



STGB3NB60SD

N-CHANNEL 3A - 600V D²PAK

Power MESH™ IGBT

TYPE	V _{CES}	V _{CE(sat)}	I _C
STGB3NB60SD	600 V	<1.5 V	3 A

- HIGH INPUT IMPEDANCE (VOLTAGE DRIVEN)
- VERY LOW ON-VOLTAGE DROP (V_{cesat})
- HIGH CURRENT CAPABILITY
- OFF LOSSES INCLUDE TAIL CURRENT
- INTEGRATED FREEWHEELING DIODE
- SURFACE-MOUNTING D²PAK (TO-263) POWER PACKAGE 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 suffix "S" identifies a family optimized to achieve minimum on-voltage drop for low frequency applications (<1kHz).

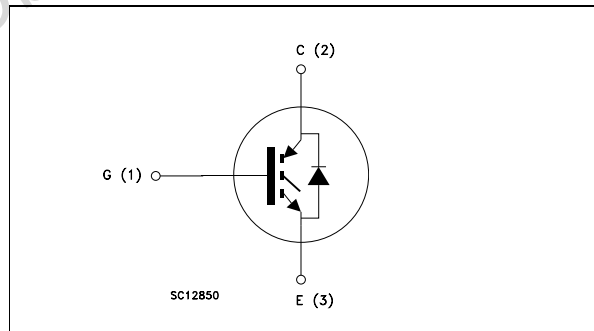
APPLICATIONS

- GAS DISCHARGE LAMP
- STATIC RELAYS
- MOTOR CONTROL



D²PAK
TO-263
(suffix "T4")

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{CES}	Collector-Emitter Voltage (V _{GS} = 0)	600	V
V _{GE}	Gate-Emitter Voltage	± 20	V
I _C	Collector Current (continuous) at T _C =25°C	6	A
I _C	Collector Current (continuous) at T _C =100°C	3	A
I _{CM} (●)	Collector Current (pulsed)	25	A
P _{tot}	Total Dissipation at T _C = 25°C	70	W
	Derating Factor	0.46	W/°C
T _{stg}	Storage Temperature	-60 to 175	°C
T _j	Max. Operating Junction Temperature	175	°C

(●) Pulse width limited by safe operating area.

STGB3NB60SD

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	2.14	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5	°C/W
$R_{thc-sink}$	Thermal Resistance Case-sink	Typ	0.5	°C/W

ELECTRICAL CHARACTERISTICS ($T_{case} = 25\text{ °C}$ unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{BR(CES)}$	Collector-Emitter Breakdown Voltage	$I_D = 250\text{ }\mu\text{A}$ $V_{GE} = 0$	600			V
I_{CES}	Collector cut-off ($V_{GE} = 0$)	$V_{CE} = \text{Max Rating}$ $T_j = 25\text{ °C}$ $V_{CE} = \text{Max Rating}$ $T_j = 125\text{ °C}$			10 100	μA μA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 20\text{ V}$ $V_{CE} = 0$			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GE(th)}$	Gate Threshold Voltage	$V_{CE} = V_{GE}$ $I_C = 250\text{ }\mu\text{A}$	2.5		5	V
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage	$V_{GE} = 15\text{ V}$ $I_C = 1.5\text{ A}$ $V_{GE} = 15\text{ V}$ $I_C = 3\text{ A}$ $V_{GE} = 15\text{ V}$ $I_D = 3\text{ A}$ $T_j = 125\text{ °C}$		1 1.2 1.1	1.5	V V V

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs}	Forward Transconductance	$V_{CE} = 25\text{ V}$ $I_C = 3\text{ A}$	1.7	2.5		S
C_{ies}	Input Capacitance	$V_{CE} = 25\text{ V}$ $f = 1\text{ MHz}$ $V_{GE} = 0$		255	330	pF
C_{oes}	Output Capacitance			30	40	pF
C_{res}	Reverse Transfer Capacitances			5.6	7	pF
Q_G	Total Gate Charge	$V_{CE} = 480\text{ V}$ $I_C = 3\text{ A}$ $V_{GE} = 15\text{ V}$		18		nC
Q_{GE}	Gate-Emitter Charge			5.4		nC
Q_{GC}	Gate-Collector Charge			5.5		nC
I_{CL}	Latching Current	$V_{clamp} = 480\text{ V}$ $R_G = 1\text{ k}\Omega$ $T_j = 150\text{ °C}$	12			A

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Delay Time Rise Time	$V_{CC} = 480\text{ V}$ $I_C = 3\text{ A}$ $V_{GE} = 15\text{ V}$ $R_G = 1\text{ k}\Omega$		125 150		ns ns
$(di/dt)_{on}$ E_{on}	Turn-on Current Slope Turn-on Switching Losses	$V_{CC} = 480\text{ V}$ $I_C = 3\text{ A}$ $V_{GE} = 15\text{ V}$ $R_G = 1\text{ k}\Omega$ $T_j = 125\text{ °C}$		50 1100		A/ μs μJ

ELECTRICAL CHARACTERISTICS (continued)**SWITCHING OFF**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_c	Cross-Over Time	$V_{CC} = 480\text{ V}$ $I_C = 3\text{ A}$		1.8		μs
$t_r(v_{off})$	Off Voltage Rise Time	$R_{GE} = 1\text{ k}\Omega$ $V_{GE} = 15\text{ V}$		1.0		μs
$t_d(v_{off})$	Delay Time			3.4		μs
t_f	Fall Time			0.72		μs
$E_{off(**)}$	Turn-off Switching Loss			1.15		mJ
t_c	Cross-Over Time	$V_{CC} = 480\text{ V}$ $I_C = 3\text{ A}$		2.8		μs
$t_r(v_{off})$	Off Voltage Rise Time	$R_{GE} = 1\text{ k}\Omega$ $V_{GE} = 15\text{ V}$		1.45		μs
$t_d(v_{off})$	Delay Time	$T_j = 125\text{ }^\circ\text{C}$		3.6		μs
t_f	Fall Time			1.2		μs
$E_{off(**)}$	Turn-off Switching Loss			1.8		mJ

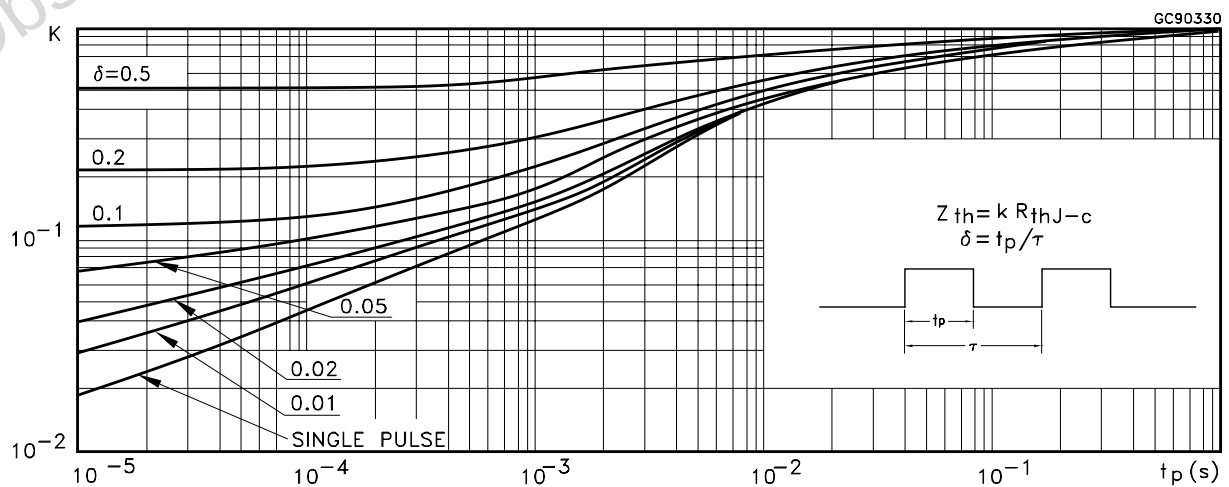
COLLECTOR-EMITTER DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_f	Forward Current				3	A
I_{fm}	Forward Current pulsed				25	A
V_f	Forward On-Voltage	$I_f = 3\text{ A}$ $I_f = 1\text{ A}$		1.55 1.15	1.9	V V
t_{rr}	Reverse Recovery Time	$I_f = 3\text{ A}$ $V_R = 200\text{ V}$		1700		ns
Q_{rr}	Reverse Recovery Charge	$di/dt = 100\text{ A}/\mu\text{s}$ $T_j = 125\text{ }^\circ\text{C}$		4500		nC
I_{rrm}	Reverse Recovery Current			9.5		A

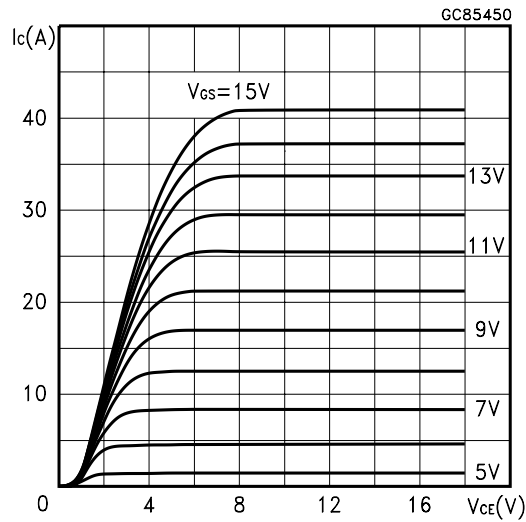
(●) Pulse width limited by max. junction temperature

(*) Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %.

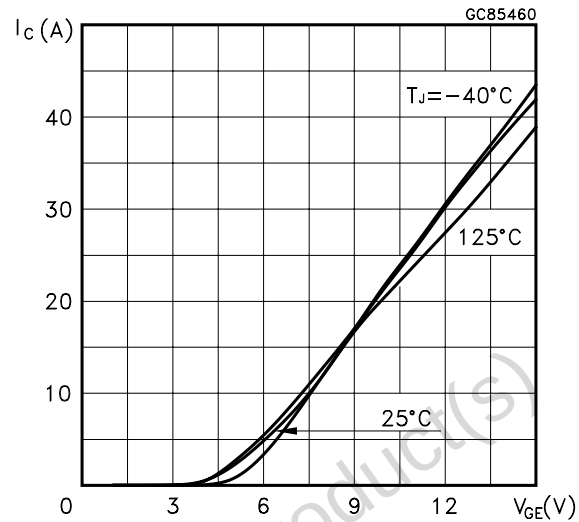
(**) Losses Include Also The Tail (Jedec Standardization)

Thermal Impedance

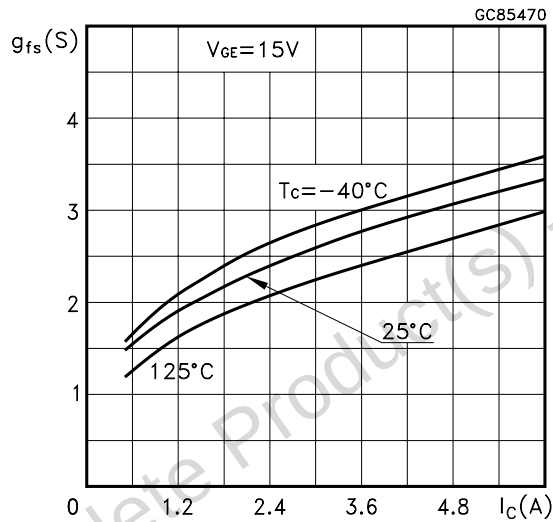
Output Characteristics



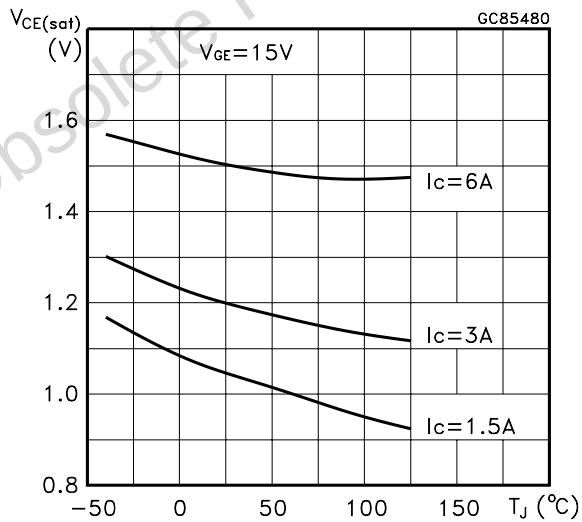
Transfer Characteristics



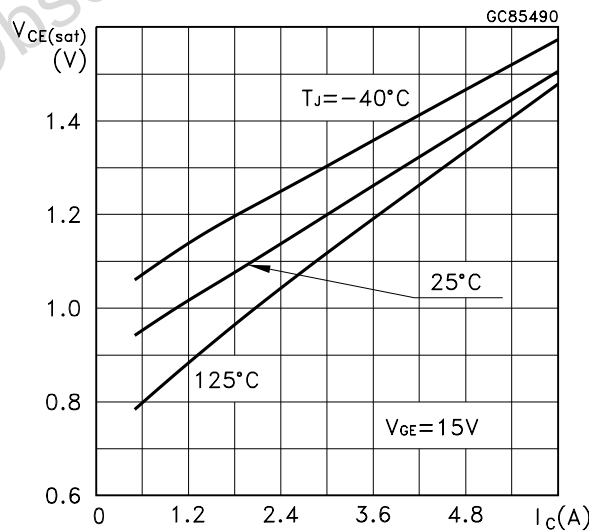
Transconductance



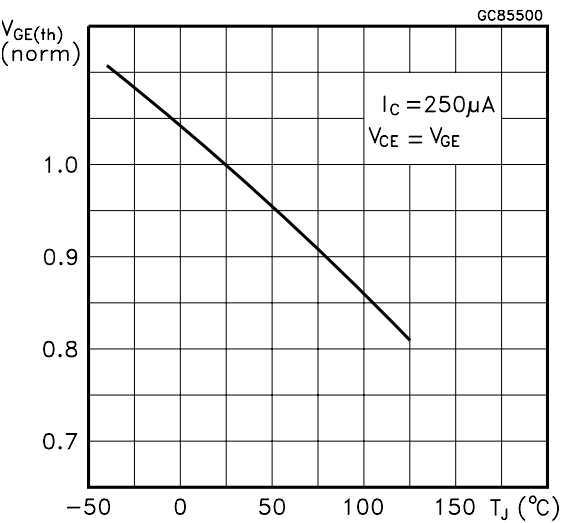
Collector-Emitter on Voltage vs Temperature



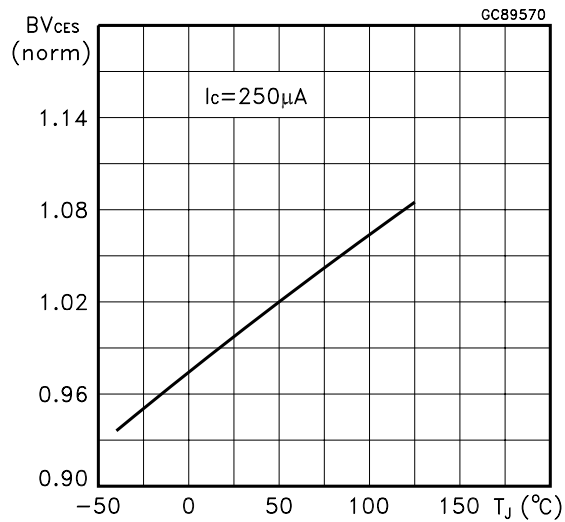
Collector-Emitter on Voltage vs Collector Current



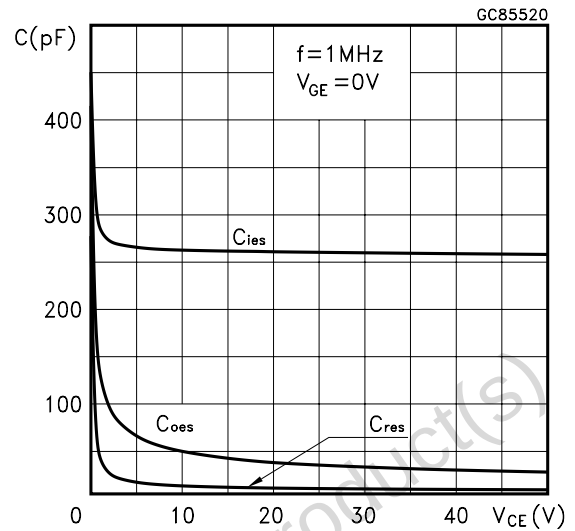
Gate Threshold vs Temperature



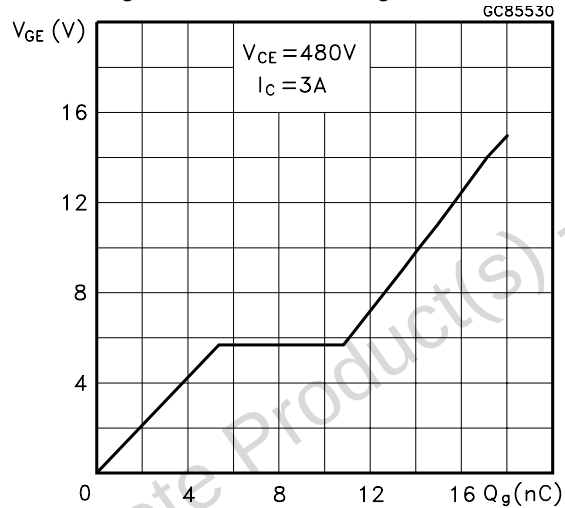
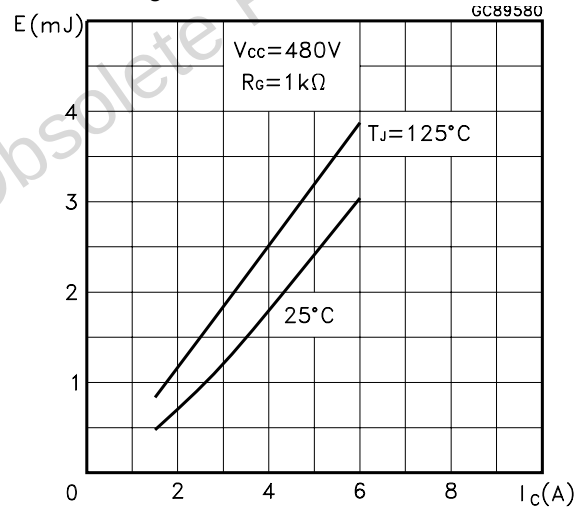
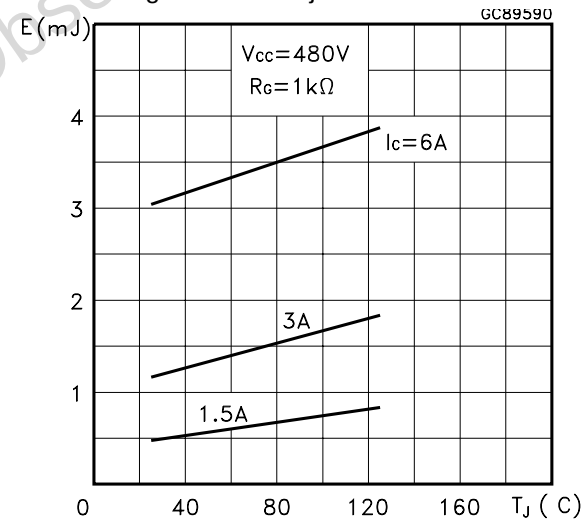
Normalized Breakdown Voltage vs Temperature



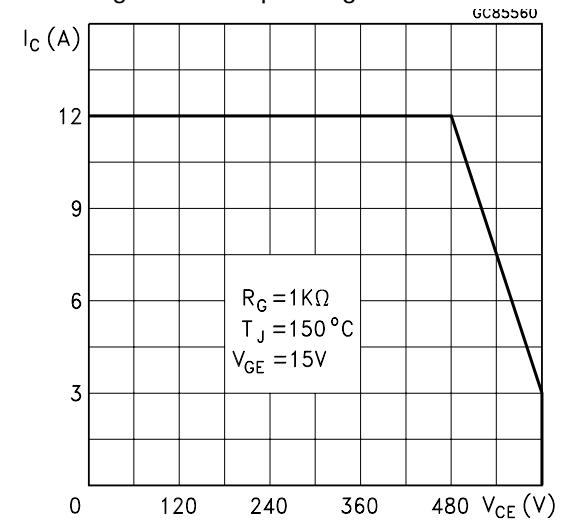
Capacitance Variations



Gate charge Gate-Emitter Voltage

Off Switching Losses vs I_C Off Switching Losses vs T_J 

Switching Off Safe Operating Area



Diode Forward vs Tj

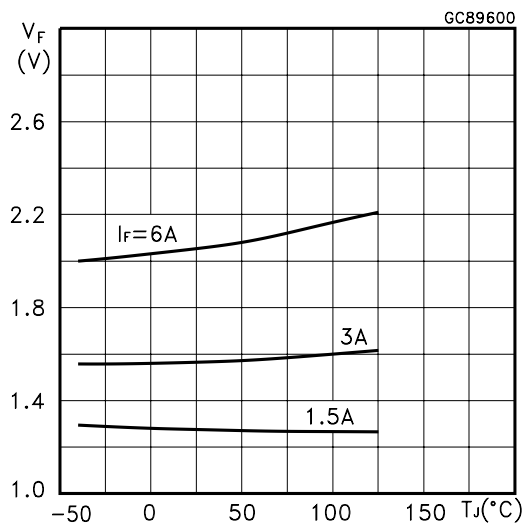
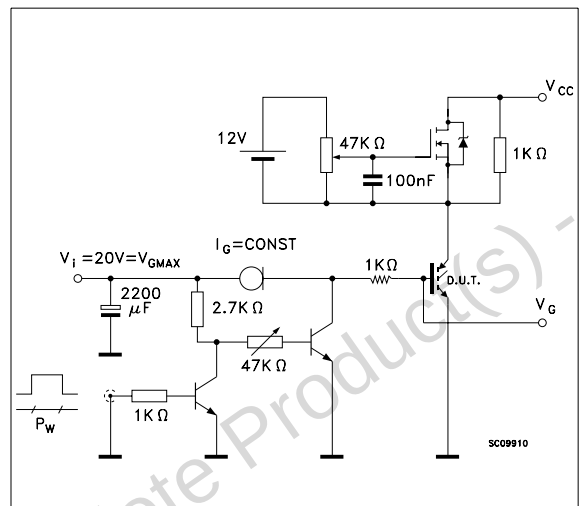


Fig. 1: Gate Charge test Circuit



Diode Forward Voltage

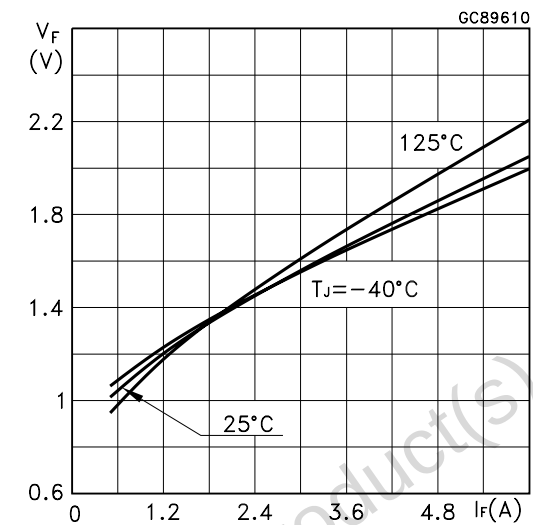


Fig. 2 Test Circuit For Inductive Load Switching

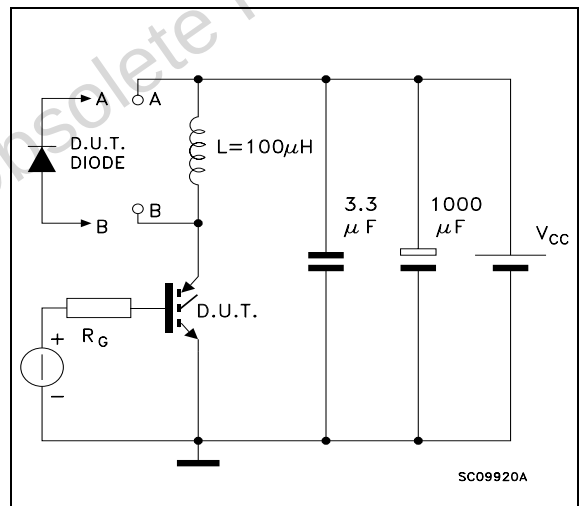
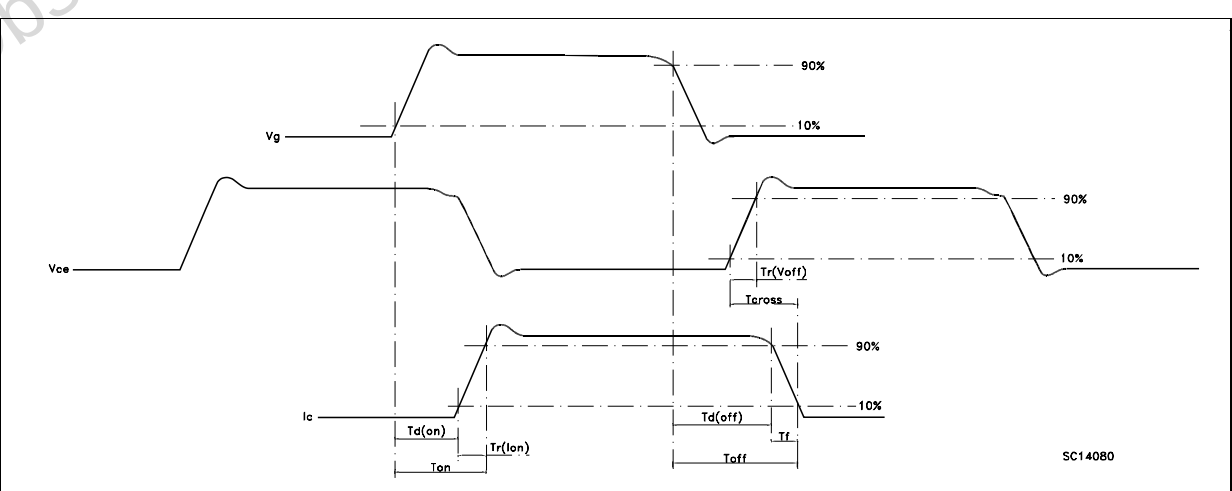
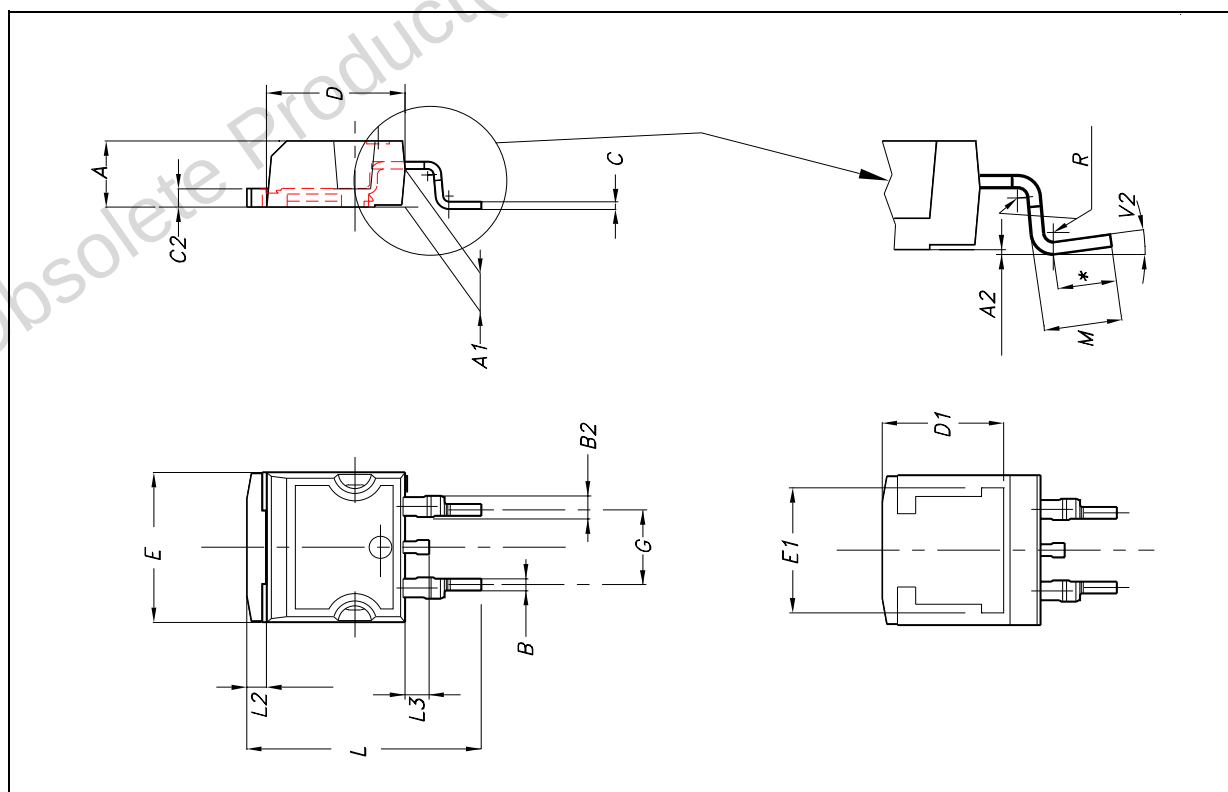


Fig. 3: Switching Waveforms



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°			



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