

# TSG15N120A

## IGBT

### Features

- 1200V, 15A
- $V_{CE(sat)(typ.)}=2.5V@V_{GE}=15V, I_C=15A$
- High speed switching
- Higher system efficiency
- Soft current turn-off waveforms
- Square RBSOA using NPT technology

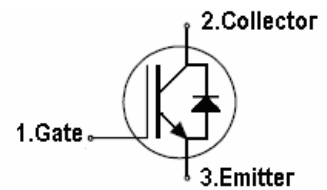
### General Description

TS NPT IGBTs offer lower losses and higher energy efficiency for application such as IH (induction heating), UPS, general inverter and other soft switching applications.

## DRAWING



G C E



## Absolute Maximum Ratings

Symbol	Parameter	Spec	Units
$V_{CES}$	Collector-Emitter Voltage	1200	V
$V_{GES}$	Gate-Emitter Voltage	$\pm 30$	V
$I_C$	Continuous Collector Current ( $T_C=25\text{ }^\circ\text{C}$ )	30	A
	Continuous Collector Current ( $T_C=100\text{ }^\circ\text{C}$ )	15	A
$I_{CM}$	Pulsed Collector Current (Note 1)	45	A
$I_F$	Diode Continuous Forward Current ( $T_C=100\text{ }^\circ\text{C}$ )	15	A
$I_{FM}$	Diode Maximum Forward Current (Note 1)	45	A
tsc	Short Circuit Withstand Time	10	us
$P_D$	Maximum Power Dissipation ( $T_C=25\text{ }^\circ\text{C}$ )	170	W
	Maximum Power Dissipation ( $T_C=100\text{ }^\circ\text{C}$ )	68	W
$T_J$	Operating Junction Temperature Range	-55 to +150	$^\circ\text{C}$
$T_{STG}$	Storage Temperature Range	-55 to +150	$^\circ\text{C}$

Notes:

1. 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	0.74	$^\circ\text{C}/\text{W}$
Rth j-c	Thermal Resistance, Junction to case for Diode	0.85	$^\circ\text{C}/\text{W}$
Rth j-a	Thermal Resistance, Junction to Ambient	40	$^\circ\text{C}/\text{W}$

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$BV_{CES}$	Collector-Emitter Breakdown Voltage	$V_{GE}=0V, I_C=250\mu A$	1200			V
$I_{CES}$	Collector-Emitter Leakage Current	$V_{CE}=1200V, V_{GE}=0V$			250	$\mu A$
$I_{GES}$	Gate Leakage Current, Forward	$V_{GE}=30V, V_{CE}=0V$			100	nA
	Gate Leakage Current, Reverse	$V_{GE}=-30V, V_{CE}=0V$			-100	nA
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE}=V_{CE}, I_C=250\mu A$	4		6	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$V_{GE}=15V, I_C=20A$		2.5		V
$Q_g$	Total Gate Charge	$V_{CC}=960V$		70		nC
$Q_{ge}$	Gate-Emitter Charge	$V_{GE}=15V$		23		nC
$Q_{gc}$	Gate-Collector Charge	$I_C=15A$		24		nC
$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=600V$ $V_{GE}=15V$ $I_C=15A$ $R_G=28\Omega$ Inductive Load $TC=25^\circ C$		38		ns
$t_r$	Turn-on Rise Time			34		ns
$t_{d(off)}$	Turn-off Delay Time			255		ns
$t_f$	Turn-off Fall Time			249		ns
$E_{on}$	Turn-on Switching Loss			1.3		mJ
$E_{off}$	Turn-off Switching Loss			0.7		mJ
$E_{ts}$	Total Switching Loss		2.0		mJ	
$C_{ies}$	Input Capacitance	$V_{CE}=25V$		635		pF
$C_{oes}$	Output Capacitance	$V_{GE}=0V$		85		pF
$C_{res}$	Reverse Transfer Capacitance	$f=100kHz$		25		pF
$R_{Gint}$	Integrated gate resistor			3.8		$\Omega$

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units	
$V_F$	Diode Forward Voltage	$I_F=15A$		1.8	2.8	V	
$t_{rr}$	Diode Reverse Recovery Time	$V_{CE}=600V$ $I_F=15A$ $dI_F/dt=500A/\mu s$		160		ns	
$I_{rr}$	Diode peak Reverse Recovery Current				20		A
$Q_{rr}$	Diode Reverse Recovery Charge				2015		nC

Typical Characteristics

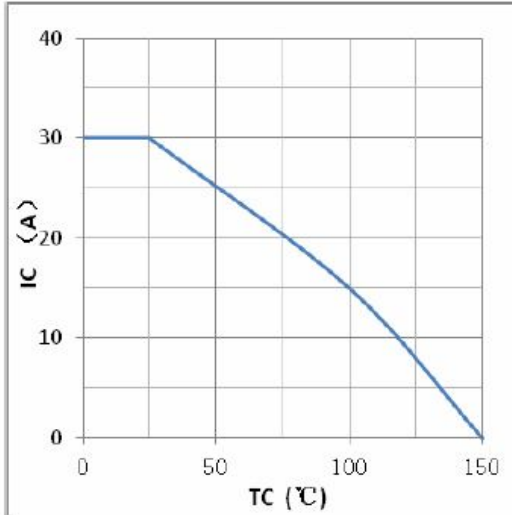


Figure1:maximum DC collector current VS. case temperature

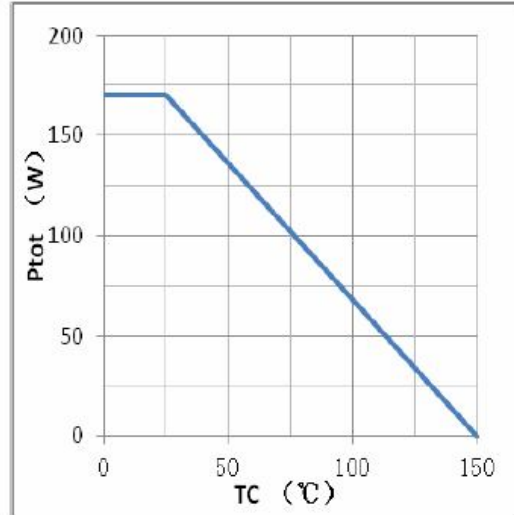


Figure2:power dissipation VS. case temperature

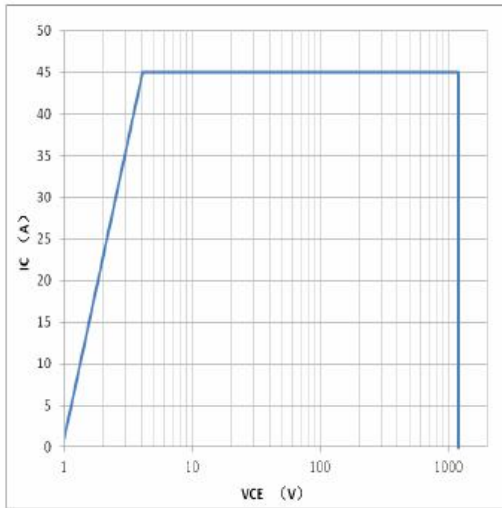


Figure3:reverse bias SOA, TJ=150°C, VGE=15V

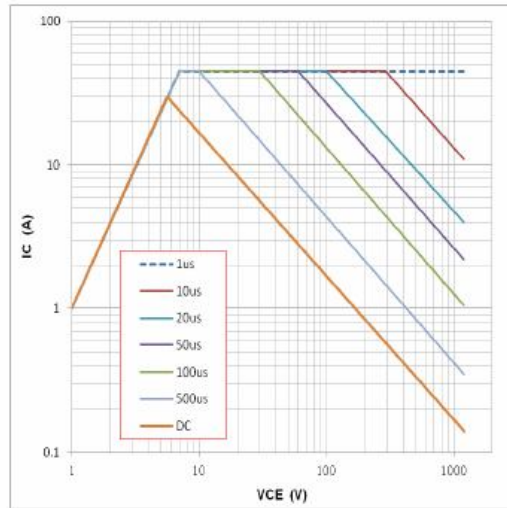


Figure4:forward SOA, TC=25°C, TJ≤150°C

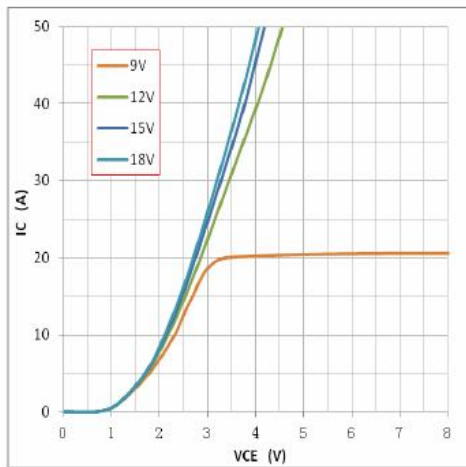


Figure5:typical IGBT output characteristics, TJ=25°C; tp=300us

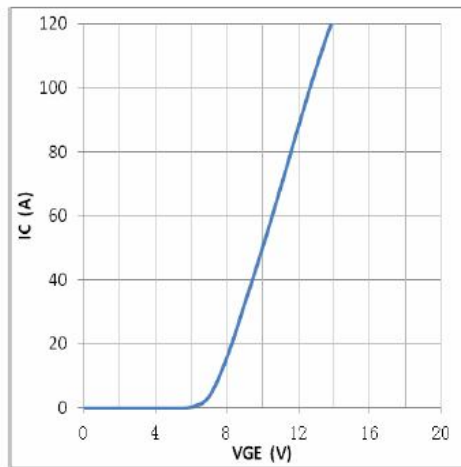


Figure6:typical trans characteristics, VCE=20V, tp=20us

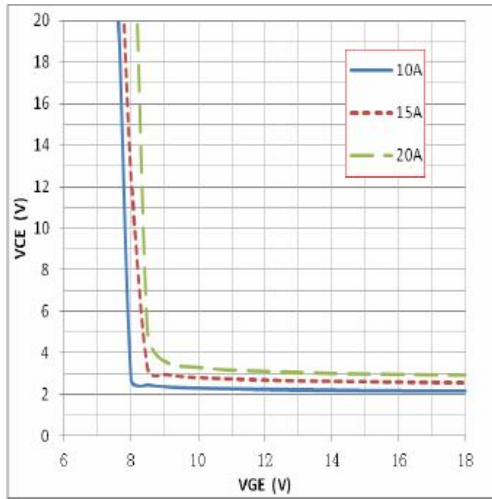


Figure7: typical VCE VS. VGE, TJ=25°C

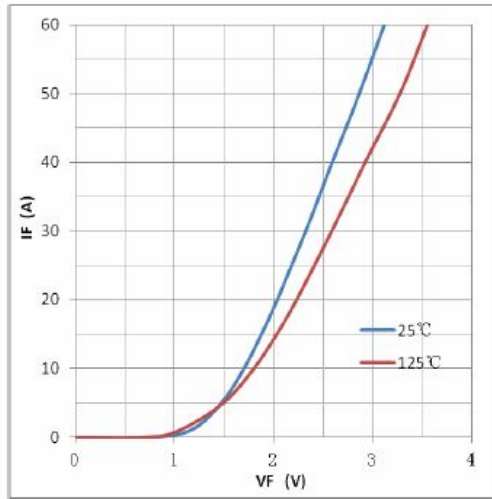


Figure8: typical diode forward characteristic, tp=300us

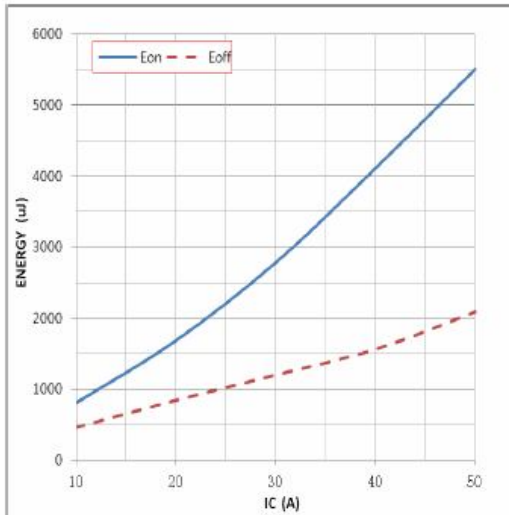


Figure9: typical energy loss VS. IC, TC=25°C,  
L=500uH, VCE=600V, VGE=15V, Rg=28Ω

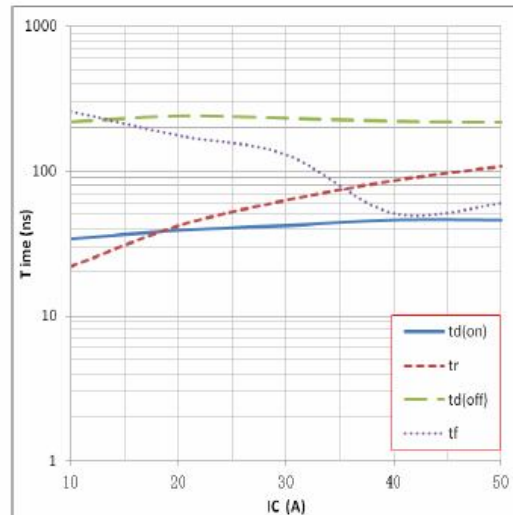


Figure10: typical switching time VS. IC, TC=25°C,  
L=500uH, VCE=600V, VGE=15V, Rg=28Ω

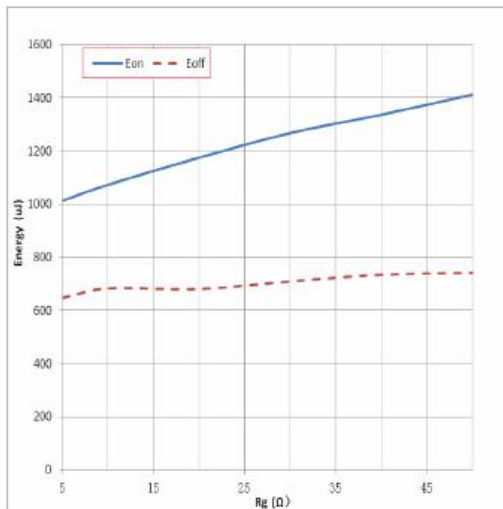


Figure11: typical energy loss VS. Rg, TC=25°C,  
L=500uH, VCE=600V, VGE=15V, IC=15A

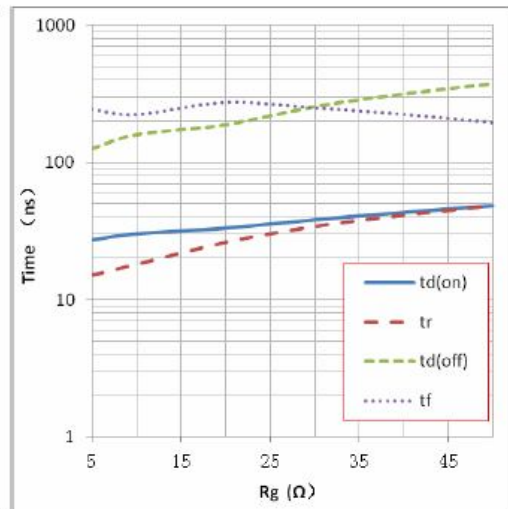


Figure12: typical switching time VS. Rg, TC=25°C,  
L=500uH, VCE=600V, VGE=15V, IC=15A

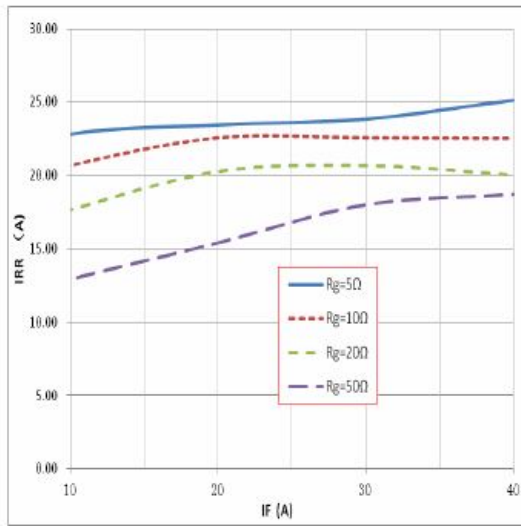


Figure13: typical diode IRR VS. IF, TC=25°C

VCC=600V, VGE=15V

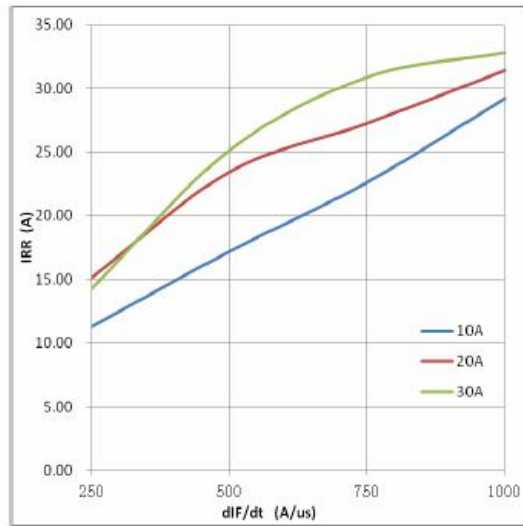


Figure14: typical diode IRR VS. dIF/dt

VCC=600V, VGE=15V

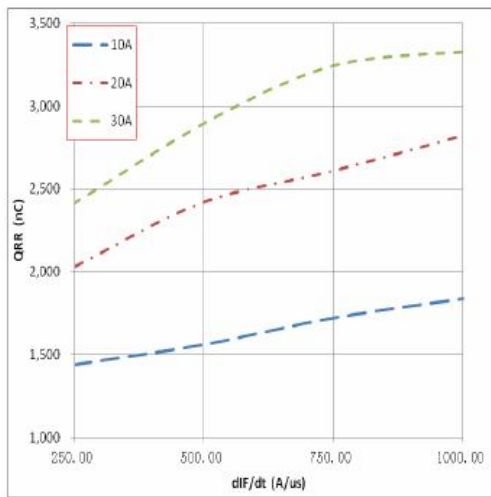


Figure15: typical diode QRR VS. dIF/dt

VCC=600V, VGE=15V

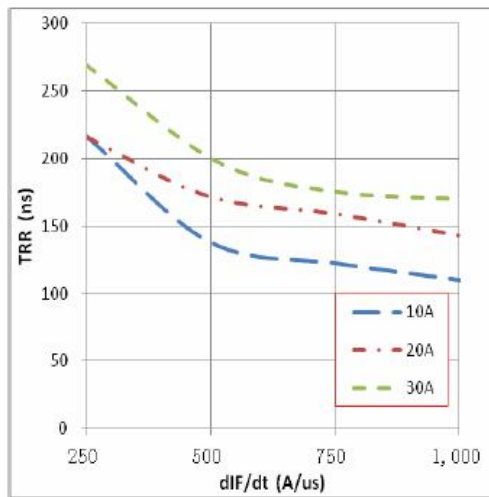


Figure16: typical diode TRR VS. dIF/dt,

VCC=600V, VGE=15V

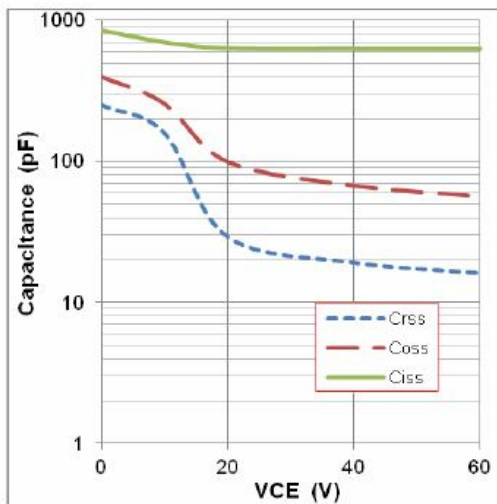


Figure17: typical capacitance VS. VCE, VGE=0V, f=100kHz

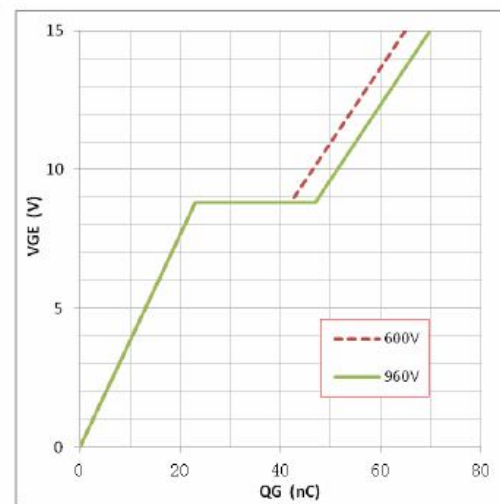


Figure18: typical gate charge VS. VGE, IC=15A

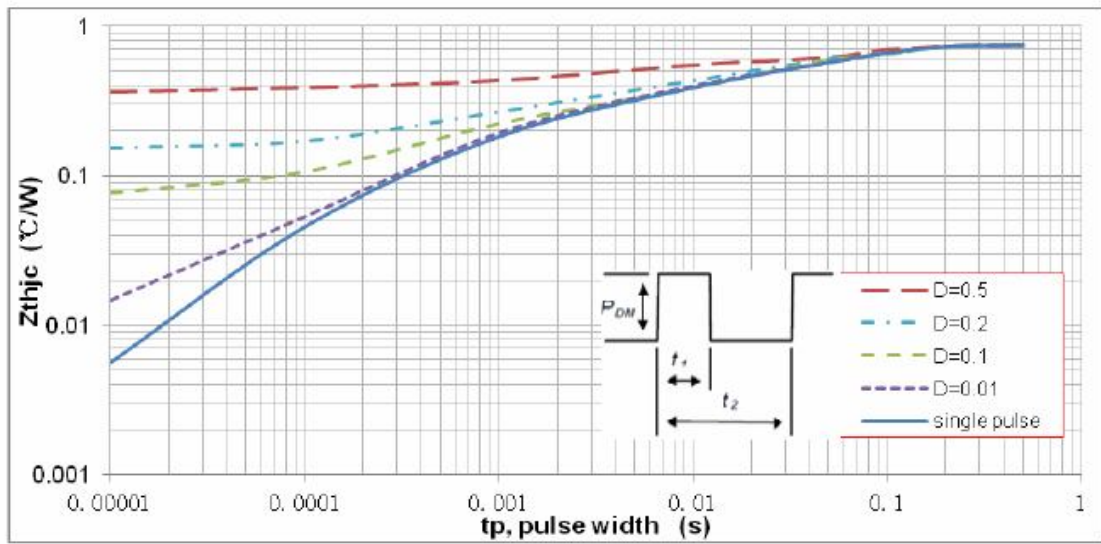


Figure 19: normalized transient thermal impedance, junction-to-case

Note 1. Duty factor  $D=t_1/t_2$ ; Note 2. peak  $T_J=PDM \times Z_{thjc}+T_C$

Mechanical Dimensions

