



# STGB20NB32LZ STGB20NB32LZ-1

N-CHANNEL CLAMPED 20A - D<sup>2</sup>PAK/I<sup>2</sup>PAK  
INTERNALLY CLAMPED PowerMESH™ IGBT

TYPE	V <sub>CES</sub>	V <sub>CE(sat)</sub>	I <sub>c</sub>
STGB20NB32LZ	CLAMPED	< 2.0 V	20 A
STGB20NB32LZ-1	CLAMPED	< 2.0 V	20 A

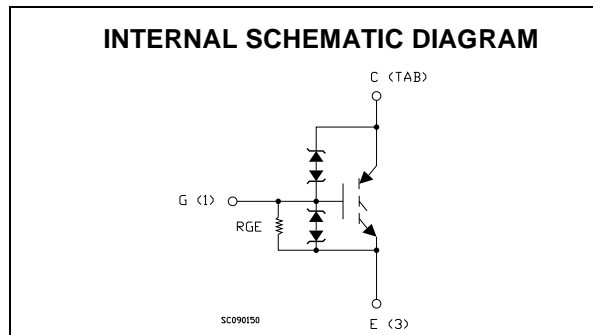
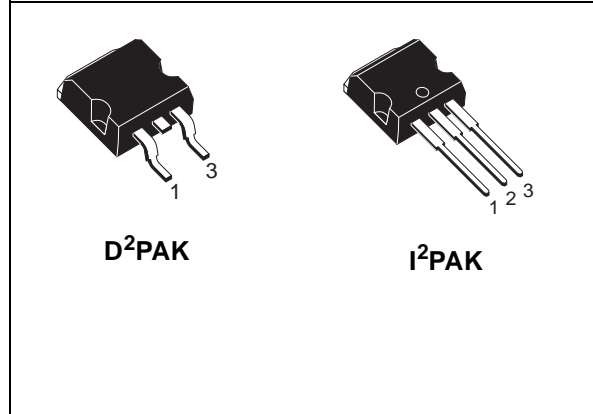
- POLYSILICON GATE VOLTAGE DRIVEN
- LOW THRESHOLD VOLTAGE
- LOW ON-VOLTAGE DROP
- HIGH CURRENT CAPABILITY
- HIGH VOLTAGE CLAMPING FEATURE

## 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

- ELECTRONIC IGNITION FOR AUTOMOTIVE



## ORDERING INFORMATION

SALES TYPE	MARKING	PACKAGE	PACKAGING
STGB20NB32LZT4	GB20NB32LZ	D <sup>2</sup> PAK	TAPE & REEL
STGB20NB32LZ-1	GB20NB32LZ	I <sup>2</sup> PAK	TUBE

## STGB20NB32LZ - STGB20NB32LZ-1

### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
$V_{CES}$	Collector-Emitter Voltage ( $V_{GS} = 0$ )	CLAMPED	V
$V_{ECR}$	Reverse Battery Protection	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 $T_c = 100^\circ\text{C}$	30	A
$I_{CM}(\bullet)$	Collector Current (pulsed)	80	A
$E_{as}$	Single Pulse Energy $T_c = 25^\circ\text{C}$	700	mJ
$P_{tot}$	Total Dissipation at $T_c = 25^\circ\text{C}$	150	W
	Derating Factor	1	W/ $^\circ\text{C}$
$E_{SD}$	ESD (Human Body Model)	4	KV
$T_{stg}$	Storage Temperature	-65 to 175	$^\circ\text{C}$
$T_j$	Max. Operating Junction Temperature	175	$^\circ\text{C}$

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

### THERMAL DATA

Rthj-case	Thermal Resistance Junction-case Max	1	$^\circ\text{C}/\text{W}$
Rthj-amb	Thermal Resistance Junction-ambient Max	62.5	$^\circ\text{C}/\text{W}$

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

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$BV_{(CES)}$	Clamped Voltage	$I_C = 2\text{ mA}, V_{GE} = 0, T_c = -40^\circ\text{C}$	330	355	380	V
		$I_C = 2\text{ mA}, V_{GE} = 0, T_c = 25^\circ\text{C}$	325	350	375	V
		$I_C = 2\text{ mA}, V_{GE} = 0, T_c = 150^\circ\text{C}$	320	345	370	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	$\mu\text{A}$
		$V_{CE} = 200\text{ V}, V_{GE} = 0, T_c = 150^\circ\text{C}$			100	$\mu\text{A}$
$I_{GES}$	Gate-Emitter Leakage Current ( $V_{CE} = 0$ )	$V_{GE} = \pm 10\text{ V}, V_{CE} = 0$	$\pm 400$	$\pm 660$	$\pm 1000$	$\mu\text{A}$
$R_{GE}$	Gate Emitter Resistance		10	15	25	K $\Omega$

ON (1)

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	$V_{GE} = 4.5\text{ V}, I_C = 10\text{ A}, T_c = 25^\circ\text{C}$		1.1	1.8	V
		$V_{GE} = 4.5\text{ V}, I_C = 10\text{ A}, T_c = 150^\circ\text{C}$		1	1.7	V
		$V_{GE} = 4.5\text{ V}, I_C = 20\text{ A}, T_c = 25^\circ\text{C}$		1.35	2	V
		$V_{GE} = 4.5\text{ V}, I_C = 20\text{ A}, T_c = 150^\circ\text{C}$		1.25	2	V

**ELECTRICAL CHARACTERISTICS** (T<sub>CASE</sub> = 25 °C UNLESS OTHERWISE SPECIFIED)  
DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g <sub>fs</sub>	Forward Transconductance	V <sub>CE</sub> = 25 V , I <sub>C</sub> =20 A		35		S
C <sub>ies</sub>	Input Capacitance	V <sub>CE</sub> = 25 V, f = 1 MHz, V <sub>GE</sub> = 0		2300		pF
C <sub>oes</sub>	Output Capacitance			165		pF
C <sub>res</sub>	Reverse Transfer Capacitance			28		pF
Q <sub>g</sub>	Gate Charge	V <sub>CE</sub> = 280 V, I <sub>C</sub> = 20 A, V <sub>GE</sub> = 5 V		51		nC

**FUNCTIONAL CHARACTERISTICS**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I <sub>l</sub>	Latching Current	R <sub>GOFF</sub> =127Ω, V <sub>Clamp</sub> = 250 V, V <sub>GE</sub> = 5 V, T <sub>C</sub> = 125 °C	34			A
U.I.S.	Functional Test Open Secondary Coil	R <sub>GOFF</sub> =1KΩ ,T <sub>C</sub> =125°C, V <sub>G</sub> = 5 V, L = 1.6mH	21.6			A

**SWITCHING ON**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t <sub>d(on)</sub> t <sub>r</sub>	Delay Time Rise Time	V <sub>CC</sub> = 250 V, I <sub>C</sub> = 20 A R <sub>G</sub> = 1KΩ , V <sub>GE</sub> = 4.5 V		2.3 0.6		μs μs
(di/dt) <sub>on</sub>	Turn-on Current Slope	V <sub>CC</sub> = 250 V, I <sub>C</sub> = 20 A R <sub>G</sub> =1KΩ, V <sub>GE</sub> = 4.5 V		550		A/μs
E <sub>on</sub>	Turn-on Switching Losses	V <sub>CC</sub> = 250 V, I <sub>C</sub> = 20 A, T <sub>c</sub> =25°C R <sub>G</sub> =1KΩ, V <sub>GE</sub> = 4.5 V, T <sub>c</sub> =150°C		8.8 9.2		mJ mJ

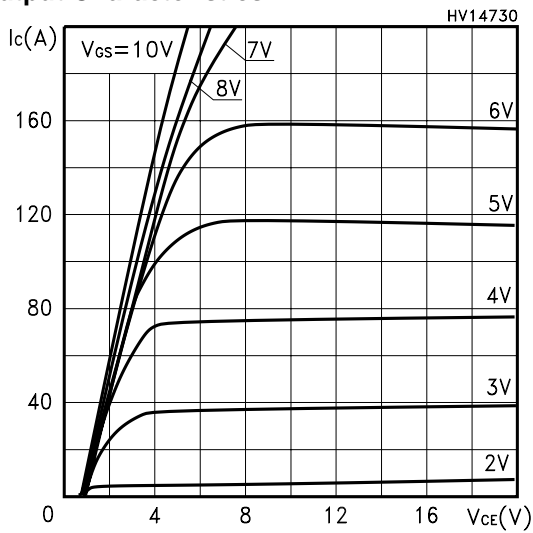
**SWITCHING OFF**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t <sub>c</sub> t <sub>r</sub> (V <sub>off</sub> ) t <sub>f</sub>	Cross-Over Time Off Voltage Rise Time Fall Time	V <sub>CC</sub> = 250 V, I <sub>C</sub> = 20 A, R <sub>GE</sub> = 1 KΩ , V <sub>GE</sub> = 4.5 V		4.8 2.6 2		μs μs μs
t <sub>d(off)</sub>	Off Voltage Delay Time			11.5		μs
E <sub>off</sub> (**)	Turn-off Switching Loss			11.8		mJ
t <sub>c</sub> t <sub>r</sub> (V <sub>off</sub> ) t <sub>f</sub> t <sub>d(off)</sub> E <sub>off</sub> (**)	Cross-Over Time Off Voltage Rise Time Fall Time Off Voltage Delay Time Turn-off Switching Loss	V <sub>CC</sub> = 250 V, I <sub>C</sub> = 20 A, R <sub>GE</sub> = 1 KΩ , V <sub>GE</sub> = 4.5 V T <sub>c</sub> = 150 °C		7.8 3.5 3.9 12 17.8		μs μs μs μs mJ

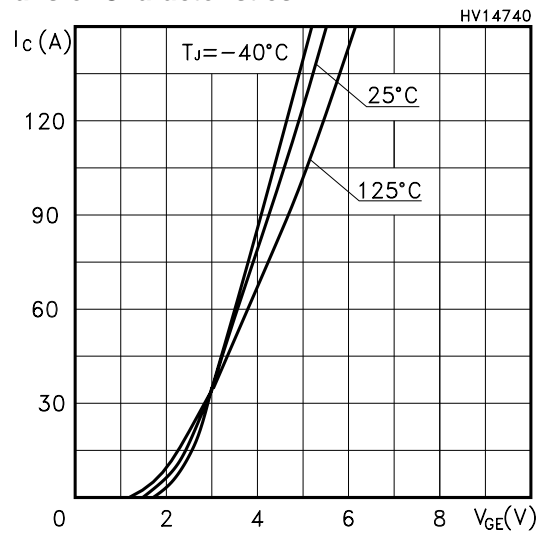
(\*\*)Losses Include Also the Tail (jedec Standardization)

# STGB20NB32LZ - STGB20NB32LZ-1

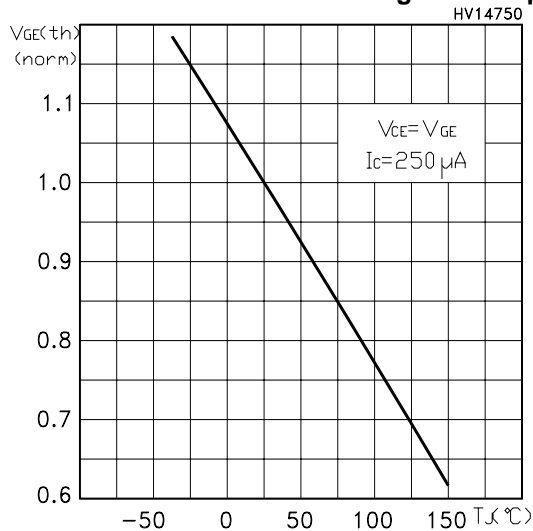
## Output Characteristics



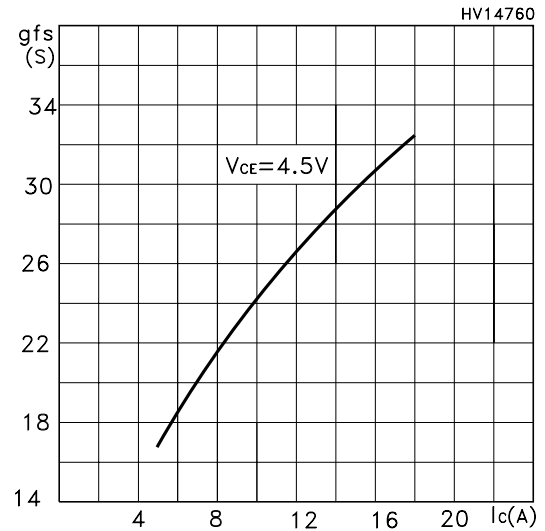
## Transfer Characteristics



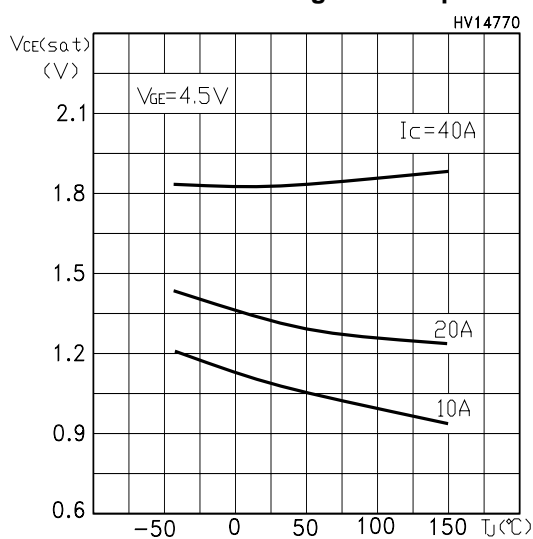
## Normalized Gate Threshold Voltage vs Temp.



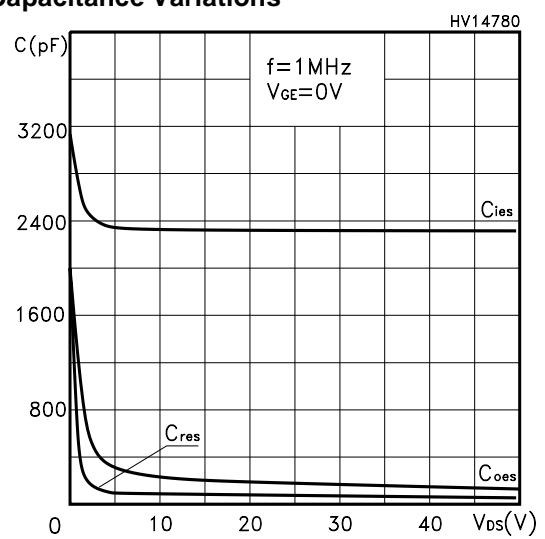
## Transconductance



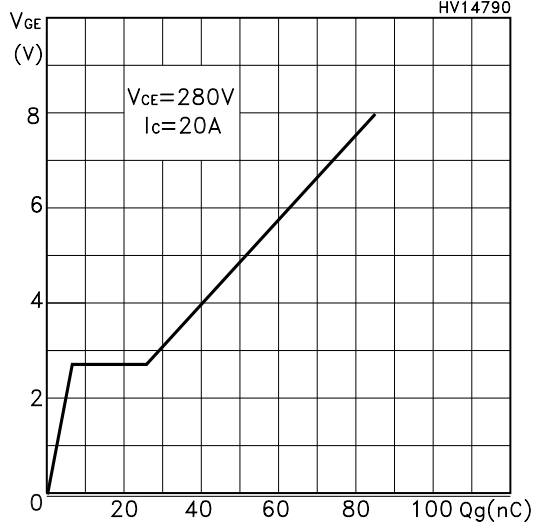
## Collector-Emitter On Voltage vs Temperature



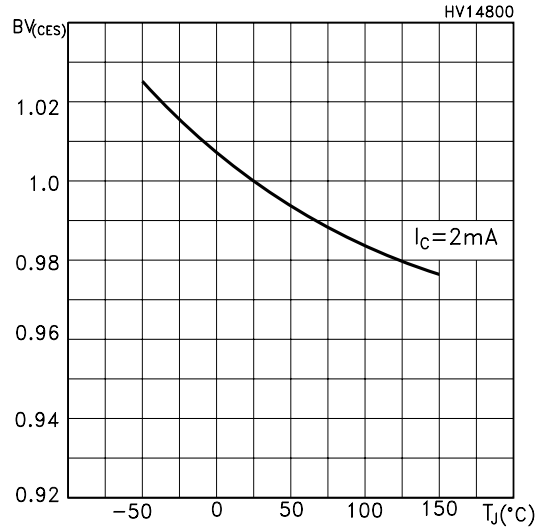
## Capacitance Variations



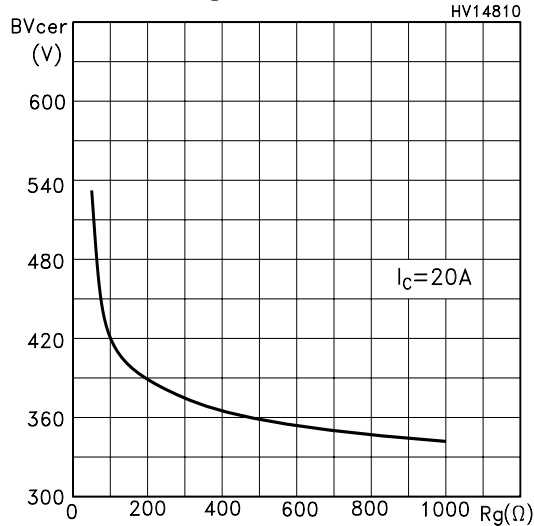
Gate Charge vs Gate-Emitter Voltage



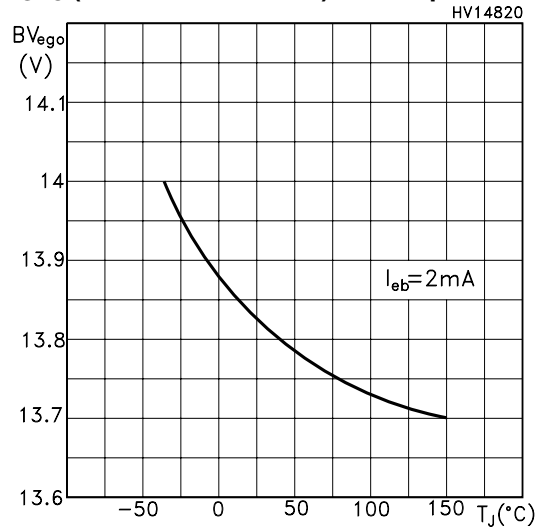
Normalized BreakDown Voltage vs Temperature



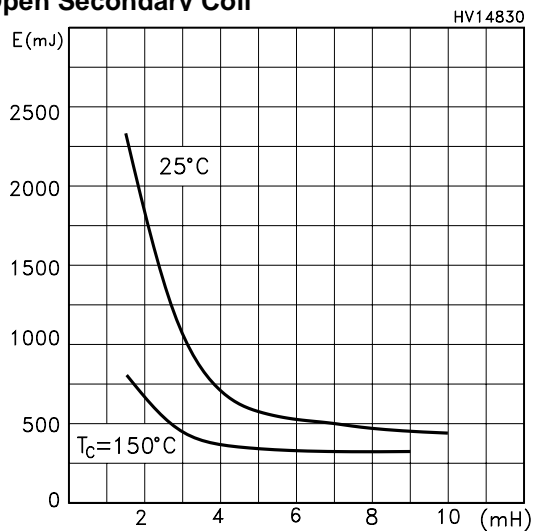
Break-Down Voltage vs Emitter Resistance



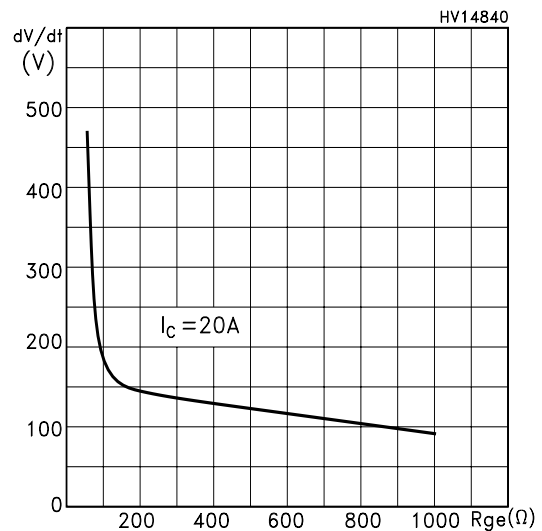
BVGE0 (Zener Gate-Emitter) vs Temperature



Self Clamped Inductive Switching Energy vs Open Secondary Coil

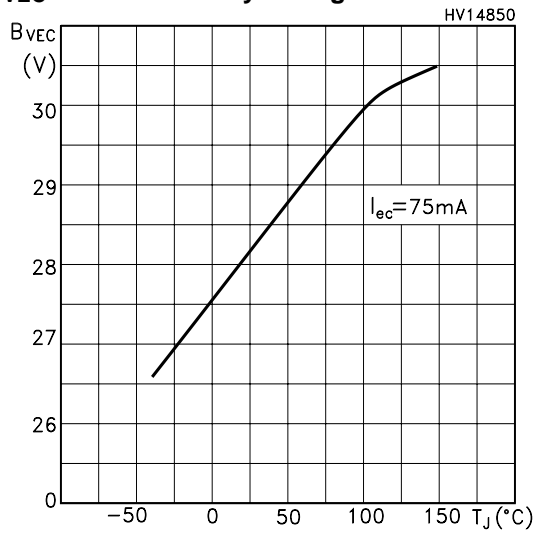


dV/dt Gate-Emitter Resistance

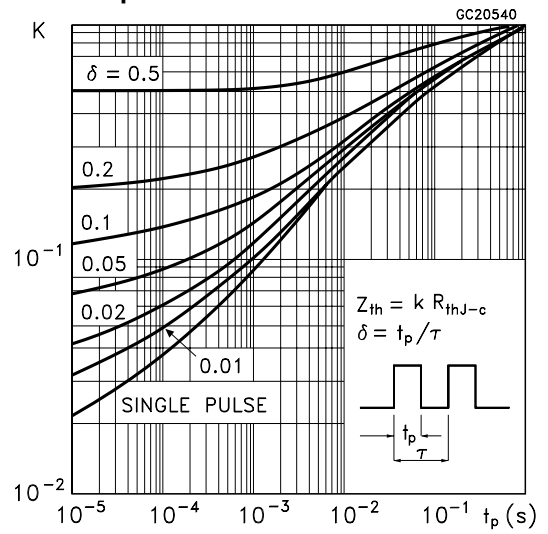


# STGB20NB32LZ - STGB20NB32LZ-1

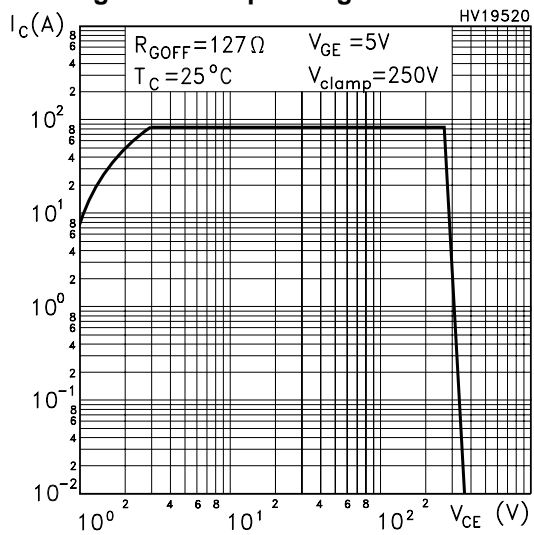
## B<sub>VEC</sub> Reverse Battery Voltage



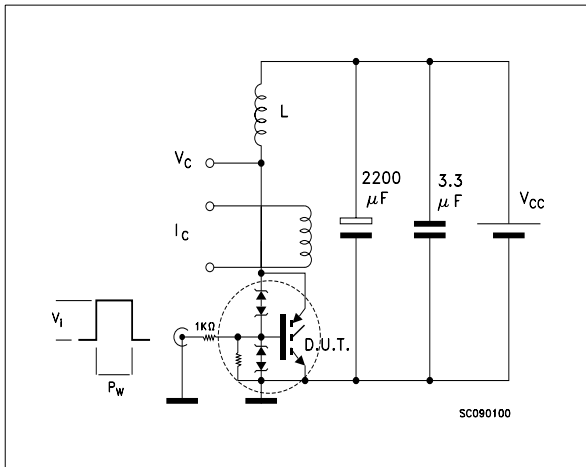
## Thermal Impedance



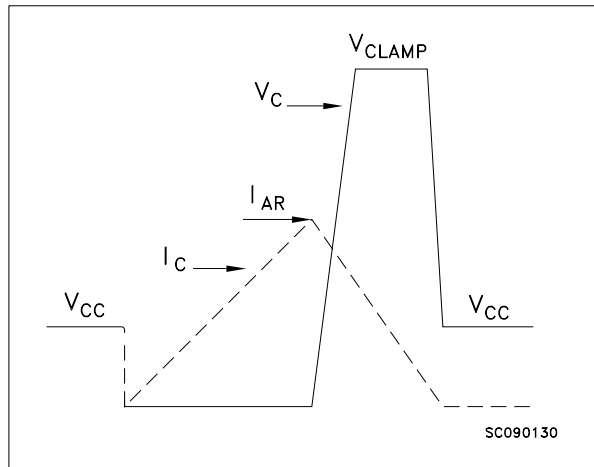
## Switching Off Safe Operating Area



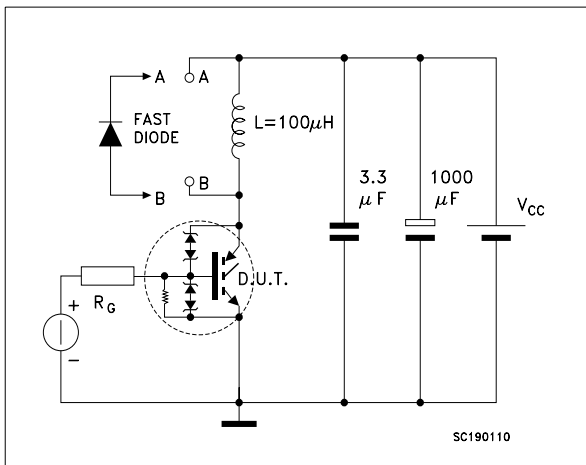
**Fig. 1: Unclamped Inductive Load Test Circuit**



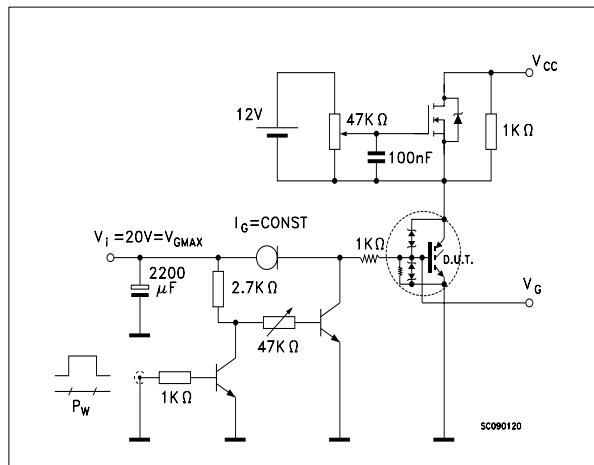
**Fig. 2: Unclamped Inductive Waveform**



**Fig. 3: Test Circuit For Inductive Load Switching And Diode Recovery Times**

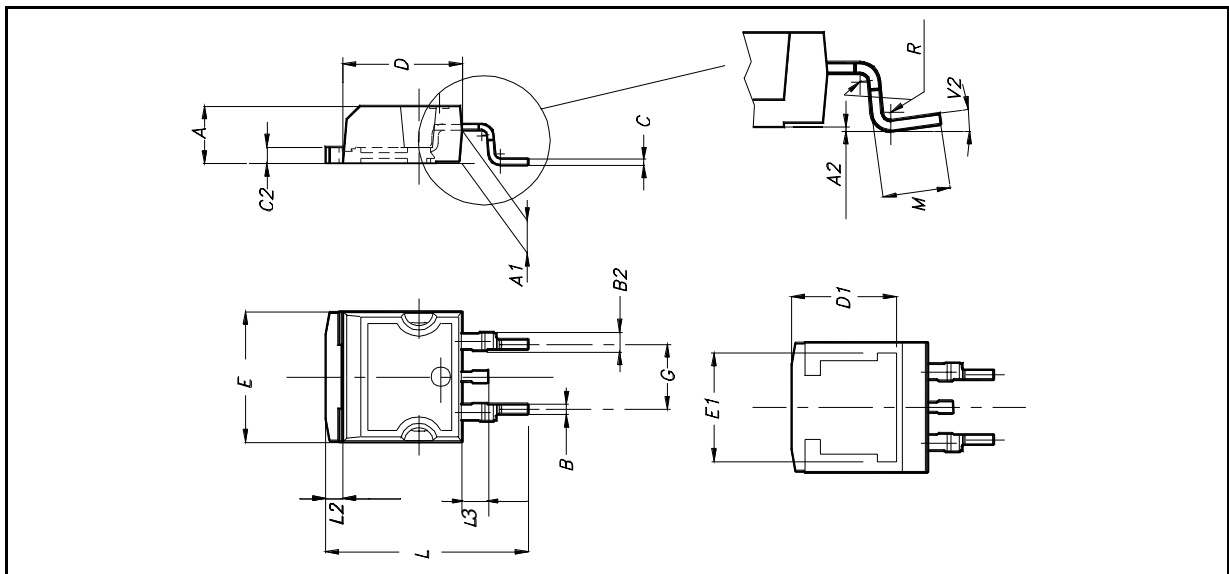


**Fig. 4: Gate Charge test Circuit**



**D<sup>2</sup>PAK MECHANICAL DATA**

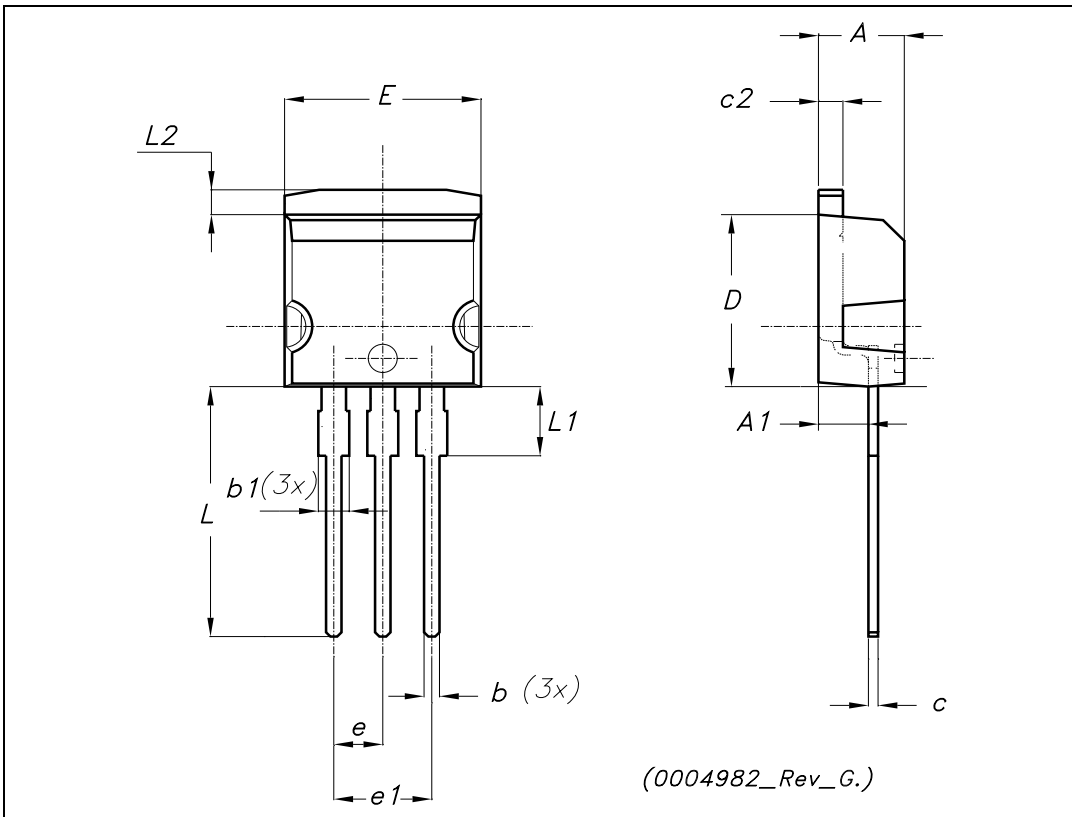
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
A2	0.03		0.23	0.001		0.009
B	0.7		0.93	0.027		0.036
B2	1.14		1.7	0.044		0.067
C	0.45		0.6	0.017		0.023
C2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1		8			0.315	
E	10		10.4	0.393		
E1		8.5			0.334	
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°			



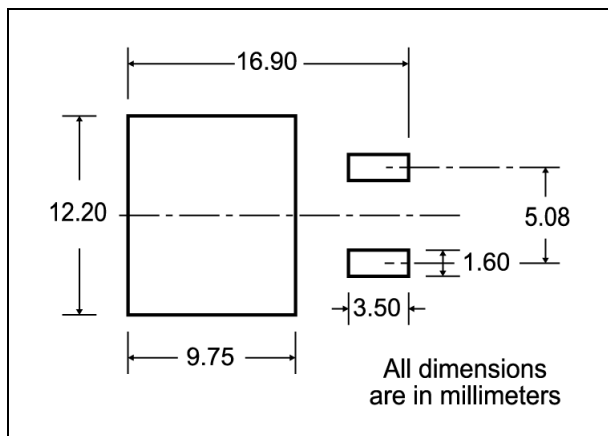


**TO-262 (I<sup>2</sup>PAK) MECHANICAL DATA**

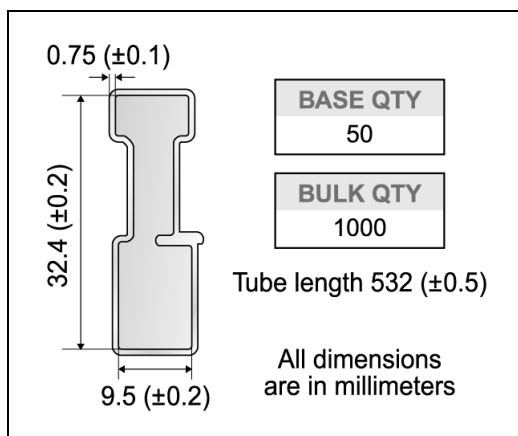
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
A1	2.40		2.72	0.094		0.107
b	0.61		0.88	0.024		0.034
b1	1.14		1.70	0.044		0.066
c	0.49		0.70	0.019		0.027
c2	1.23		1.32	0.048		0.052
D	8.95		9.35	0.352		0.368
e	2.40		2.70	0.094		0.106
e1	4.95		5.15	0.194		0.202
E	10		10.40	0.393		0.410
L	13		14	0.511		0.551
L1	3.50		3.93	0.137		0.154
L2	1.27		1.40	0.050		0.055



**D<sup>2</sup>PAK FOOTPRINT**



**TUBE SHIPMENT (no suffix)\***



**TAPE AND REEL SHIPMENT (suffix "T4")\***

40 mm min. Access hole at slot location

Full radius

Tape slot in core for tape start 2.5mm min. width

G measured at hub

**TAPE MECHANICAL DATA**

DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A0	10.5	10.7	0.413	0.421
B0	15.7	15.9	0.618	0.626
D	1.5	1.6	0.059	0.063
D1	1.59	1.61	0.062	0.063
E	1.65	1.85	0.065	0.073
F	11.4	11.6	0.449	0.456
K0	4.8	5.0	0.189	0.197
P0	3.9	4.1	0.153	0.161
P1	11.9	12.1	0.468	0.476
P2	1.9	2.1	0.075	0.082
R	50		1.574	
T	0.25	0.35	0.0098	0.0137
W	23.7	24.3	0.933	0.956

**REEL MECHANICAL DATA**

DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A		330		12.992
B	1.5		0.059	
C	12.8	13.2	0.504	0.520
D	20.2		0.795	
G	24.4	26.4	0.960	1.039
N	100		3.937	
T		30.4		1.197

BASE QTY	BULK QTY
1000	1000

10 pitches cumulative tolerance on tape +/- 0.2 mm

Center line of cavity

User Direction of Feed

TRL

FEED DIRECTION

Bending radius R min.

\* on sales type  
10/11



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