



STGD3NB60S

N-CHANNEL 3A - 600V DPAK Power MESH™ IGBT

PRELIMINARY DATA

TYPE	V _{CES}	V _{CE(sat)}	I _C
STGD3NB60S	600 V	< 1.5 V	3 A

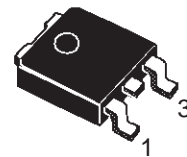
- HIGH INPUT IMPEDANCE (VOLTAGE DRIVEN)
- VERY LOW ON-VOLTAGE DROP (V_{cesat})
- HIGH CURRENT CAPABILITY
- OFF LOSSES INCLUDE TAIL CURRENT
- SURFACE-MOUNTING DPAK (TO-252) POWER PACKAGE IN TAPE & REEL (SUFFIX "T4")

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 to achieve minimum on-voltage drop for low frequency applications (<1kHz).

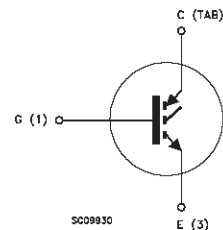
APPLICATIONS

- LIGHT DIMMER
- STATIC RELAYS
- MOTOR CONTROL



**DPAK
TO-252**
(Suffix "T4")

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
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 T _c = 25 °C	6	A
I _C	Collector Current (continuous) at T _c = 100 °C	3	A
I _{CM} (•)	Collector Current (pulsed)	24	A
P _{tot}	Total Dissipation at T _c = 25 °C	40	W
	Derating Factor	0.32	W/°C
T _{stg}	Storage Temperature	-65 to 150	°C
T _j	Max. Operating Junction Temperature	150	°C

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	3.125	$^{\circ}C/W$
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	100	$^{\circ}C/W$
$R_{thc-sink}$	Thermal Resistance Case-sink	Typ	1.5	$^{\circ}C/W$

ELECTRICAL CHARACTERISTICS ($T_j = 25^{\circ}C$ unless otherwise specified)

OFF

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

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GE(th)}$	Gate Threshold Voltage	$V_{CE} = V_{GE}$ $I_C = 250 \mu A$	2.5		5	V
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage	$V_{GE} = 15 V$ $I_C = 3 A$ $V_{GE} = 15 V$ $I_C = 1 A$		1.2 1	1.5	V V

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs}	Forward Transconductance	$V_{CE} = 25 V$ $I_C = 3 A$	1.7	2.5		S
C_{ies} C_{oes} C_{res}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{CE} = 25 V$ $f = 1 \text{ MHz}$ $V_{GE} = 0$		255 30 5.6		pF pF pF
Q_G Q_{GE} Q_{GC}	Total Gate Charge Gate-Emitter Charge Gate-Collector Charge	$V_{CE} = 480 V$ $I_C = 3 A$ $V_{GE} = 15 V$		18 5.4 5.5		nC nC nC
I_{CL}	Latching Current	$V_{clamp} = 480 V$ $R_G = 1k\Omega$ $T_j = 150^{\circ}C$	12			A

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Delay Time Rise Time	$V_{CC} = 480 V$ $I_C = 3 A$ $V_{GE} = 15 V$ $R_G = 1k\Omega$		170 540		ns ns
$(di/dt)_{on}$	Turn-on Current Slope	$V_{CC} = 480 V$ $I_C = 3 A$ $R_G = 1k\Omega$ $V_{GE} = 15 V$		30		A/ μs
E_{on}	Turn-on Switching Losses	$T_j = 125^{\circ}C$		300		μJ

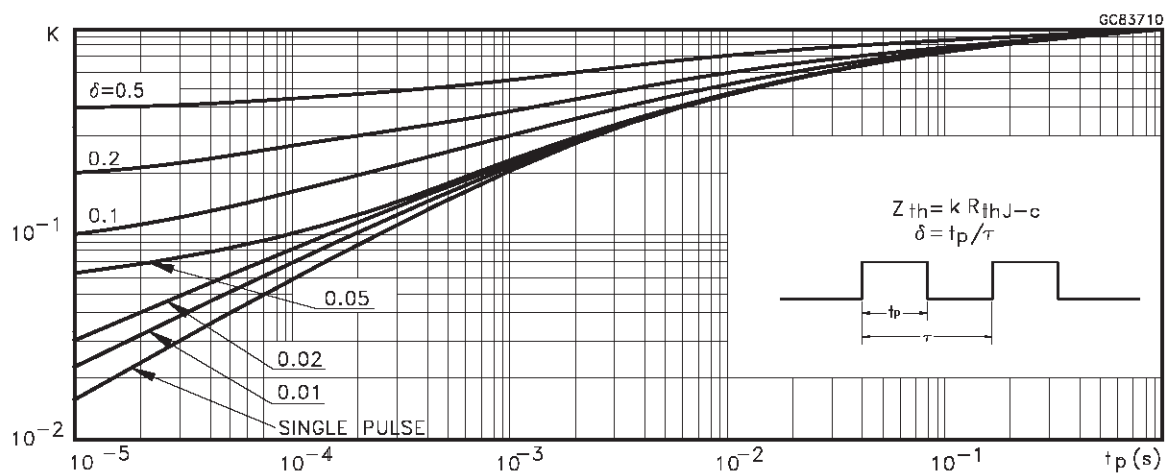
ELECTRICAL CHARACTERISTICS (continued)**SWITCHING OFF**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_c	Cross-Over Time	$V_{CC} = 480\text{ V}$ $R_{GE} = 1\text{ k}\Omega$ $I_C = 3\text{ A}$ $V_{GE} = 15\text{ V}$		1.8		μs
$t_r(v_{off})$	Off Voltage Rise Time			1.0		μs
$t_d(off)$	Delay Time			3.4		μs
t_f	Fall Time			0.72		μs
$E_{off(**)}$	Turn-off Switching Loss			1.15		mJ
t_c	Cross-Over Time	$V_{CC} = 480\text{ V}$ $R_{GE} = 10\text{ }\Omega$ $T_j = 125\text{ }^\circ\text{C}$ $I_C = 3\text{ A}$ $V_{GE} = 15\text{ V}$		2.8		μs
$t_r(v_{off})$	Off Voltage Rise Time			1.45		μs
$t_d(off)$	Delay Time			3.6		μs
t_f	Fall Time			1.2		μs
$E_{off(**)}$	Turn-off Switching Loss			1.8		mJ

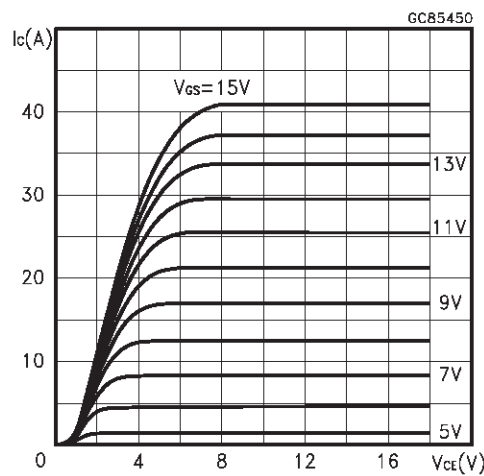
(*) Pulse width limited by max. junction temperature

(*) Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %

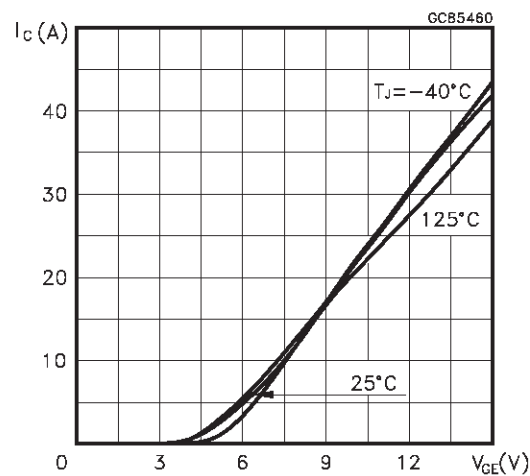
(**) Losses Include Also The Tail (Jedec Standardization)

Thermal Impedance

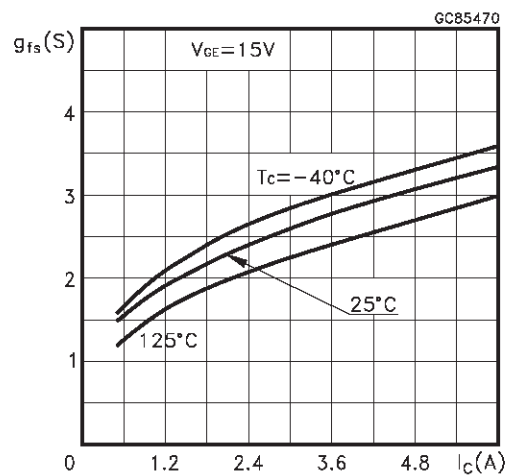
Output Characteristics



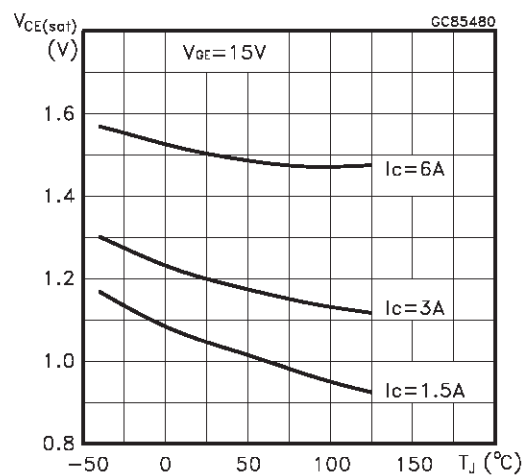
Transfer Characteristics



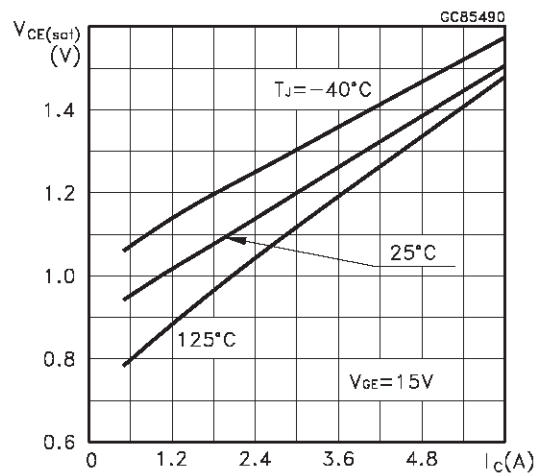
Transconductance



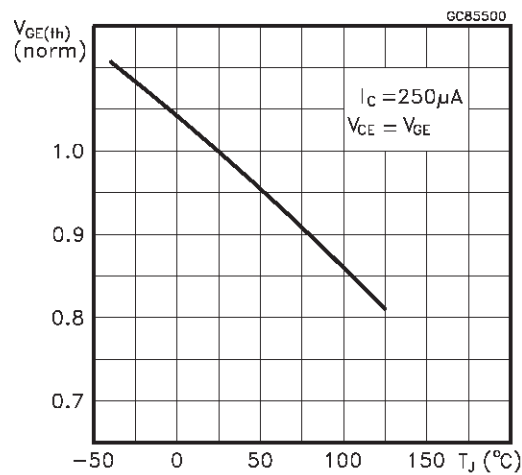
Collector-Emitter On Voltage vs Temperature



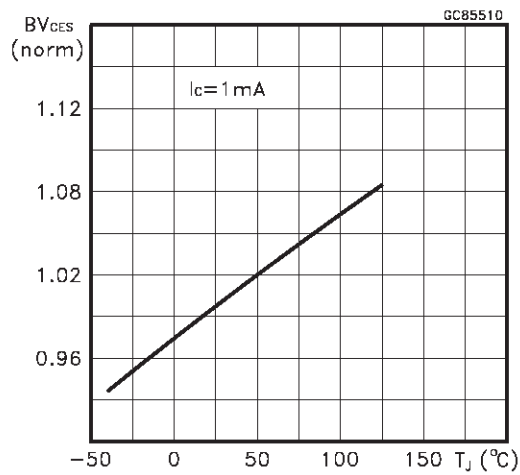
Collector-Emitter On Voltage vs Collector Current



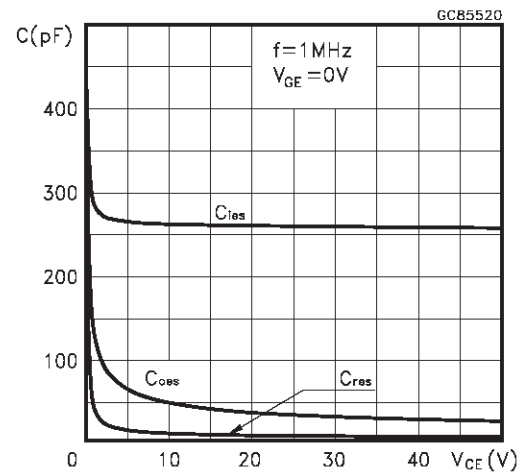
Gate Threshold vs Temperature



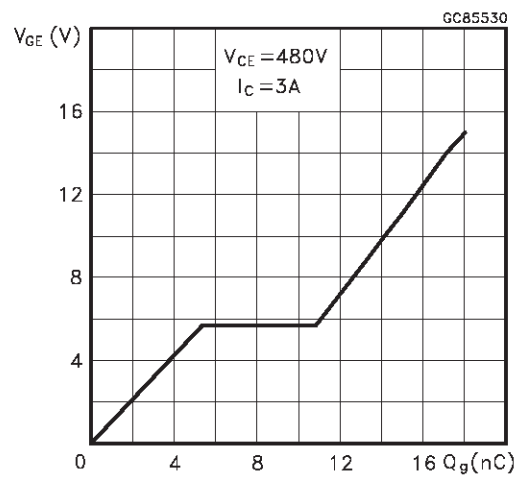
Normalized Breakdown Voltage vs Temperature



Capacitance Variations

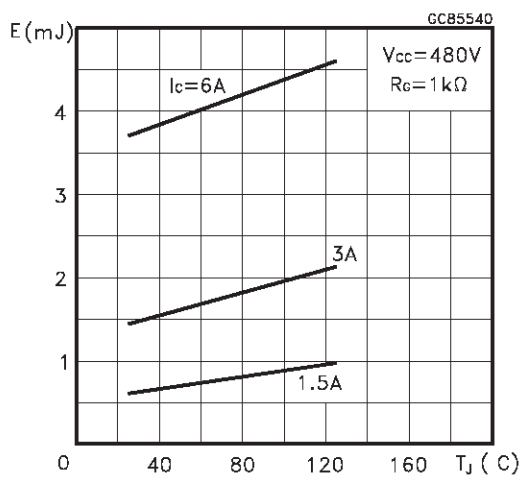


Gate Charge vs Gate-Emitter Voltage

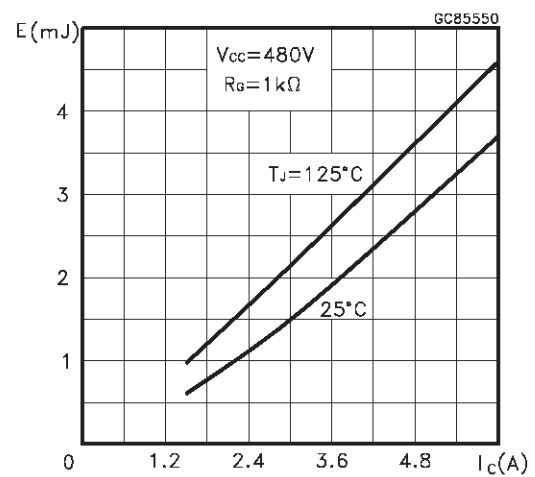


Total Switching Losses vs Gate Resistance

Total Switching Losses vs Temperature



Total Switching Losses vs Collector Current



Switching Off Safe Operatin Area

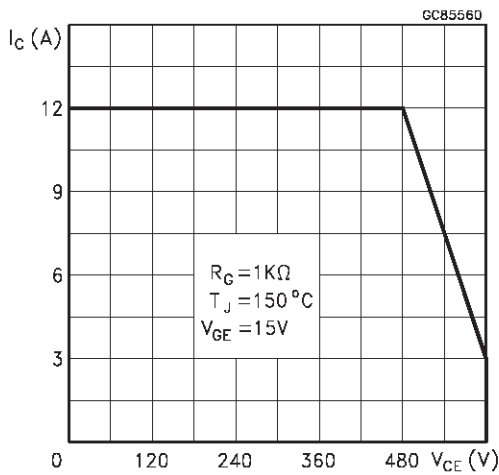


Fig. 1: Gate Charge test Circuit

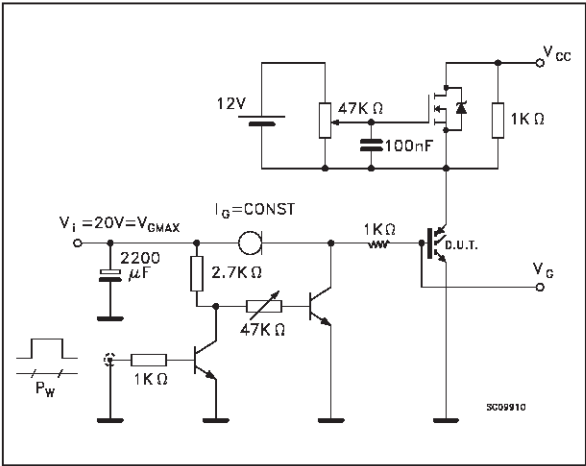
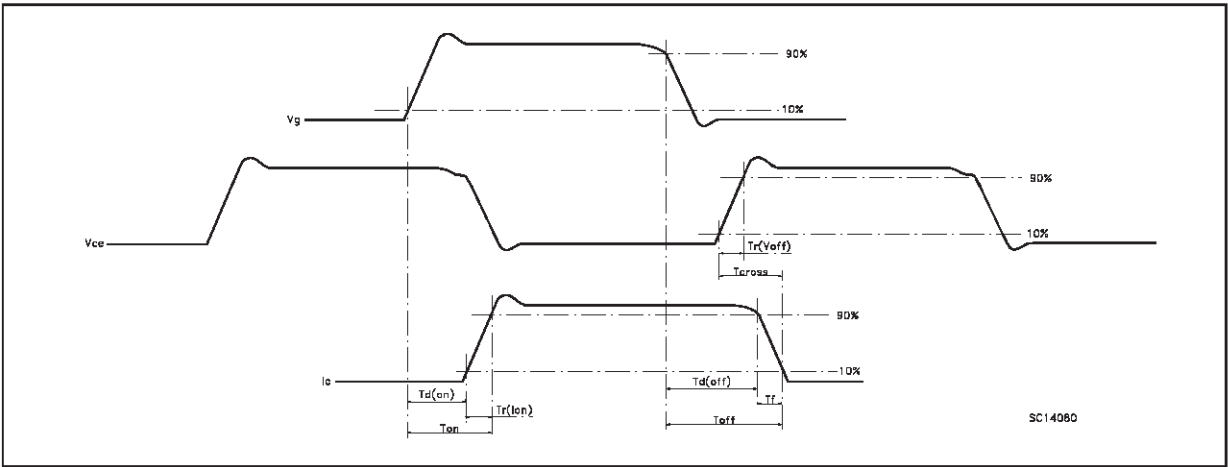
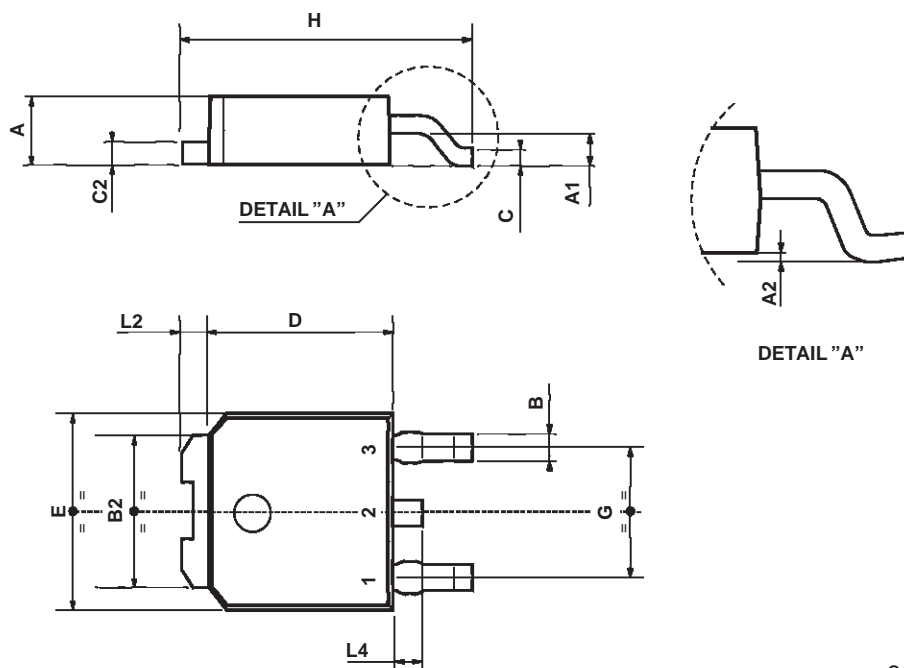


Fig. 3: Switching Waveforms



TO-252 (DPAK) MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.2		2.4	0.086		0.094
A1	0.9		1.1	0.035		0.043
A2	0.03		0.23	0.001		0.009
B	0.64		0.9	0.025		0.035
B2	5.2		5.4	0.204		0.212
C	0.45		0.6	0.017		0.023
C2	0.48		0.6	0.019		0.023
D	6		6.2	0.236		0.244
E	6.4		6.6	0.252		0.260
G	4.4		4.6	0.173		0.181
H	9.35		10.1	0.368		0.397
L2		0.8			0.031	
L4	0.6		1	0.023		0.039



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