



STGB20NB32LZ STGB20NB32LZ-1

N-CHANNEL CLAMPED 20A - D²PAK/I²PAK
 INTERNALLY CLAMPED PowerMESH™ IGBT

TYPE	V _{CES}	V _{CE(sat)}	I _C
STGB20NB32LZ	CLAMPED	< 2.0 V	20 A
STGB20NB32LZ-1	CLAMPED	< 2.0 V	20 A

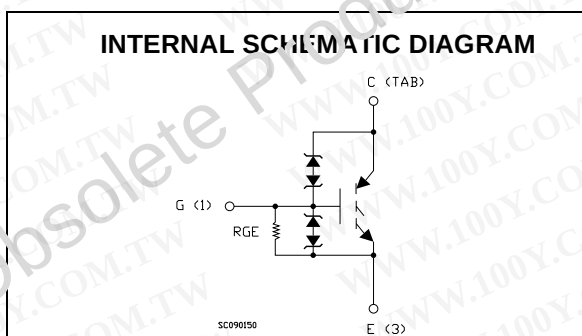
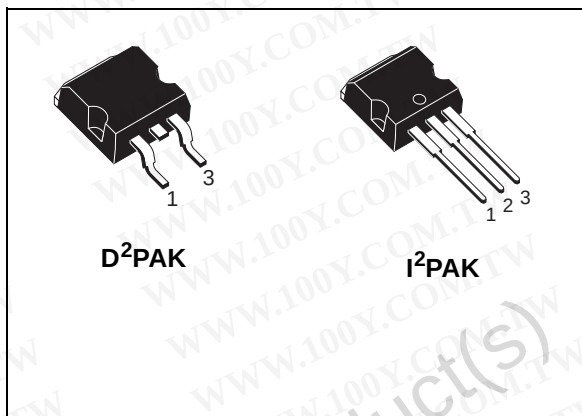
- POLYSILICON GATE VOLTAGE DRIVEN
- LOW THRESHOLD VOLTAGE
- LOW ON-VOLTAGE DROP
- HIGH CURRENT CAPABILITY
- HIGH VOLTAGE CLAMPING FEATURE

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 ² PAK	TAPE & REEL
STGB20NB32LZ-1	GB20NB32LZ	I ² 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	$^\circ\text{C}$

(*)Pulse width limited by safe operating area

THERMAL DATA

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

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$BV_{(CES)}$	Clamped Voltage	$I_C = 2\text{ mA}, V_{GE} = 0, T_C = -40^\circ\text{C}$	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	μA
		$V_{CE} = 200\text{ V}, V_{GE} = 0, T_C = 150^\circ\text{C}$			100	μA
I_{GES}	Gate-Emitter Leakage Current ($V_{CE} = 0$)	$V_{GE} = \pm 10\text{ V}, V_{CE} = 0$	± 400	± 660	± 1000	μA
R_{GE}	Gate Emitter Resistance		10	15	25	K Ω

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs}	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
I_l	Latching Current	$R_{G\text{OFF}} = 127\Omega$, $V_{\text{Clamp}} = 250\text{ V}$, $V_{GE} = 5\text{ V}$, $T_C = 125\text{ }^{\circ}\text{C}$	34			A
U.I.S.	Functional Test Open Secondary Coil	$R_{G\text{OFF}} = 1\text{ K}\Omega$, $T_C = 125\text{ }^{\circ}\text{C}$, $V_G = 5\text{ V}$, $L = 1.6\text{ mH}$	21.6			A

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(\text{on})}$	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
$(di/dt)_{\text{on}}$	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

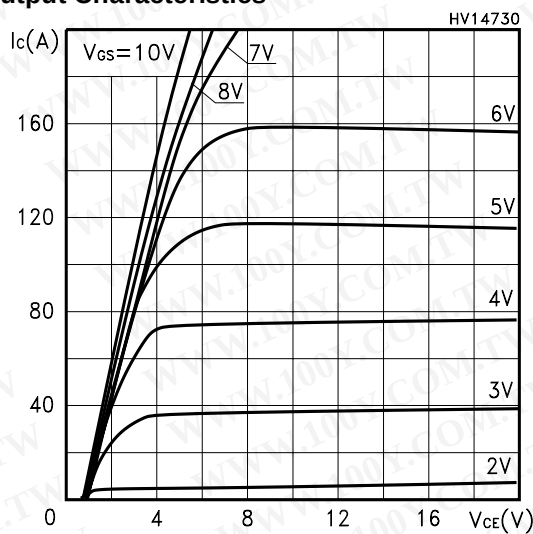
SWITCHING OFF

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
$t_r(V_{\text{off}})$	Off Voltage Rise Time			2.6		μs
t_f	Fall Time			2		μs
$t_{d(\text{off})}$	Off Voltage Delay Time			11.5		μs
$E_{\text{off}}(**)$	Turn-off Switching Loss			11.8		mJ
t_c	Cross-Over Time	$V_{CC} = 250\text{ V}$, $I_C = 20\text{ A}$, $R_{GE} = 1\text{ K}\Omega$, $V_{GE} = 4.5\text{ V}$ $T_C = 150\text{ }^{\circ}\text{C}$		7.8		μs
$t_r(V_{\text{off}})$	Off Voltage Rise Time			3.5		μs
t_f	Fall Time			3.9		μs
$t_{d(\text{off})}$	Off Voltage Delay Time			12		μs
$E_{\text{off}}(**)$	Turn-off Switching Loss			17.8		mJ

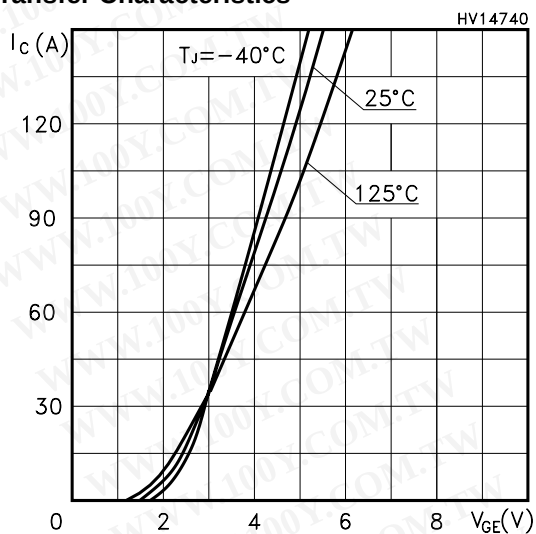
(**) Losses Include Also the Tail (jedec Standardization)

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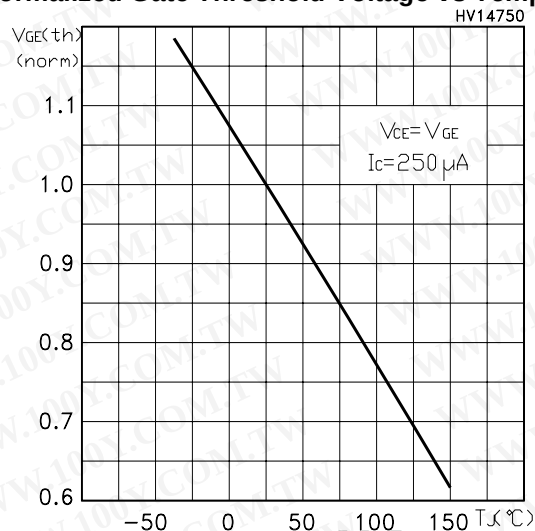
Output Characteristics



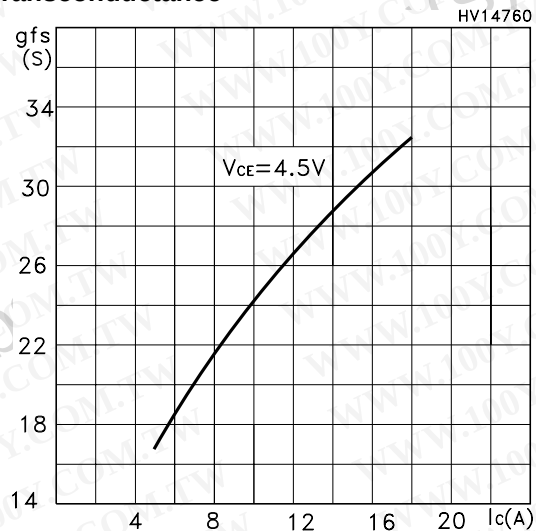
Transfer Characteristics



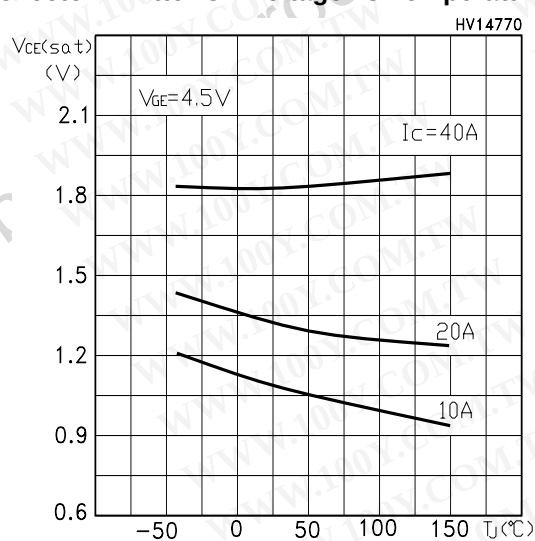
Normalized Gate Threshold Voltage vs Temp.



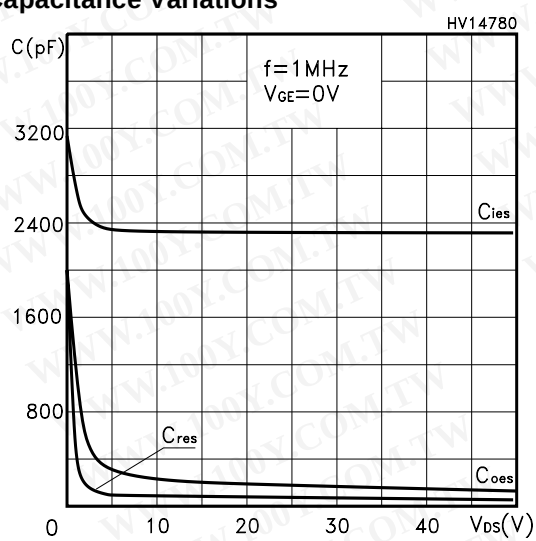
Transconductance



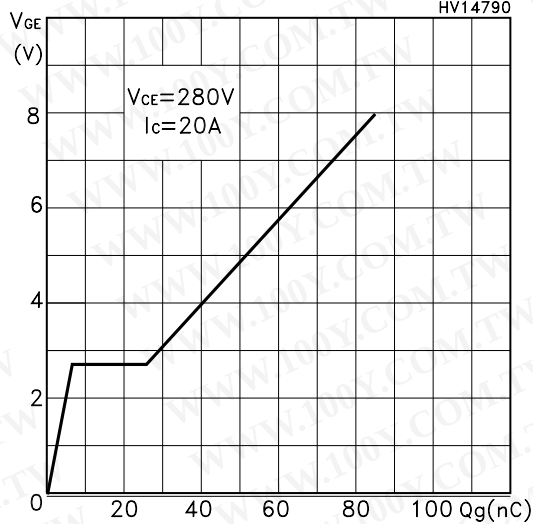
Collector-Emitter On Voltage vs Temperature



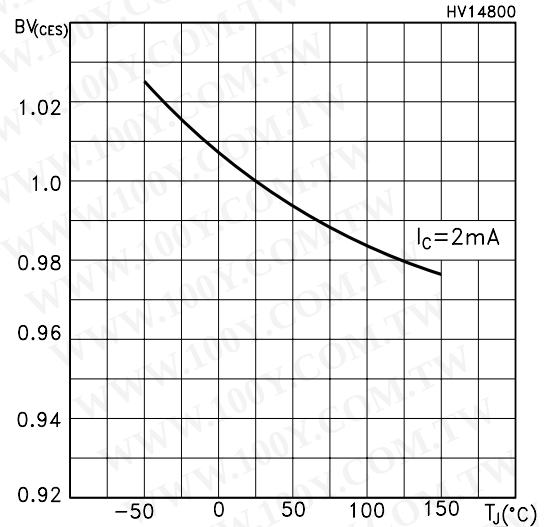
Capacitance Variations



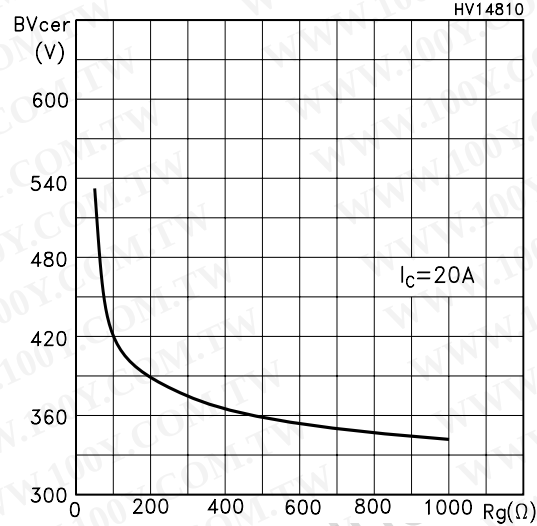
Gate Charge vs Gate-Emitter Voltage



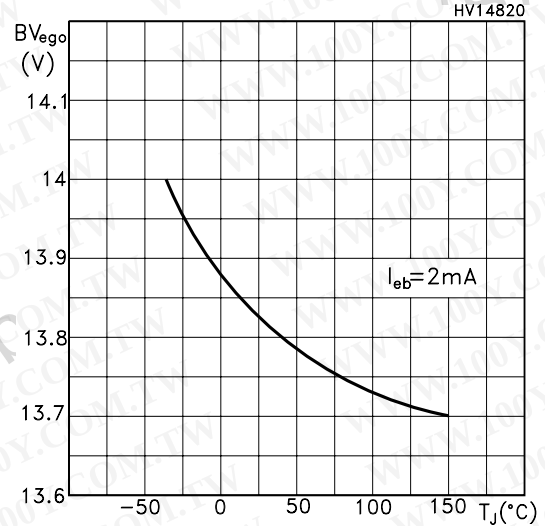
Normalized BreakDown Voltage vs Temperature



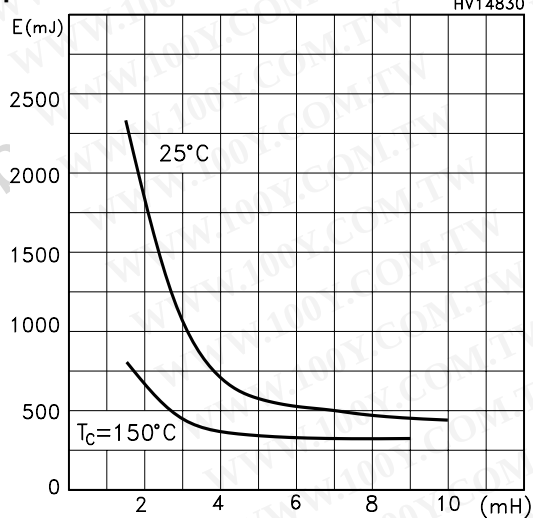
Break-Down Voltage vs Emitter Resistance



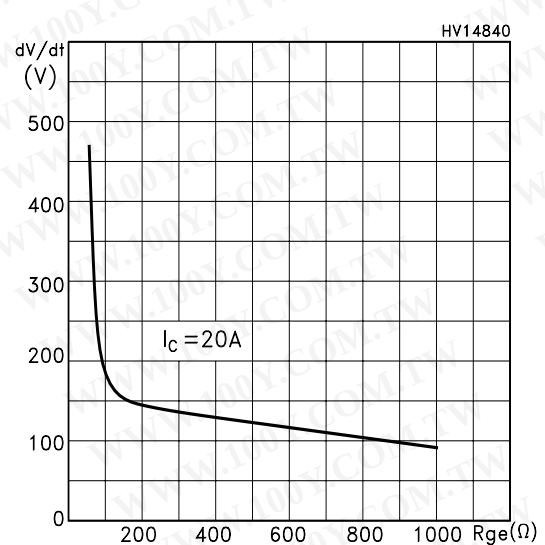
BVGE0 (Zener Gate-Emitter) vs Temperature



Self Clamped Inductive Switching Energy vs Open Secondary Coil

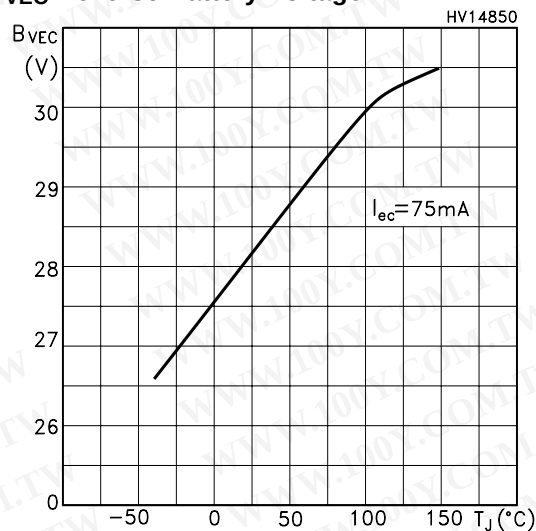


dV/dt Gate-Emitter Resistance

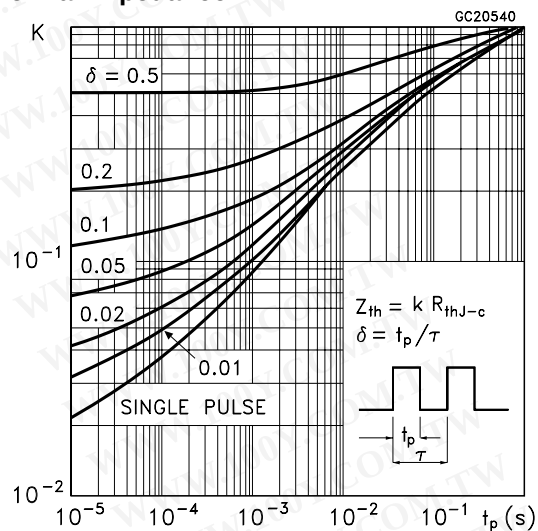


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B_{VEC} Reverse Battery Voltage



Thermal Impedance



Switching Off Safe Operating Area

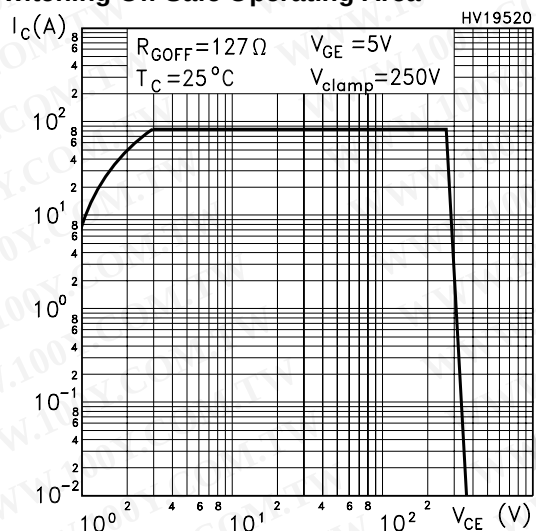


Fig. 1: Unclamped Inductive Load Test Circuit

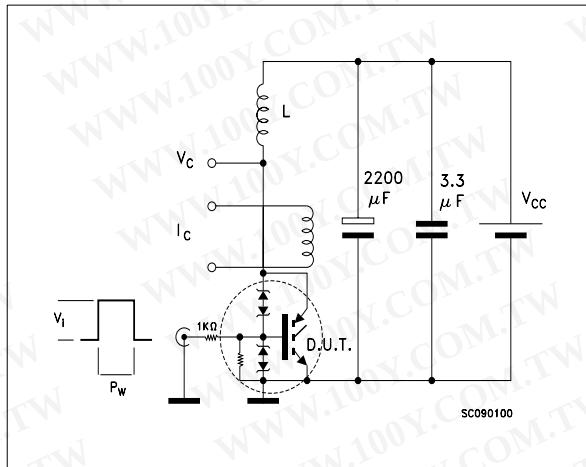


Fig. 2: Unclamped Inductive Waveform

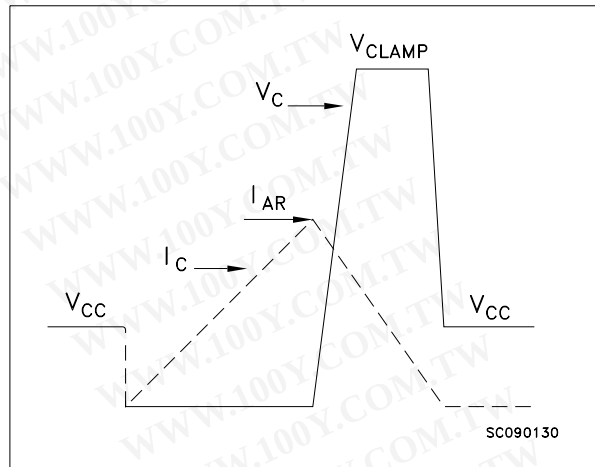


Fig. 3: Test Circuit For Inductive Load Switching And Diode Recovery Times

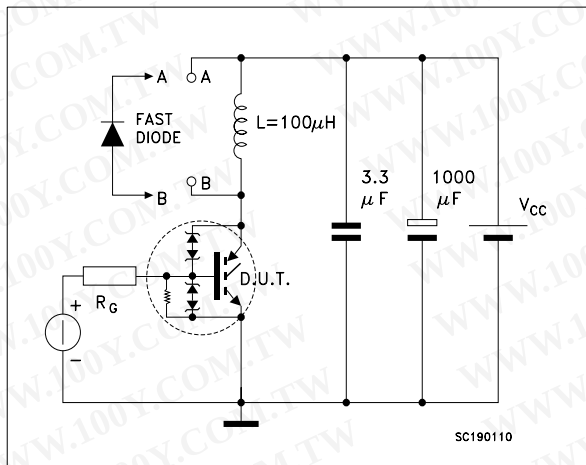
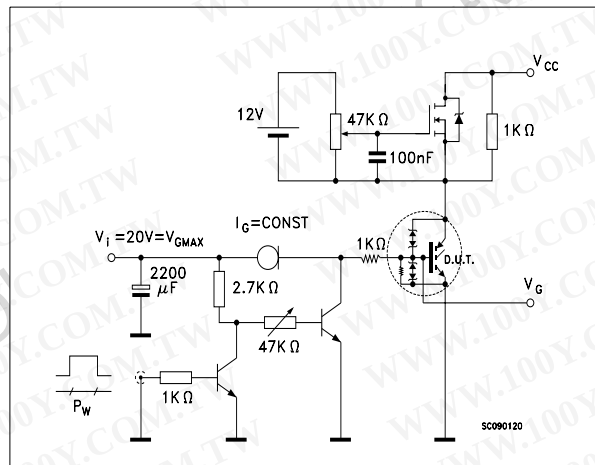
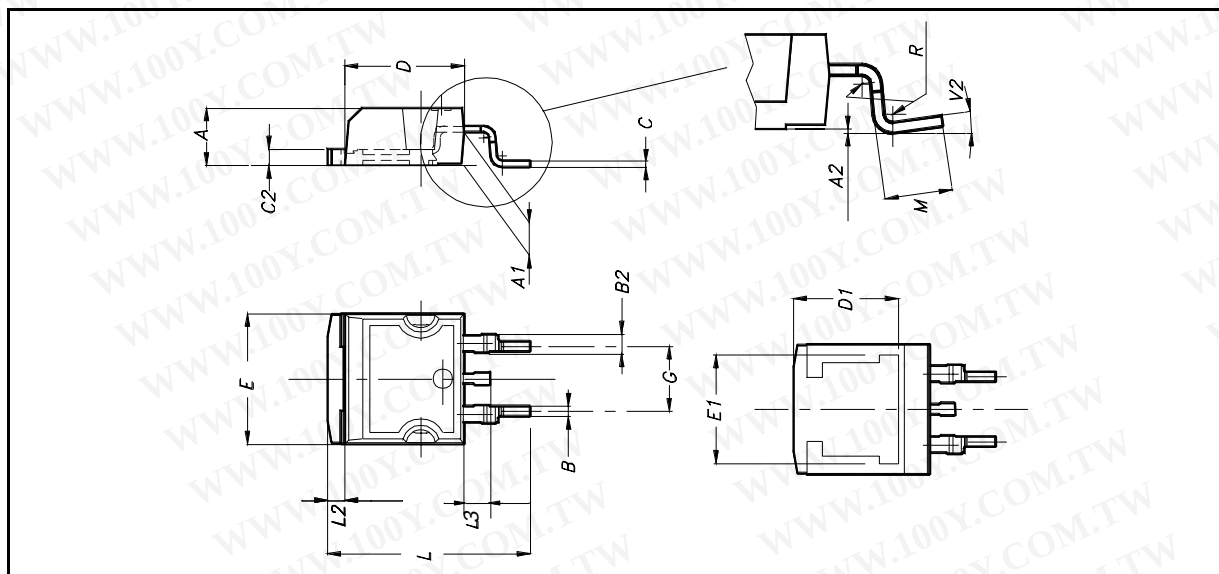


Fig. 4: Gate Charge test Circuit



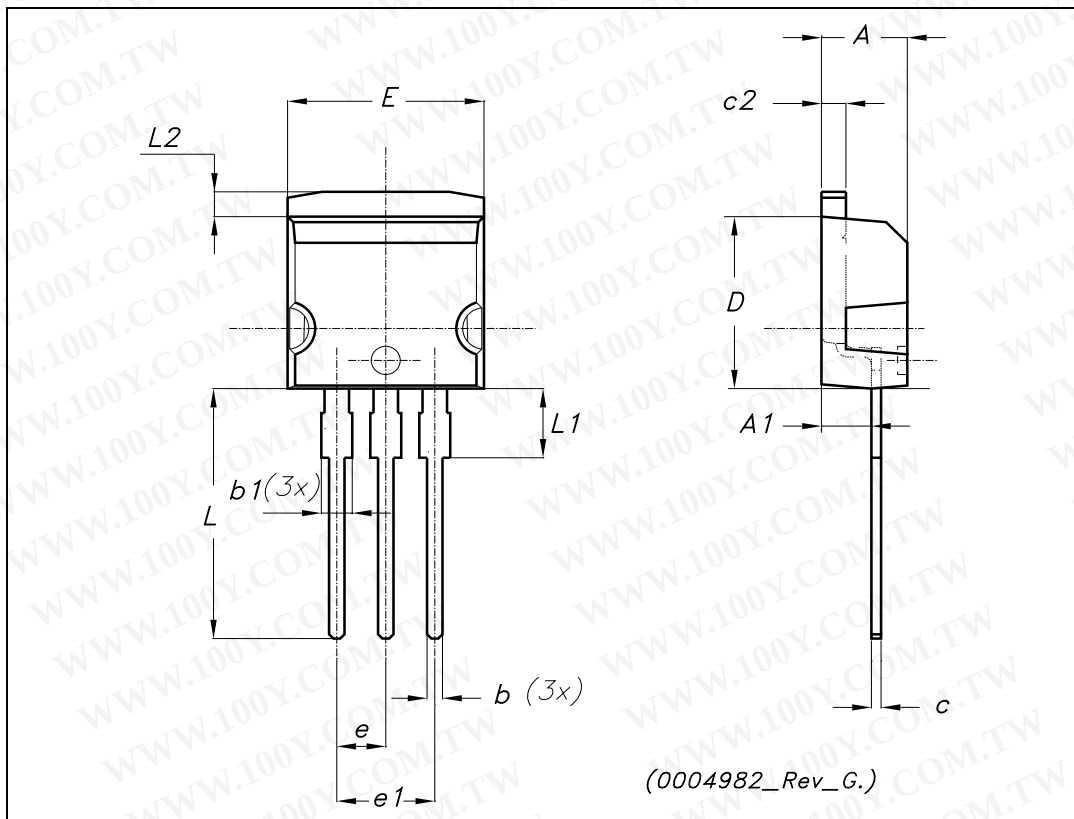
D²PAK MECHANICAL DATA

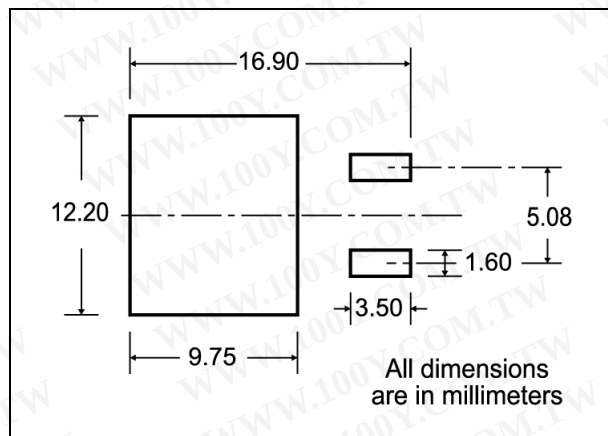
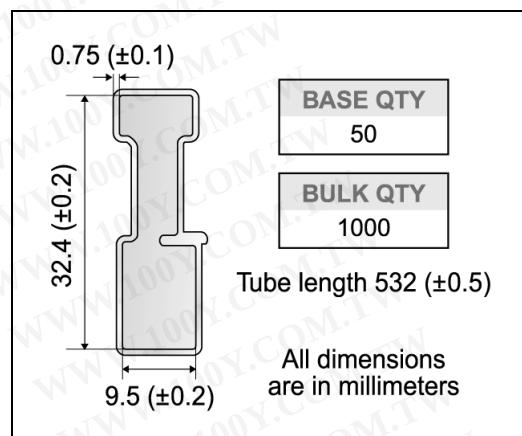
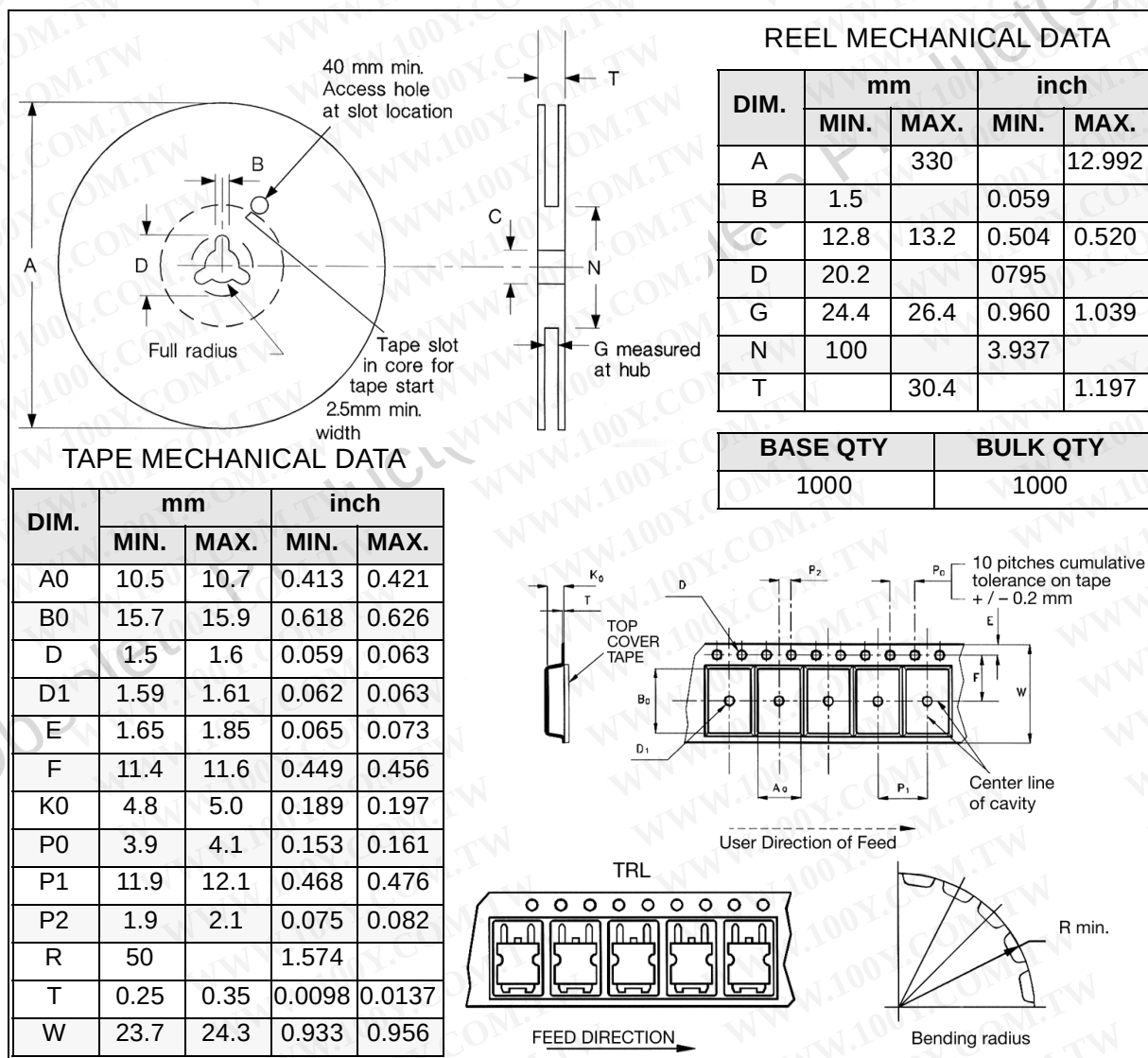
DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
A2	0.03		0.23	0.001		0.009
B	0.7		0.93	0.027		0.036
B2	1.14		1.7	0.044		0.067
C	0.45		0.6	0.017		0.023
C2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1		8			0.315	
E	10		10.4	0.393		
E1		8.5			0.334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



TO-262 (I²PAK) 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



D²PAK FOOTPRINT**TUBE SHIPMENT (no suffix)*****TAPE AND REEL SHIPMENT (suffix "T4")***

* on sales type
10/11

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