

TSG25N120

IGBT trench process

DRAWING

Features

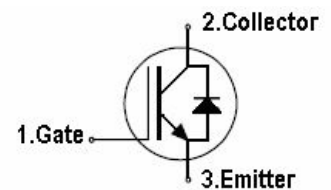
- ◆ 1200V,25A
- ◆ $V_{CE(sat)}(typ.)=2.3V@V_{GE}=15V, I_C=25A$
- ◆ High speed switching
- ◆ Higher system efficiency
- ◆ built-in FRD

General Description

- ◆ Package:TO-247
- ◆ TS IGBTs with trench process offer lower losses and higher energy efficiency for application such as IH (induction heating),UPS, general inverter and other soft switching applications.



G C E



Absolute Maximum Ratings

Symbol	Parameter	Spec	Units
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Continuous Collector Current	(TC=25 °C)	50
		(TC=100°C)	25
I_{CM}	Pulsed Collector Current (Note 1)	75	A
I_F	Diode Continuous Forward Current	(TC=25 °C)	30
		(TC=100°C)	25
I_{FM}	Diode Maximum Forward Current (Note 1)	75	A
P_D	Maximum Power Dissipation	(TC=25 °C)	297
		(TC=100°C)	119
T_J	Operating Junction Temperature Range	-55 to +150	°C
T_{STG}	Storage Temperature Range	-55 to +150	°C

Note1: Repetitive Rating: Pulse width limited by maximum junction temperature

Thermal Characteristics

Symbol	Parameter	Spec	Units
Rth j-c	Thermal Resistance, Junction to case for IGBT	0.42	KW
Rth j-c	Thermal Resistance, Junction to case for Diode	1.2	
Rth j-a	Thermal Resistance, Junction to Ambient	40	

Electrical Characteristics (TC=25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Static characteristics						
BV _{CES}	Collector-Emitter Breakdown Voltage	V _{GE} = 0V, I _C = 250uA	1200			V
I _{CES}	Collector-Emitter Leakage Current	V _{CE} = 1200V, V _{GE} = 0V			0.1	mA
					2.0	
I _{GES}	Gate Leakage Current, Forward	V _{GE} =20V, V _{CE} = 0V			100	nA
	Gate Leakage Current, Reverse	V _{GE} = -20V, V _{CE} = 0V			-100	nA
V _{GE(th)}	Gate Threshold Voltage	V _{GE} = V _{CE} , I _C = 250uA	5.0	6.0	7.0	V
V _{CE(sat)}	Collector-Emitter Saturation Voltage	V _{GE} =15V, I _C = 25A	T _J =25 °C	2.24	2.40	V
			T _J =150 °C		2.6	
V _F	Diode Forward Voltage	V _{GE} = 0V, I _F =25A	T _J =25 °C	1.30		V
			T _J =150 °C	1.35		
g _{FS}	transconductance	V _{CE} = 20V, I _C = 25A		10.5		S
Dynamic characteristics						
C _{iss}	Input Capacitance	V _{CE} =25V V _{GE} =0V f = 1MHz		3480		pF
C _{oss}	Output Capacitance			99		
C _{rss}	Reverse Transfer Capacitance			58		
Q _G	Gate Charge		V _{CC} =900V, I _C =25A, V _{GE} =15V		tbd	
IGBT switching characteristic(Inductive Load)						
t _{d(on)}	Turn-on Delay Time	V _{CC} =600V I _C =25A V _{GE} =15V/0V R _G =15 Ω		45		ns
t _r	Turn-on Rise Time			50		
t _{d(off)}	Turn-off Delay Time			165		
t _f	Turn-off Fall Time			98		
E _{on}	Turn-on Switching Loss	L _{Load} =500 μ H TC=25 °C		1.33		mJ
E _{off}	Turn-off Switching Loss			0.82		
E _{ts}	Total Switching Loss			2.15		
t _{d(on)}	Turn-on Delay Time		V _{CC} =600V I _C =25A V _{GE} =15V R _G =15 Ω		35	
t _r	Turn-on Rise Time			52		
t _{d(off)}	Turn-off Delay Time			200		
t _f	Turn-off Fall Time			225		
E _{on}	Turn-on Switching Loss	L _{Load} =500 μ H TC=150 °C		1.35		mJ
E _{off}	Turn-off Switching Loss			1.60		
E _{ts}	Total Switching Loss			2.95		

Typical Characteristics

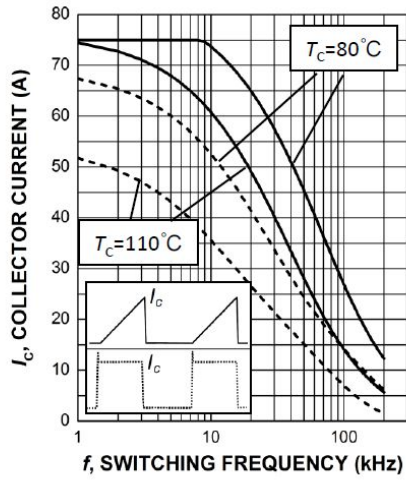


Figure 1. Collector current as a function of switching frequency
 ($T_j \leq 150^\circ\text{C}$, $D = 0.5$, $V_{CE} = 600\text{V}$,
 $V_{GE} = 0/+15\text{V}$, $R_G = 15\Omega$)

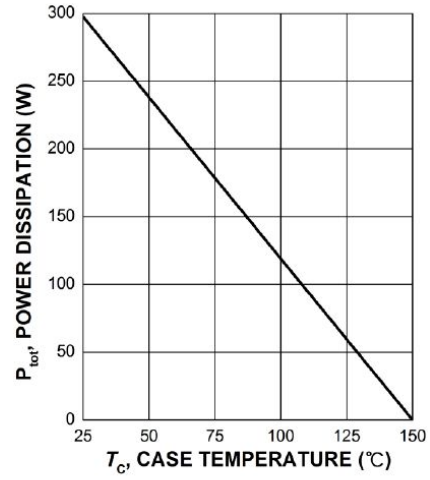


Figure 2. Maximum power dissipation as a function of case temperature
 ($T_j \leq 150^\circ\text{C}$)

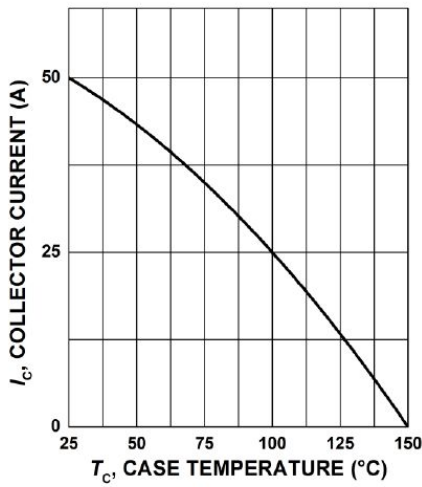


Figure 3. Maximum collector current as a function of case temperature
 ($V_{GE} \geq 15\text{V}$, $T_j \leq 150^\circ\text{C}$)

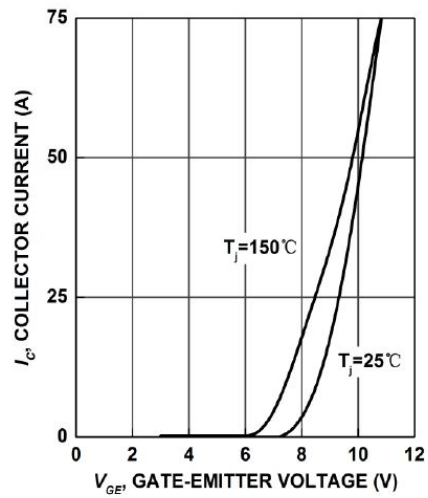


Figure 4. Typical transfer characteristic
 ($V_{CE} = 15\text{V}$)

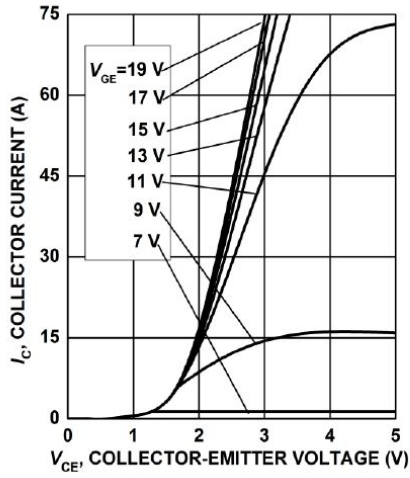


Figure 5. Typical output characteristic ($T_j = 25^\circ\text{C}$)

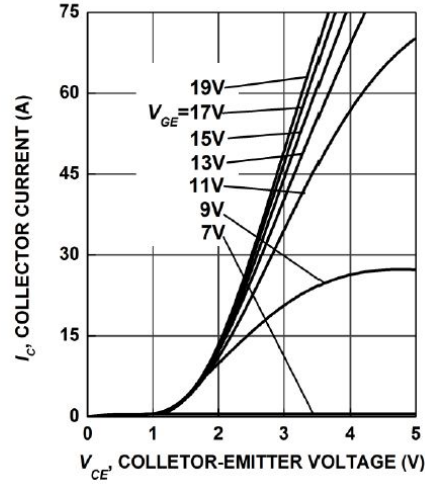


Figure 6. Typical output characteristic ($T_j = 150^\circ\text{C}$)

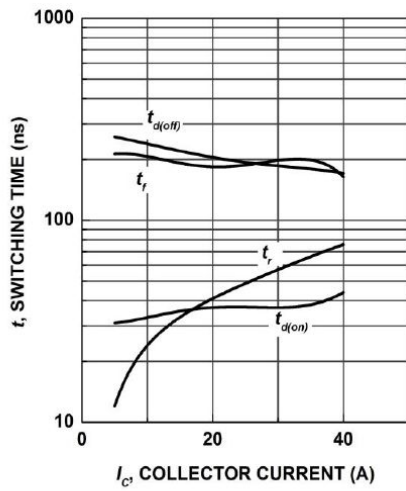


Figure 7. Typical switching times as a function of collector current (inductive load, $T_j=150^\circ\text{C}$, $V_{CE}=600\text{V}$, $V_{GE}=0/15\text{V}$, $R_G=15\Omega$, Dynamic test circuit in Figure D)

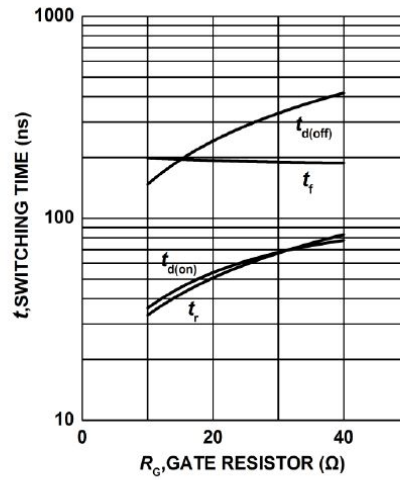


Figure 8. Typical switching times as a function of gate resistor (inductive load, $T_j=150^\circ\text{C}$, $V_{CE}=600\text{V}$, $V_{GE}=0/15\text{V}$, $I_C=25\text{A}$, Dynamic test circuit in Figure D)

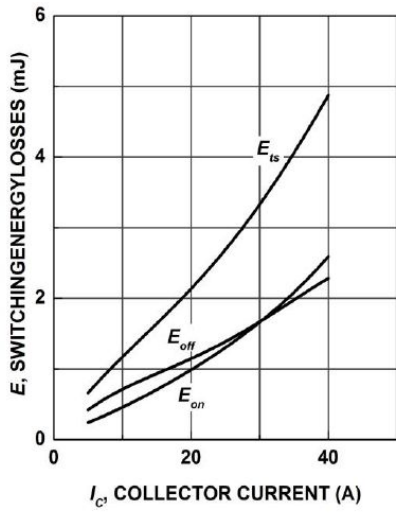


Figure 9. Typical switching energy losses as a function of collector current (inductive load, $T_j=150^{\circ}\text{C}$, $V_{CE}=600\text{V}$, $V_{GE}=0/15\text{V}$, $R_G=15\Omega$, Dynamic test circuit in Figure D)

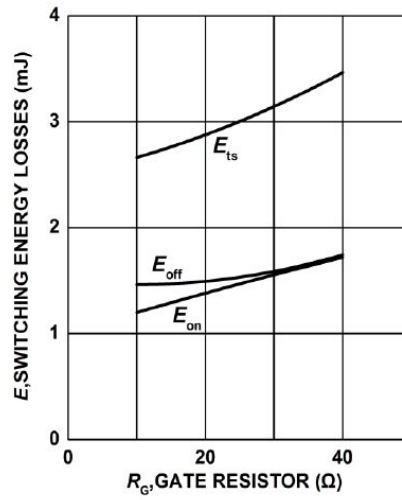


Figure 10. Typical switching energy losses as a function of gate resistor (inductive load, $T_j=150^{\circ}\text{C}$, $V_{CE}=600\text{V}$, $V_{GE}=0/15\text{V}$, $I_C=25\text{A}$, Dynamic test circuit in Figure D)

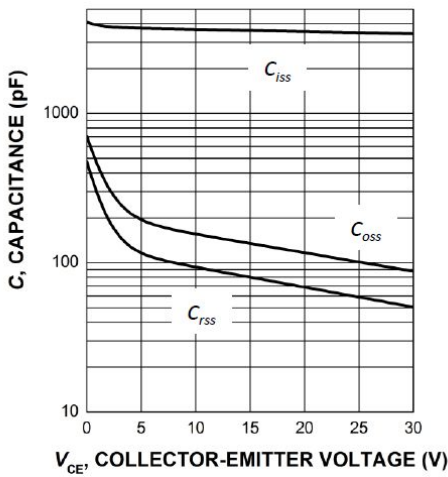


Figure 11. Typical capacitance as a function of collector-emitter voltage ($V_{GE}=0\text{V}$, $f = 1\text{MHz}$)

Test circuits and waveforms

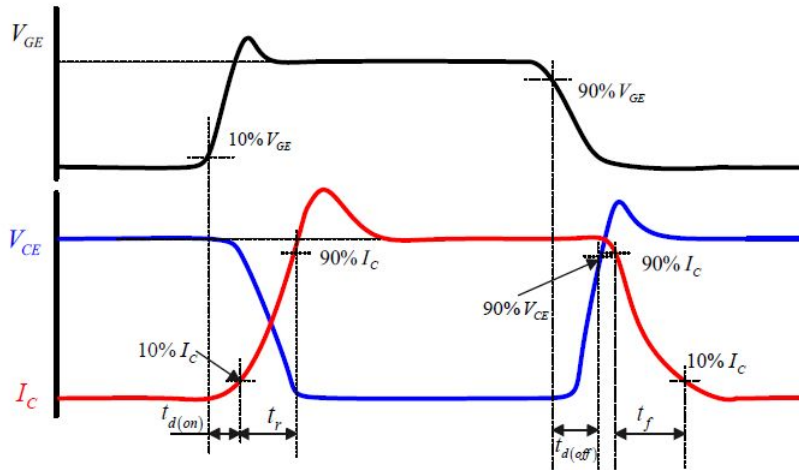


Figure A. Definition of switching times

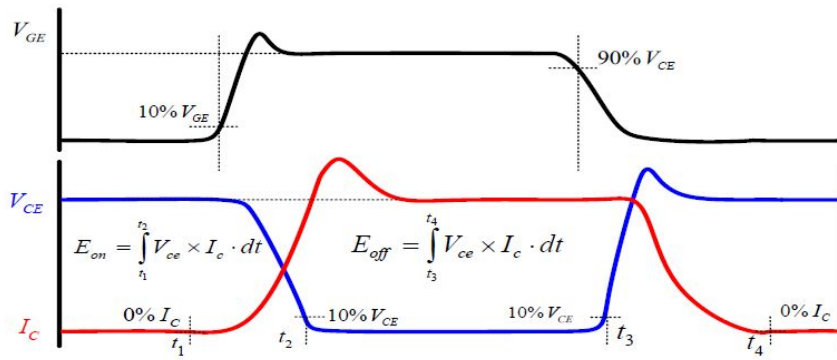


Figure B. Definition of switching losses

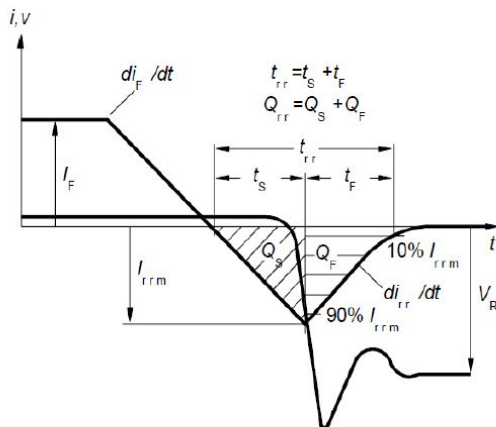


Figure C. Definition of diodes switching characteristics

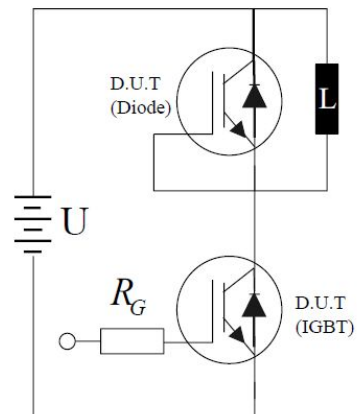


Figure D. Dynamic test circuit

Mechanical Dimensions

