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

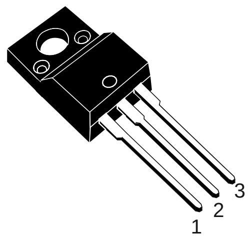

Figure 2: Internal Schematic Diagram

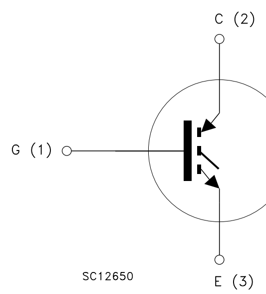

Table 2: Order Codes

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

Rev.3

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°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°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 µA, V_{GE} = 0	600			V
$V_{BR(ECS)}$	Emitter-Collector Breakdown Voltage	I_C = 1mA, V_{GE} = 0	20			V
I_{CES}	Collector-Emitter Leakage Current (V_{CE} = 0)	V_{GE} = Max Rating Tc=25°C Tc=125°C			10 100	µA µA
I_{GES}	Gate-Emitter Leakage Current (V_{CE} = 0)	V_{GE} = ± 20 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 µA	1.2		2.4	V
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage	V_{GE}=4.5 V, I_C= 7A, Tj= 25°C V_{GE}=4.5 V, I_C= 7A, Tj= 125°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 V, I_C= 7 A		5		S
C_{ies} C_{oes} C_{res}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{CE} = 25V, f = 1 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} = 480V, I_C = 7 A, V_{GE} = 5V (see Figure 20)		16 2.5 8.5	22	nC nC nC
I_{CL}	Turn-Off SOA Minimum Current	V_{clamp} = 480 V , Tj = 125°C R_G = 1 KΩ, V_{GE}=5V	20			A
tscw	Short Circuit Withstand Time	V_{ce} = 0.5 $V_{BR(CES)}$, V_{GE}=5V, Tj = 125°C , R_G = 1KΩ		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 V, I_C = 7 A R_G=1KΩ , V_{GE} = 5 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 V, I_C = 7 A R_G=1KΩ V_{GE} = 5 V,Tj = 125°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 V, I_C = 7 A, R_{GE} = 1KΩ , V_{GE} = 5 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 V, I_C = 7 A, R_{GE} = 1KΩ , V_{GE} = 5 V Tj = 125 °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

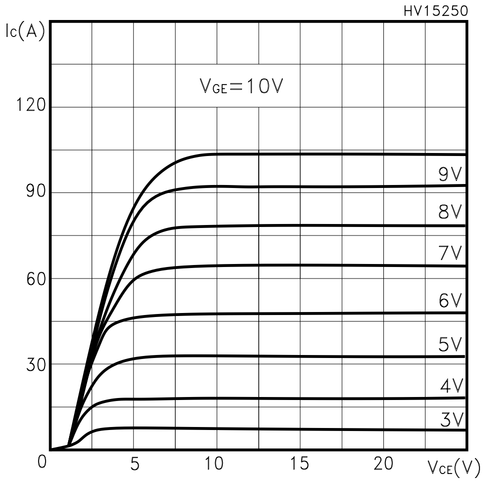

Figure 6: Transfer Characteristics

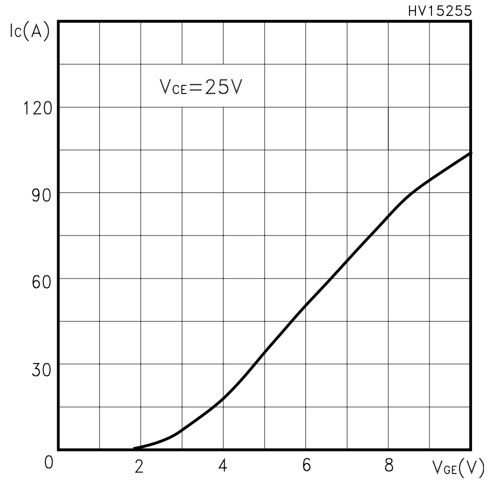

Figure 4: Transconductance

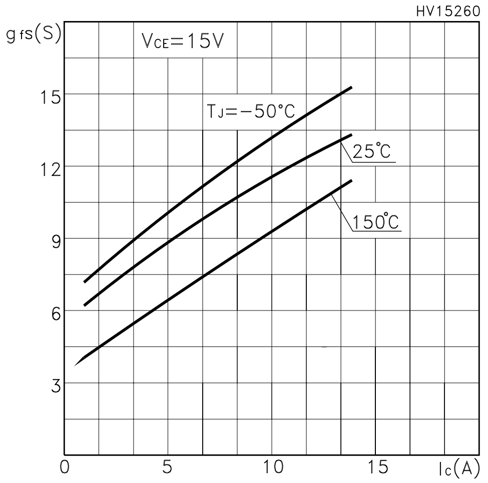

Figure 7: Collector-Emitter On Voltage vs Temperature

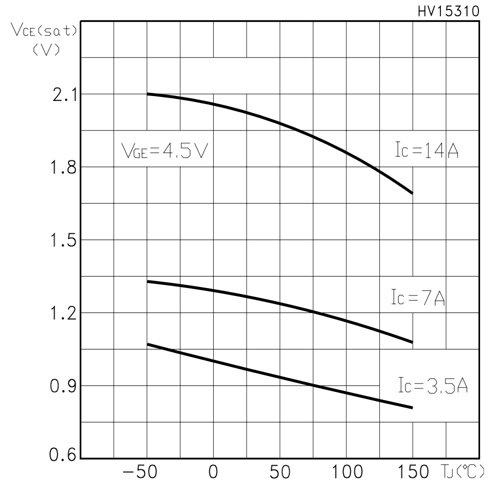

Figure 5: Collector-Emitter On Voltage vs Collector Current

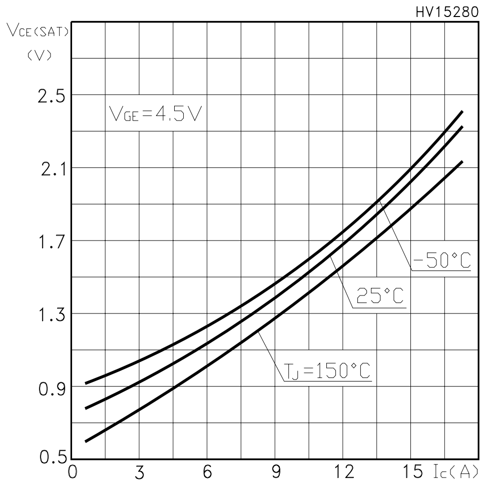

Figure 8: Normalized Collector-Emitter On Voltage vs Temperature

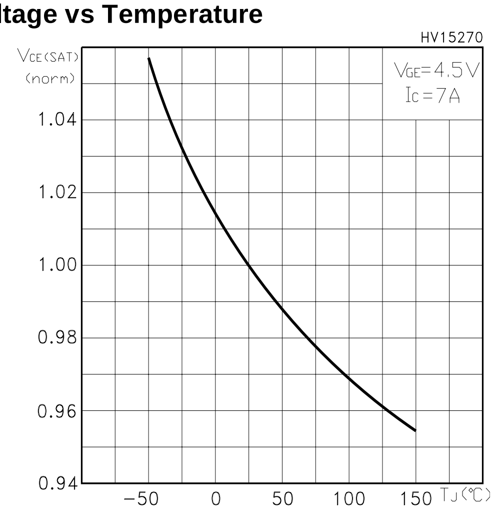

Figure 9: Gate Thereshold vs Temperature

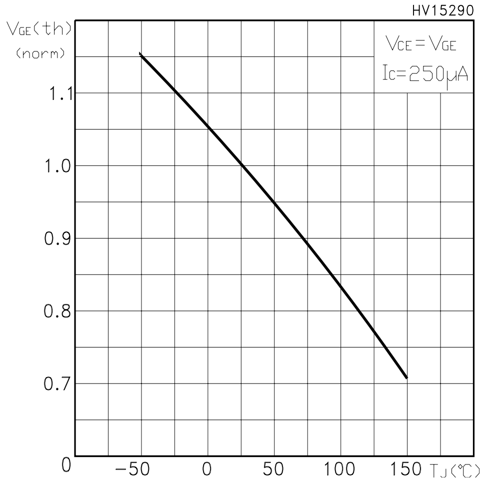

Figure 12: Normalized Breakdown Voltage vs Temperature

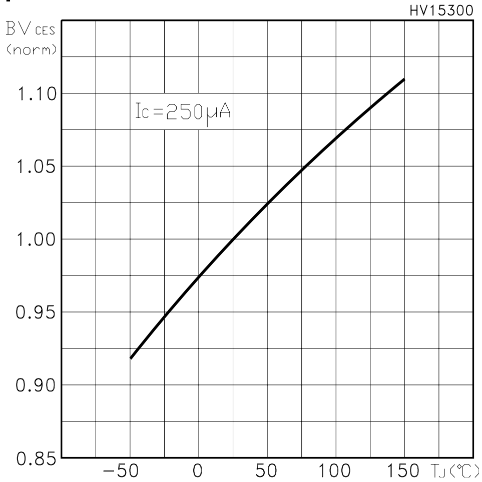

Figure 10: Capacitance Variations

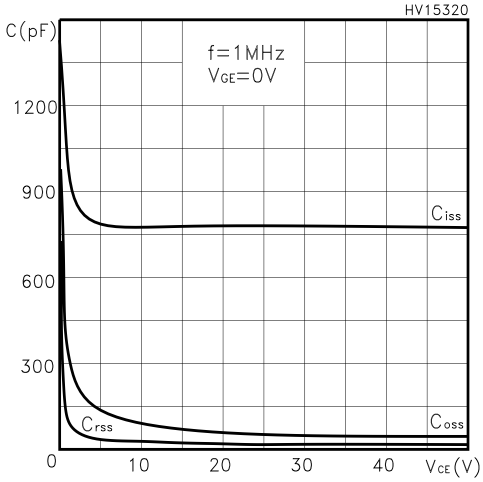

Figure 13: Gate Charge vs Gate-Emitter Voltage

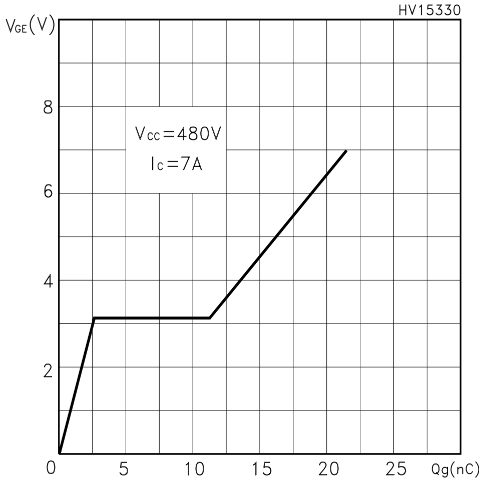

Figure 11: Total Switching Losses vs Gate Resistance

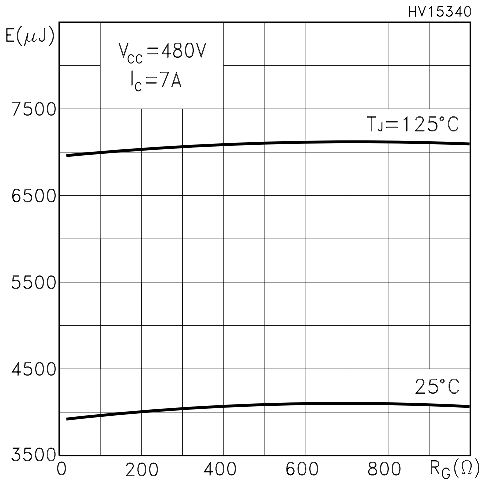

Figure 14: Total Switching Losses vs Temperature

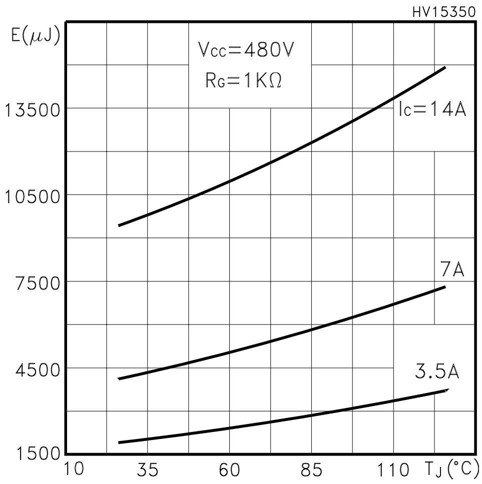

Figure 15: Total Switching Losses vs Collector Current

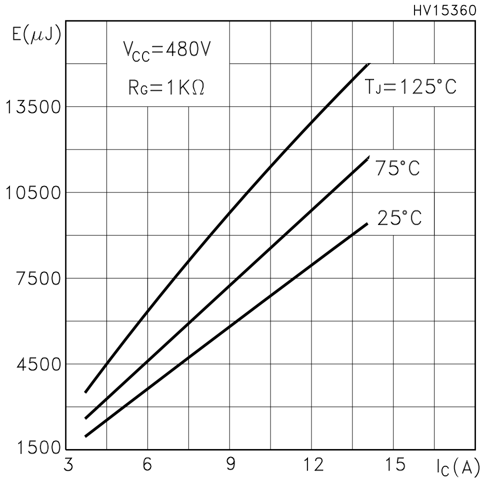

Figure 16: Thermal Impedance

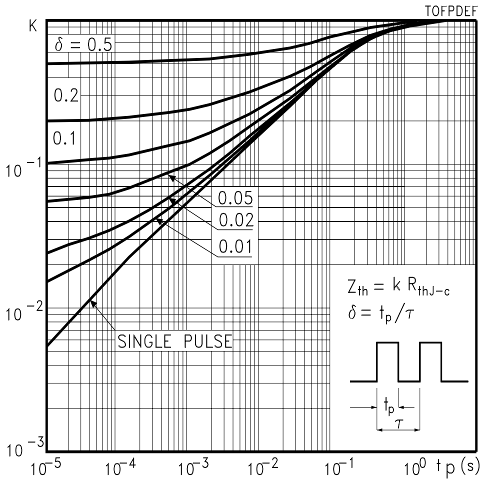

Figure 17: Turn-Off SOA

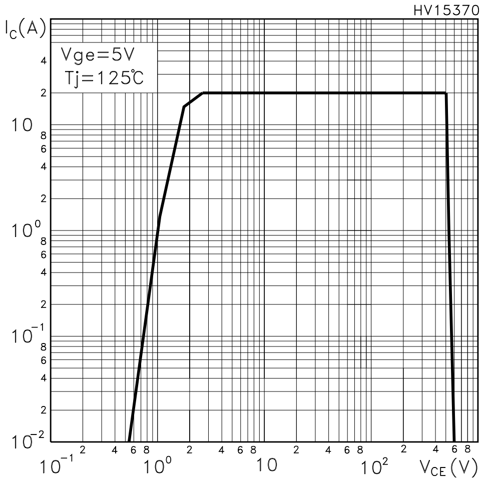

Figure 18: Test Circuit for Inductive Load Switching

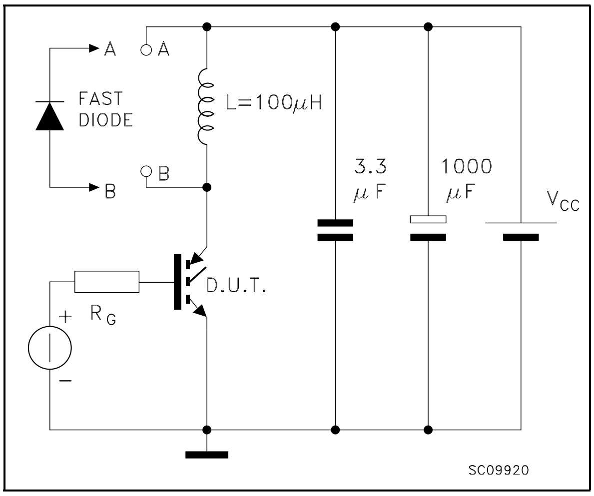

Figure 19: Switching Waveforms

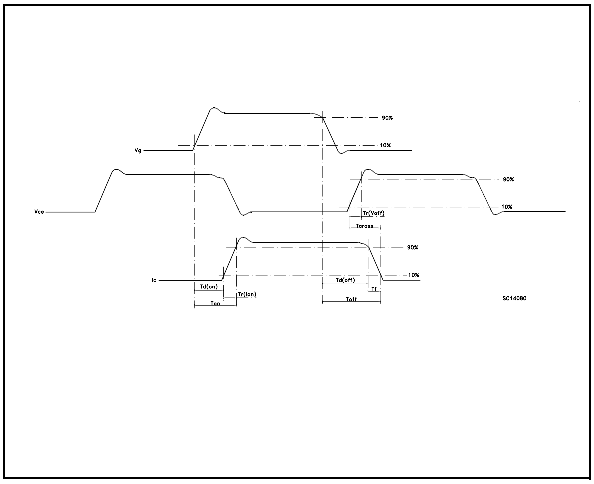

Figure 20: Gate Charge Test Circuit

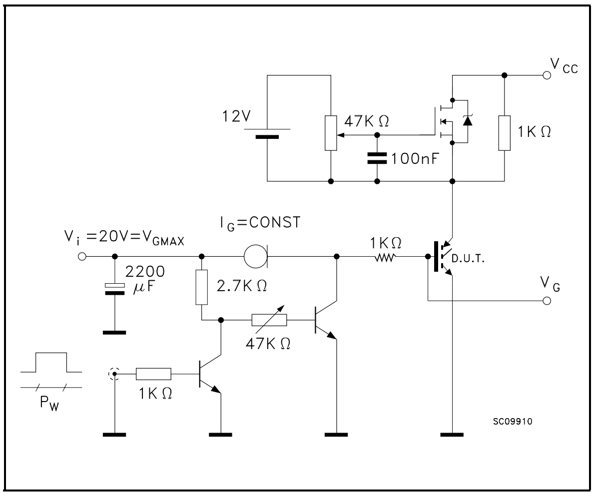

Table 10: Revision History

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