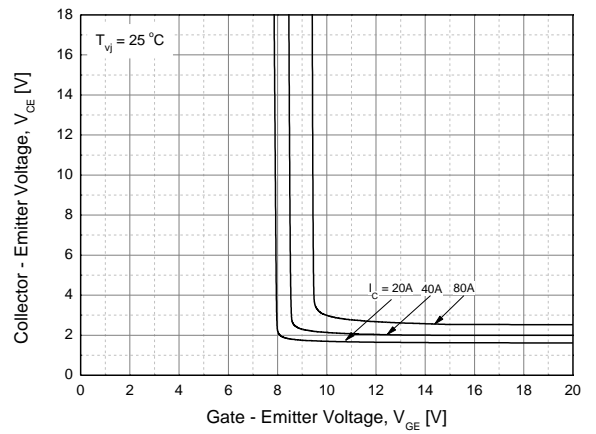
Fig. 5 IGBT Saturation Voltage vs. Gate Bias
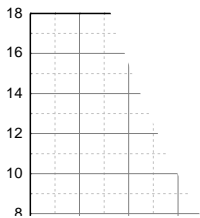
Fig. 6 IGBT Capacitance Characteristics
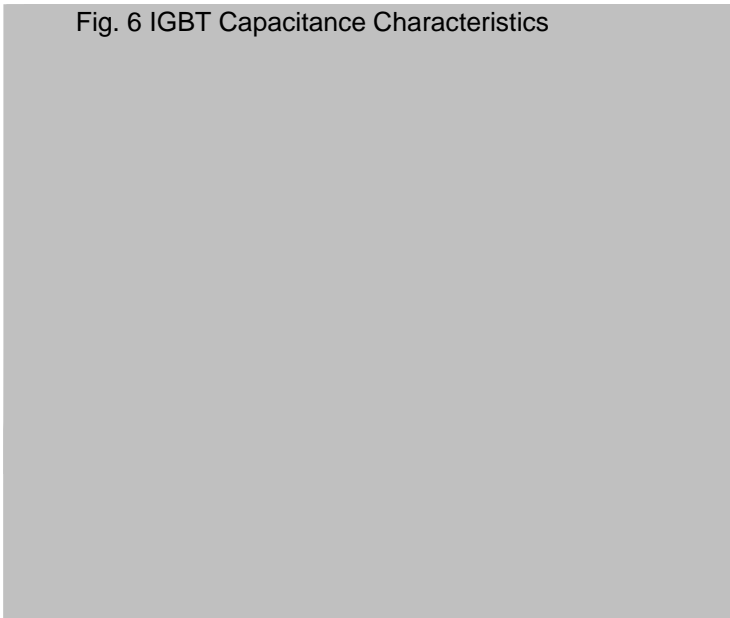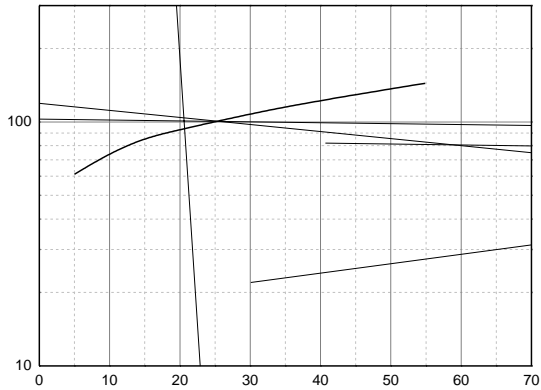
IGBT Characteristics

Fig. 7 Turn-on Time vs. Gate Resistor

Fig. 8 Turn-off Time vs. Gate Resistor
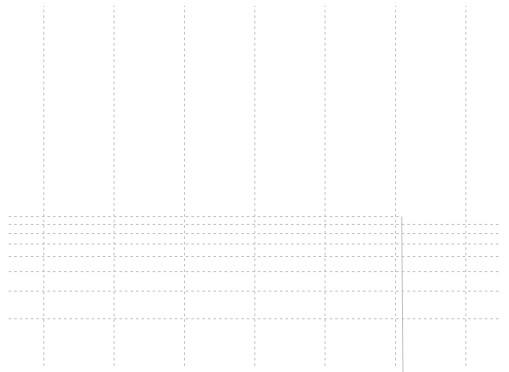
Fig. 9 Switching Loss vs. Gate Resistor
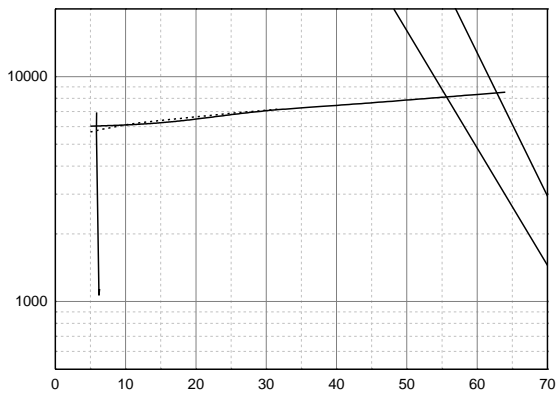
Fig. 10 Turn-on Time vs. Collector Current
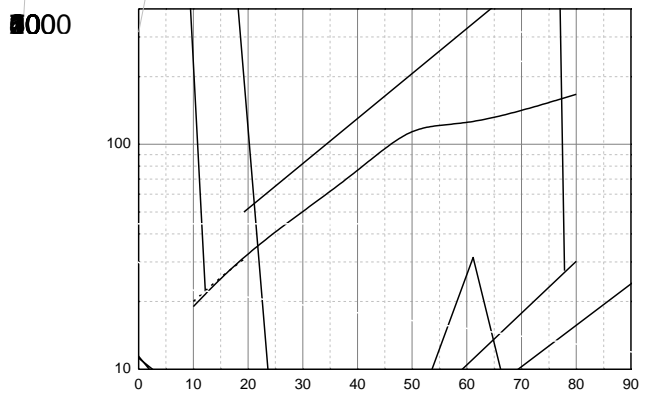
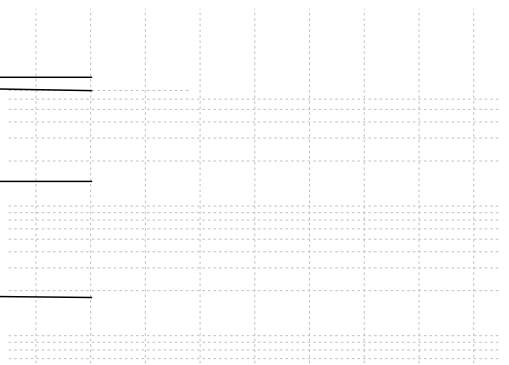Fig. 11 Turn-off Time vs. Collector Current
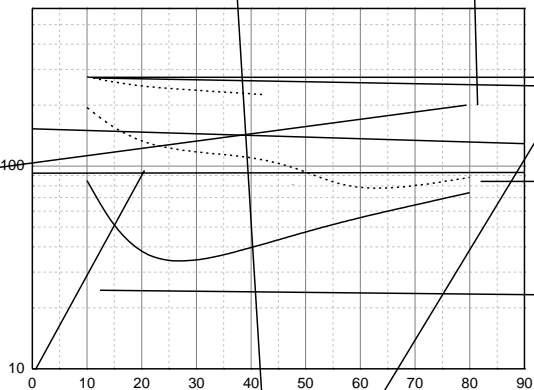
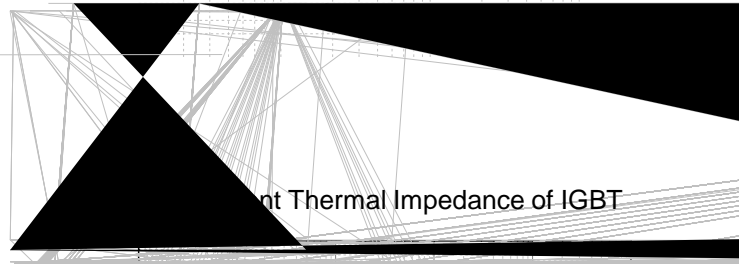Fig. 12 Switching Loss vs. Collector Current
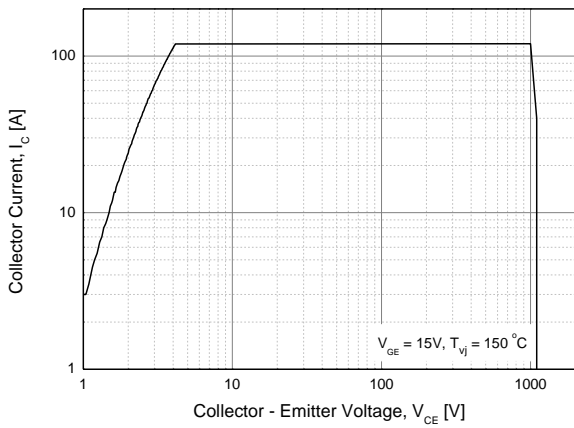
IGBT Characteristics

Fig. 15 RBSOA

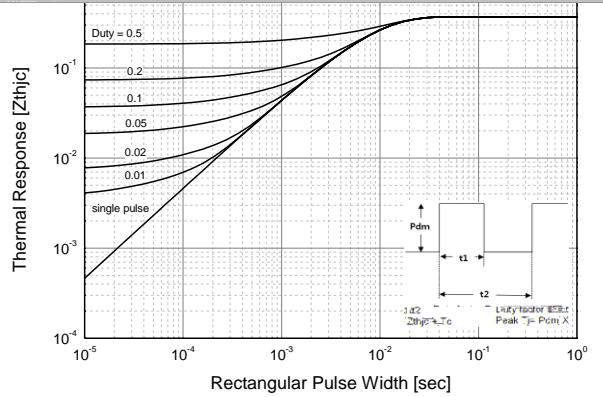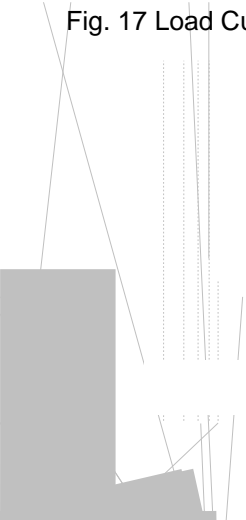nt Thermal Impedance of IGBT

Fig. 17 Load Current vs. Frequency

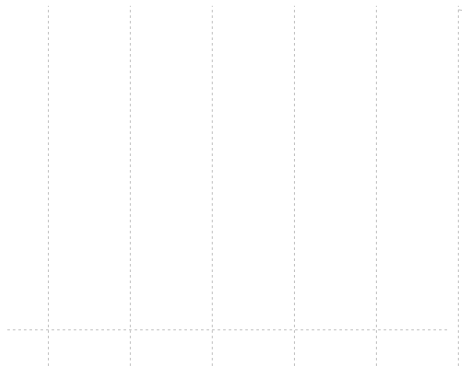## Diode Characteristics

Fig. 18 Diode Conduction Characteristics

Fig. 19 Reverse Recovery Current vs. Forward Current

$T_{vj} = 25°C$

di/dt= 200A/μs

di/dt= 100A/μs

Reverse Recovery Current, I_{rr} [A]
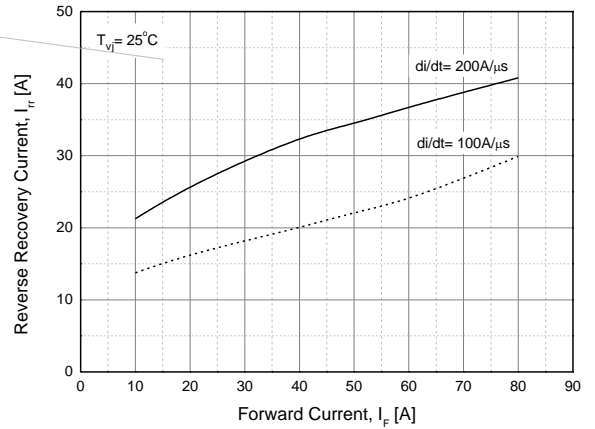
Forward Current, I_F [A]

Fig. 20 Reverse Recovery Charge vs. Forward Current
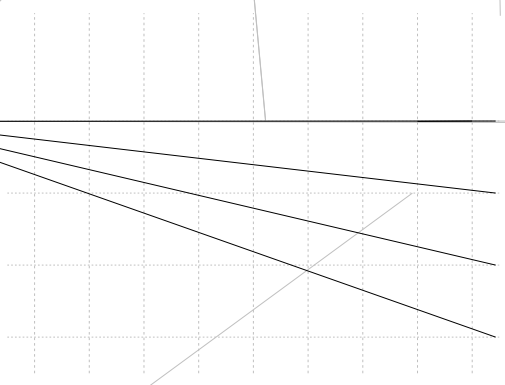
Fig. 21 Reverse Recovery Time vs. Forward Current

$T_{vj} = 25°C$

di/dt= 200A/μs

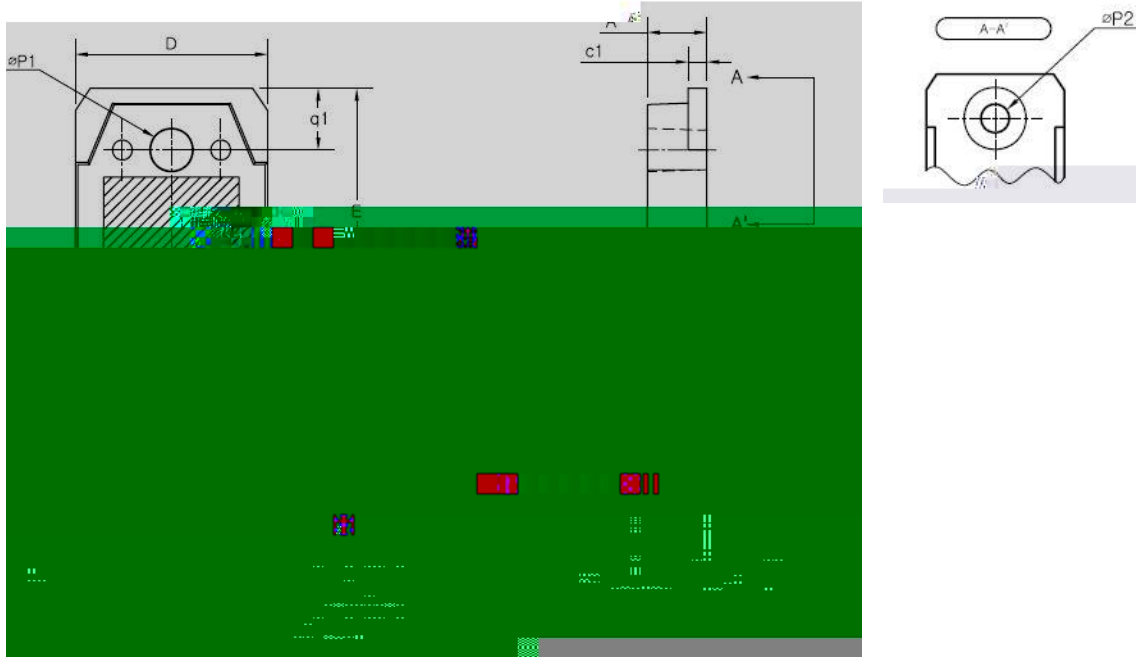di/dt= 100A/μs

Reverse Recovery Time, t_{rr} [ns]

Forward Current, I_F [A]
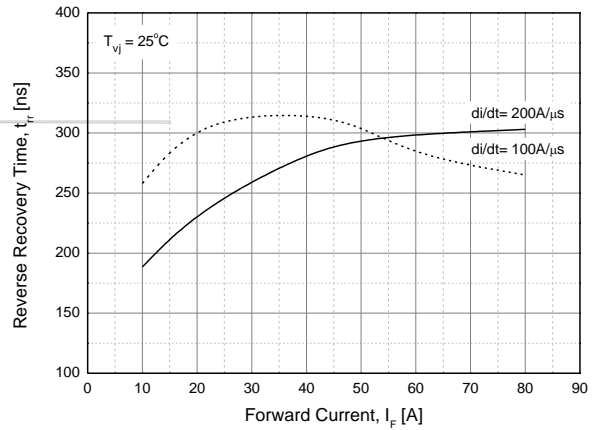
TO-3PN MECHANICAL DATA

SYMBOL	MIN	NOM	MAX
A	4.60	4.80	5.00
b	0.80	1.00	1.20
b1	1.80	2.00	2.20
b2	2.80	3.00	3.20
c	0.55	0.60	0.75
c1	1.45	1.50	1.65
D	15.40	15.60	15.80
E	19.70	19.90	20.10
e	5.15	5.45	5.75
L1	3.30	3.50	3.70
L2	19.80	20.00	20.20
øP1	3.30	3.40	3.50
øP2		(3.20)	
Q		2.40	2.60
q1	4.80	5.00	5.20

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