



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

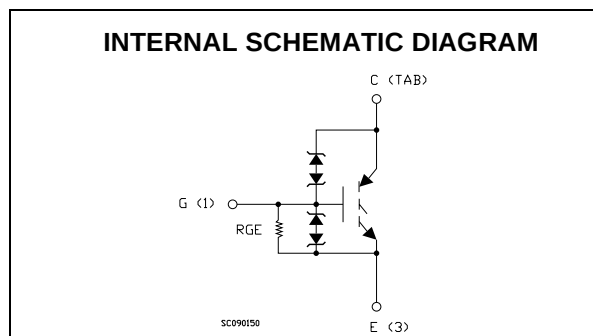
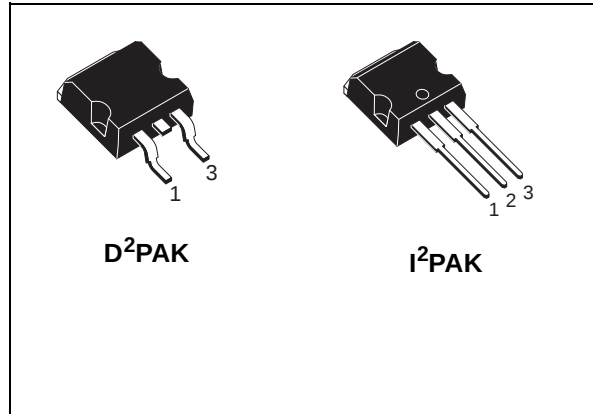
- POLYSILICON GATE VOLTAGE DRIVEN
- LOW THRESHOLD VOLTAGE
- LOW ON-VOLTAGE DROP
- HIGH CURRENT CAPABILITY
- HIGH VOLTAGE CLAMPING FEATURE
- SURFACE-MOUNTING D²PAK (TO-263)
POWER PACKAGE IN TUBE (NO SUFFIX) OR
IN TAPE & REEL (SUFFIX "T4")

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

APPLICATIONS

- AUTOMOTIVE IGNITION



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°C	40	A
I _C	Collector Current (continuous) at T _c = 100°C	30	A
I _{CM} (•)	Collector Current (pulsed)	80	A
E _{as}	Single Pulse Energy T _c = 25°C	700	mJ
P _{tot}	Total Dissipation at T _c = 25°C	150	W
	Derating Factor	1	W/°C
E _{SD}	ESD (Human Body Model)	4	KV
T _{stg}	Storage Temperature	-65 to 175	°C
T _j	Max. Operating Junction Temperature	175	°C

(•)Pulse width limited by safe operating area

STGB20NB32LZ - STGB20NB32LZ-1**THERMAL DATA**

Rthj-case	Thermal Resistance Junction-case Max	1	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	62.5	°C/W
Rthc-sink	Thermal Resistance Case-sink Typ	0.2	°C/W

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

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
BV _(CES)	Clamped Voltage	I _C = 2 mA, V _{GE} = 0, T _C = -40°C	330	355	380	V
		I _C = 2 mA, V _{GE} = 0, T _C = 25°C	325	350	375	V
		I _C = 2 mA, V _{GE} = 0, T _C = 150°C	320	345	370	V
BV _(ECR)	Emitter Collector Break-down Voltage	I _C = 75 mA, T _C = 25°C	20	28		V
BV _{GE}	Gate Emitter Break-down Voltage	I _G = ± 2 mA	12	14	16	V
I _{CES}	Collector cut-off Current (V _{GE} = 0)	V _{CE} = 15 V, V _{GE} = 0, T _C = 150 °C			10	μA
		V _{CE} = 200 V, V _{GE} = 0, T _C = 150°C			100	μA
I _{GES}	Gate-Emitter Leakage Current (V _{CE} = 0)	V _{GE} = ± 10V, V _{CE} = 0	± 400	± 660	± 1000	μA
R _{GE}	Gate Emitter Resistance		10	15	25	KΩ

ON (1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{GE(th)}	Gate Threshold Voltage	V _{CE} = V _{GE} , I _C = 250μA, T _C = -40°C	1.2			V
		V _{CE} = V _{GE} , I _C = 250μA, T _C = 25°C	1	1.4	2	V
		V _{CE} = V _{GE} , I _C = 250μA, T _C = 150°C	0.6			V
V _{CE(SAT)}	Collector-Emitter Saturation Voltage	V _{GE} = 4.5V, I _C = 10 A, T _C = 25°C		1.1	1.8	V
		V _{GE} = 4.5V, I _C = 10 A, T _C = 150°C		1	1.7	V
		V _{GE} = 4.5V, I _C = 20 A, T _C = 25°C		1.35	2	V
		V _{GE} = 4.5V, I _C = 20 A, T _C = 150°C		1.25	2	V

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g _{fs}	Forward Transconductance	V _{CE} = 25 V, I _C = 20 A		35		S
C _{ies}	Input Capacitance	V _{CE} = 25 V, f = 1 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 V, I _C = 20 A, V _{GE} = 5 V		51		nC

FUNCTIONAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
II	Latching Current	$V_{\text{Clamp}} = 250 \text{ V}$, $T_C = 150^\circ\text{C}$ $R_{\text{GOFF}} = 1\text{K}\Omega$, $V_{\text{GE}} = 4.5 \text{ V}$	80			A
U.I.S.	Functional Test Open Secondary Coil	$R_{\text{GOFF}} = 1\text{K}\Omega$, $L = 3 \text{ mH}$, $T_C = 25^\circ\text{C}$ $R_{\text{GOFF}} = 1\text{K}\Omega$, $L = 3\text{mH}$, $T_C = 150^\circ\text{C}$	21.6 15	26 18		A A

SWITCHING ON

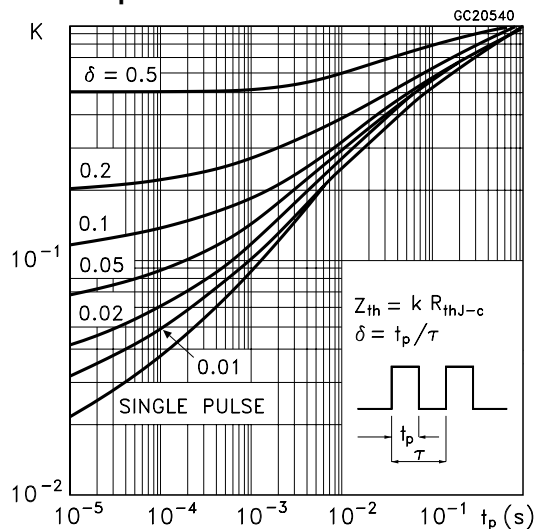
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(\text{on})}$ t_r	Delay Time Rise Time	$V_{\text{CC}} = 250 \text{ V}$, $I_C = 20 \text{ A}$ $R_G = 1\text{K}\Omega$, $V_{\text{GE}} = 4.5 \text{ V}$		2.3 0.6		μs μs
$(di/dt)_{\text{on}}$	Turn-on Current Slope	$V_{\text{CC}} = 250 \text{ V}$,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

SWITCHING OFF

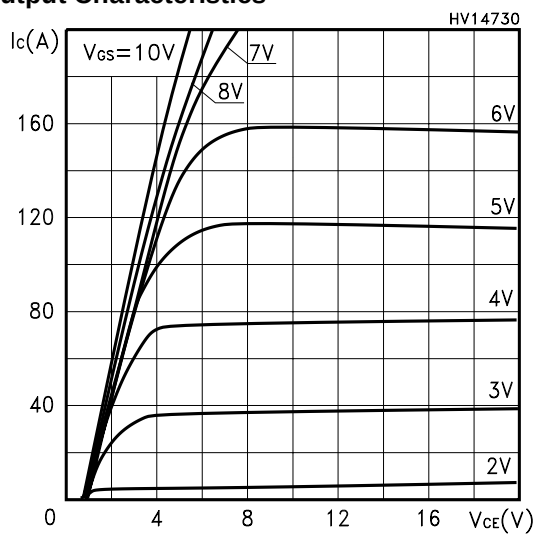
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_c $t_r(V_{\text{off}})$ t_f $t_{d(\text{off})}$ $E_{\text{off}}(**)$	Cross-Over Time Off Voltage Rise Time Fall Time Off Voltage Delay Time Turn-off Switching Loss	$V_{\text{CC}} = 250 \text{ V}$, $I_C = 20 \text{ A}$, $R_{\text{GE}} = 1 \text{ K}\Omega$, $V_{\text{GE}} = 4.5 \text{ V}$		4.8 2.6 2 11.5 11.8		μs μs μs μs mJ
t_c $t_r(V_{\text{off}})$ t_f $t_{d(\text{off})}$ $E_{\text{off}}(**)$	Cross-Over Time Off Voltage Rise Time Fall Time Off Voltage Delay Time Turn-off Switching Loss	$V_{\text{CC}} = 250 \text{ V}$, $I_C = 20 \text{ A}$, $R_{\text{GE}} = 1 \text{ K}\Omega$, $V_{\text{GE}} = 4.5 \text{ V}$ $T_C = 150^\circ\text{C}$		7.8 3.5 3.9 12 17.8		μs μs μs μs mJ

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

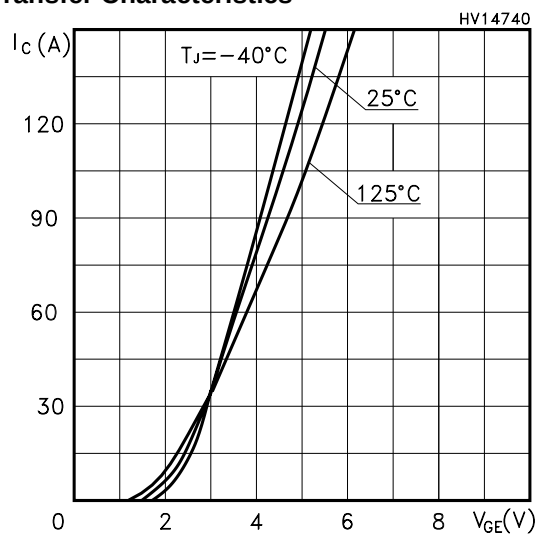
Thermal Impedance



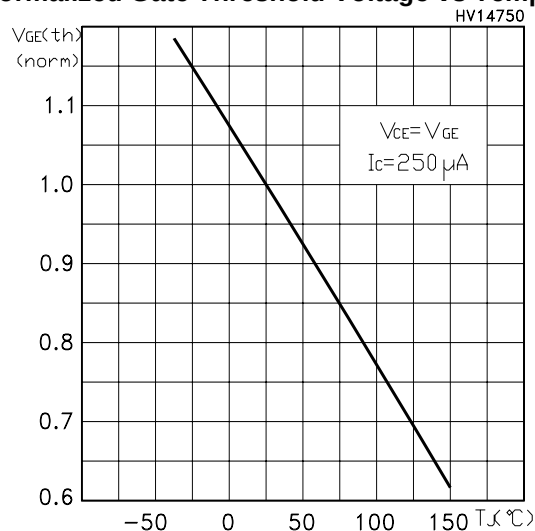
Output Characteristics



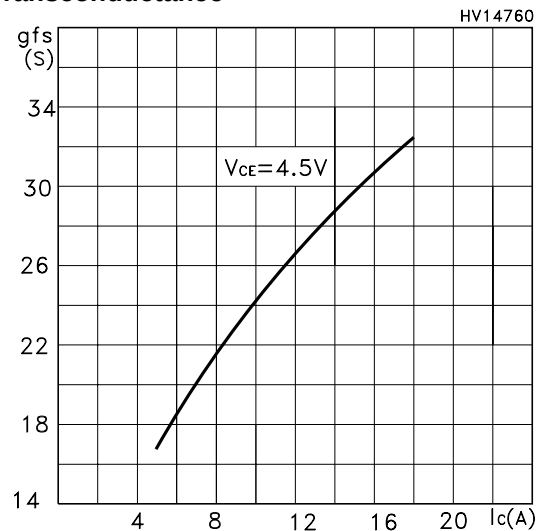
Transfer Characteristics



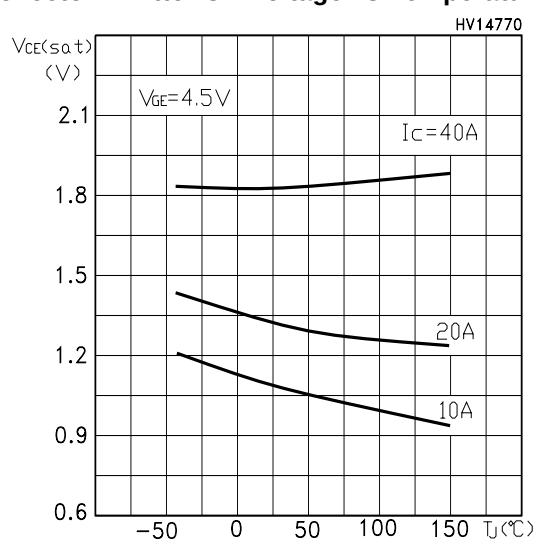
Normalized Gate Threshold Voltage vs Temp.



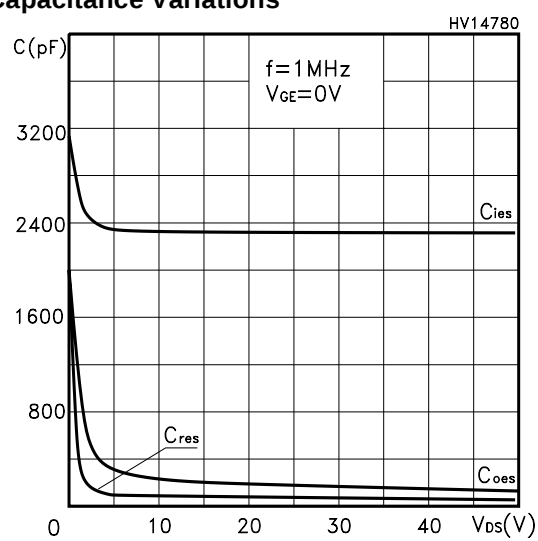
Transconductance



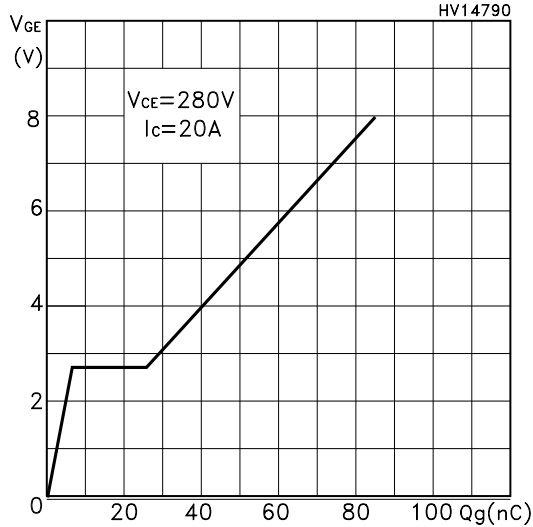
Collector-Emitter On Voltage vs Temperature



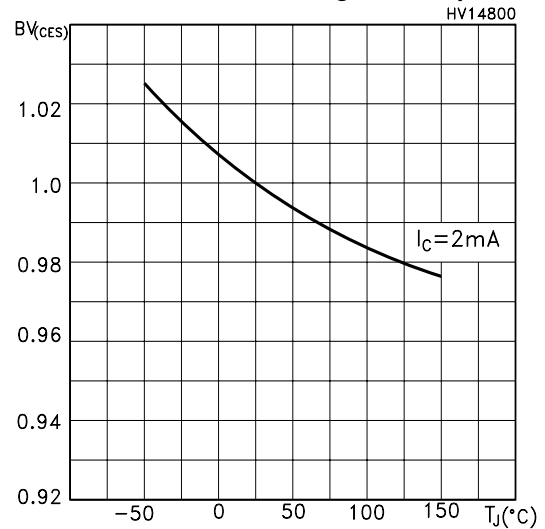
Capacitance Variations



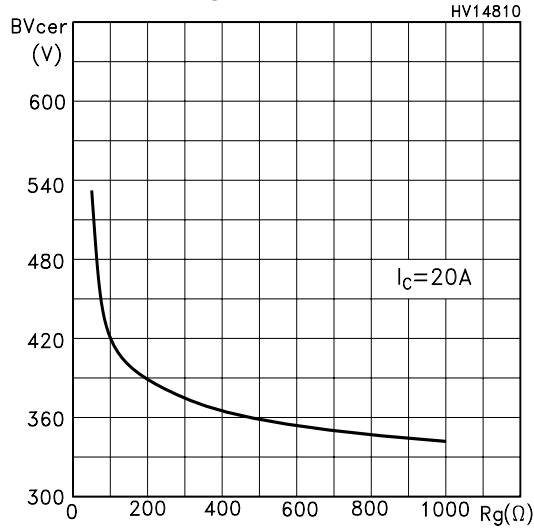
Gate Charge vs Gate-Emitter Voltage



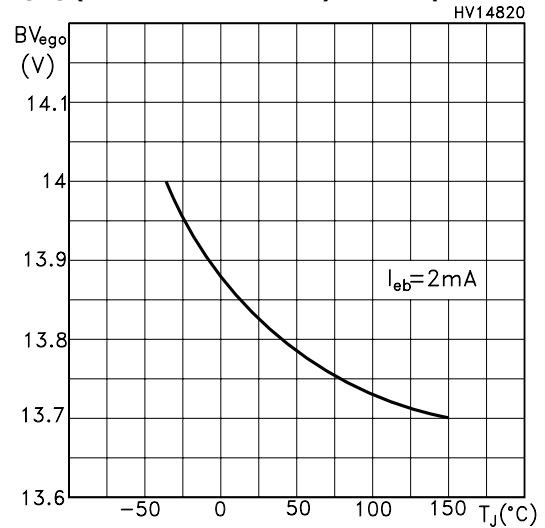
Normalized BreakDown Voltage vs Temperature



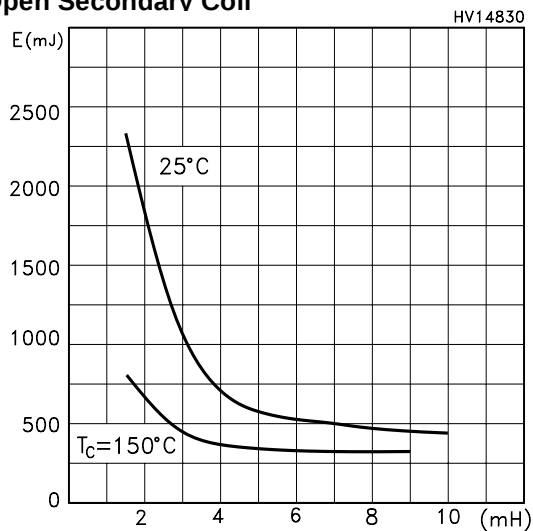
Break-Down Voltage vs Emitter Resistance



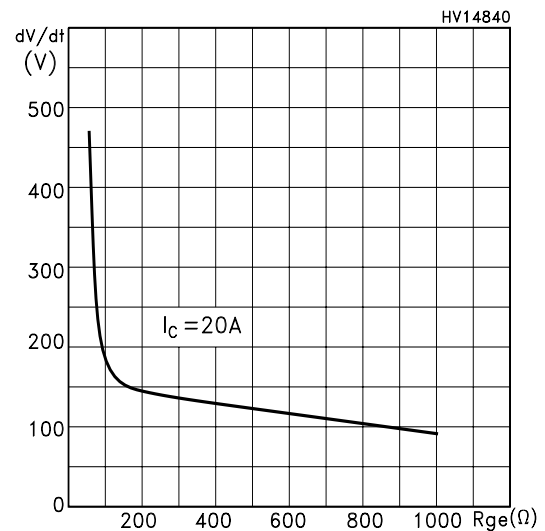
BV_{GEO} (Zener Gate-Emitter) vs Temperature



Self Clamped Inductive Switching Energy vs Open Secondary Coil



dV/dt Gate-Emitter Resistance



B_{VEC} Reverse Battery Voltage

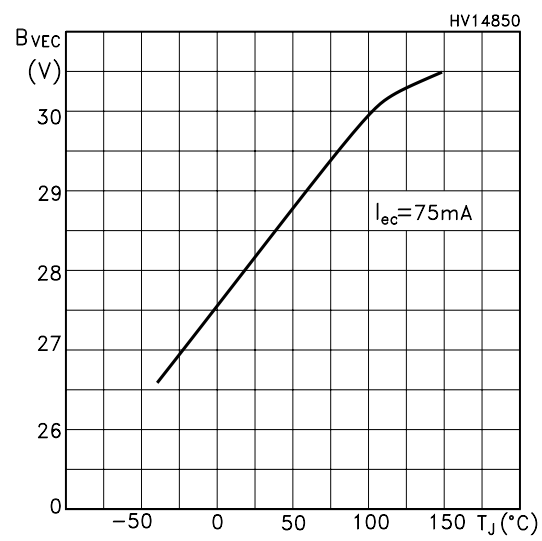


Fig. 1: Unclamped Inductive Load Test Circuit

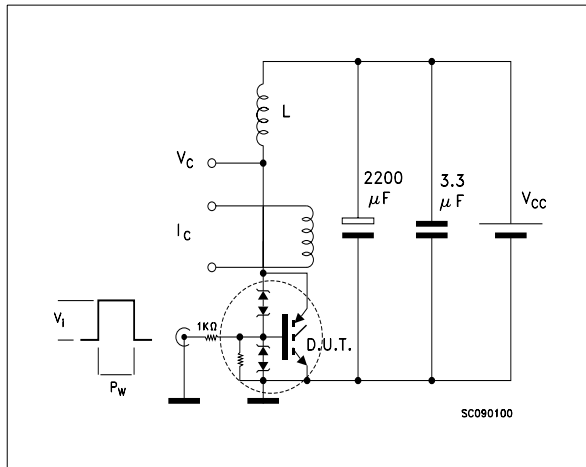


Fig. 2: Unclamped Inductive Waveform

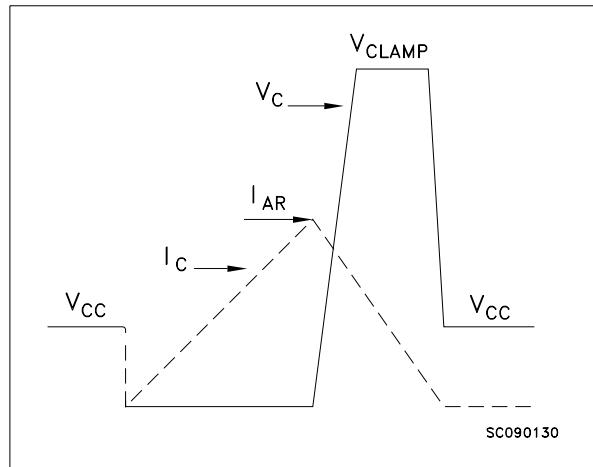


Fig. 3: Test Circuit For Inductive Load Switching And Diode Recovery Times

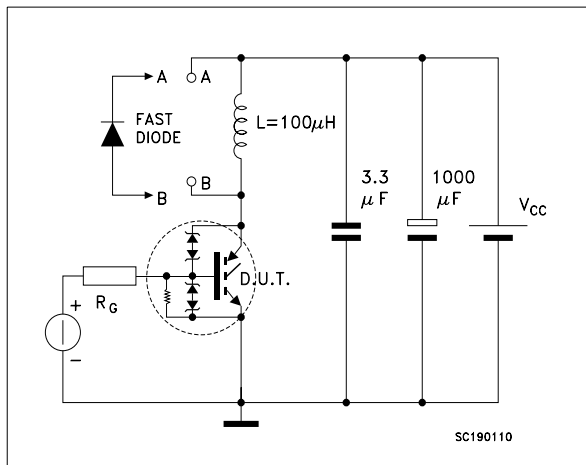
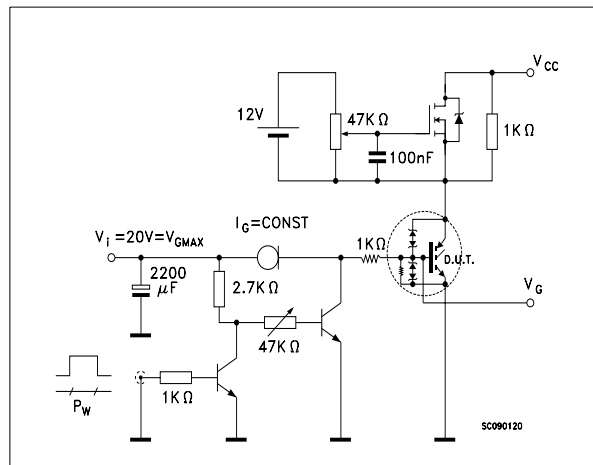
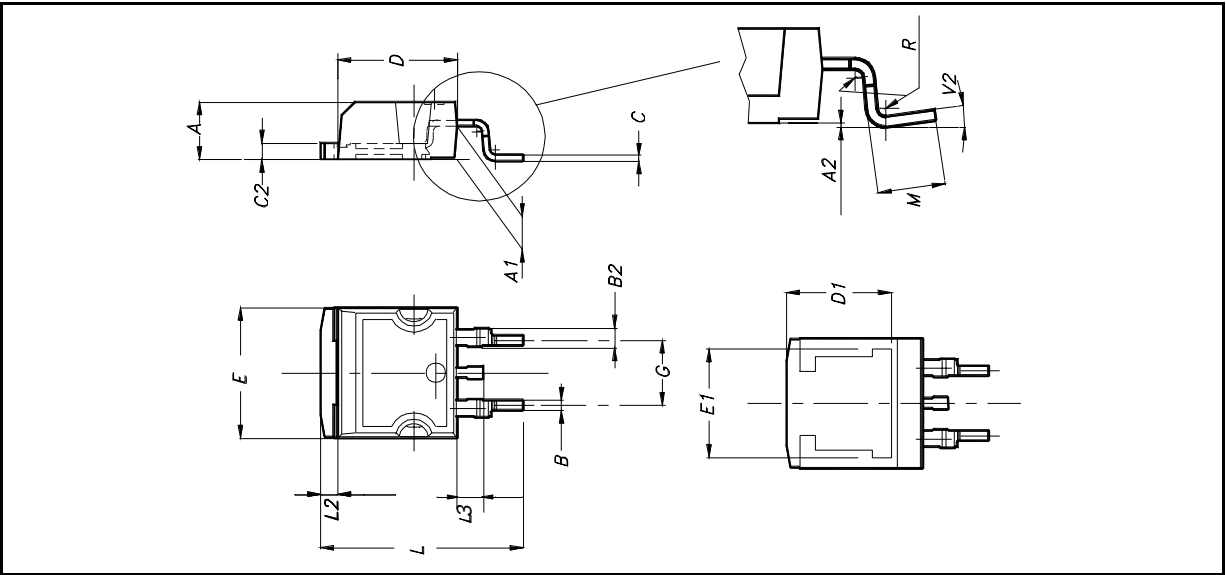


Fig. 4: Gate Charge test Circuit



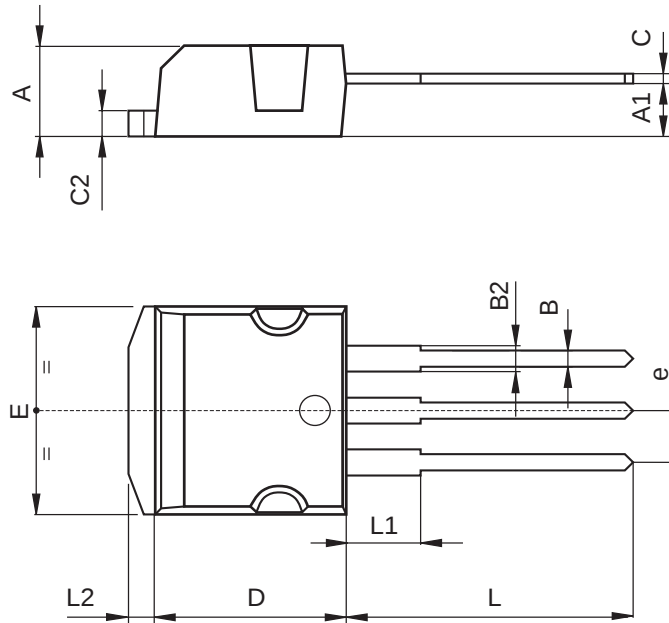
D²PAK MECHANICAL DATA

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°			



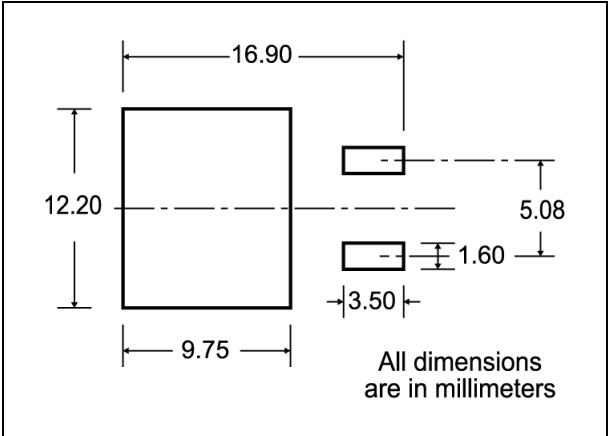
TO-262 (I²PAK) MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
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
e	2.4		2.7	0.094		0.106
E	10		10.4	0.393		0.409
L	13.1		13.6	0.515		0.531
L1	3.48		3.78	0.137		0.149
L2	1.27		1.4	0.050		0.055

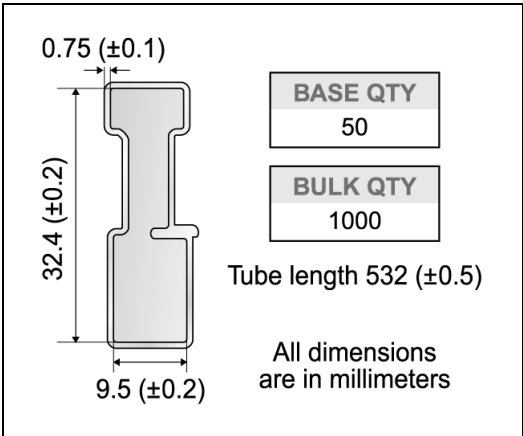


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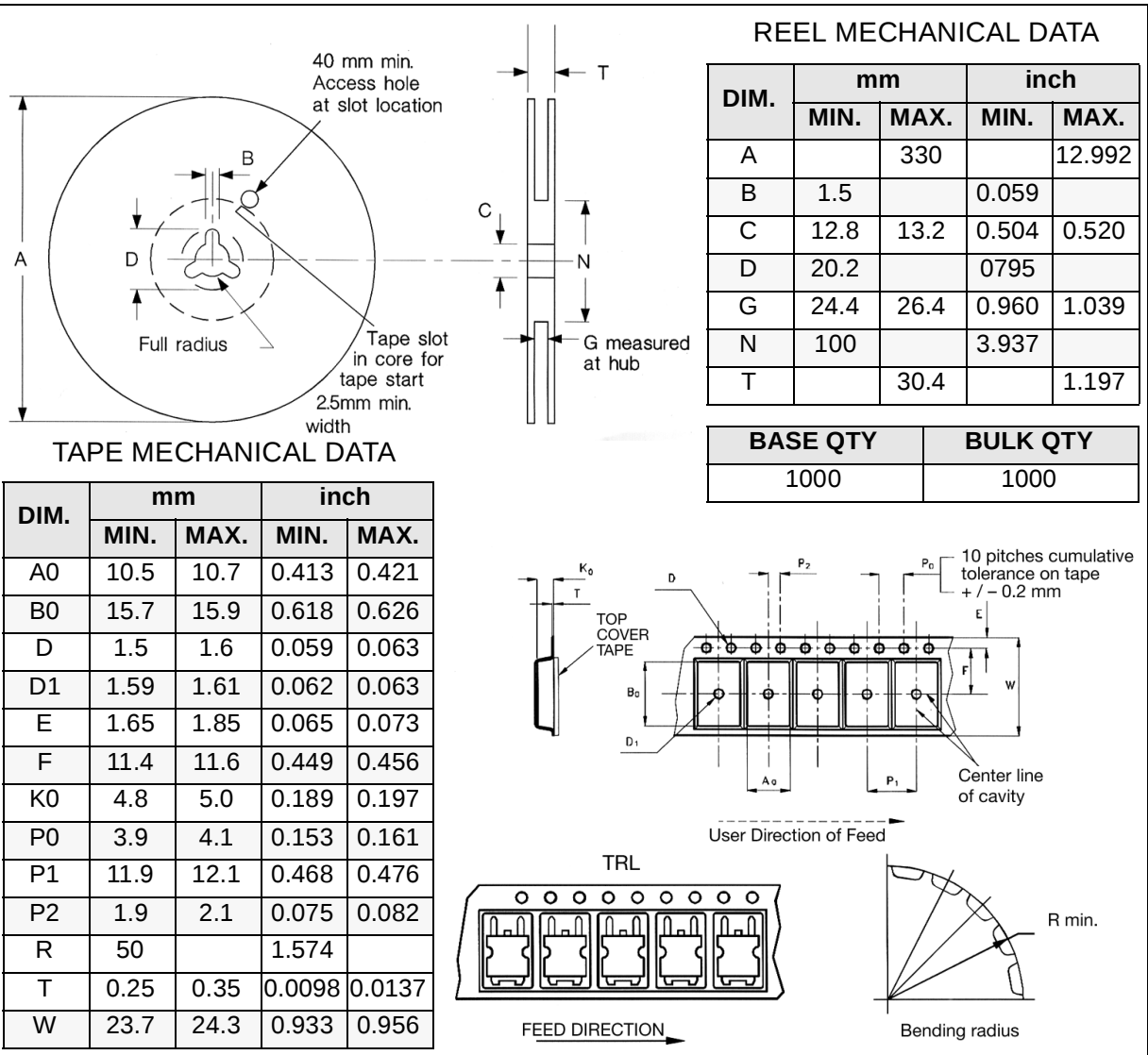
D²PAK FOOTPRINT



TUBE SHIPMENT (no suffix)*



TAPE AND REEL SHIPMENT (suffix "T4")*



* on sales type
10/11

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