



STGF7NB60SL

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

PowerMESH™ IGBT

Table 1: General Features

TYPE	V <sub>CES</sub>	V <sub>CE(sat)</sub> (Max) @ 25°C	I <sub>C</sub> @ 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

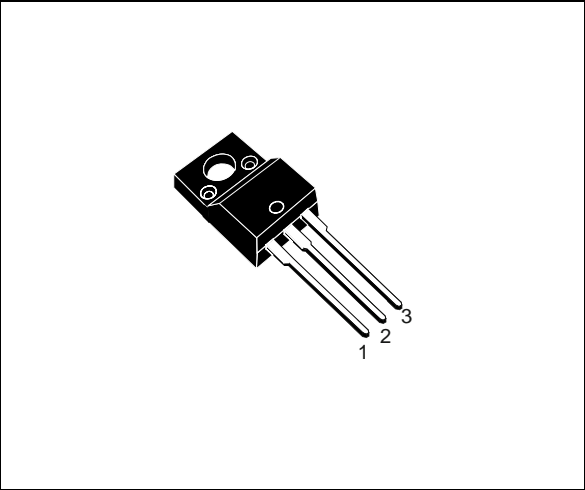


Figure 2: Internal Schematic Diagram

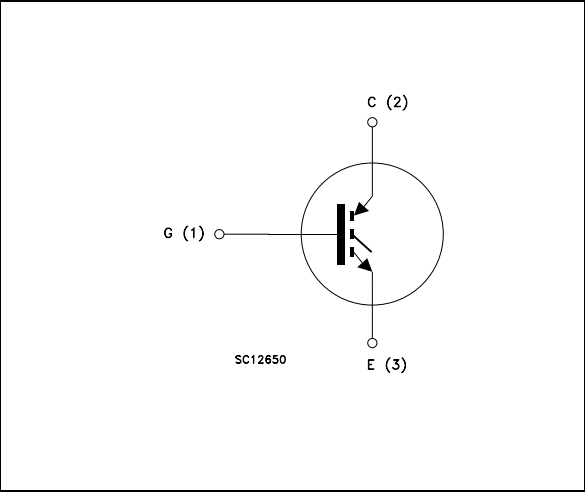


Table 2: Order Codes

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	$\pm 20$	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**

$R_{thj-case}$	Thermal Resistance Junction-case Max	5	°C/W
$R_{thj-amb}$	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	$\mu\text{A}$ $\mu\text{A}$
$I_{GES}$	Gate-Emitter Leakage Current ( $V_{CE} = 0$ )	$V_{GE} = \pm 20 \text{ V}$ , $V_{CE} = 0$			$\pm 100$	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		$\mu\text{s}$

**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		$\mu\text{s}$ $\mu\text{s}$
$(di/dt)_{on}$ $E_{on}$	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/ $\mu\text{s}$ 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		$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$ 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		$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$ mJ

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

Figure 3: Output Characteristics

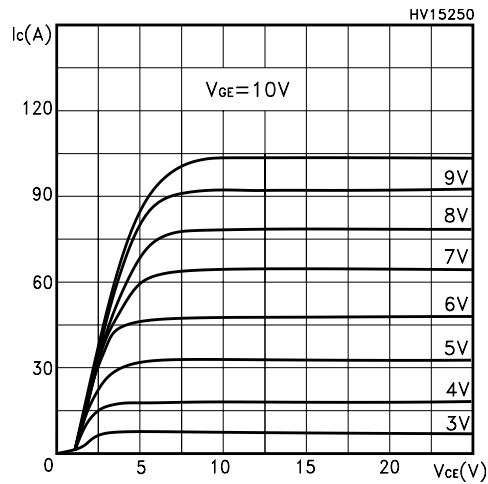


Figure 4: Transconductance

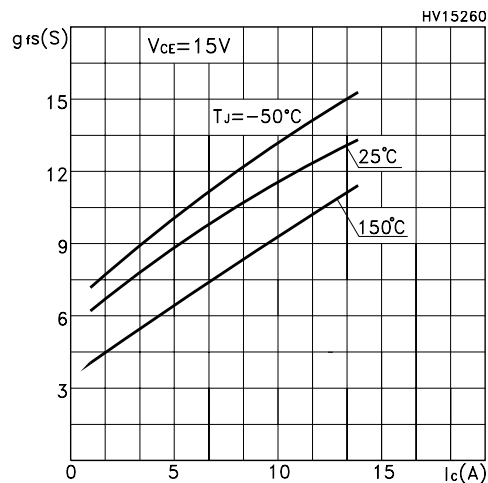


Figure 5: Collector-Emitter On Voltage vs Collector Current

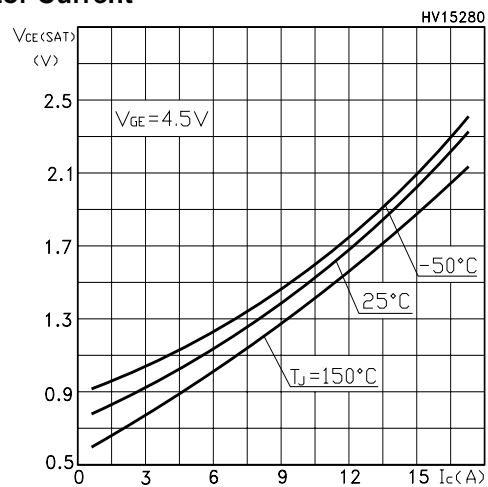


Figure 6: Transfer Characteristics

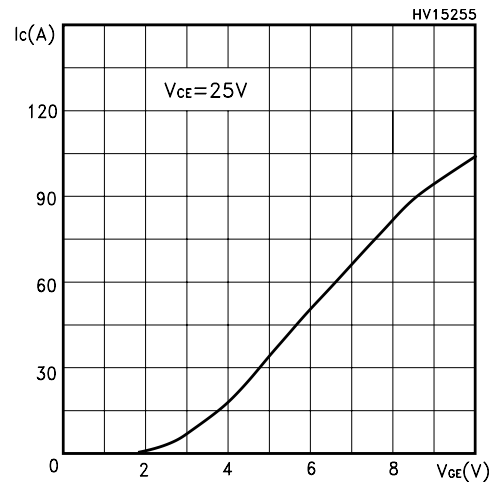


Figure 7: Collector-Emitter On Voltage vs Temperature

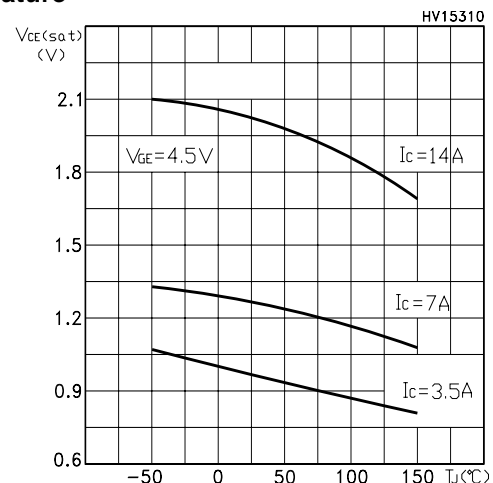


Figure 8: Normalized Collector-Emitter On Voltage vs Temperature

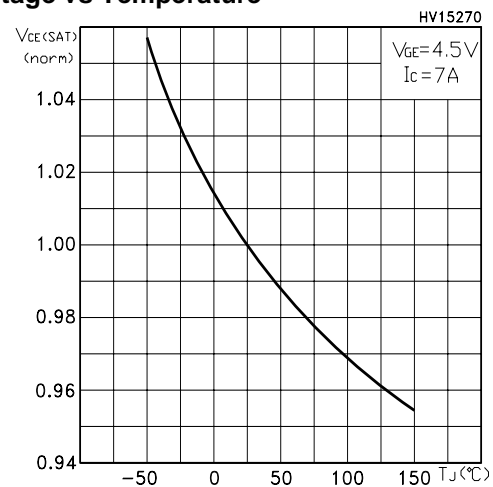


Figure 9: Gate Thershold vs Temperature

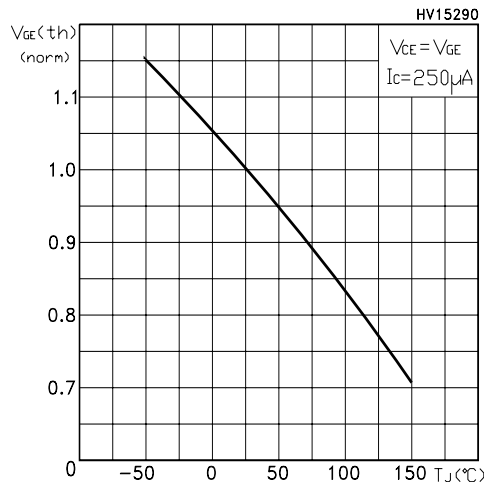


Figure 10: Capacitance Variations

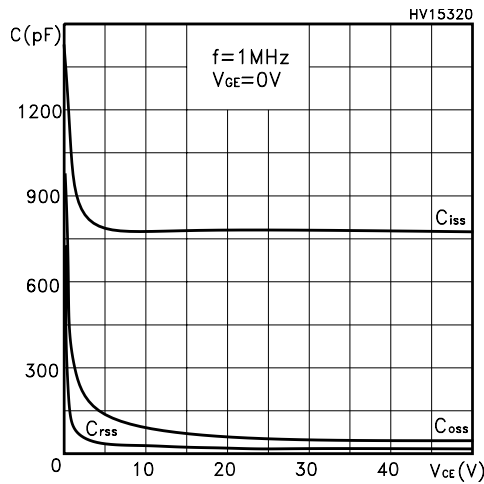


Figure 11: Total Switching Losses vs Gate Resistance

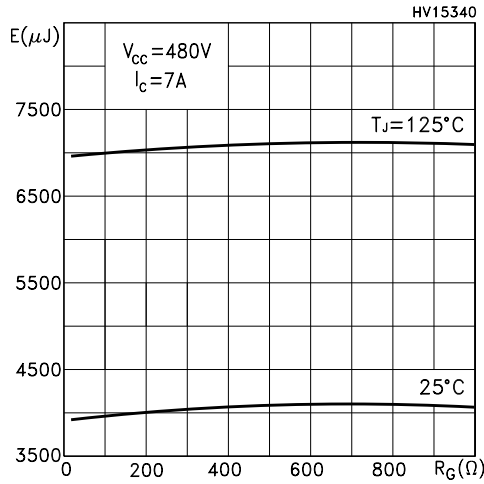


Figure 12: Normalized Breakdown Voltage vs Temperature

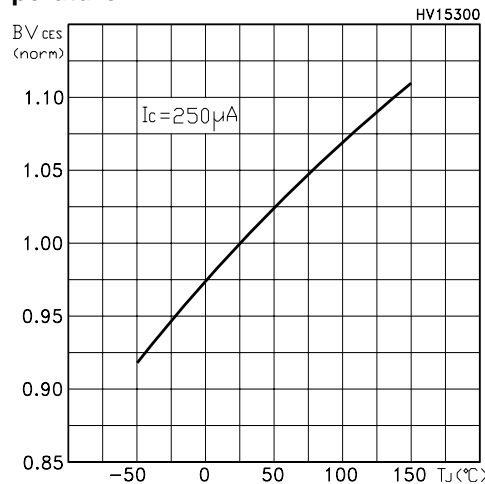


Figure 13: Gate Charge vs Gate-Emitter Voltage

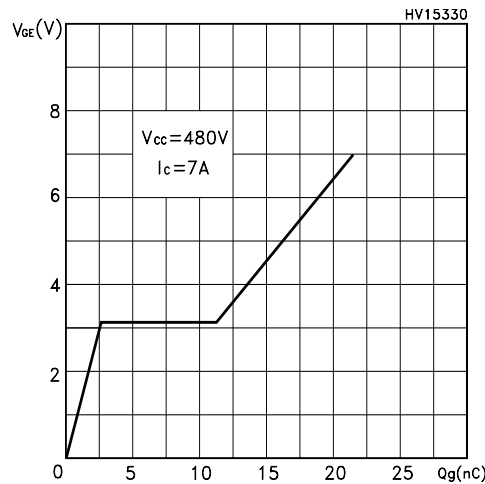


Figure 14: Total Switching Losses vs Temperature

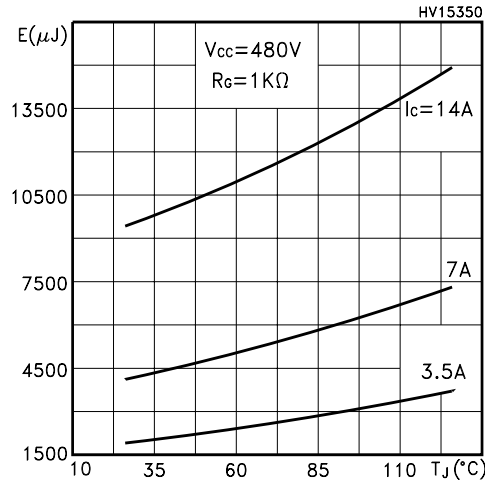


Figure 15: Total Switching Losses vs Collector Current

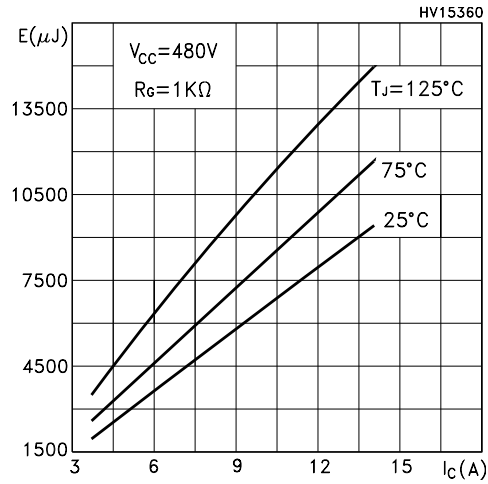


Figure 16: Thermal Impedance

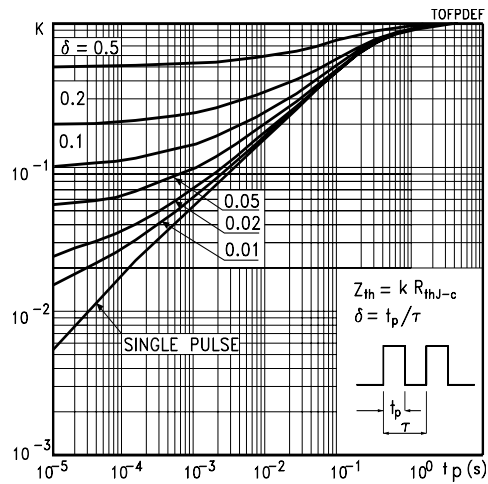


Figure 17: Turn-Off SOA

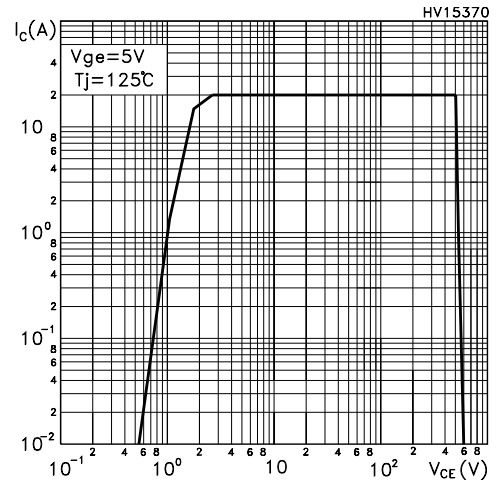


Figure 18: Test Circuit for Inductive Load Switching

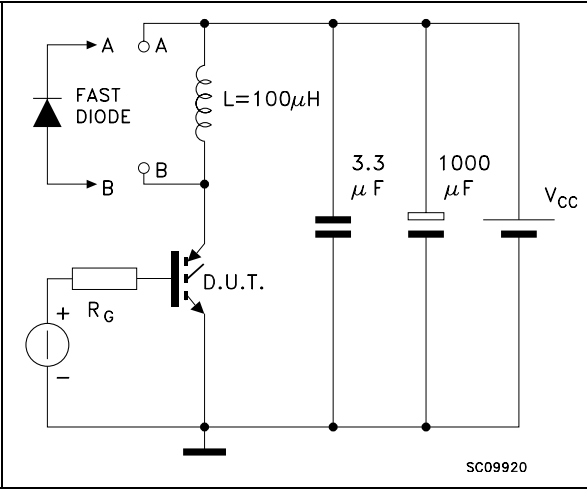


Figure 19: Switching Waveforms

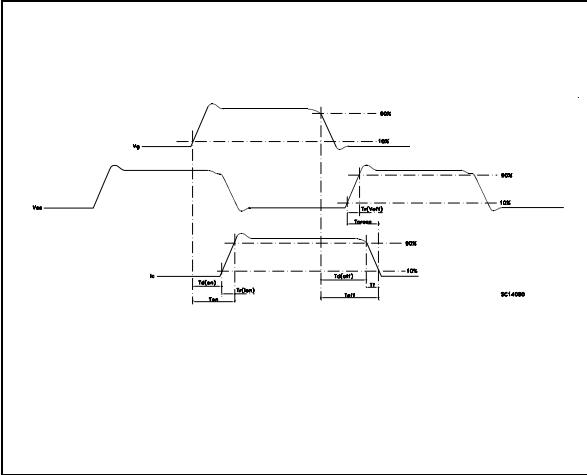
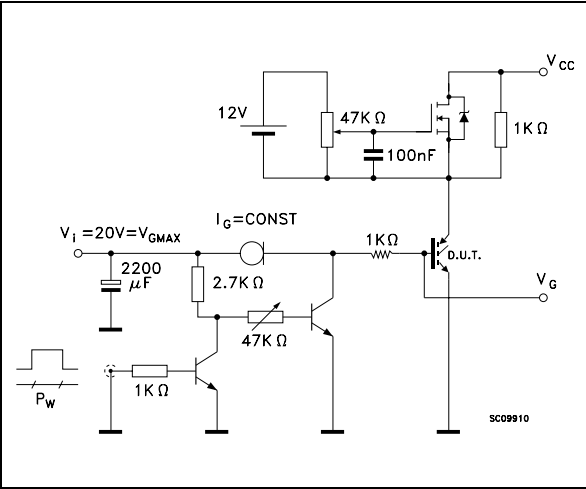


Figure 20: Gate Charge Test Circuit



**Table 10: Revision History**

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



Information furnished is believed to be accurate and reliable. However, STMicroelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of STMicroelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. STMicroelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of STMicroelectronics.

The ST logo is a registered trademark of STMicroelectronics

All other names are the property of their respective owners

© 2004 STMicroelectronics - All Rights Reserved

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America