



STGB20NB37LZ

N-CHANNEL CLAMPED 20A - D²PAK INTERNALLY CLAMPED PowerMESH™ IGBT

TYPE	V _{CES}	V _{CE(sat)}	I _C
STGB20NB37LZ	CLAMPED	< 2.0 V	20 A

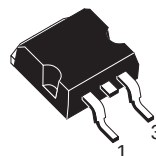
- POLYSILICON GATE VOLTAGE DRIVEN
- LOW THRESHOLD VOLTAGE
- LOW ON-VOLTAGE DROP
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- HIGH VOLTAGE CLAMPING FEATURE
- ADD SUFFIX "T4" FOR ORDERING IN TAPE & REEL

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 built in collector-gate zener exhibits a very precise active clamping while the gate-emitter zener supplies an ESD protection.

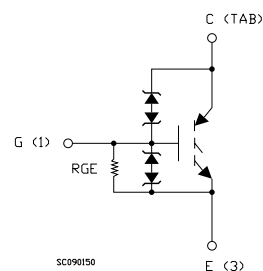
APPLICATIONS

- AUTOMOTIVE IGNITION



D²PAK

INTERNAL SCHEMATIC DIAGRAM



ORDERING INFORMATION

SALES TYPE	MARKING	PACKAGE	PACKAGING
STGB20NB37LZT4	GB20NB37LZ	D ² PAK	TAPE & REEL

STGB20NB37LZ

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CES}	Collector-Emitter Voltage ($V_{GS} = 0$)	CLAMPED	V
V_{ECR}	Emitter-Collector Voltage	20	V
V_{GE}	Gate-Emitter Voltage	CLAMPED	V
I_C	Collector Current (continuous) at $T_C = 25^\circ\text{C}$	40	A
I_C	Collector Current (continuous) at $T_C = 100^\circ\text{C}$	20	A
$I_{CM} (\blacksquare)$	Collector Current (pulsed)	80	A
E_{as}	Single Pulse Energy $T_c = 25^\circ\text{C}$	700	mJ
P_{TOT}	Total Dissipation at $T_C = 25^\circ\text{C}$	200	W
	Derating Factor	1.33	W/°C
E_{SD}	ESD (Human Body Model)	8	KV
T_{stg}	Storage Temperature	-55 to 175	°C
T_j	Max. Operating Junction Temperature		

($\blacksquare$) Pulse width limited by safe operating area

THERMAL DATA

Rthj-case	Thermal Resistance Junction-case Max	0.75	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	62.5	°C/W

ELECTRICAL CHARACTERISTICS ($T_{CASE} = 25^\circ\text{C}$ UNLESS OTHERWISE SPECIFIED)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$BV_{(CES)}$	Clamped Voltage	$I_C = 2\text{ mA}$, $V_{GE} = 0$, $T_c = -40^\circ\text{C}$		405		V
		$I_C = 2\text{ mA}$, $V_{GE} = 0$, $T_c = 25^\circ\text{C}$	375	400	425	V
		$I_C = 2\text{ mA}$, $V_{GE} = 0$, $T_c = 150^\circ\text{C}$		395		V
$BV_{(ECR)}$	Emitter Collector Break-down Voltage	$I_C = 75\text{ mA}$, $T_c = 25^\circ\text{C}$	20	28		V
BV_{GE}	Gate Emitter Break-down Voltage	$I_G = \pm 2\text{ mA}$	12	14	16	V
I_{CES}	Collector cut-off Current ($V_{GE} = 0$)	$V_{CE} = 15\text{ V}$, $V_{GE} = 0$, $T_C = 150^\circ\text{C}$			10	μA
		$V_{CE} = 200\text{ V}$, $V_{GE} = 0$, $T_C = 150^\circ\text{C}$			100	μA
I_{GES}	Gate-Emitter Leakage Current ($V_{CE} = 0$)	$V_{GE} = \pm 10\text{ V}$, $V_{CE} = 0$	± 300	± 660	± 1000	μA
R_{GE}	Gate Emitter Resistance		10	15	30	K Ω

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GE(th)}$	Gate Threshold Voltage	$V_{CE} = V_{GE}$, $I_C = 250\mu\text{A}$, $T_c = -40^\circ\text{C}$	1.2			V
		$V_{CE} = V_{GE}$, $I_C = 250\mu\text{A}$, $T_c = 25^\circ\text{C}$	1	1.4	2	V
		$V_{CE} = V_{GE}$, $I_C = 250\mu\text{A}$, $T_c = 150^\circ\text{C}$	0.6			V
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage	$V_{CE} = 4.5\text{ V}$, $I_C = 10\text{ A}$, $T_c = 25^\circ\text{C}$		1.1	1.8	V
		$V_{CE} = 4.5\text{ V}$, $I_C = 10\text{ A}$, $T_c = 150^\circ\text{C}$		1.0	1.7	V
		$V_{CE} = 4.5\text{ V}$, $I_C = 20\text{ A}$, $T_c = 25^\circ\text{C}$		1.35	2.0	V
		$V_{CE} = 4.5\text{ V}$, $I_C = 20\text{ A}$, $T_c = 150^\circ\text{C}$		1.25	2.0	V

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (1)	Forward Transconductance	$V_{CE} = 25\text{ V}$, $I_C = 20\text{ A}$		35		S
C_{ies}	Input Capacitance	$V_{CE} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GE} = 0$		2300		pF
C_{oes}	Output Capacitance			165		pF
C_{res}	Reverse Transfer Capacitance			28		pF
Q_g	Gate Charge	$V_{CE} = 280\text{ V}$, $I_C = 20\text{ A}$, $V_{GE} = 5\text{ V}$		51		nC

FUNCTIONAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
II	Latching Current	$V_{Clamp} = 250\text{ V}$, $T_C = 125\text{ }^\circ\text{C}$ $R_{Goff} = 1\text{ K}\Omega$, $V_{GE} = 4.5\text{ V}$		40		A
U.I.S.	Functional Test Open Secondary Coil	$R_{Goff} = 1\text{ K}\Omega$, $L = 1.6\text{ mH}$, $T_C = 125\text{ }^\circ\text{C}$		20		A

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	$V_{CC} = 250\text{ V}$, $I_C = 20\text{ A}$ $R_G = 1\text{ K}\Omega$, $V_{GE} = 4.5\text{ V}$		2.3		μs
t_r	Rise Time			0.6		μs
$(di/dt)_{on}$	Turn-on Current Slope	$V_{CC} = 250\text{ V}$, $I_C = 20\text{ A}$ $R_G = 1\text{ K}\Omega$, $V_{GE} = 4.5\text{ V}$		550		A/ μs
E_{on}	Turn-on Switching Losses	$V_{CC} = 250\text{ V}$, $I_C = 20\text{ A}$, $T_C = 25\text{ }^\circ\text{C}$ $R_G = 1\text{ K}\Omega$, $V_{GE} = 4.5\text{ V}$, $T_C = 150\text{ }^\circ\text{C}$		8.8 9.2		mJ mJ

SWITCHING OFF

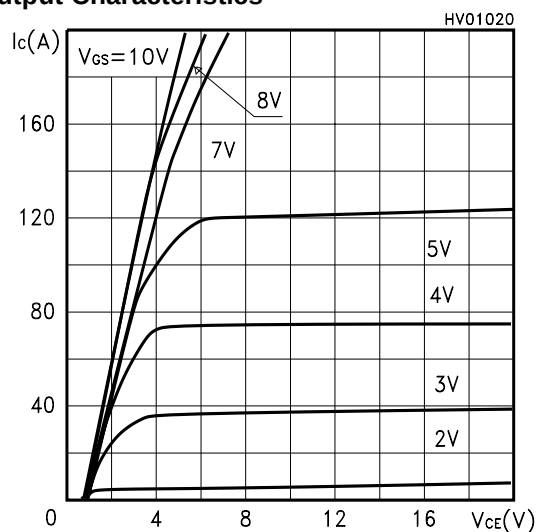
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_c	Cross-over Time	$V_{CC} = 250\text{ V}$, $I_C = 20\text{ A}$, $R_{GE} = 1\text{ K}\Omega$, $V_{GE} = 4.5\text{ V}$		4.8		μs
$t_r(V_{off})$	Off Voltage Rise Time			2.6		μs
$t_{d(off)}$	Delay Time			2.0		μs
t_f	Fall Time			11.5		μs
$E_{off}(**)$	Turn-off Switching Loss			11.8		mJ
t_c	Cross-over Time	$V_{CC} = 250\text{ V}$, $I_C = 20\text{ A}$, $R_{GE} = 1\text{ K}\Omega$, $V_{GE} = 4.5\text{ V}$ $T_j = 125\text{ }^\circ\text{C}$		7.8		μs
$t_r(V_{off})$	Off Voltage Rise Time			3.5		μs
$t_{d(off)}$	Delay Time			3.9		μs
t_f	Fall Time			12.0		μs
$E_{off}(**)$	Turn-off Switching Loss			17.8		mJ

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

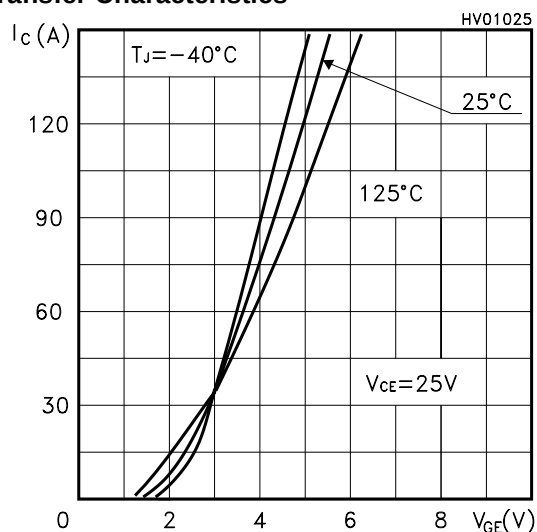
(*) Pulse width limited by max. junction temperature.

(**) Losses Include Also the Tail

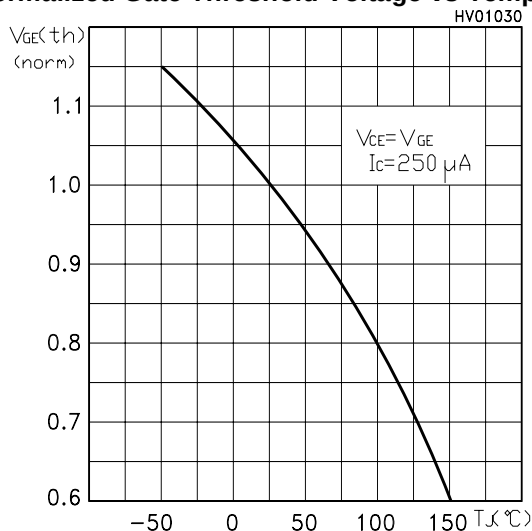
Output Characteristics



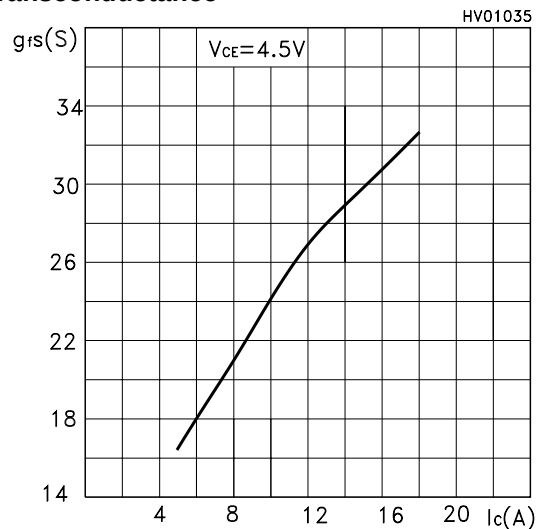
Transfer Characteristics



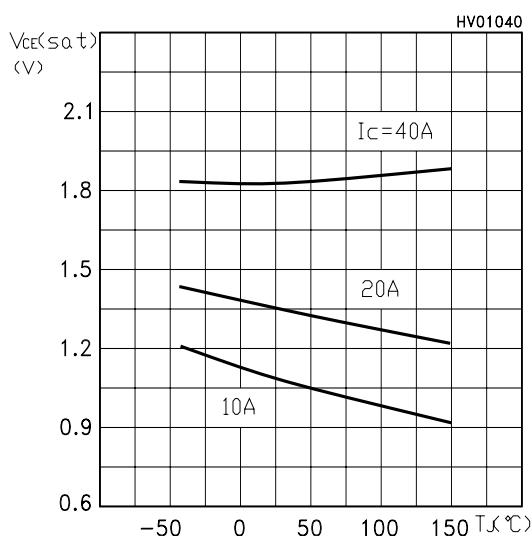
Normalized Gate Threshold Voltage vs Temp.



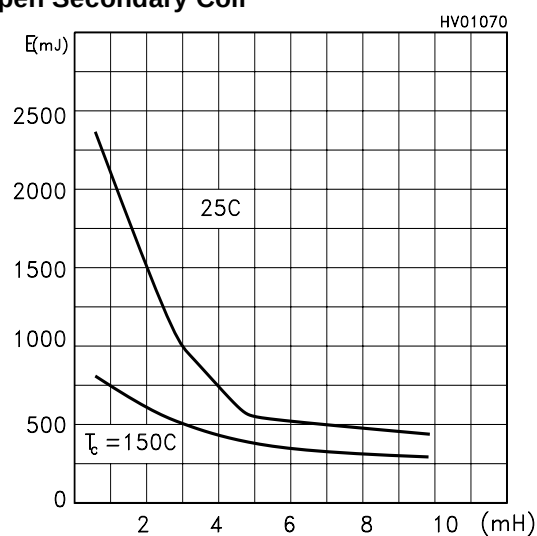
Transconductance



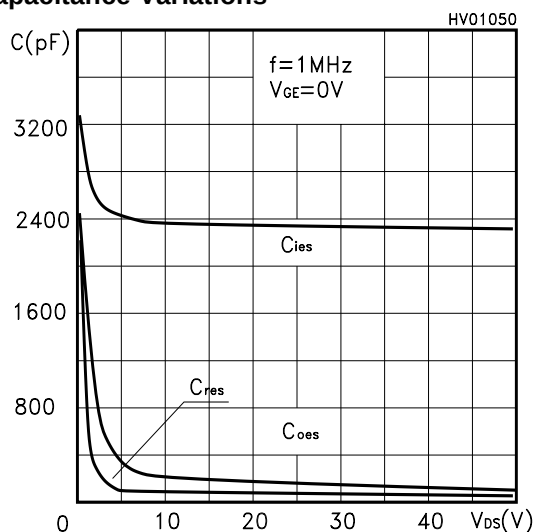
Collector-Emitter On Voltage vs Temperature



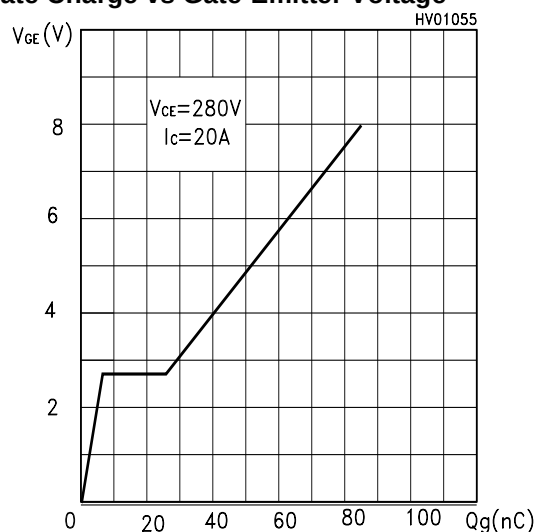
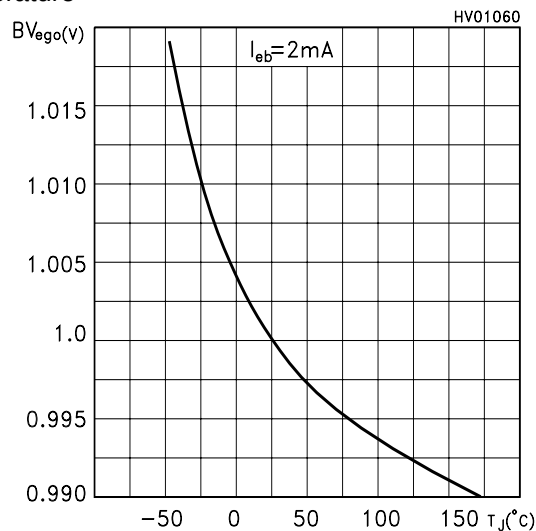
Self Clamped Inductive Switching Energy vs Open Secondary Coil



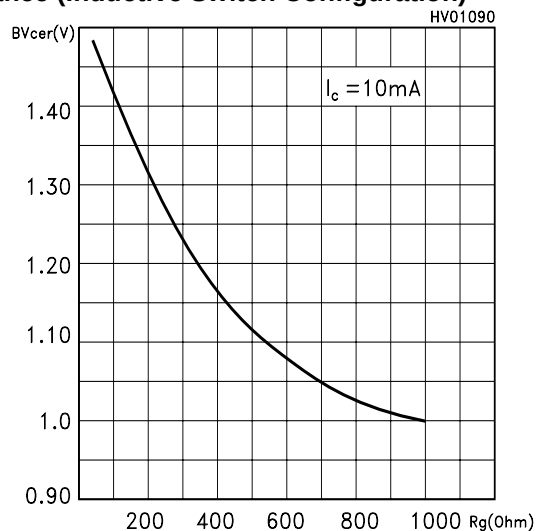
Capacitance Variations



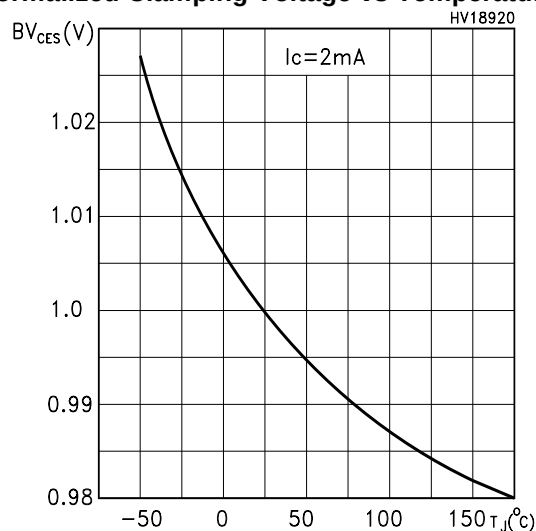
Gate Charge vs Gate-Emitter Voltage

Normalized $B_{V_{GE0}}$ (Zener Gate-Emitter) vs Temperature

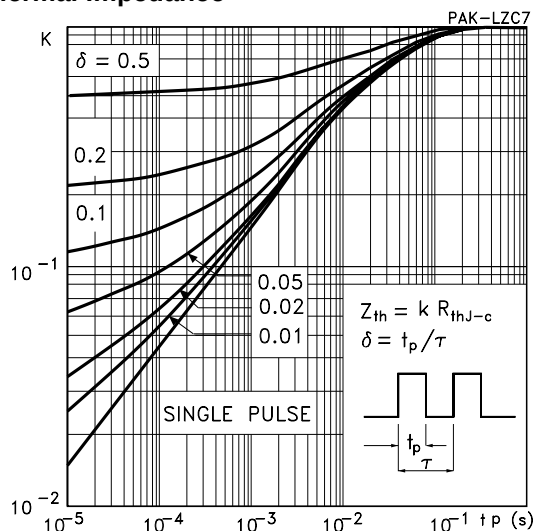
Normalized Clamping Voltage vs Gate Resistance (Inductive Switch Configuration)



Normalized Clamping Voltage vs Temperature

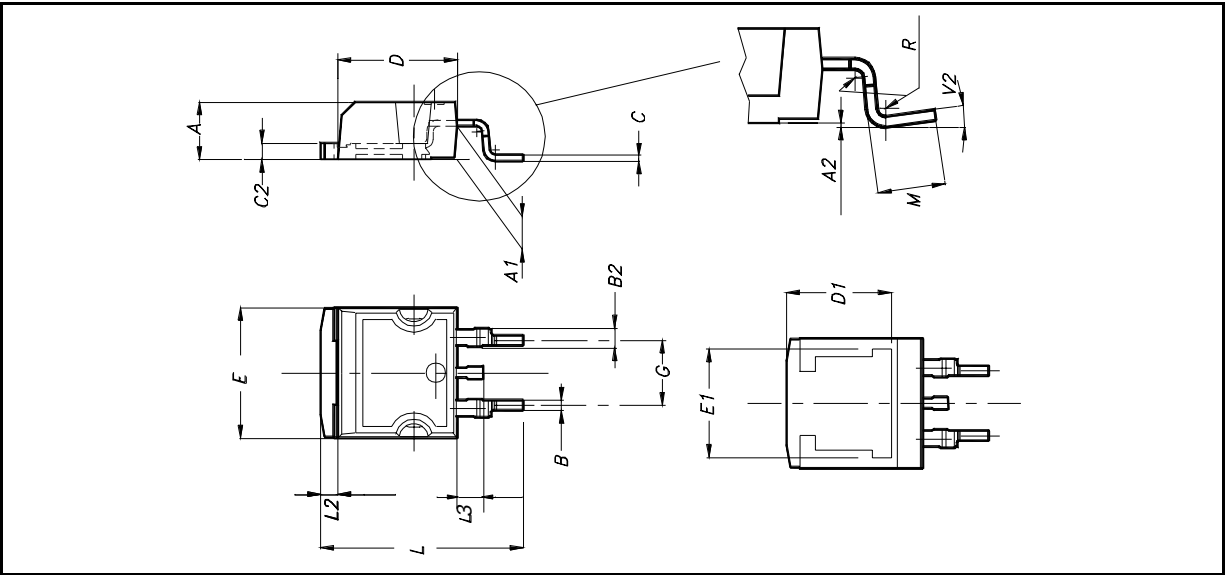


Thermal Impedance



D²PAK MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
A2	0.03		0.23	0.001		0.009
B	0.7		0.93	0.027		0.036
B2	1.14		1.7	0.044		0.067
C	0.45		0.6	0.017		0.023
C2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1		8			0.315	
E	10		10.4	0.393		
E1		8.5			0.334	
G	4.88		5.28	0.192		0.208
L	15		15.85	0.590		0.625
L2	1.27		1.4	0.050		0.055
L3	1.4		1.75	0.055		0.068
M	2.4		3.2	0.094		0.126
R		0.4			0.015	
V2	0°		8°			





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