



# STGP20NB60K

N-CHANNEL 20A - 600V - TO-220

PowerMesh™ IGBT

PRELIMINARY DATA

TYPE	V <sub>CES</sub>	V <sub>CE(sat)</sub>	I <sub>C</sub>
STGP20NB60K	600 V	< 2.8 V	20 A

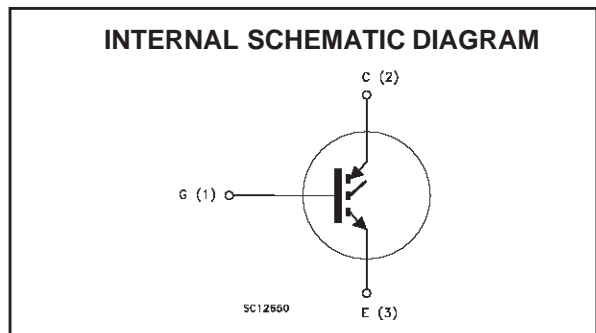
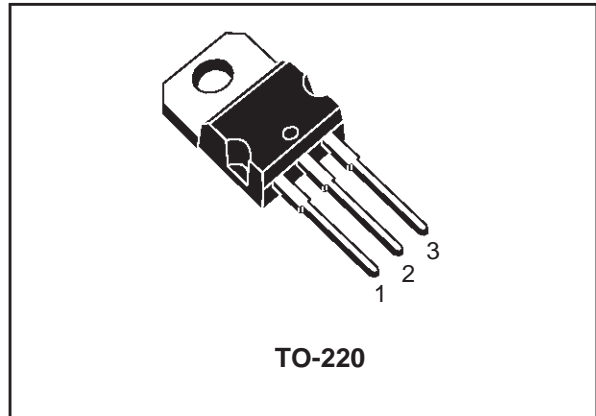
- HIGH INPUT IMPEDANCE (VOLTAGE DRIVEN)
- LOW ON-VOLTAGE DROP (V<sub>cesat</sub>)
- LOW ON-LOSSES
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- OFF LOSSES INCLUDE TAIL CURRENT
- VERY HIGH FREQUENCY OPERATION
- SHORT CIRCUIT RATED
- LATCH CURRENT FREE OPERATION

## 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 "K" identifies a family optimized for high frequency motor control applications with short circuit withstand capability.

## APPLICATIONS

- HIGH FREQUENCY MOTOR CONTROLS
- U.P.S.
- WELDING EQUIPMENTS



## ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V <sub>CES</sub>	Collector-Emitter Voltage (V <sub>GS</sub> = 0)	600	V
V <sub>ECR</sub>	Emitter-Collector Voltage	20	V
V <sub>GE</sub>	Gate-Emitter Voltage	±20	V
I <sub>C</sub>	Collector Current (continuous) at T <sub>C</sub> = 25°C	40	A
I <sub>C</sub>	Collector Current (continuous) at T <sub>C</sub> = 100°C	20	A
I <sub>CM</sub> (■)	Collector Current (pulsed)	80	A
T <sub>sc</sub>	Short Circuit Withstand	10	μs
P <sub>TOT</sub>	Total Dissipation at T <sub>C</sub> = 25°C	125	W
	Derating Factor	1	W/°C
T <sub>stg</sub>	Storage Temperature	-65 to 150	°C
T <sub>j</sub>	Max. Operating Junction Temperature	150	°C

## STGP20NB60K

### THERMAL DATA

Rthj-case	Thermal Resistance Junction-case Max	1.0	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	62.5	°C/W
Rthc-h	Thermal Resistance Case-heatsink Typ	0.5	°C/W

### ELECTRICAL CHARACTERISTICS (TCASE = 25 °C UNLESS OTHERWISE SPECIFIED)

OFF

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

ON (1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GE(th)}$	Gate Threshold Voltage	$V_{CE} = V_{GE}, I_C = 250\mu A$	5		7	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$V_{GE} = 15V, I_C = 20 A$ $V_{GE} = 15V, I_C = 20 A, T_J = 125^\circ\text{C}$		2.3 1.9	2.8	V V

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$g_{fs}$	Forward Transconductance	$V_{CE} = 25 V, I_C = 20 A$		8		S
$C_{ies}$	Input Capacitance	$V_{CE} = 25V, f = 1 \text{ MHz}, V_{GE} = 0$		1300		pF
$C_{oes}$	Output Capacitance			200		pF
$C_{res}$	Reverse Transfer Capacitance			30		pF
$Q_g$	Total Gate Charge	$V_{CE} = 480V, I_C = 20 A,$ $V_{GE} = 15V$		90		nC
$Q_{ge}$	Gate-Emitter Charge			T.B.D.		nC
$Q_{gc}$	Gate-Collector Charge			T.B.D.		nC
$t_{wsc}$	Short Circuit Withstand Time	$V_{ce} = 0.5 BV_{ces}, V_{GE} = 15 V,$ $T_J = 125^\circ\text{C}, R_G = 10 \Omega$	10			$\mu s$

SWITCHING ON

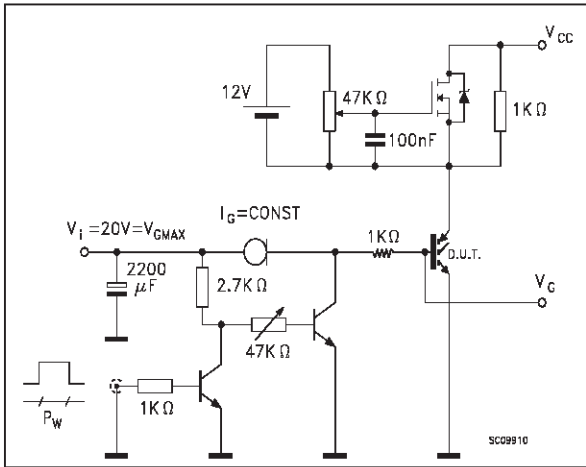
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	$V_{CC} = 480 V, I_C = 20 A$ $R_G = 10 \Omega, V_{GE} = 15 V$		20		ns
$t_r$	Rise Time			70		ns
$(di/dt)_{on}$	Turn-on Current Slope	$V_{CC} = 480 V, I_C = 20 A, R_G = 10 \Omega$ $V_{GE} = 15 V, T_J = 125^\circ\text{C}$		350		A/ $\mu s$
$E_{on}$	Turn-on Switching Losses			300		$\mu J$

**ELECTRICAL CHARACTERISTICS (CONTINUED)****SWITCHING OFF**

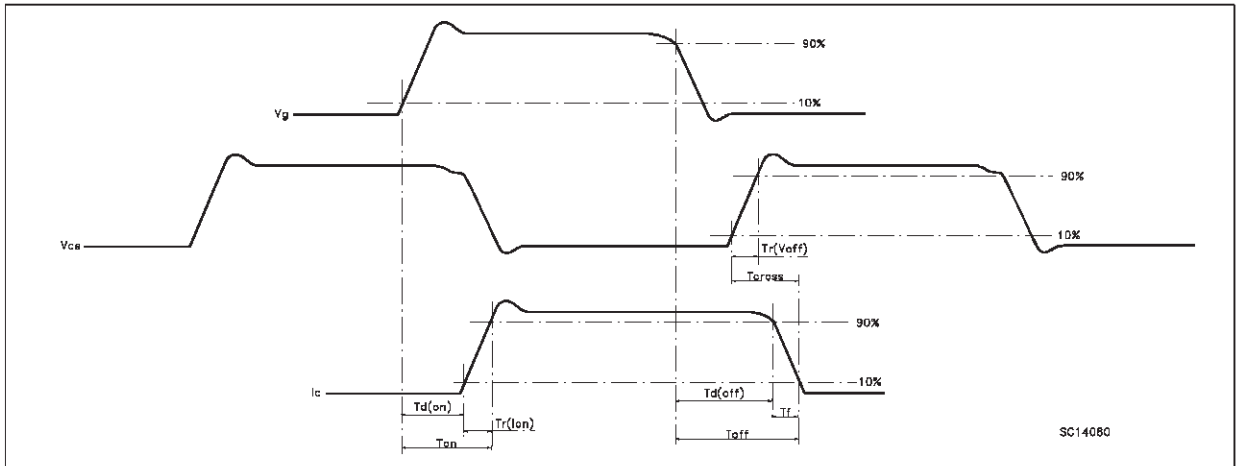
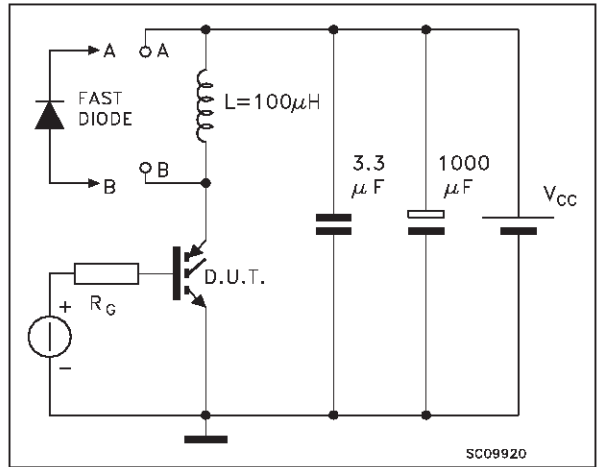
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_c$	Cross-over Time	$V_{CC} = 480\text{ V}$ , $I_C = 20\text{ A}$ , $R_{GE} = 10\ \Omega$ , $V_{GE} = 15\text{ V}$		120		ns
$t_r(V_{off})$	Off Voltage Rise Time			35		ns
$t_{d(off)}$	Delay Time			130		ns
$t_f$	Fall Time			80		ns
$E_{off(**)}$	Turn-off Switching Loss			0.45		mJ
$E_{ts}$	Total Switching Loss			0.6		mJ
$t_c$	Cross-over Time	$V_{CC} = 480\text{ V}$ , $I_C = 20\text{ A}$ , $R_{GE} = 10\ \Omega$ , $V_{GE} = 15\text{ V}$ $T_j = 125\text{ }^\circ\text{C}$		190		ns
$t_r(V_{off})$	Off Voltage Rise Time			55		ns
$t_{d(off)}$	Delay Time			160		ns
$t_f$	Fall Time			150		ns
$E_{off(**)}$	Turn-off Switching Loss			0.75		mJ
$E_{ts}$	Total Switching Loss			1.05		mJ

Note: 1. Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %.  
 2. Pulse width limited by max. junction temperature.  
 (\*\*\*)Losses include Also the Tail (Jedec Standardization)

**Fig. 1: Gate Charge test Circuit**

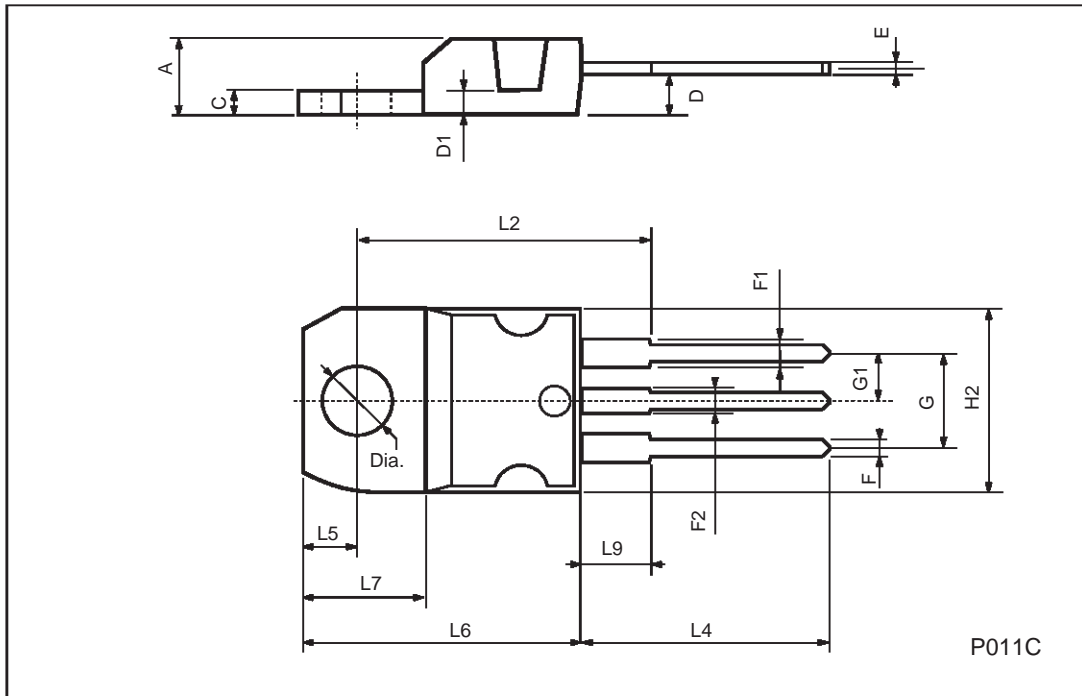


**Fig. 2: Test Circuit For Inductive Load Switching**



TO-220 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
C	1.23		1.32	0.048		0.051
D	2.40		2.72	0.094		0.107
D1		1.27			0.050	
E	0.49		0.70	0.019		0.027
F	0.61		0.88	0.024		0.034
F1	1.14		1.70	0.044		0.067
F2	1.14		1.70	0.044		0.067
G	4.95		5.15	0.194		0.203
G1	2.4		2.7	0.094		0.106
H2	10.0		10.40	0.393		0.409
L2		16.4			0.645	
L4	13.0		14.0	0.511		0.551
L5	2.65		2.95	0.104		0.116
L6	15.25		15.75	0.600		0.620
L7	6.2		6.6	0.244		0.260
L9	3.5		3.93	0.137		0.154
DIA.	3.75		3.85	0.147		0.151



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