



STGF7NB60SL

N-CHANNEL 7A - 600V - TO-220FP

PowerMESH™ IGBT

Table 1: General Features

TYPE	V _{CES}	V _{CE(sat)} (Max) @25°C	I _C @100°C
STGF7NB60SL	600 V	< 1.6 V	7 A

- POLYSILICON GATE VOLTAGE DRIVEN
- LOW THRESHOLD VOLTAGE
- LOW ON-VOLTAGE DROP
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY

DESCRIPTION

Using the latest high voltage technology based on a patented strip layout, STMicroelectronics has designed an advanced family of IGBTs, the PowerMESH™ IGBTs, with outstanding performances. The suffix "S" identifies a family optimized achieve minimum on-voltage drop for low frequency applications (<1kHz).

APPLICATIONS

- LIGHT DIMMER
- STATIC RELAYS

Figure 1: Package

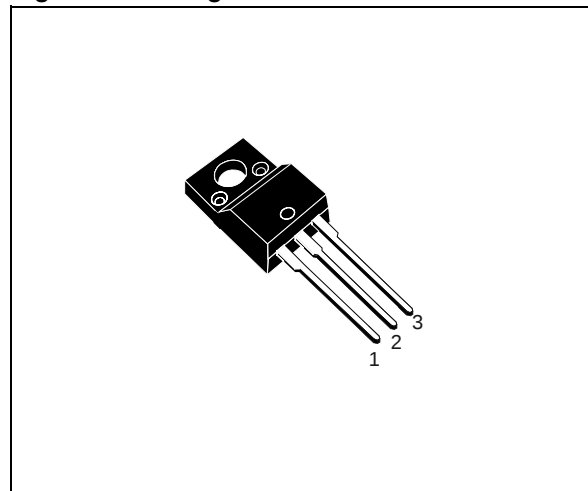


Figure 2: Internal Schematic Diagram

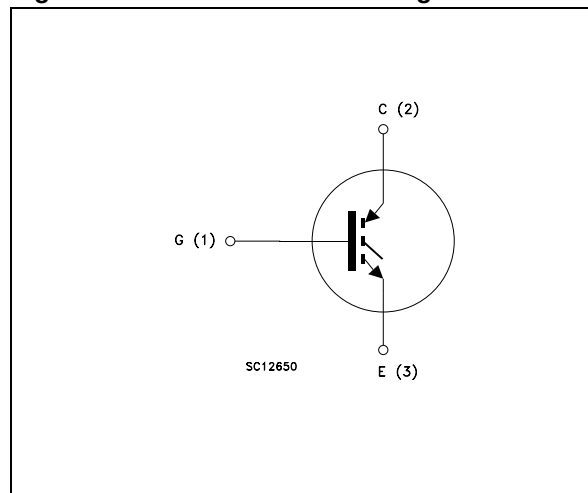


Table 2: Order Codes

SALES TYPE	MARKING	PACKAGE	PACKAGING
STGF7NB60SL	GF7NB60SL	TO-220FP	TUBE

Table 3: Absolute Maximum ratings

Symbol	Parameter	Value	Symbol
V_{CES}	Collector-Emitter Voltage ($V_{GS} = 0$)	600	V
V_{ECR}	Reverse Battery Protection	20	V
V_{GE}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current (continuous) at 25°C	15	A
I_C	Collector Current (continuous) at 100°C	7	A
I_{CM} (1)	Collector Current (pulsed)	20	A
P_{TOT}	Total Dissipation at $T_C = 25^\circ\text{C}$	25	W
	Derating Factor	0.2	W/°C
V_{ISO}	Insulation Withstand Voltage A.C.	2500	V
T_{stg}	Storage Temperature	– 55 to 150	°C
T_j	Operating Junction Temperature		

(1)Pulse width limited by max. junction temperature.

Table 4: Thermal Data

Rthj-case	Thermal Resistance Junction-case Max	5	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	62.5	°C/W

ELECTRICAL CHARACTERISTICS ($T_{CASE} = 25^\circ\text{C}$ UNLESS OTHERWISE SPECIFIED)**Table 5: Off**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{BR(CES)}$	Collectro-Emitter Breakdown Voltage	$I_C = 250\ \mu\text{A}$, $V_{GE} = 0$	600			V
$V_{BR(ECS)}$	Emitter-Collector Breakdown Voltage	$I_C = 1\text{mA}$, $V_{GE} = 0$	20			V
I_{CES}	Collector-Emitter Leakage Current ($V_{CE} = 0$)	$V_{GE} = \text{Max Rating}$ $T_C = 25^\circ\text{C}$ $T_C = 125^\circ\text{C}$			10 100	μA μA
I_{GES}	Gate-Emitter Leakage Current ($V_{CE} = 0$)	$V_{GE} = \pm 20\text{ V}$, $V_{CE} = 0$			± 100	nA

Table 6: On

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GE(th)}$	Gate Threshold Voltage	$V_{CE} = V_{GE}$, $I_C = 250\ \mu\text{A}$	1.2		2.4	V
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage	$V_{GE} = 4.5\text{ V}$, $I_C = 7\text{A}$, $T_j = 25^\circ\text{C}$ $V_{GE} = 4.5\text{ V}$, $I_C = 7\text{A}$, $T_j = 125^\circ\text{C}$		1.2 1.1	1.6	V V

ELECTRICAL CHARACTERISTICS (CONTINUED)**Table 7: Dynamic**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs}	Forward Transconductance	$V_{CE} = 15\text{ V}$, $I_C = 7\text{ A}$		5		S
C_{ies} C_{oes} C_{res}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{CE} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GE} = 0$		800 60 10		pF pF pF
Q_g Q_{ge} Q_{gc}	Total Gate Charge Gate-Emitter Charge Gate-Collector Charge	$V_{CE} = 480\text{ V}$, $I_C = 7\text{ A}$, $V_{GE} = 5\text{ V}$ (see Figure 20)		16 2.5 8.5	22	nC nC nC
I_{CL}	Turn-Off SOA Minimum Current	$V_{clamp} = 480\text{ V}$, $T_J = 125^\circ\text{C}$ $R_G = 1\text{ K}\Omega$, $V_{GE} = 5\text{ V}$	20			A
t_{scw}	Short Circuit Withstand Time	$V_{ce} = 0.5 V_{BR(CES)}$, $V_{GE} = 5\text{ V}$, $T_J = 125^\circ\text{C}$, $R_G = 1\text{ K}\Omega$		14		μs

Table 8: Switching On

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Delay Time Current Rise Time	$V_{CC} = 480\text{ V}$, $I_C = 7\text{ A}$, $R_G = 1\text{ K}\Omega$, $V_{GE} = 5\text{ V}$ (see Figure 18)		1.1 0.25		μs μs
$(di/dt)_{on}$ E_{on}	Turn-on Current Slope Turn-on Switching Losses	$V_{CC} = 480\text{ V}$, $I_C = 7\text{ A}$, $R_G = 1\text{ K}\Omega$ $V_{GE} = 5\text{ V}$, $T_J = 125^\circ\text{C}$		45 2.7		A/ μs mJ

Table 9: Switching Off

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_c $t_r(V_{off})$ $t_{d(off)}$ t_f $E_{off(**)}$	Cross-over Time Off Voltage Rise Time Delay Time Current Fall Time Turn-off Switching Loss	$V_{CC} = 480\text{ V}$, $I_C = 7\text{ A}$, $R_{GE} = 1\text{ K}\Omega$, $V_{GE} = 5\text{ V}$ (see Figure 18)		2.7 1.6 5.2 1.1 4.1		μs μs μs μs mJ
t_c $t_r(V_{off})$ $t_{d(off)}$ t_f $E_{off(**)}$	Cross-over Time Off Voltage Rise Time Delay Time Fall Time Turn-off Switching Loss	$V_{CC} = 480\text{ V}$, $I_C = 7\text{ A}$, $R_{GE} = 1\text{ K}\Omega$, $V_{GE} = 5\text{ V}$ $T_J = 125^\circ\text{C}$ (see Figure 18)		4.4 2.4 6.4 1.7 7.1		μs μs μs μs mJ

(**) Turn-off losses include also the tail of the collector current.

Figure 3: Output Characteristics

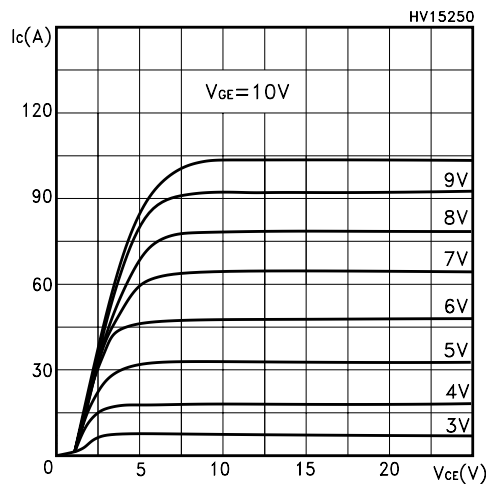


Figure 4: Transconductance

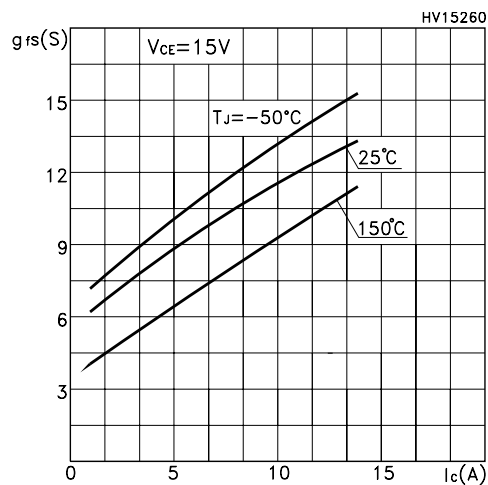


Figure 5: Collector-Emitter On Voltage vs Collector Current

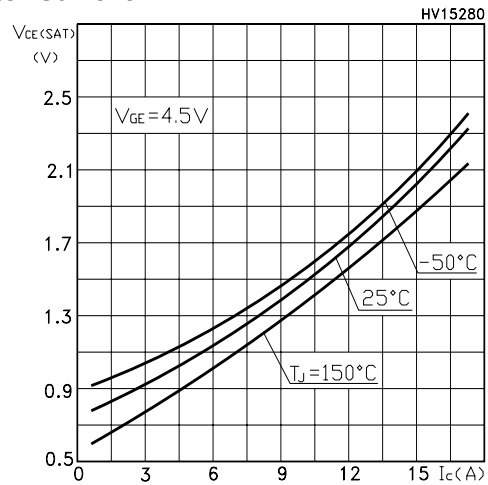


Figure 6: Transfer Characteristics

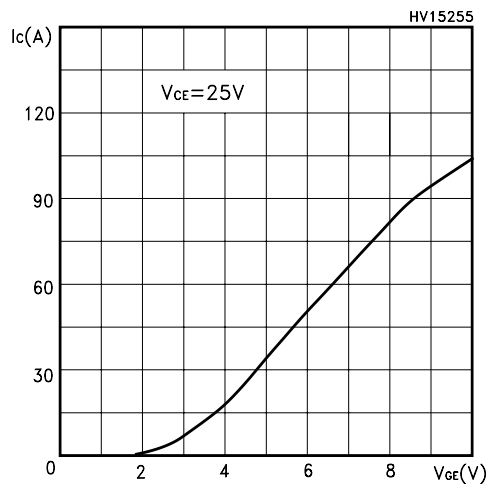


Figure 7: Collector-Emitter On Voltage vs Temperature

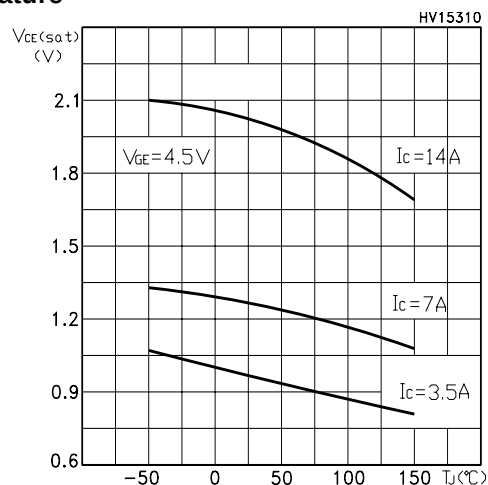


Figure 8: Normalized Collector-Emitter On Voltage vs Temperature

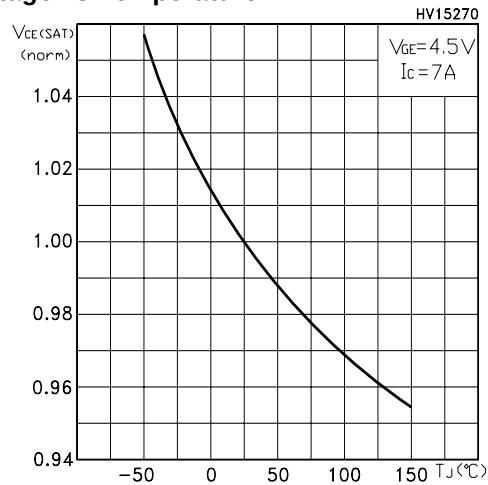


Figure 9: Gate Threshold vs Temperature

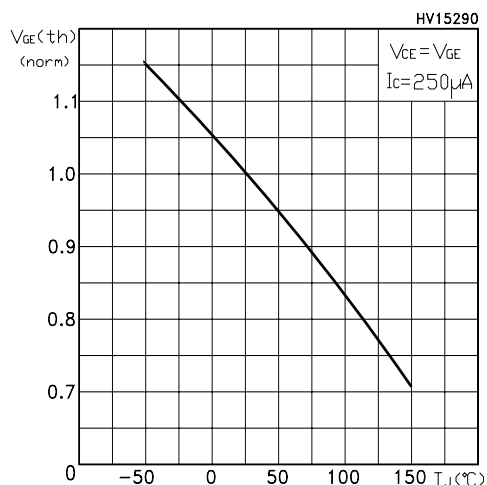


Figure 10: Capacitance Variations

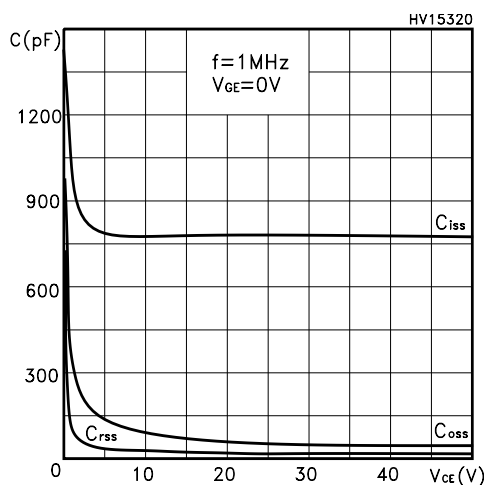


Figure 11: Total Switching Losses vs Gate Resistance

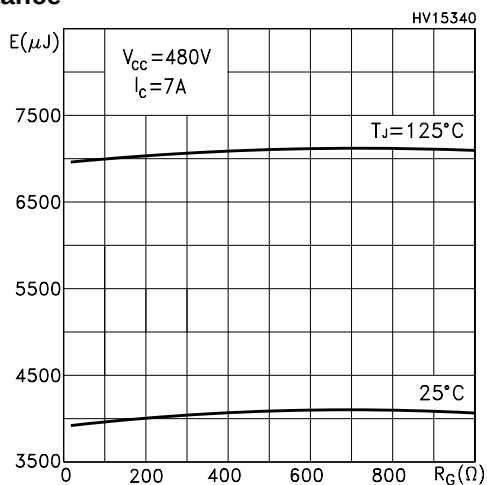


Figure 12: Normalized Breakdown Voltage vs Temperature

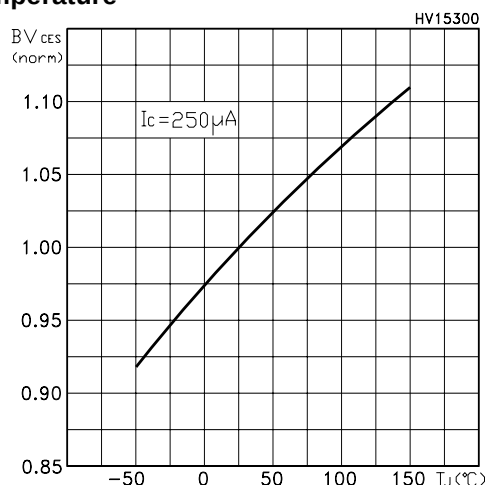


Figure 13: Gate Charge vs Gate-Emitter Voltage

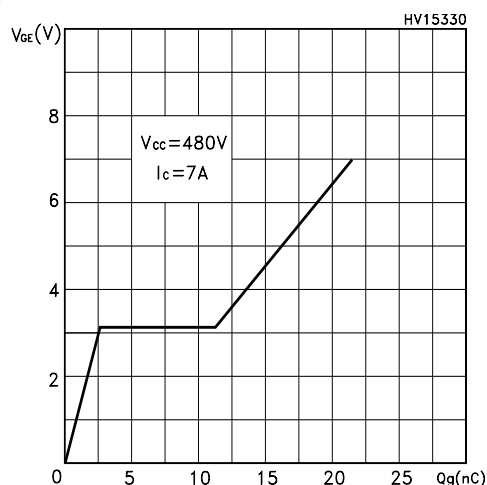


Figure 14: Total Switching Losses vs Temperature

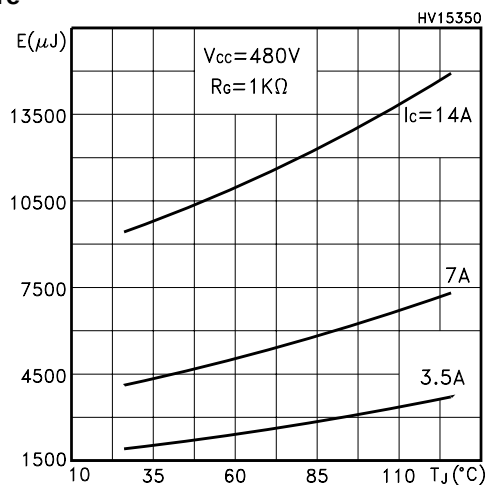


Figure 15: Total Switching Losses vs Collector Current

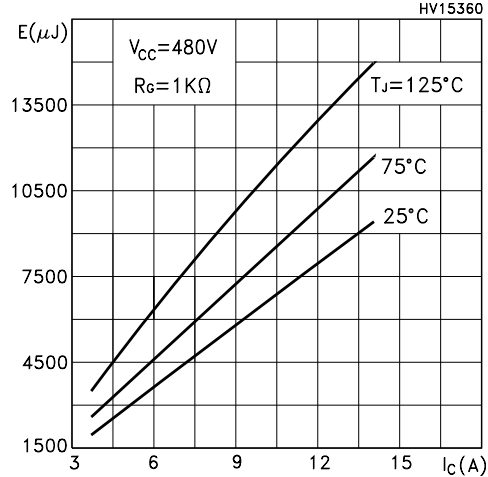


Figure 16: Thermal Impedance

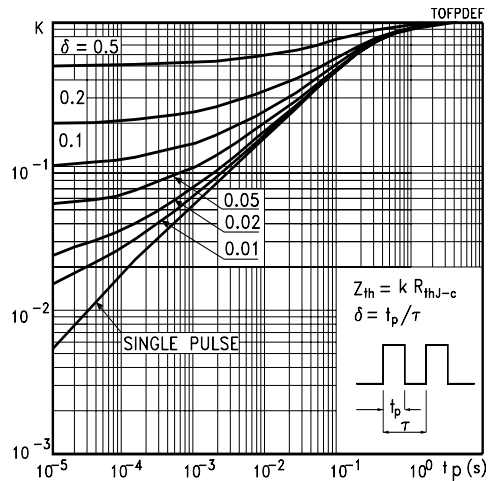


Figure 17: Turn-Off SOA

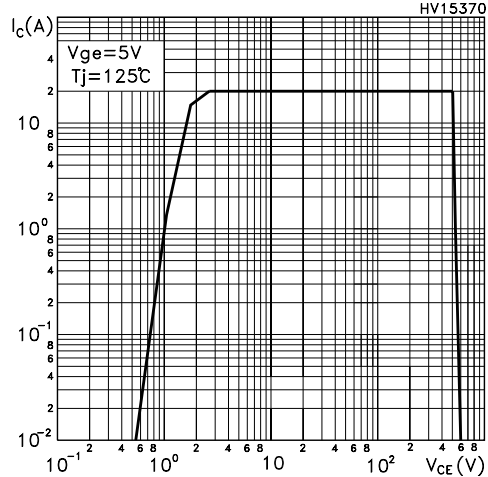


Figure 18: Test Circuit for Inductive Load Switching

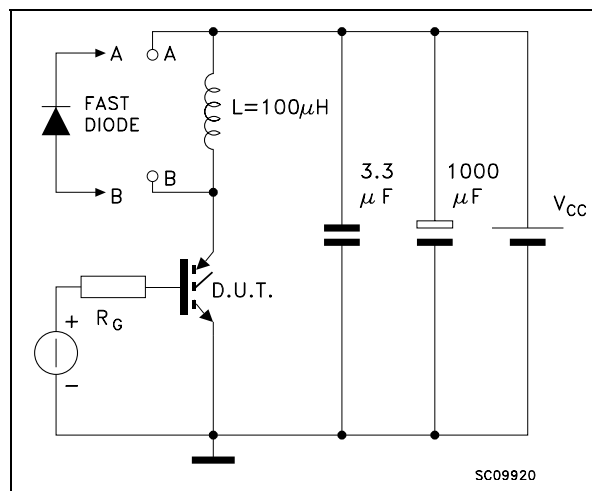


Figure 19: Switching Waveforms

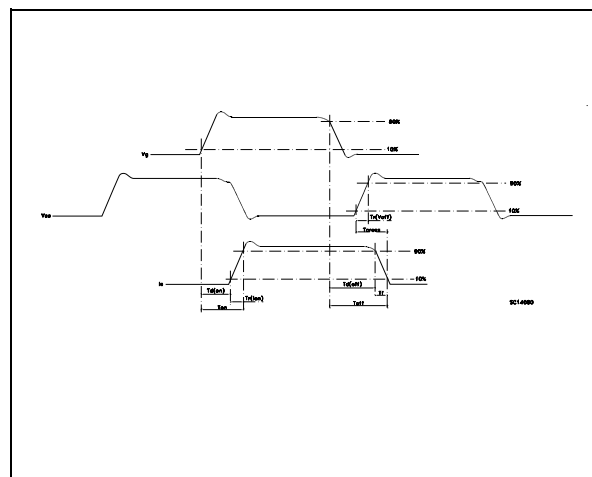


Figure 20: Gate Charge Test Circuit

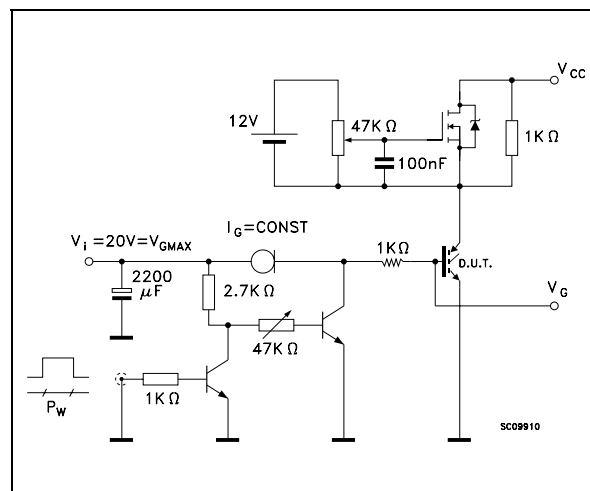


Table 10: Revision History

Date	Revision	Description of Changes
04-June-2004	2	Stylesheet update. No content change
02-Sep-2004	3	Datasheet updated, see table1

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