



STGB10NB37LZ

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

TYPE	V _{CES}	V _{CE(sat)}	I _C
STGB10NB37LZ	CLAMPED	< 1.8 V	20 A

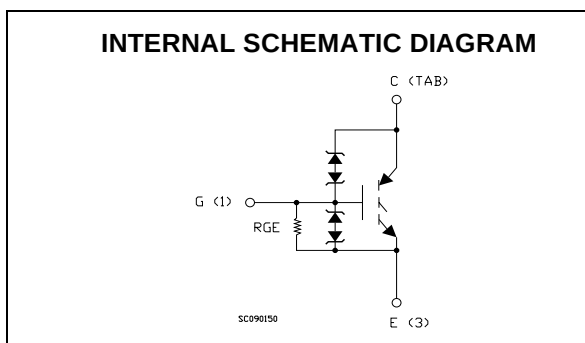
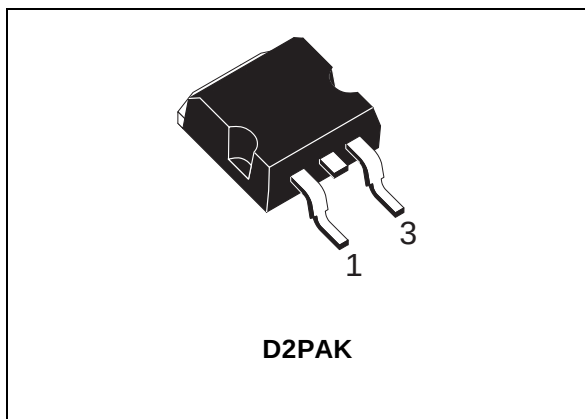
- POLYSILICON GATE VOLTAGE DRIVEN
- LOW THRESHOLD VOLTAGE
- LOW ON-VOLTAGE DROP
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- HIGH VOLTAGE CLAMPING FEATURE

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

- AUTOMOTIVE IGNITION



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{CES}	Collector-Emitter Voltage (V _{GS} = 0)	CLAMPED	V
V _{ECR}	Reverse Battery Protection	18	V
V _{GE}	Gate-Emitter Voltage	CLAMPED	V
I _C	Collector Current (continuous) at T _C = 100°C	20	A
I _{CM}	Collector Current (pulse width < 100μs)	60	A
P _{TOT}	Total Dissipation at T _C = 25°C	125	W
	Derating Factor	0.83	W/°C
ESD	ESD (Human Body Model)	4	KV
T _{stg}	Storage Temperature	-65 to 175	°C
T _j	Max. Operating Junction Temperature	175	°C

THERMAL DATA

Rthj-case	Thermal Resistance Junction-case Max	1.2	°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 (TCASE = 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, T _j = - 40°C to 150°C	375	400	425	V
BV(ECR)	Emitter Collector Break-down Voltage	I _{EC} = 75 mA, V _{GE} = 0, T _j = - 40°C to 150°C	18			V
BV _{GE}	Gate Emitter Break-down Voltage	I _G = ± 2 mA T _j = - 40°C to 150°C	12		16	V
I _{CES}	Collector cut-off Current (V _{GE} = 0)	V _{CE} = 15 V, V _{GE} = 0, T _j = 150 °C V _{CE} = 200 V, V _{GE} = 0, T _C = 150°C			10 100	μA μA
I _{GES}	Gate-Emitter Leakage Current (V _{CE} = 0)	V _{GE} = ± 10V, V _{CE} = 0			± 700	μA
R _{GE}	Gate Emitter Resistance			20		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 _j = - 40°C to 150°C	0.6		2.4	V
V _{CE(SAT)}	Collector-Emitter Saturation Voltage	V _{GE} = 4.5V, I _C = 10 A, T _j = 25°C V _{GE} = 4.5V, I _C = 10 A, T _C = -40°C		1.2 1.3	1.8	V V
I _C	Collector Current	V _{GE} = 4.5V, V _{CE} = 9 V	20			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g _{fs}	Forward Transconductance	V _{CE} = 15 V, I _C = 20 A		18		S
C _{ies}	Input Capacitance	V _{CE} = 25V, f = 1 MHz, V _{GE} = 0		1250		pF
C _{oes}	Output Capacitance			103		pF
C _{res}	Reverse Transfer Capacitance			18		pF
Q _g	Gate Charge	V _{CE} = 320V, I _C = 10 A, V _{GE} = 5V		28		nC

FUNCTIONAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_L	Latching Current	$V_{Clamp} = 320\text{ V}$, $T_C = 125\text{ }^\circ\text{C}$ $R_{G\text{OFF}} = 1\text{ K}\Omega$, $V_{GE} = 5\text{ V}$ $L = 300\mu\text{H}$	20			A
U.I.S.	Unclamped Inductive Switching Current	$R_{G\text{OFF}} = 1\text{ K}\Omega$, $L = 1.6\text{ mH}$, $T_C = 125\text{ }^\circ\text{C}$, $V_{CC} = 30\text{ V}$	15			A

SWITCHING ON

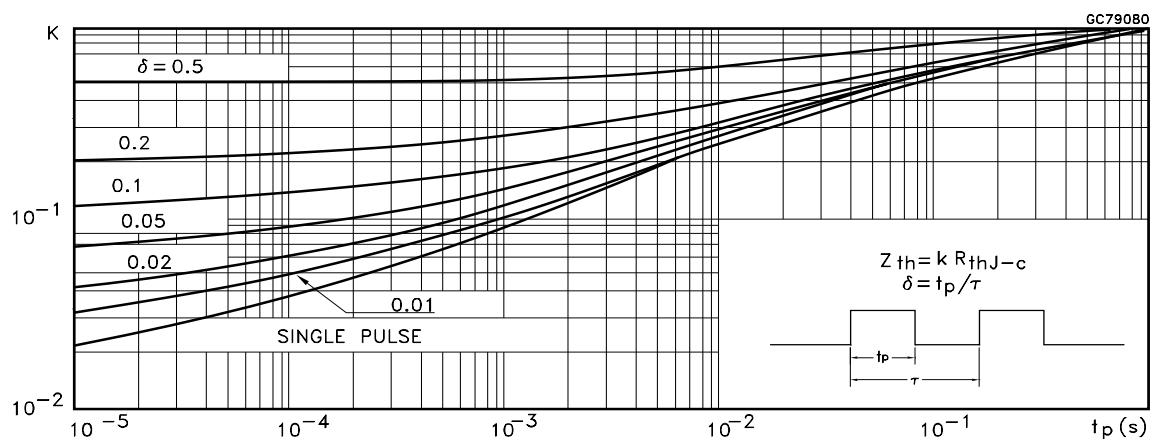
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(\text{on})}$	Turn-on Delay Time	$V_{CC} = 320\text{ V}$, $I_C = 10\text{ A}$		520		ns
t_r	Rise Time	$R_G = 1\text{ K}\Omega$, $V_{GE} = 5\text{ V}$		340		ns
$(di/dt)_{\text{on}}$	Turn-on Current Slope	$V_{CC} = 320\text{ V}$, $I_C = 10\text{ A}$		17		A/ μs
E_{on}	Turn-on Switching Losses	$R_G = 1\text{ K}\Omega$, $V_{GE} = 5\text{ V}$		180		μJ

SWITCHING OFF

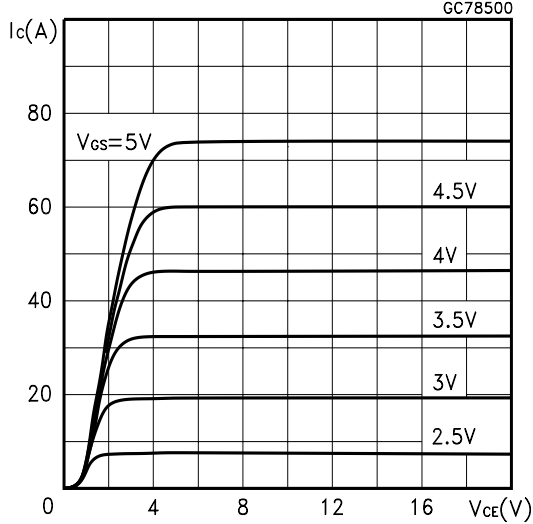
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_c	Cross-over Time	$V_{Clamp} = 320\text{ V}$, $I_C = 10\text{ A}$, $R_{GE} = 1\text{ K}\Omega$, $V_{GE} = 5\text{ V}$		4		μs
$t_r(V_{\text{off}})$	Off Voltage Rise Time			2.2		μs
$t_{d(\text{off})}$	Delay Time			14.8		μs
t_f	Fall Time			1.5		μs
$E_{\text{off}}(**)$	Turn-off Switching Loss			4.0		mJ
t_c	Cross-over Time	$V_{Clamp} = 320\text{ V}$, $I_C = 10\text{ A}$, $R_{GE} = 1\text{ K}\Omega$, $V_{GE} = 5\text{ V}$ $T_J = 125\text{ }^\circ\text{C}$		5.2		μs
$t_r(V_{\text{off}})$	Off Voltage Rise Time			2.8		μs
$t_{d(\text{off})}$	Delay Time			15.8		μs
t_f	Fall Time			2		μs
$E_{\text{off}}(**)$	Turn-off Switching Loss			6.5		mJ

(●) Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %. (1) Pulse width limited by max. junction temperature. (**) Losses Include Also the Tail

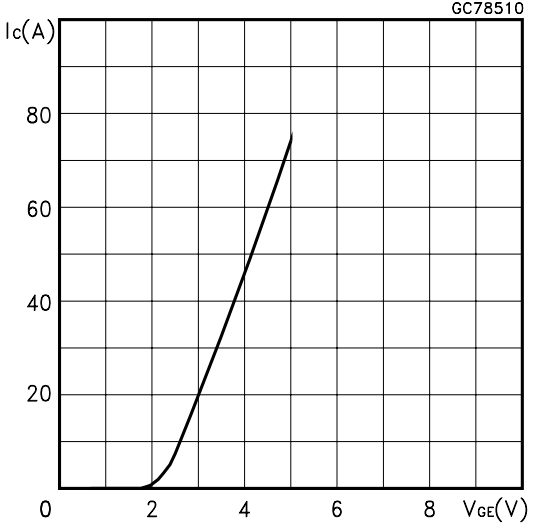
Normalized Transient Thermal Impedance



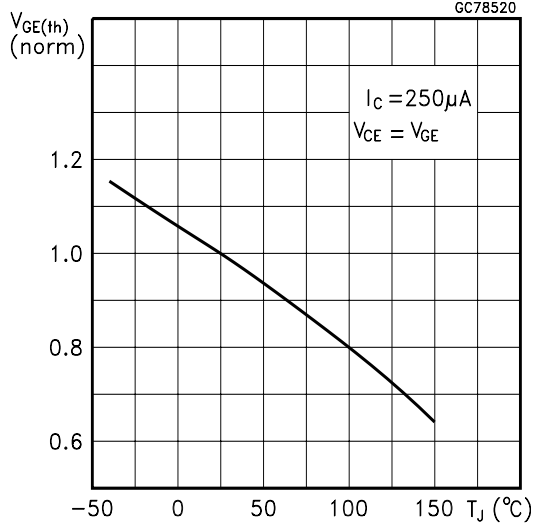
Output Characteristics



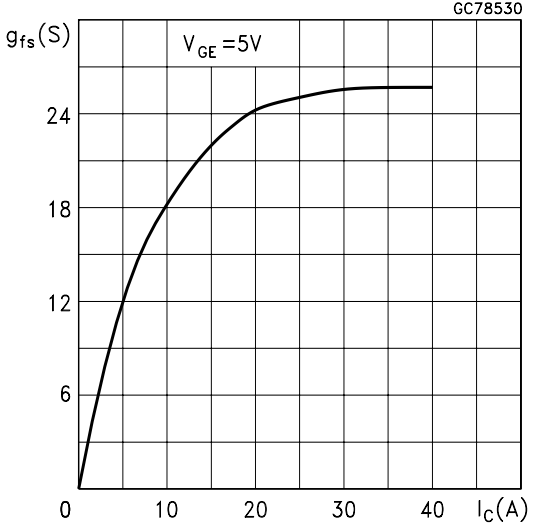
Transfer Characteristics



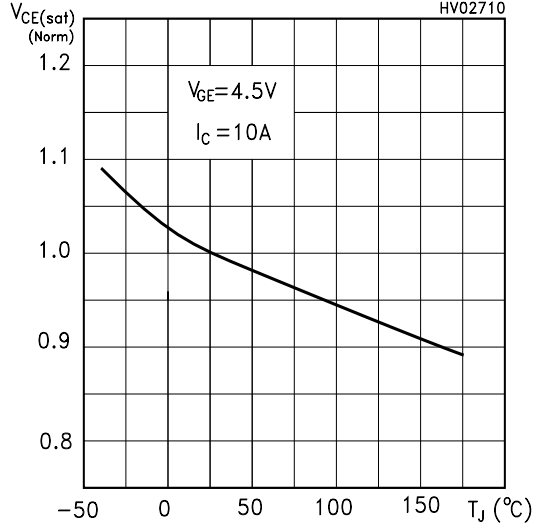
Normalized Gate Threshold Voltage vs Temp.



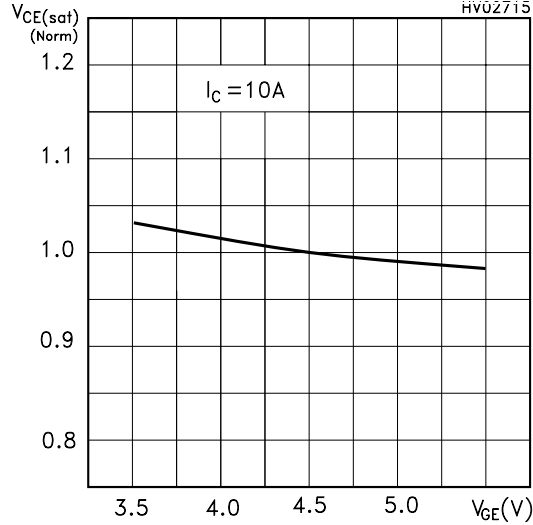
Transconductance



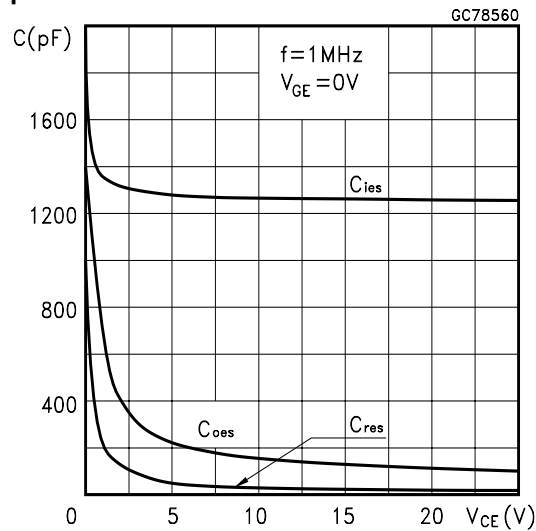
Normalized Collector-Emitter On Voltage vs Temperature



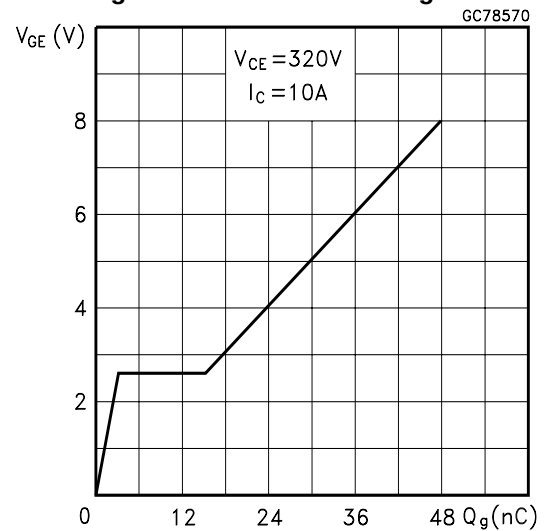
Normalized Collector-Emitter On Voltage vs Gate-Emmitter Voltage



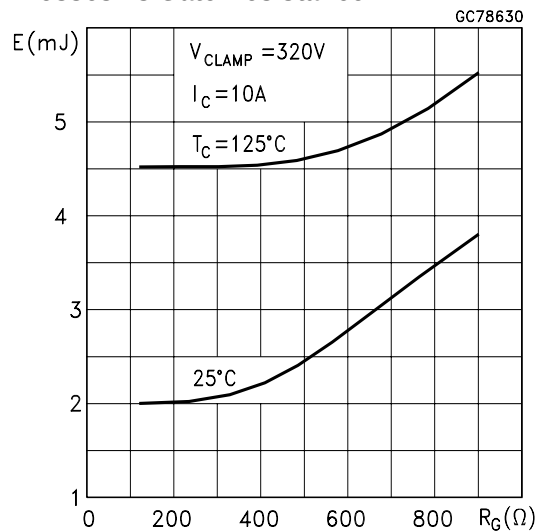
Capacitance Variations



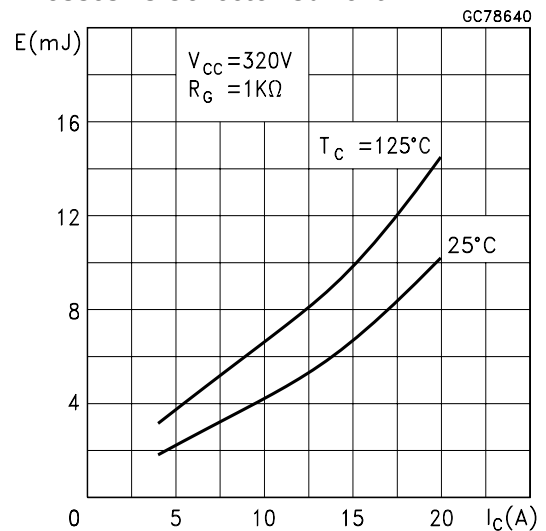
Gate Charge vs Gate-Emitter Voltage



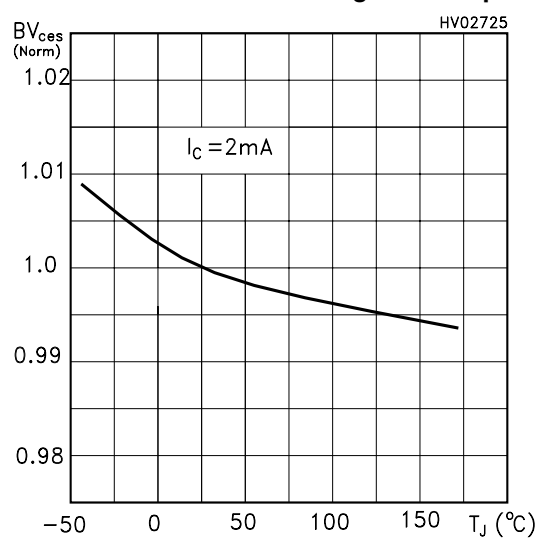
Off Losses vs Gate Resistance



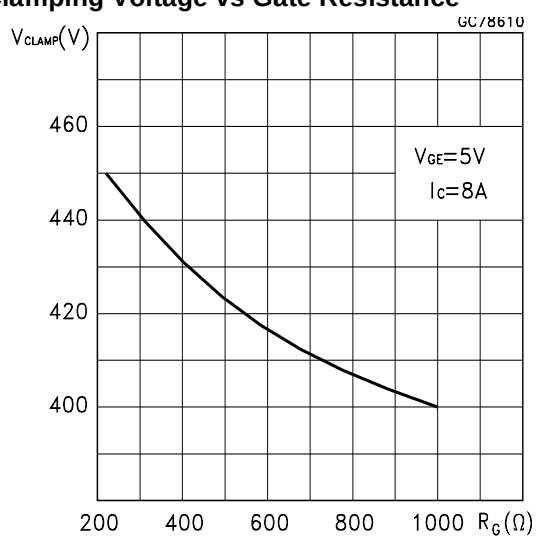
Off Losses vs Collector Current



Normalized Break-down Voltage vs Temp.



Clamping Voltage vs Gate Resistance



Self Clamped Inductive Switching I_{MAX} vs
Open Secondary Coil

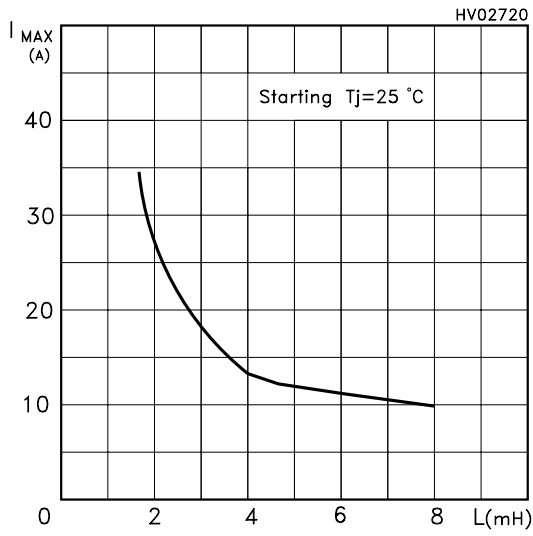
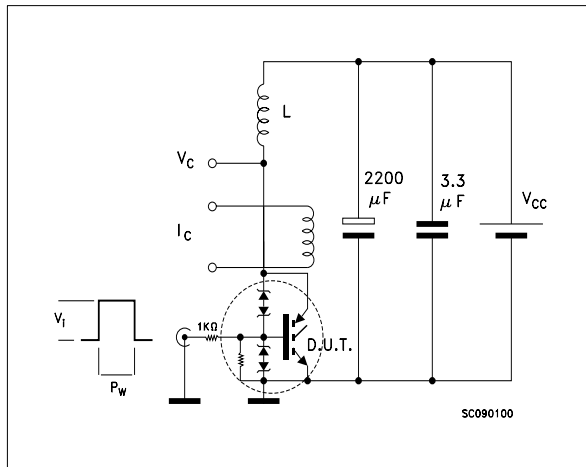
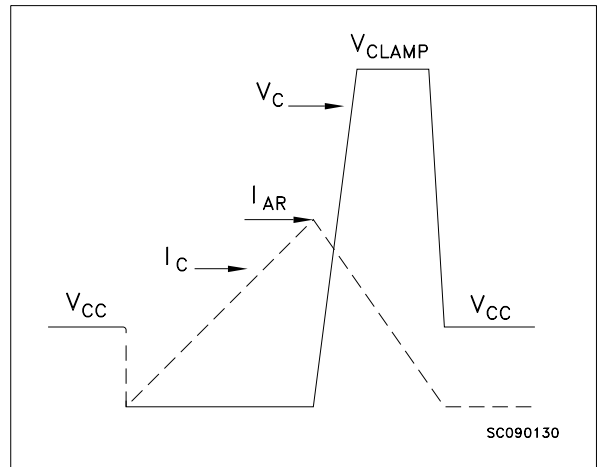
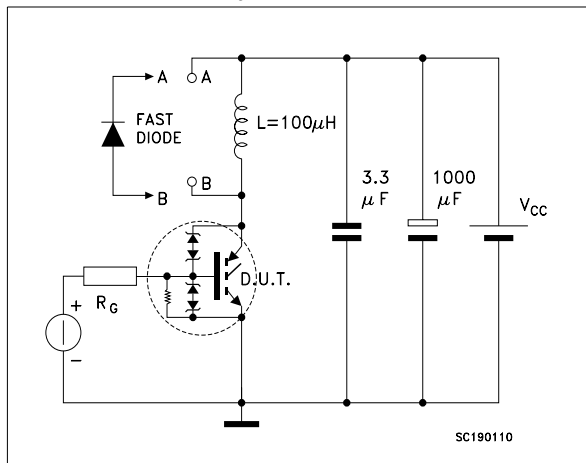
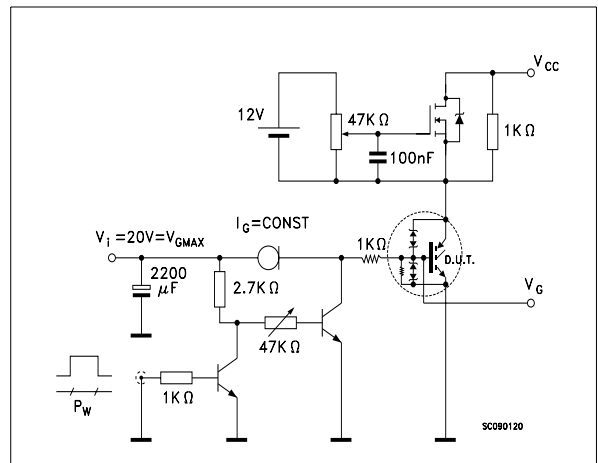
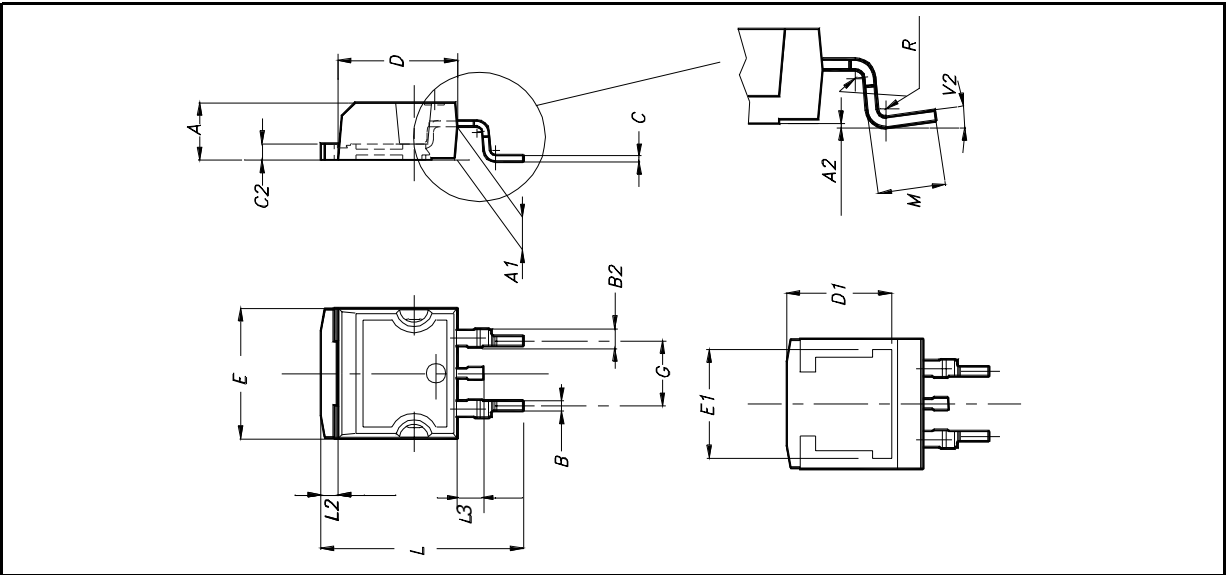
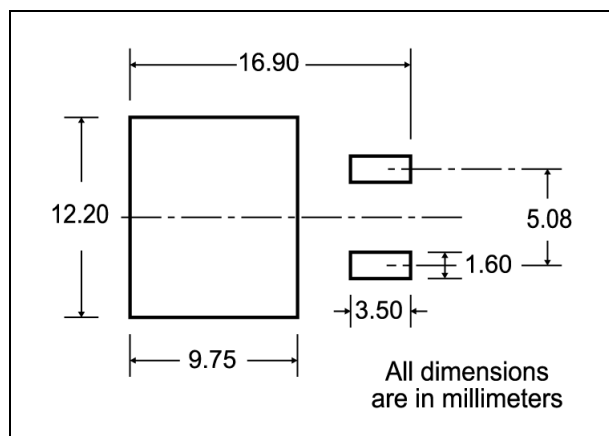
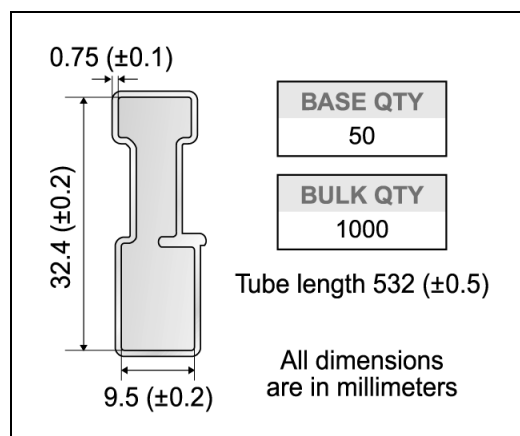


Fig. 1: Unclamped Inductive Load Test Circuit**Fig. 2: Unclamped Inductive Waveform****Fig. 3: Test Circuit For Inductive Load Switching And Diode Recovery Times****Fig. 4: Gate Charge test Circuit**

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°			



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