



## STGD3NB60H

N-CHANNEL 3A - 600V - DPAK

PowerMESH™ IGBT

TYPE	V <sub>CES</sub>	V <sub>CE(sat)</sub>	I <sub>C</sub>
STD3NB60H	600 V	< 2.8 V	3 A

- HIGH INPUT IMPEDANCE
- LOW ON-VOLTAGE DROP (V<sub>cesat</sub>)
- OFF LOSSES INCLUDE TAIL CURRENT
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- VERY HIGH FREQUENCY OPERATION
- CO-PACKAGED WITH TURBOSWITCHT
- TYPICAL SHORT CIRCUIT WITHSTAND TIME  
5MICROS S-family, 4 micro H family
- ANTIPARALLEL DIODE

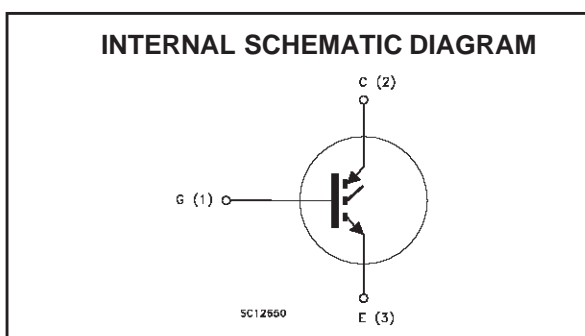
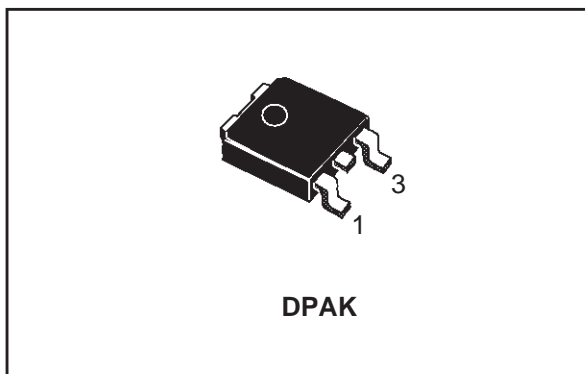
### DESCRIPTION

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 "H" identifies a family optimized for high frequency applications (up to 50kHz) in order to achieve very high switching performances (reduced t<sub>fall</sub>) maintaining a low voltage drop.

### APPLICATIONS

- HIGH FREQUENCY MOTOR CONTROLS
- SMPS and PFC IN BOTH HARD SWITCH AND RESONANT TOPOLOGIES



### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V <sub>CES</sub>	Collector-Emitter Voltage (V <sub>GS</sub> = 0)	600	V
V <sub>ECR</sub>	Emitter-Collector Voltage	20	V
V <sub>GE</sub>	Gate-Emitter Voltage	± 20	V
I <sub>C</sub>	Collector Current (continuous) at T <sub>C</sub> = 25°C	6	A
I <sub>C</sub>	Collector Current (continuous) at T <sub>C</sub> = 100°C	3	A
I <sub>CM</sub> (■)	Collector Current (pulsed)	24	A
P <sub>TOT</sub>	Total Dissipation at T <sub>C</sub> = 25°C	35	W
	Derating Factor	0.28	W/°C
T <sub>stg</sub>	Storage Temperature	-65 to 150	°C
T <sub>j</sub>	Max. Operating Junction Temperature	150	°C

## STGD3NB60H

### THERMAL DATA

Rthj-case	Thermal Resistance Junction-case Max	3.57	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	100	°C/W
Rthc-sink	Thermal Resistance Case-sink Typ	1.5	°C/W

### ELECTRICAL CHARACTERISTICS (TCASE = 25 °C UNLESS OTHERWISE SPECIFIED)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{BR(CEs)}$	Collectro-Emitter Breakdown Voltage	$I_C = 250 \mu A, V_{GE} = 0$	600			V
$I_{CES}$	Collector cut-off ( $V_{GE} = 0$ )	$V_{CE} = \text{Max Rating}, T_C = 25 \text{ }^\circ\text{C}$ $V_{CE} = \text{Max Rating}, T_C = 125 \text{ }^\circ\text{C}$			10 100	$\mu A$ $\mu A$
$I_{GES}$	Gate-Emitter Leakage Current ( $V_{CE} = 0$ )	$V_{GE} = \pm 20V, V_{CE} = 0$			$\pm 100$	nA

ON (1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GE(th)}$	Gate Threshold Voltage	$V_{CE} = V_{GE}, I_C = 250\mu A$	3		5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$V_{GE} = 15V, I_C = 3 A$ $V_{GE} = 15V, I_C = 3 A, T_J = 125^\circ C$		2.4 1.9	2.8	V V

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$g_{fs}$	Forward Transconductance	$V_{CE} = 25 V, I_C = 3 A$	1.3	2.4		S
$C_{ies}$	Input Capacitance	$V_{CE} = 25V, f = 1 \text{ MHz}, V_{GE} = 0$		235		pF
$C_{oes}$	Output Capacitance			33		pF
$C_{res}$	Reverse Transfer Capacitance			6.6		pF
$Q_g$	Total Gate Charge	$V_{CE} = 480V, I_C = 3 A,$ $V_{GE} = 15V$		21	27	nC
$Q_{ge}$	Gate-Emitter Charge			6		nC
$Q_{gc}$	Gate-Collector Charge			7.6		nC
$I_{CL}$	Latching Current	$V_{clamp} = 480 V, T_J = 125^\circ C$ $R_G = 10 \Omega$	12			A

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	$V_{CC} = 480 V, I_C = 3 A$ $R_G = 10\Omega, V_{GE} = 15 V$		16		ns
$t_r$	Rise Time			30		ns
$(di/dt)_{on}$	Turn-on Current Slope	$V_{CC} = 480 V, I_C = 3 A R_G = 10\Omega$ $V_{GE} = 15 V, T_J = 125^\circ C$		400		A/ $\mu s$
$E_{on}$	Turn-on Switching Losses			37		$\mu J$

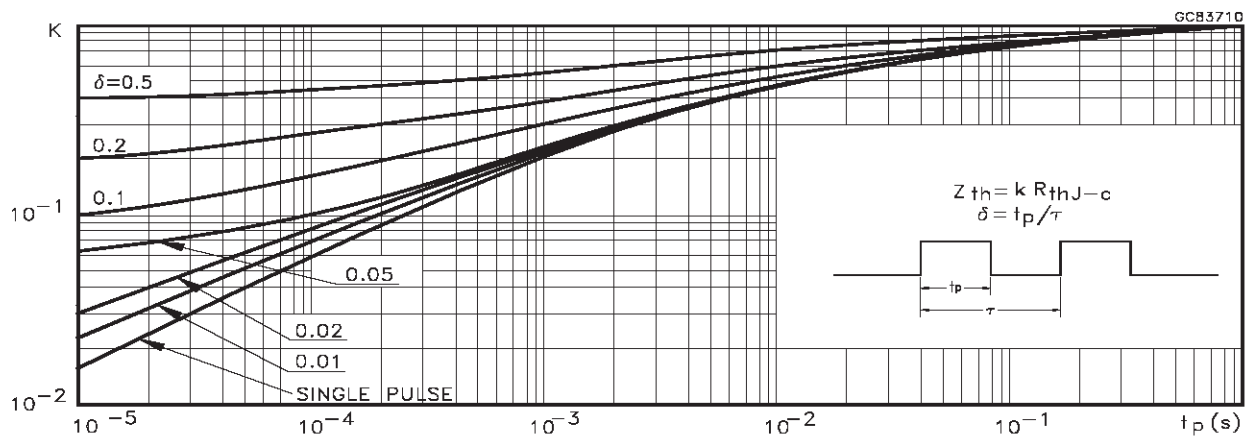
**ELECTRICAL CHARACTERISTICS (CONTINUED)**

**SWITCHING OFF**

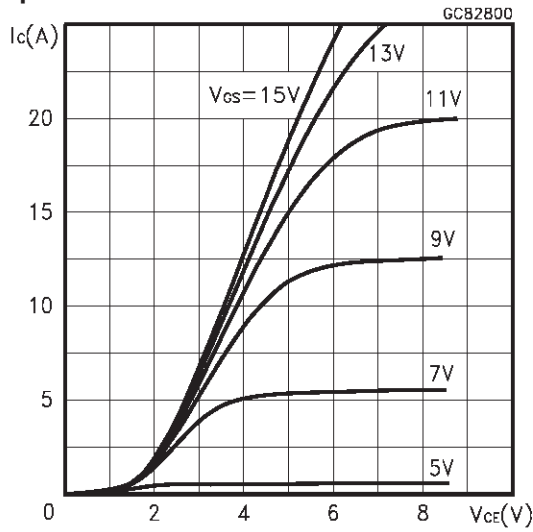
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_c$	Cross-over Time	$V_{CC} = 480\text{ V}, I_C = 3\text{ A},$ $R_{GE} = 10\ \Omega, V_{GE} = 15\text{ V}$		90		ns
$t_r(V_{off})$	Off Voltage Rise Time			36		ns
$t_{d(off)}$	Delay Time			53		ns
$t_f$	Fall Time			70		ns
$E_{off(**)}$	Turn-off Switching Loss			33		$\mu\text{J}$
$E_{ts}$	Total Switching Loss			65		$\mu\text{J}$
$t_c$	Cross-over Time	$V_{CC} = 480\text{ V}, I_C = 3\text{ A},$ $R_{GE} = 10\ \Omega, V_{GE} = 15\text{ V}$ $T_j = 125\text{ }^\circ\text{C}$		180		ns
$t_r(V_{off})$	Off Voltage Rise Time			82		ns
$t_{d(off)}$	Delay Time			58		ns
$t_f$	Fall Time			110		ns
$E_{off(**)}$	Turn-off Switching Loss			88		$\mu\text{J}$
$E_{ts}$	Total Switching Loss			125		$\mu\text{J}$

Note: 1. Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %.  
 2. Pulse width limited by max. junction temperature.  
 (\*\*)Losses include Also the Tail (Jedec Standardization)

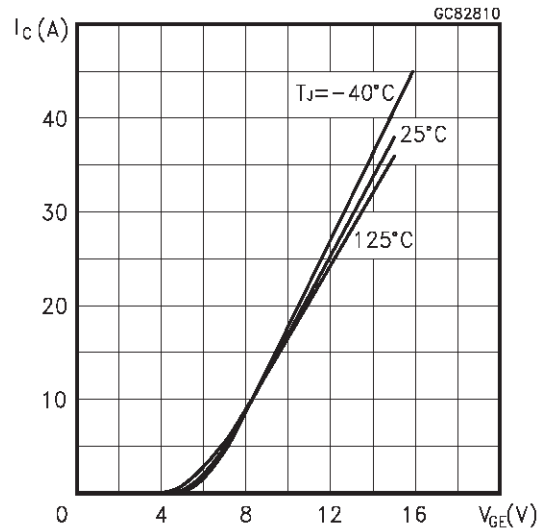
**Thermal Impedance**



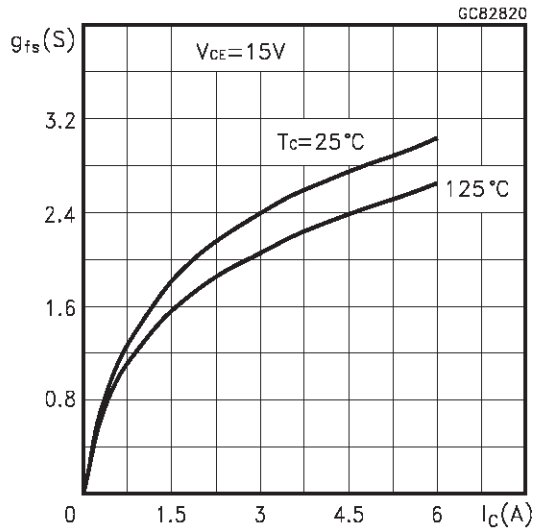
Output Characteristics



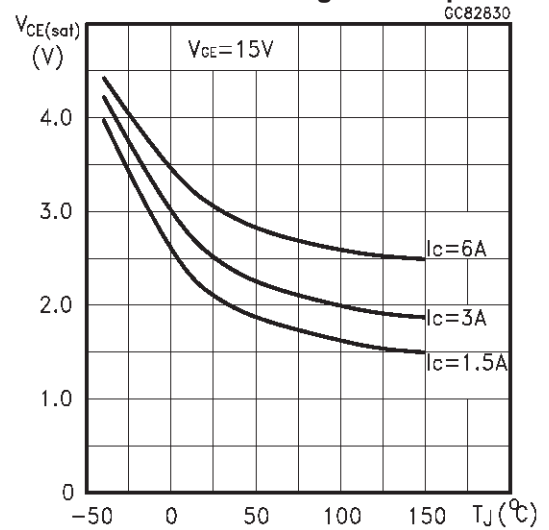
Transfer Characteristics



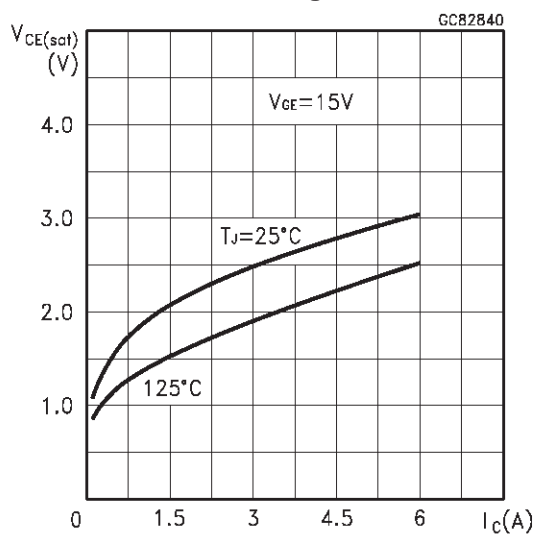
Transconductance



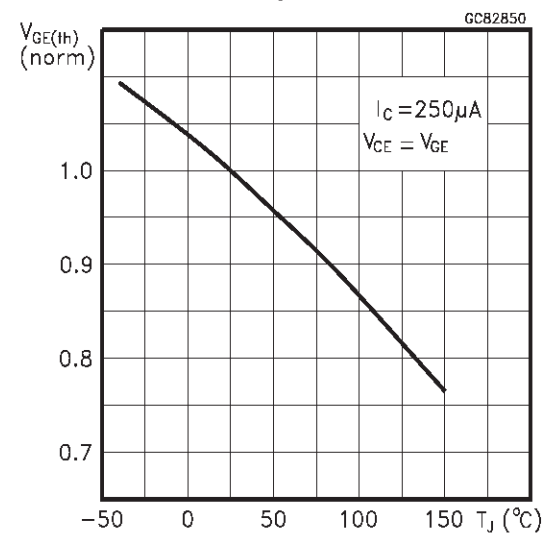
Collector-Emitter On Voltage vs Temperature



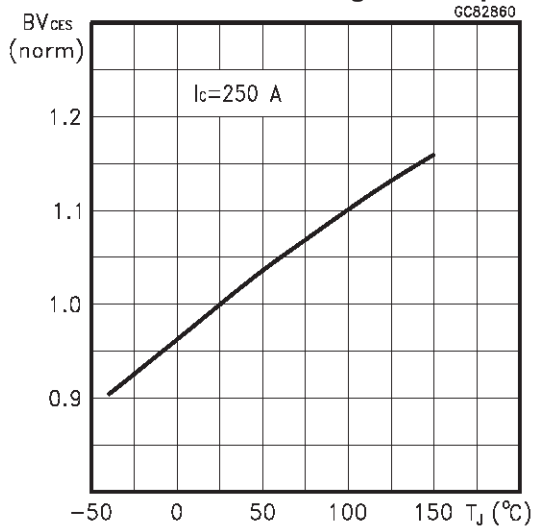
Collector-Emitter On Voltage vs Collector Current



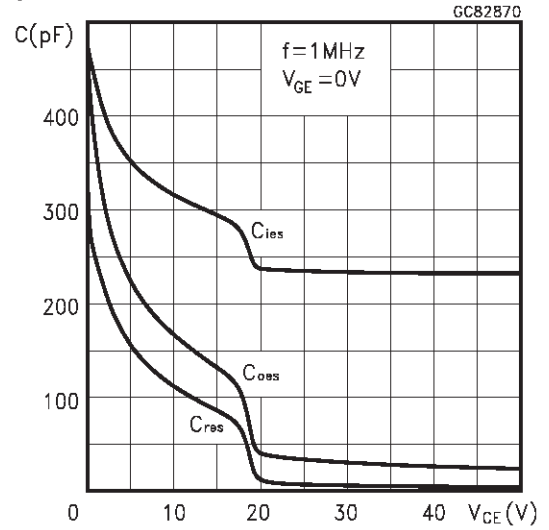
Gate Threshold vs Temperature



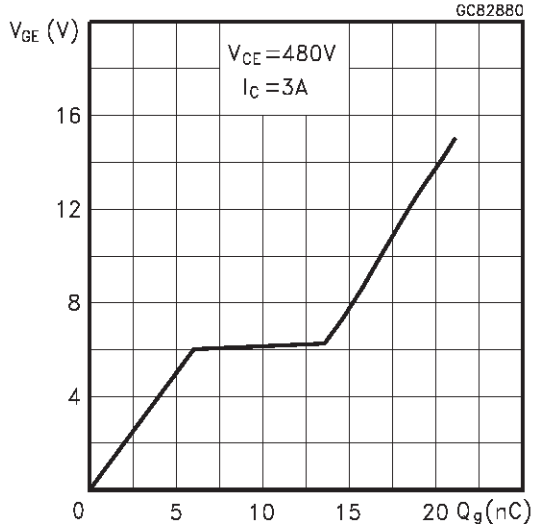
Normalized Breakdown Voltage vs Temperature



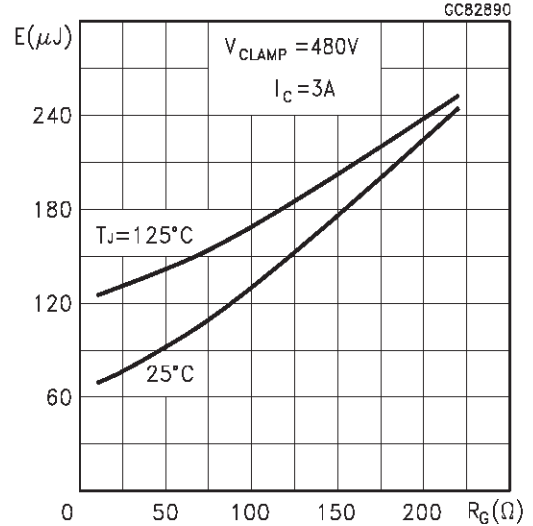
Capacitance Variations



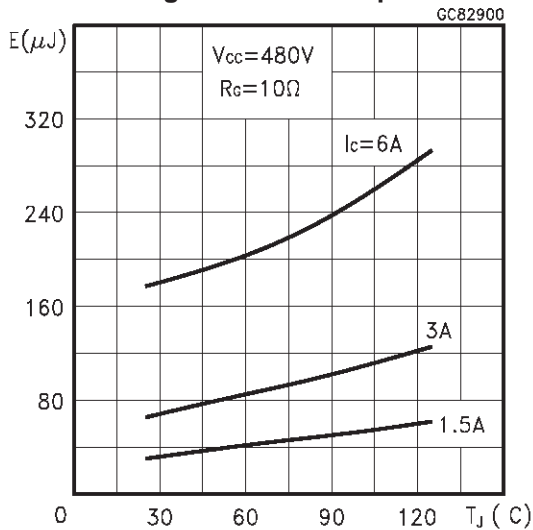
Gate Charge vs Gate-Emitter Voltage



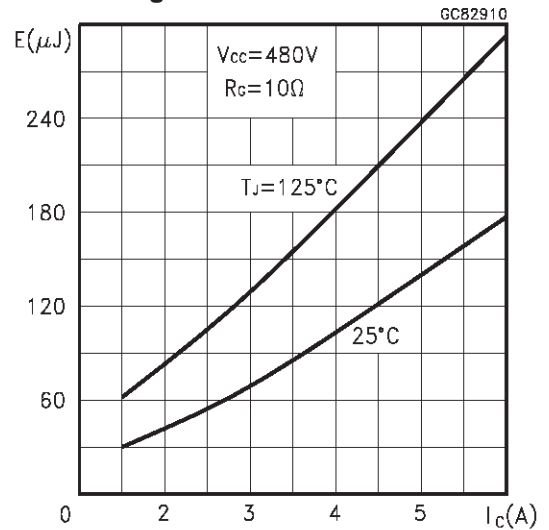
Total Switching Losses vs Gate Resistance



Total Switching Losses vs Temperature



Total Switching Losses vs Collector Current



Switching Off Safe Operating Area

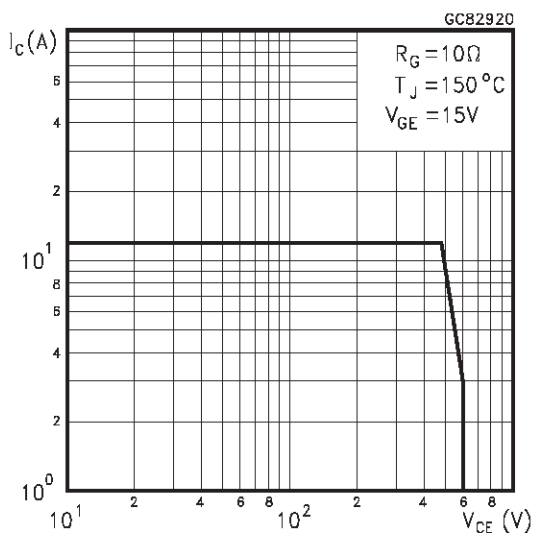


Fig. 1: Gate Charge test Circuit

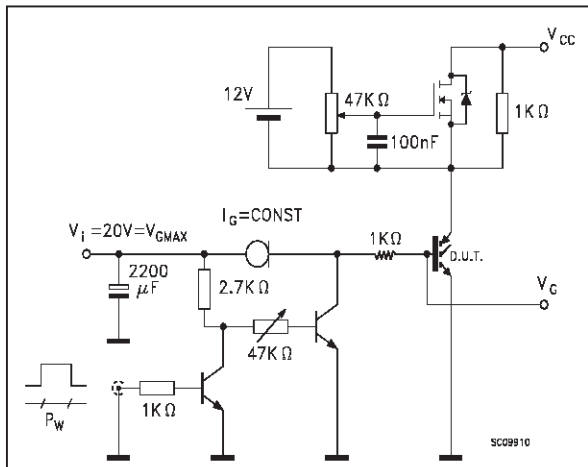
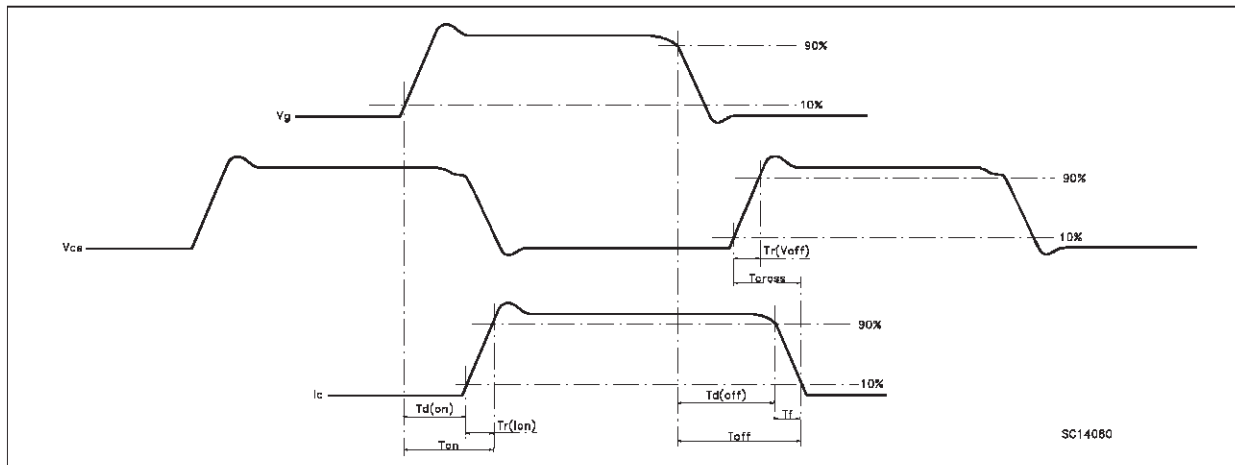
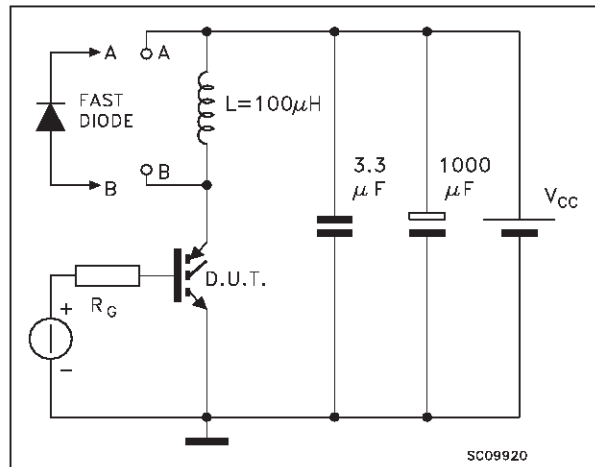
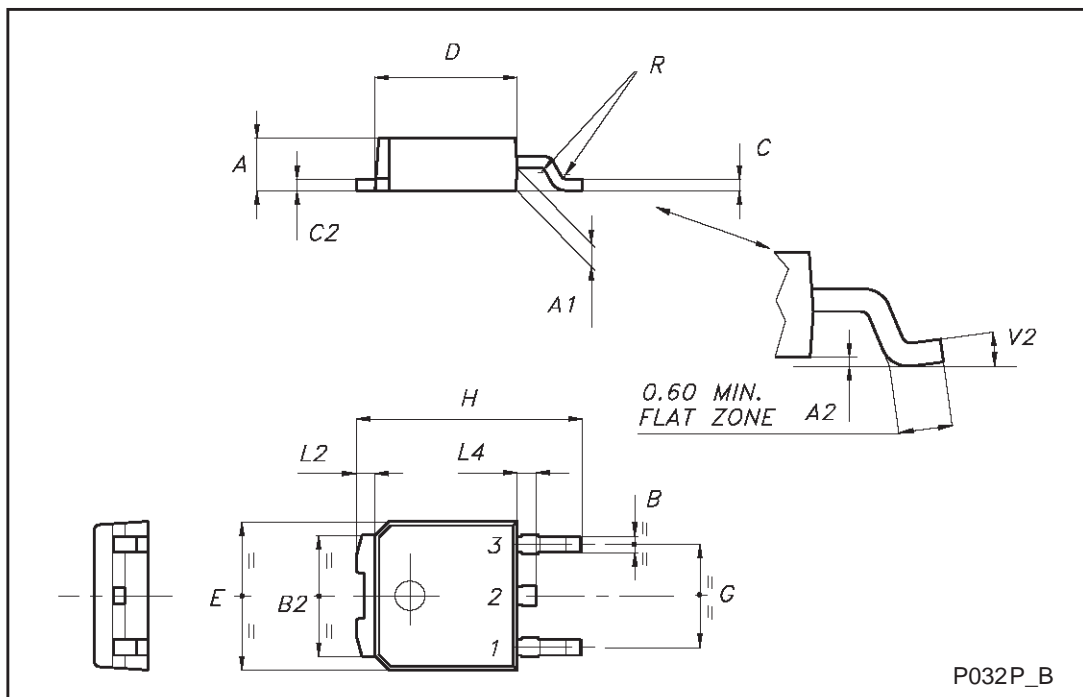


Fig. 2: Test Circuit For Inductive Load Switching



TO-252 (DPAK) MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.20		2.40	0.087		0.094
A1	0.90		1.10	0.035		0.043
A2	0.03		0.23	0.001		0.009
B	0.64		0.90	0.025		0.035
B2	5.20		5.40	0.204		0.213
C	0.45		0.60	0.018		0.024
C2	0.48		0.60	0.019		0.024
D	6.00		6.20	0.236		0.244
E	6.40		6.60	0.252		0.260
G	4.40		4.60	0.173		0.181
H	9.35		10.10	0.368		0.398
L2		0.8			0.031	
L4	0.60		1.00	0.024		0.039
V2	0°		8°	0°		0°



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