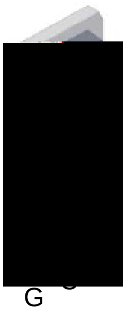
TGAN25N120FDR

Field Stop Trench IGBT

Features

- 1200V Field Stop Trench IGBT Technology
- High Speed Switching
- Low Conduction Loss
- Positive Temperature Coefficient
- Easy Parallel Operation
- Short Circuit Withstanding Time 5 s
- RoHS Compliant
- JEDEC Qualification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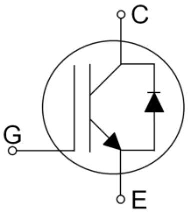


Applications

UPS, Welder, Inverter, Solar

Device	Package	Marking	Remark
TGAN25N120FDR	TO-3PN	TGAN25N120FDR	RoHS

Absolute Maximum Ratings

Parameter		Symbol	Value	Unit
Collector-Emitter Voltage		V_{CES}	1200	V
Gate-Emitter Voltage		V_{GES}	25	V
Continuous Collector Current	T_C = 25 ℃	I_C	50	A
	T_C = 100 ℃		25	A
Pulsed Collector Current (Note 1)		I_{CM}	75	A
Diode Continuous Forward Current	T_C = 100 ℃	I_F	25	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	℃

Notes :

(1) Repetitive rating : Pulse width limited by maximum junction temperature, During production, high current switching capability is 100% verified with the inductive load single-pulse switching test. (Ic=75A)

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)	2.1	℃/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	1200	--	--	V
Zero Gate Voltage Collector Current	I_{CES}	V_{CE} = 1200V, V_{GE} = 0V	--	--	1	mA
Gate Emitter Leakage Current	I_{GES}	V_{CE} = 0V, V_{GE} = ± 25V	--	--	± 500	nA
Integrated Gate Resistance	$R_{G(int)}$	f = 1MHz, Open Collector	--	4.2	--	
ON						
Gate Emitter Threshold Voltage	$V_{GE(TH)}$	V_{GE} = V_{CE}, I_C = 25mA	4.5	6.5	8.5	V
Collector Emitter Saturation Voltage	$V_{CE(SAT)}$	V_{GE} = 15V, I_C = 25A, T_{vj} = 25 ℃	--	2.0	2.5	V
		V_{GE} = 15V, I_C = 25A, T_{vj} = 150 ℃	--	2.3	--	V
DYNAMIC						
Input Capacitance	C_{IES}	V_{CE} = 30V V_{GE} = 0V f = 1MHz	--	3770	--	pF
Output Capacitance	C_{OES}		--	105	--	pF
Reverse Transfer Capacitance	C_{RES}		--	75	--	pF
Total Gate Charge	Q_g	V_{CC} = 600V, I_C = 25A V_{GE} = 15V	--	215	320	nC
Gate-Emitter Charge	Q_{ge}		--	30	45	nC
Gate-Collector Charge	Q_{gc}		--	110	165	nC
SWITCHING (Note 2)						
Turn-On Delay Time	$t_{d(on)}$	V_{CC} = 600V, I_C = 12.5A R_G = 5 , V_{GE} = 15V Inductive Load, T_{vj} = 25 ℃	--	16	--	ns
Rise Time	t_r		--	21	--	ns
Turn-Off Delay Time	$t_{d(off)}$		--	149	--	ns
Fall Time	t_f		--	19	--	ns
Turn-On Switching Loss	E_{ON}		--	1.08	--	mJ
Turn-Off Switching Loss	E_{OFF}		--	0.09	--	mJ
Total Switching Loss	E_{TS}		--	1.17	--	mJ
Turn-On Delay Time	$t_{d(on)}$	V_{CC} = 600V, I_C = 25A R_G = 5 , V_{GE} = 15V Inductive Load, T_{vj} = 25 ℃	--	21	--	ns
Rise Time	t_r		--	40	--	ns
Turn-Off Delay Time	$t_{d(off)}$		--	126	--	ns
Fall Time	t_f		--	25	--	ns
Turn-On Switching Loss	E_{ON}		--	2.38	3.57	mJ
Turn-Off Switching Loss	E_{OFF}		--	0.32	0.48	mJ
Total Switching Loss	E_{TS}		--	2.70	4.05	mJ

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

Parameter	Symbol	Test condition	Min.	Typ.	Max.	Unit
SWITCHING (Note 2)						
Turn-On Delay Time	$t_{d(on)}$	V_{CC}				

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 =12.5A, T_{vj} = 25 ℃	--	1.56	--	V
		I_F = 12.5A, T_{vj} = 150 ℃	--	1.64	--	V
		I_F = 25A, T_{vj} = 25 ℃	--	2.00	--	V
		I_F = 25A, T_{vj} = 150 ℃	--	2.13	--	V
Reverse Recovery Time	t_{rr}	I_F = 12.5A, di/dt = 200A/µs, T_{vj} = 25 ℃	--	275	--	ns
Reverse Recovery Current	I_{rr}		--	10.9	--	A
Reverse Recovery						

IGBT Characteristics

Fig. 1 IGBT Output Characteristics

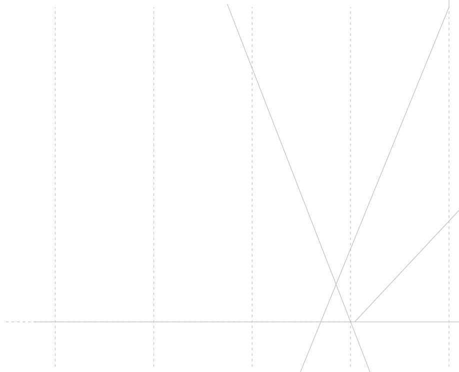


Fig. 2 IGBT Output Characteristics

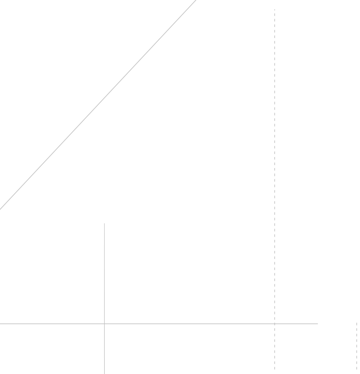


Fig. 3 IGBT Saturation Voltage vs. Junction Temperature

Fig. 4 IGBT Saturation Voltage vs. Gate Bias

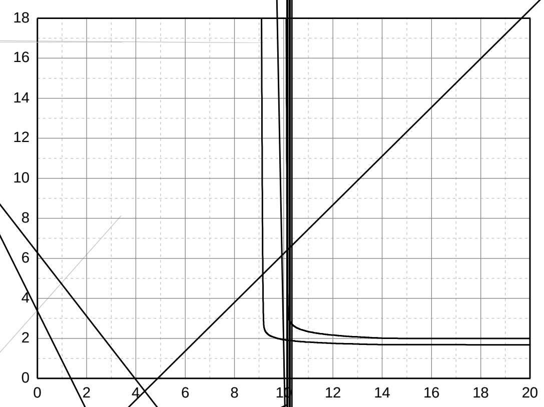


Fig. 5 IGBT Saturation Voltage vs. Gate Bias

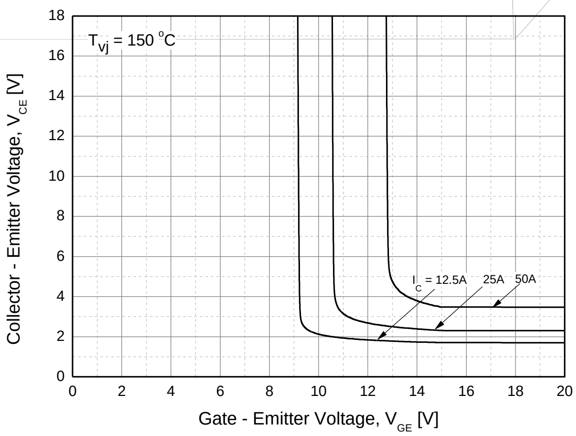
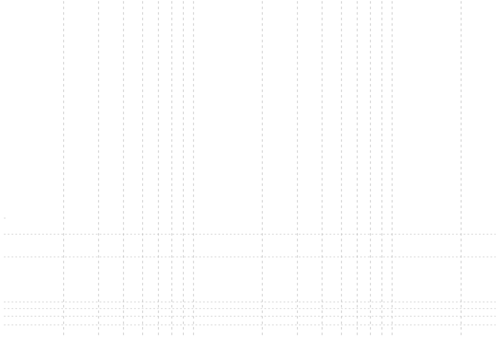


Fig. 6 IGBT Capacitance Characteristics



IGBT Characteristics

Fig. 7 Turn-on Time vs. Gate Resistor

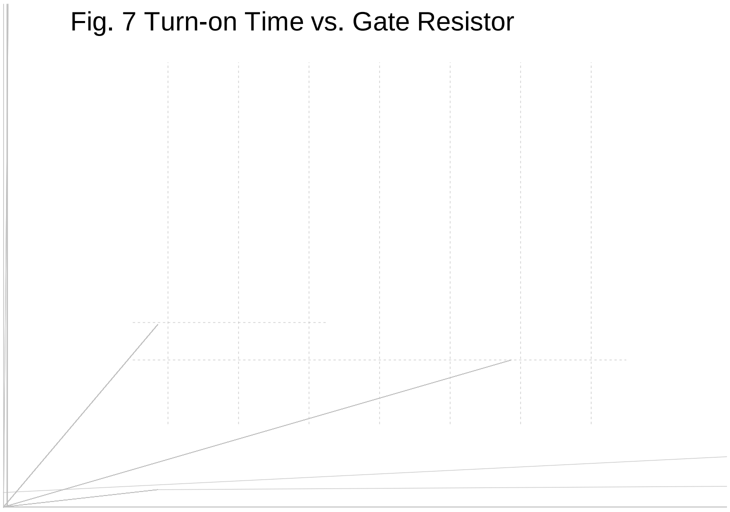


Fig. 8 Turn-off Time vs. Gate Resistor

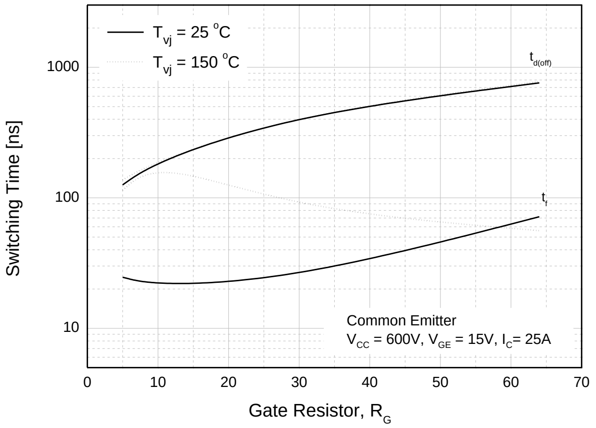


Fig. 9 Switching Loss vs. Gate Resistor

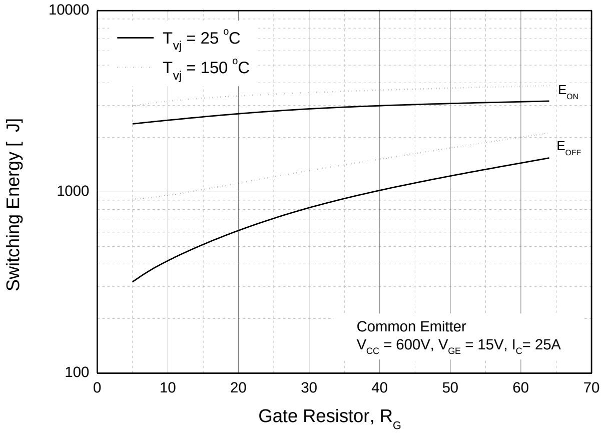


Fig. 10 Turn-on Time vs. Collector Current

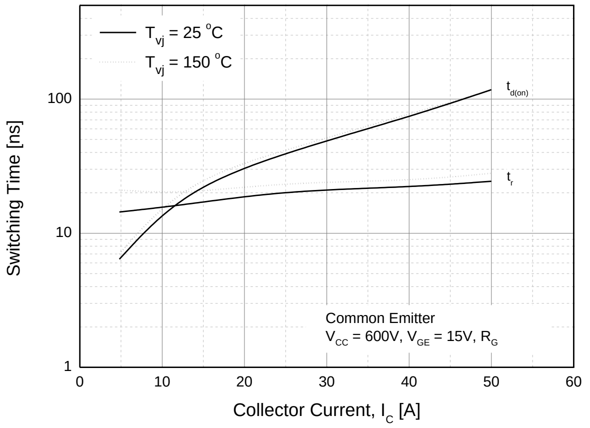
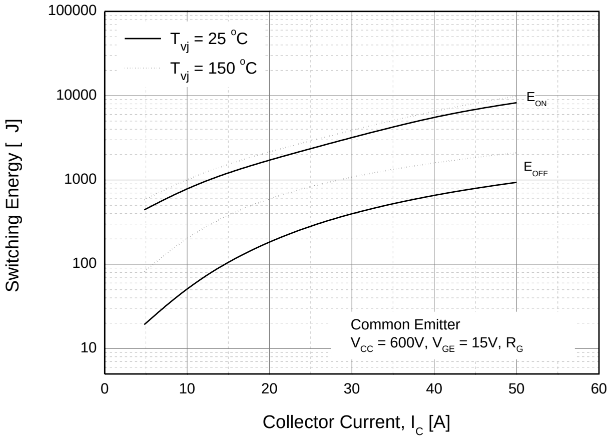


Fig. 11 Turn-off Time vs. Collector Current

Fig. 12 Switching Loss vs. Collector Current



IGBT Characteristics

Fig. 13 Gate Charge characteristics

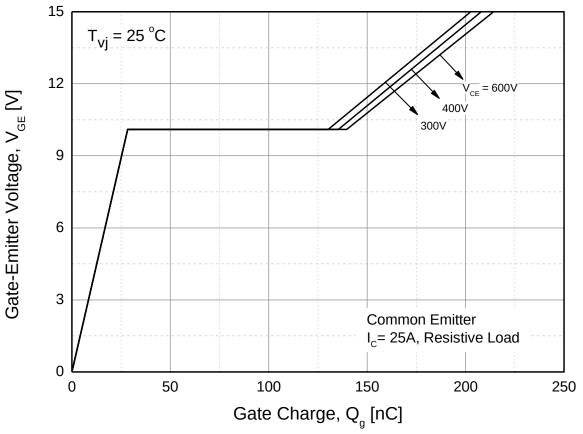


Fig. 14 SOA

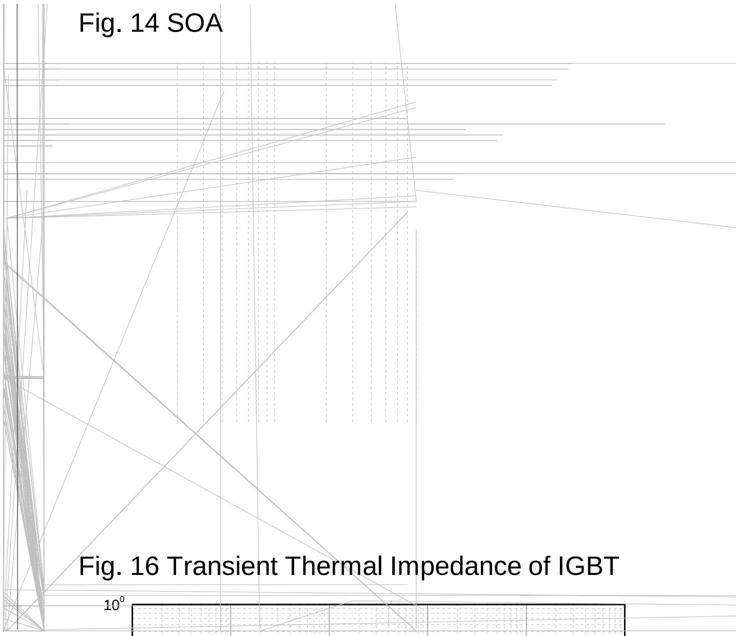


Fig. 15 RBSOA

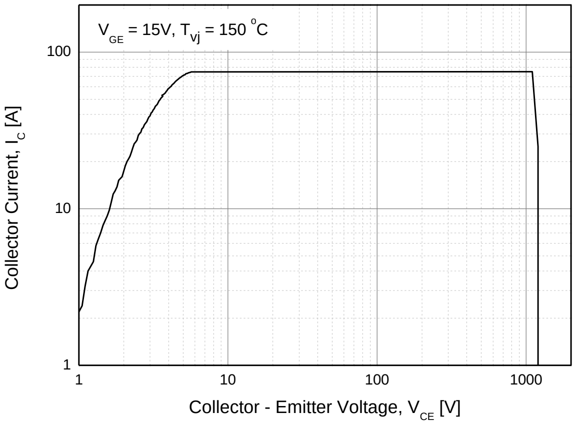


Fig. 16 Transient Thermal Impedance of IGBT

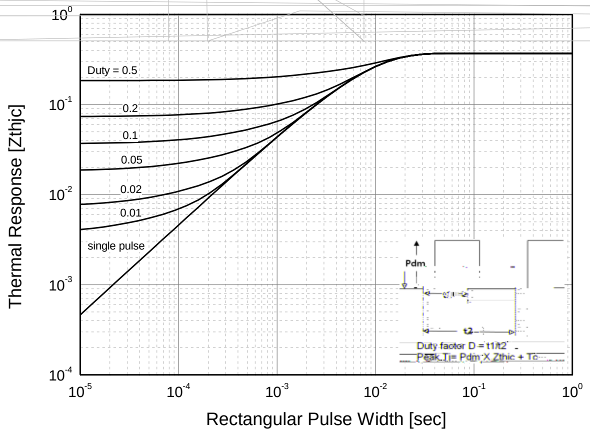
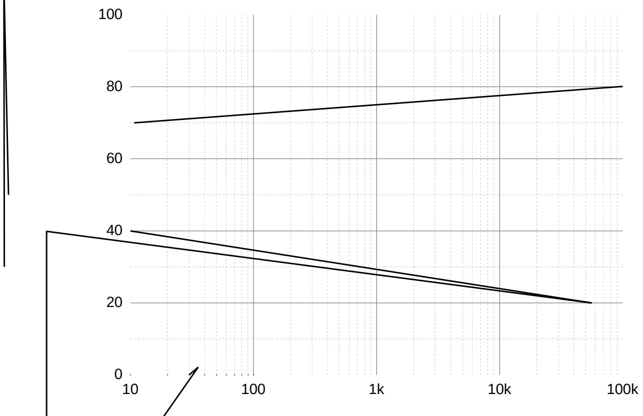


Fig. 17 Load Current vs. Frequency



Diode Characteristics

Fig. 18 Diode Conduction Characteristics

Fig. 19 Reverse Recovery Current vs. Forward Current

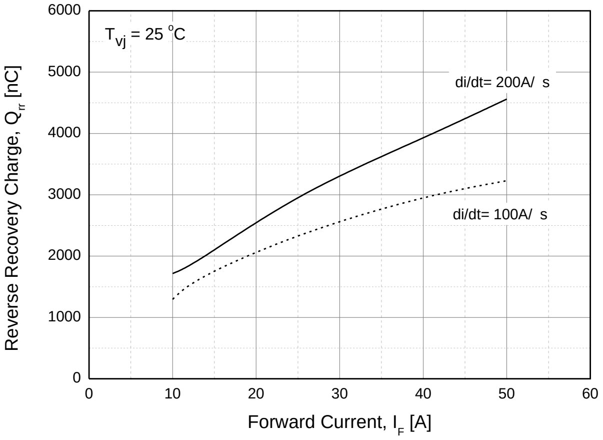


Fig. 20 Reverse Recovery Charge vs. Forward Current

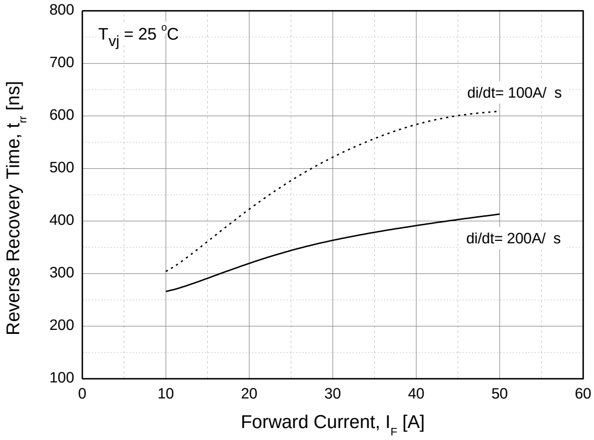


Fig. 21 Reverse Recovery Time vs. Forward Current