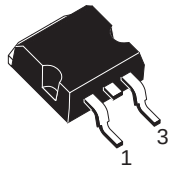
STGB20NB32LZ
STGB20NB32LZ-1

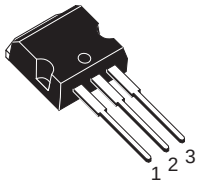
N-CHANNEL CLAMPED 20A - D²PAK/I²PAK
INTERNALLY CLAMPED PowerMESH™ IGBT

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

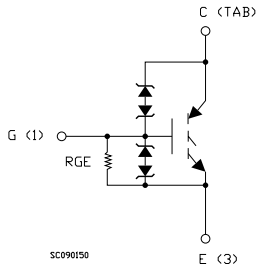


D²PAK



I²PAK

INTERNAL SCHEMATIC DIAGRAM



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	D²PAK	TAPE & REEL
STGB20NB32LZ-1	GB20NB32LZ	I²PAK	TUBE

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
Eas	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

THERMAL DATA

Rthj-case	Thermal Resistance Junction-case Max	1	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	62.5	°C/W

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

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$BV_{(CES)}$	Clamped Voltage	I_C = 2 mA, V_{GE} = 0, Tc= - 40°C	330	355	380	V
		I_C = 2 mA, V_{GE} = 0, Tc= 25°C	325	350	375	V
		I_C = 2 mA, V_{GE} = 0, Tc= 150°C	320	345	370	V
$BV_{(ECR)}$	Emitter Collector Break-down Voltage	I_C = 75 mA, Tc = 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, Tc=-40°C	1.2			V
		V_{CE} = V_{GE}, I_C = 250µA, Tc= 25°C	1	1.4	2	V
		V_{CE} =V_{GE}, I_C = 250µA, Tc=150°C	0.6			V
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage	V_{GE} =4.5V, I_C = 10 A, Tc= 25°C		1.1	1.8	V
		V_{GE} =4.5V, I_C = 10 A, Tc= 150°C		1	1.7	V
		V_{GE} =4.5V, I_C = 20 A, Tc= 25°C		1.35	2	V
		V_{GE} =4.5V, I_C = 20 A, Tc= 150°C		1.25	2	V

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

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
Il	Latching Current	R_{GOFF} =127Ω, V_{Clamp} = 250 V, V_{GE} = 5 V, T_C = 125 °C	34			A
U.I.S.	Functional Test Open Secondary Coil	R_{GOFF} =1KΩ ,Tc=125°C, V_G = 5 V, L = 1.6mH	21.6			A

SWITCHING ON

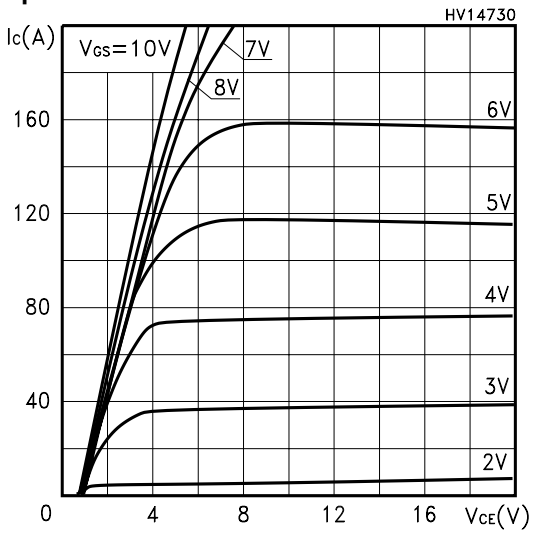
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Delay Time Rise Time	V_{CC} = 250 V, I_C = 20 A R_G = 1KΩ , V_{GE} = 4.5 V		2.3 0.6		µs µs
$(di/dt)_{on}$	Turn-on Current Slope	V_{CC}= 250 V, I_C = 20 A R_G=1KΩ, V_{GE} = 4.5 V		550		A/µs
Eon	Turn-on Switching Losses	V_{CC}= 250 V,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

SWITCHING OFF

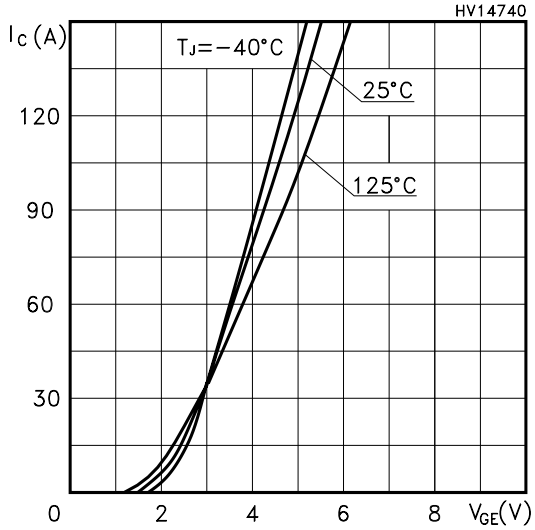
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_c	Cross-Over Time	V_{cc} = 250 V, I_C = 20 A, R_{GE} = 1 KΩ , V_{GE} = 4.5 V		4.8		µs
$t_r(V_{off})$	Off Voltage Rise Time			2.6		µs
t_f	Fall Time			2		µs
$t_{d(off)}$	Off Voltage Delay Time			11.5		µs
E_{off}(**)	Turn-off Switching Loss			11.8	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

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

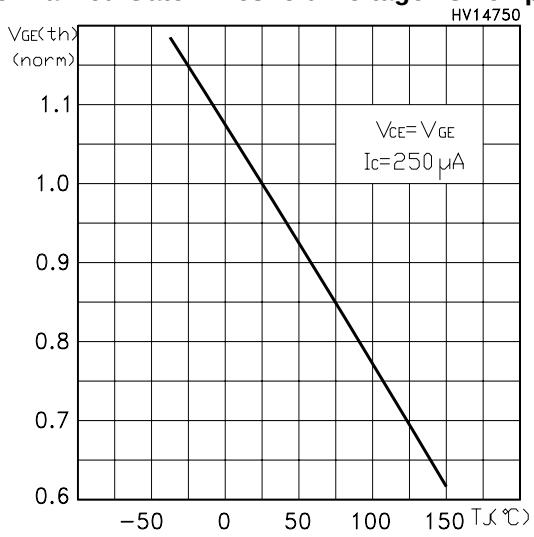
Output Characteristics



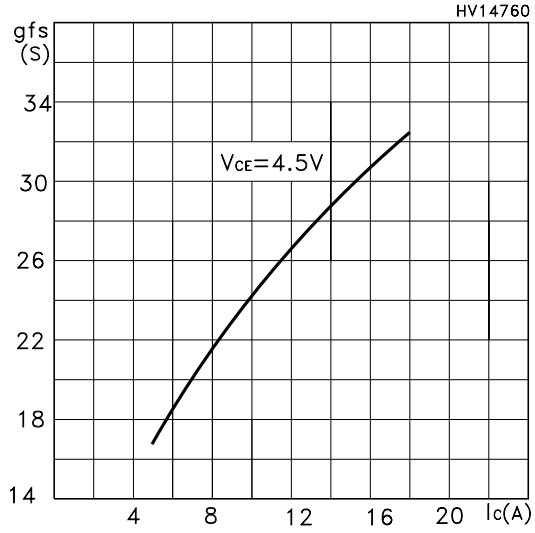
Transfer Characteristics



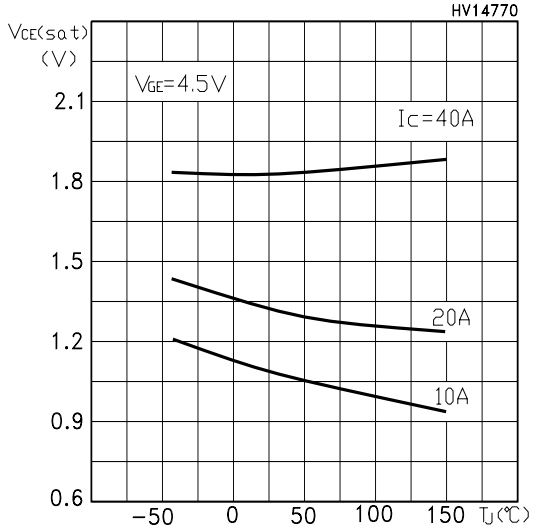
Normalized Gate Threshold Voltage vs Temp.



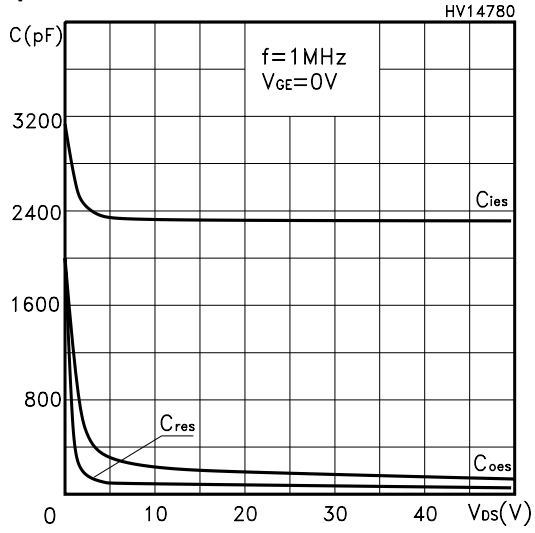
Transconductance



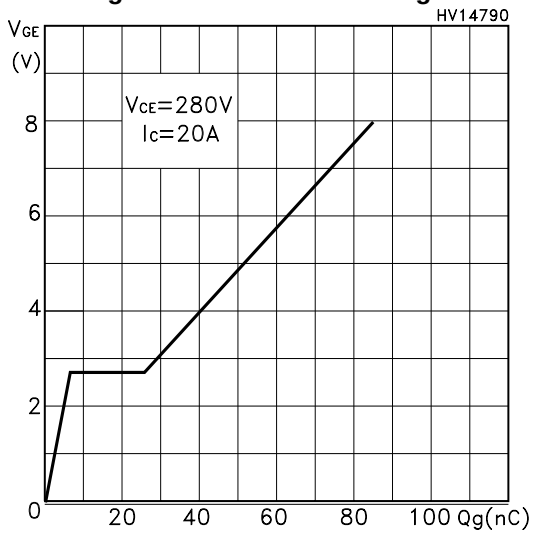
Collector-Emitter On Voltage vs Temperature



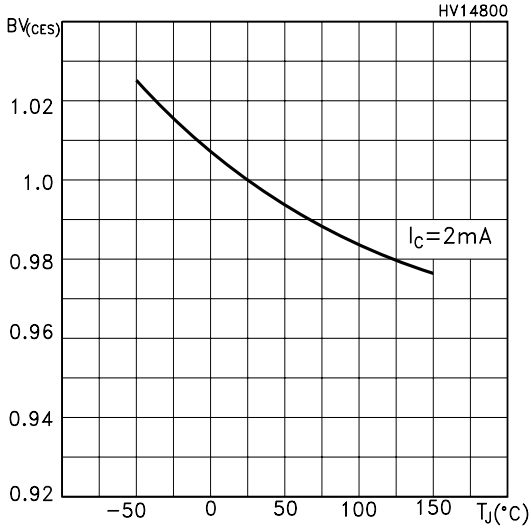
Capacitance Variations



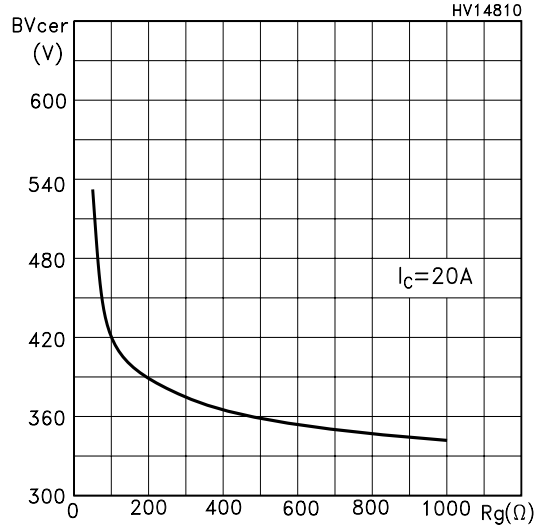
Gate Charge vs Gate-Emitter Voltage



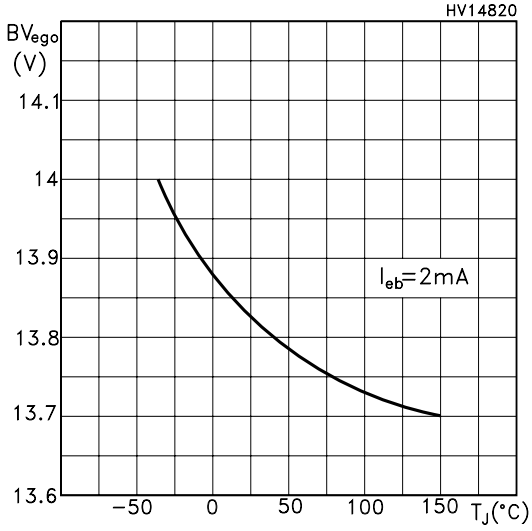
Normalized BreakDown Voltage vs Temperature



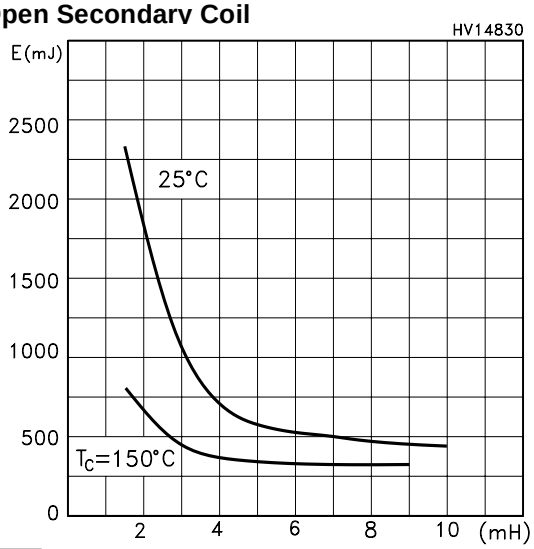
Break-Down Voltage vs Emitter Resistance



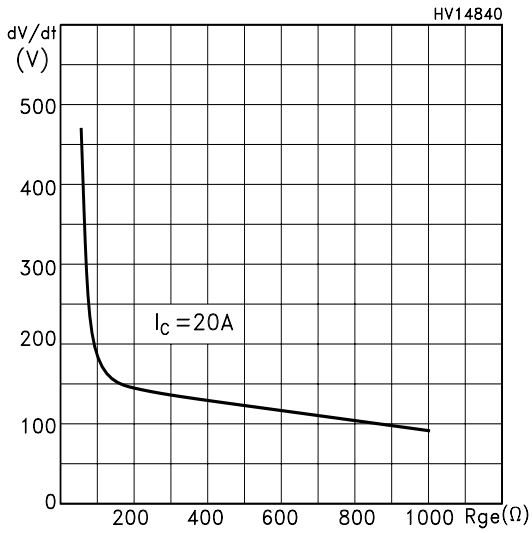
BV_{GEO} (Zener Gate-Emitter) vs Temperature



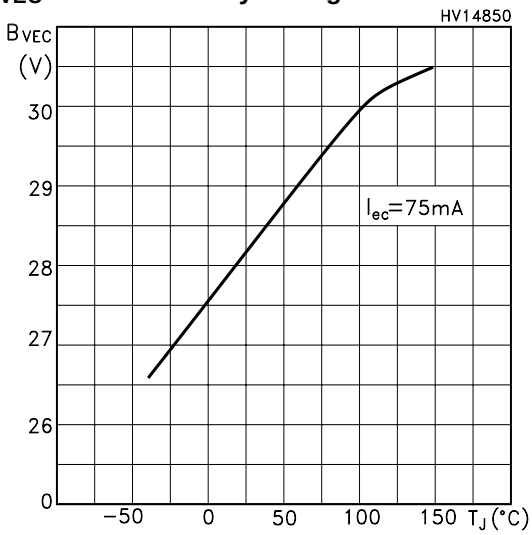
Self Clamped Inductive Switching Energy vs Open Secondary Coil



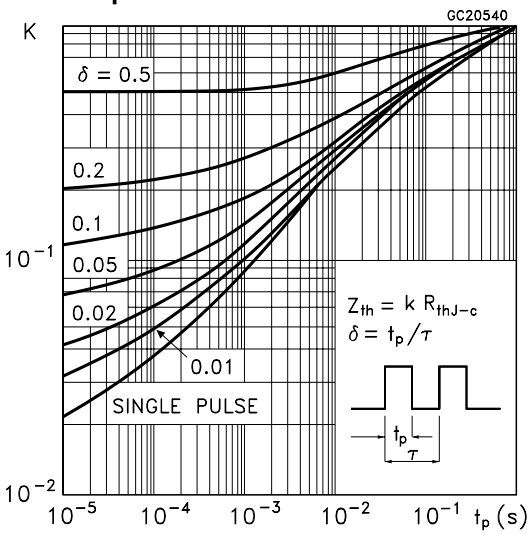
dV/dt Gate-Emitter Resistance



B_{VEC} Reverse Battery Voltage



Thermal Impedance



Switching Off Safe Operating Area

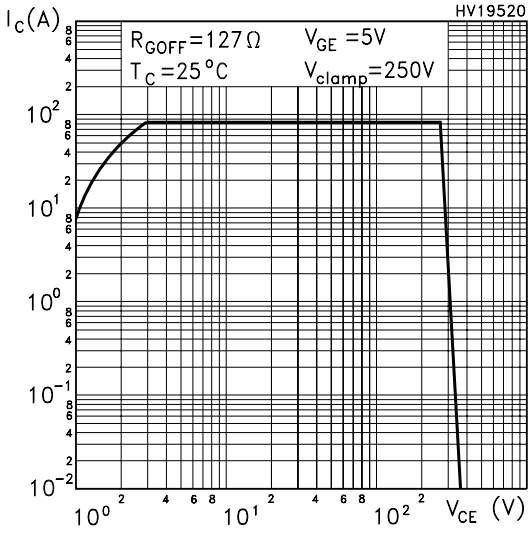


Fig. 1: Unclamped Inductive Load Test Circuit

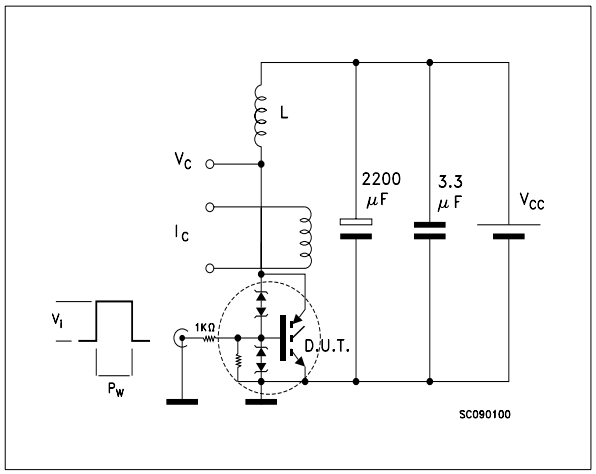


Fig. 2: Unclamped Inductive Waveform

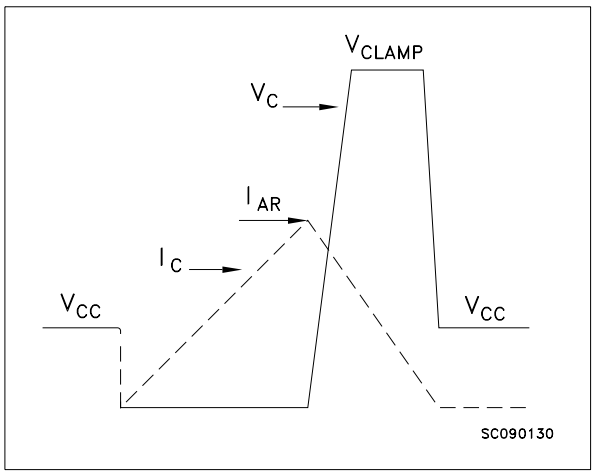


Fig. 3: Test Circuit For Inductive Load Switching And Diode Recovery Times

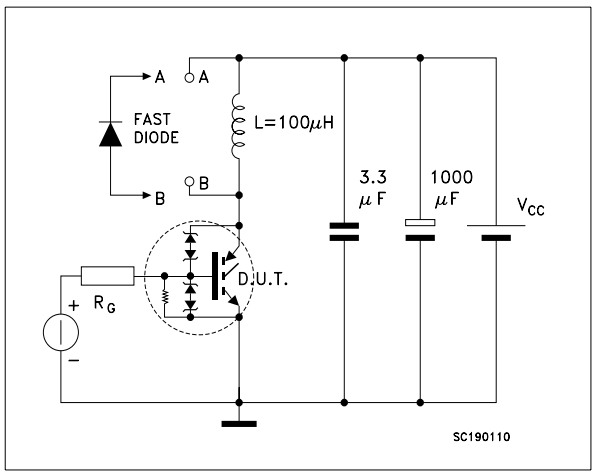
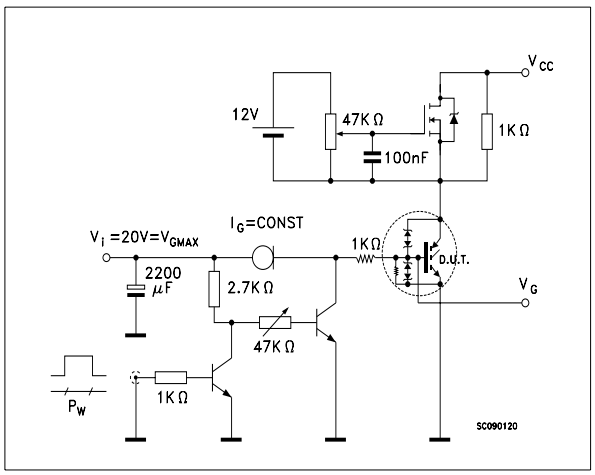
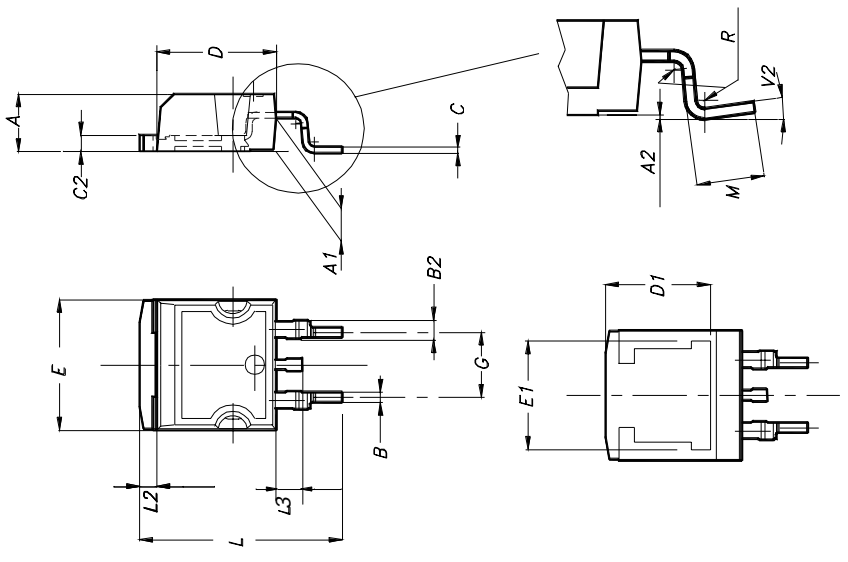


Fig. 4: Gate Charge test Circuit



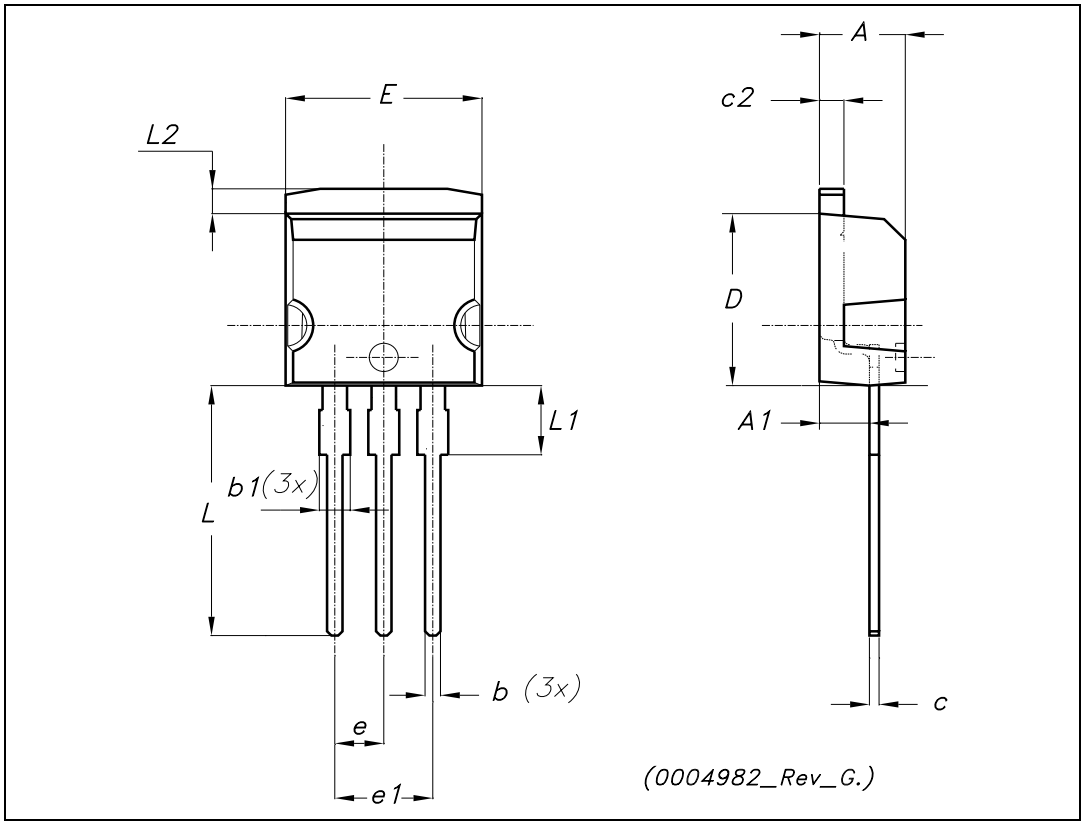
D^2PAK MECHANICAL DATA

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	0º		8º			

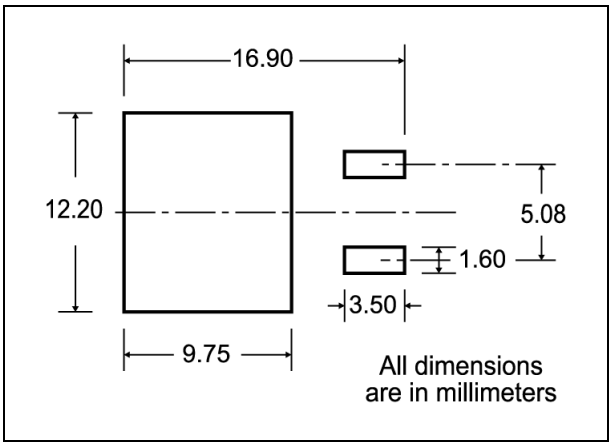


TO-262 (I^2PAK) MECHANICAL DATA

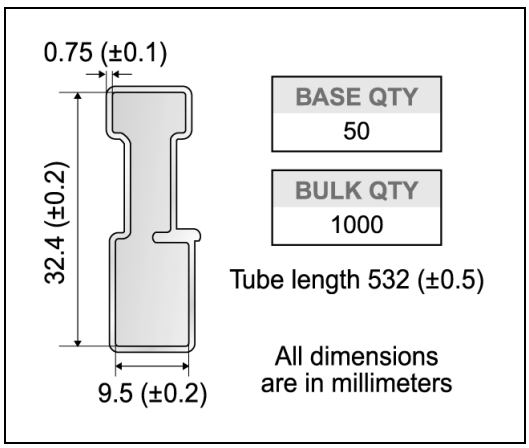
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
A1	2.40		2.72	0.094		0.107
b	0.61		0.88	0.024		0.034
b1	1.14		1.70	0.044		0.066
c	0.49		0.70	0.019		0.027
c2	1.23		1.32	0.048		0.052
D	8.95		9.35	0.352		0.368
e	2.40		2.70	0.094		0.106
e1	4.95		5.15	0.194		0.202
E	10		10.40	0.393		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



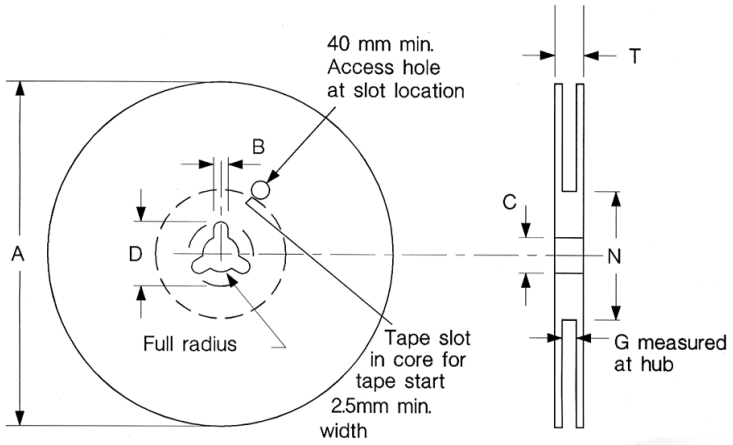
D²PAK FOOTPRINT



TUBE SHIPMENT (no suffix)*



TAPE AND REEL SHIPMENT (suffix "T4")*



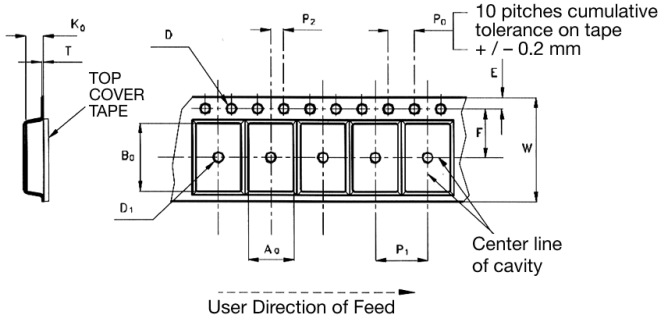
REEL MECHANICAL DATA

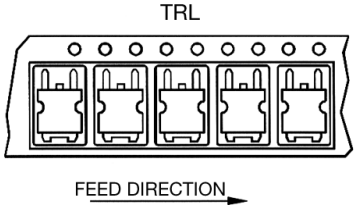
DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A		330		12.992
B	1.5		0.059	
C	12.8	13.2	0.504	0.520
D	20.2		0795	
G	24.4	26.4	0.960	1.039
N	100		3.937	
T		30.4		1.197

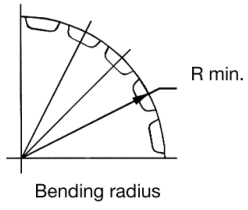
BASE QTY	BULK QTY
1000	1000

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







* on sales type