



## STGD3NB60SD

N-CHANNEL 3A - 600V - DPAK

PowerMESH™ IGBT

TYPE	V <sub>CES</sub>	V <sub>CE(sat)</sub>	I <sub>C</sub>
STGD3NB60SD	600 V	< 1.5 V	3 A

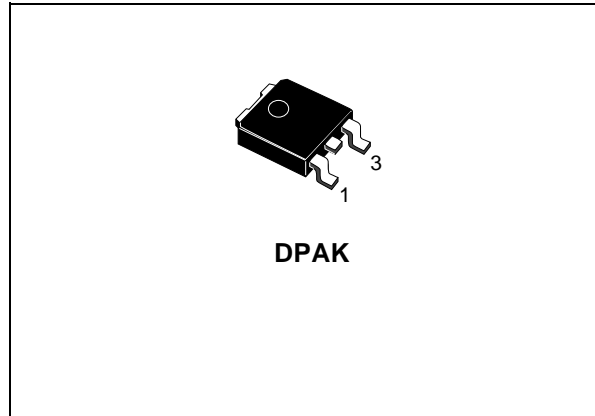
- HIGH INPUT IMPEDANCE (VOLTAGE DRIVEN)
- VERY LOW ON-VOLTAGE DROP (V<sub>cesat</sub>)
- HIGH CURRENT CAPABILITY
- INTEGRATED WHEELING DIODE
- OFF LOSSES INCLUDE TAIL CURRENT

### DESCRIPTION

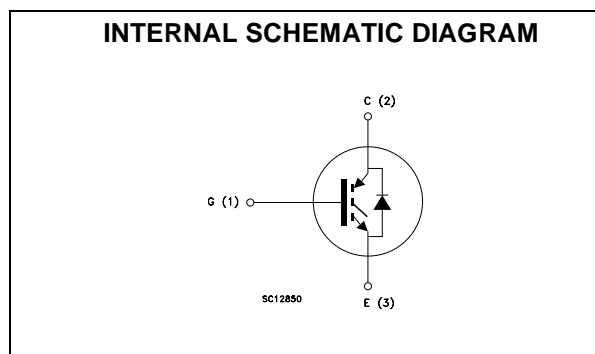
Using the latest high voltage technology based on a patented strip layout, STMicroelectronics has designed an advanced family of IGBTs, the PowerMESH™ IGBTs, with outstanding performances. The suffix "S" identifies a family optimized to achieve minimum on-voltage drop for low frequency applications (<1kHz).

### APPLICATIONS

- MOTOR CONTROL
- GAS DISCHARGE LAMP
- STATIC RELAYS



DPAK



### ORDERING INFORMATION

SALES TYPE	MARKING	PACKAGE	PACKAGING
STGD3NB60SDT4	GD3NB60SD	DPAK	TAPE & REEL

## STGD3NB60SD

### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
$V_{CES}$	Collector-Emitter Voltage ( $V_{GS} = 0$ )	600	V
$V_{GE}$	Gate-Emitter Voltage	$\pm 20$	V
$I_C$	Collector Current (continuous) at $T_C = 25^\circ\text{C}$	6	A
$I_C$	Collector Current (continuous) at $T_C = 100^\circ\text{C}$	3	A
$I_{CM} (*)$	Collector Current (pulsed)	25	A
$P_{TOT}$	Total Dissipation at $T_C = 25^\circ\text{C}$	48	W
	Derating Factor	0.32	W/°C
$T_{stg}$	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	3.125	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	100	°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	$I_C = 250 \mu\text{A}$ , $V_{GE} = 0$	600			V
$I_{CES}$	Collector cut-off ( $V_{GE} = 0$ )	$V_{CE} = \text{Max Rating}$ , $T_C = 25^\circ\text{C}$ $V_{CE} = \text{Max Rating}$ , $T_C = 125^\circ\text{C}$			10 100	$\mu\text{A}$ $\mu\text{A}$
$I_{GES}$	Gate-Emitter Leakage Current ( $V_{CE} = 0$ )	$V_{GE} = \pm 20\text{V}$ , $V_{CE} = 0$			$\pm 100$	nA

ON (1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GE(th)}$	Gate Threshold Voltage	$V_{CE} = V_{GE}$ , $I_C = 250\mu\text{A}$	2.5		4.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$V_{GE} = 15\text{V}$ , $I_C = 1.5 \text{ A}$ $V_{GE} = 15\text{V}$ , $I_C = 3 \text{ A}$ $V_{GE} = 15\text{V}$ , $I_C = 7 \text{ A}$ , $T_J = 125^\circ\text{C}$		1 1.2 1.1	1.5	V V V

### DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$g_{fs}$	Forward Transconductance	$V_{CE} = 10 \text{ V}$ , $I_C = 3 \text{ A}$	1.7	2.5		S
$C_{ies}$	Input Capacitance	$V_{CE} = 25\text{V}$ , $f = 1 \text{ MHz}$ , $V_{GE} = 0$		255		pF
$C_{oes}$	Output Capacitance			30		pF
$C_{res}$	Reverse Transfer Capacitance			5.6		pF
$Q_G$ $Q_{GE}$ $Q_{GC}$	Total Gate Charge Gate-Emitter Charge Gate-Collector Charge	$V_{CE} = 480 \text{ V}$ , $I_C = 3 \text{ A}$ , $V_{GE} = 15\text{V}$		18 5.4 5.5	23	nC nC nC
$I_{CL}$	Latching Current	$V_{clamp} = 380 \text{ V}$ , $T_j = 25^\circ\text{C}$ $R_G = 1\text{K}\Omega$	15			A

**ELECTRICAL CHARACTERISTICS (CONTINUED)**  
SWITCHING ON

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

SWITCHING OFF

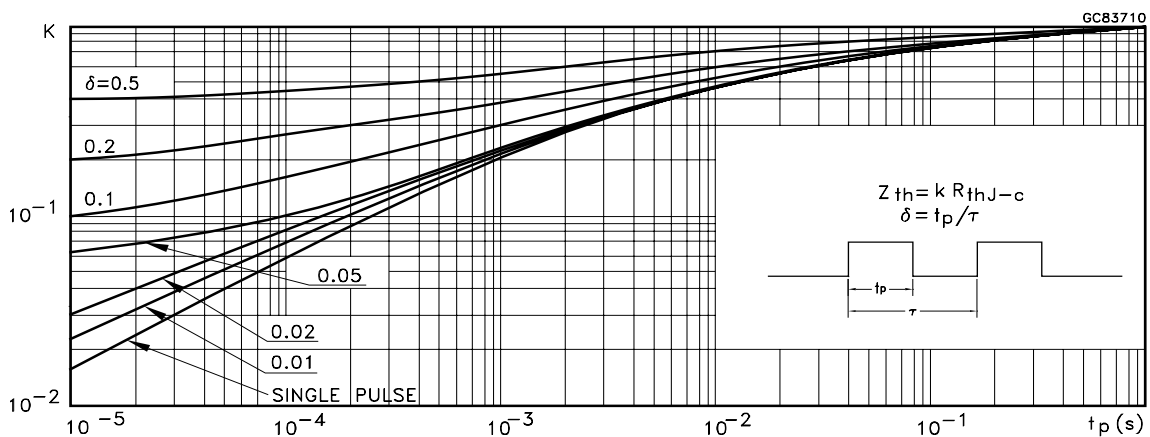
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_c$ $t_r(V_{off})$ $t_{d(on)}$ $t_f$ $E_{off(**)}$	Cross-over Time Off Voltage Rise Time Delay Time Fall Time Turn-off Switching Loss	$V_{CC} = 480\text{ V}$ , $I_C = 3\text{ A}$ , $R_{GE} = 1\text{ K}\Omega$ , $V_{GE} = 15\text{ V}$		1.8 1.0 3.4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

**COLLECTOR-EMITTER DIODE**

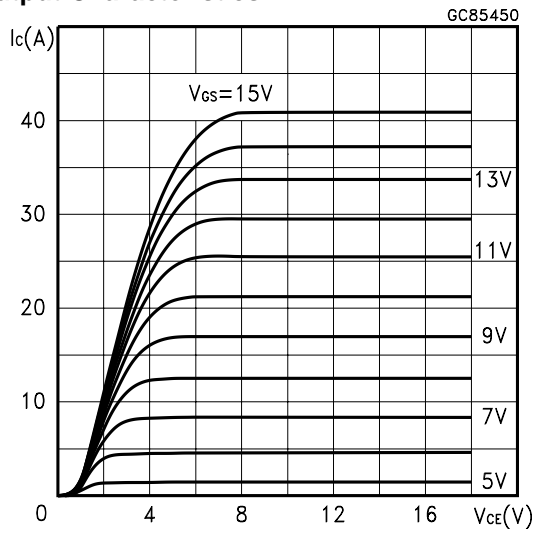
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_f$ $I_{fm}$	Forward Current Forward Current pulsed				3 25	A A
$V_f$	Forward On-Voltage	$I_f = 3\text{ A}$ $I_f = 1\text{ A}$		1.55 1.15	1.9	V V
$t_{rr}$ $Q_{rr}$ $I_{rrm}$	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_f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

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

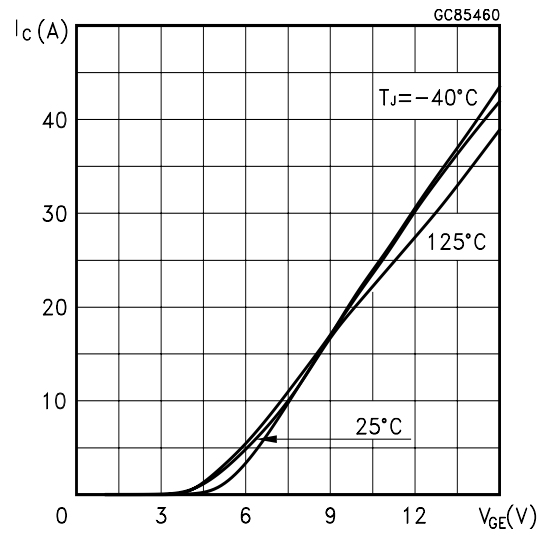
**Thermal Impedance**



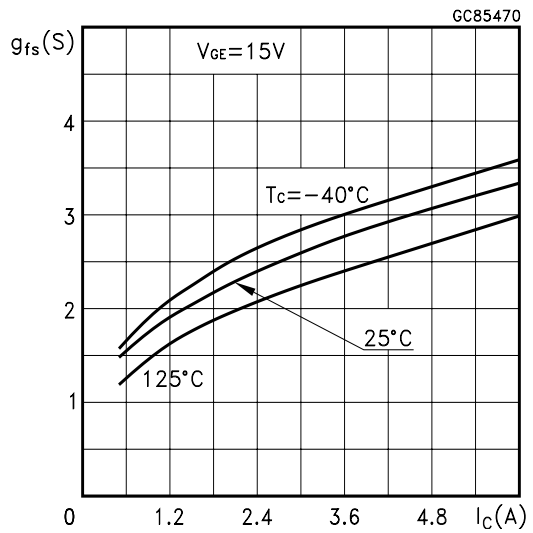
Output Characteristics



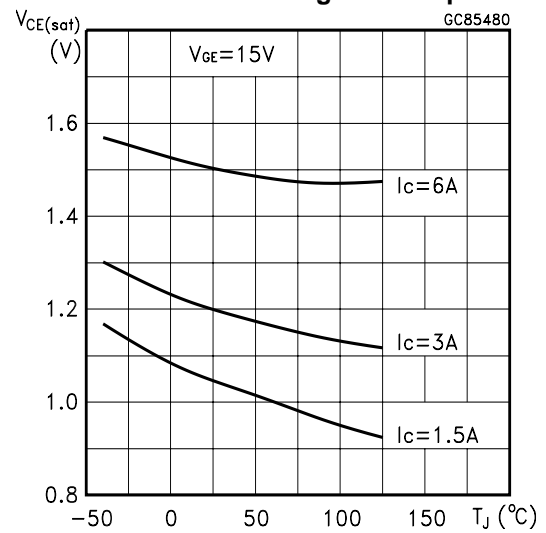
Transfer Characteristics



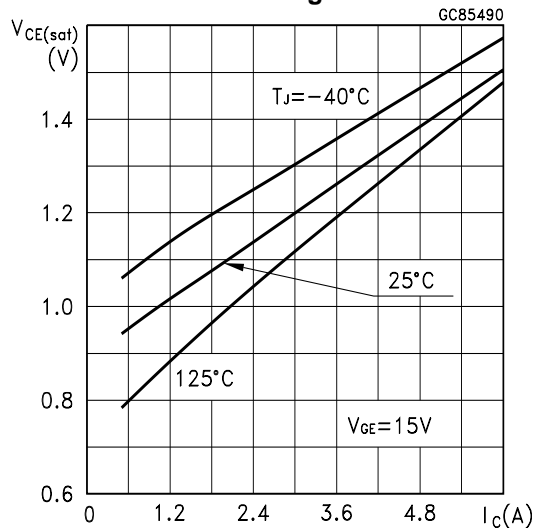
Transconductance



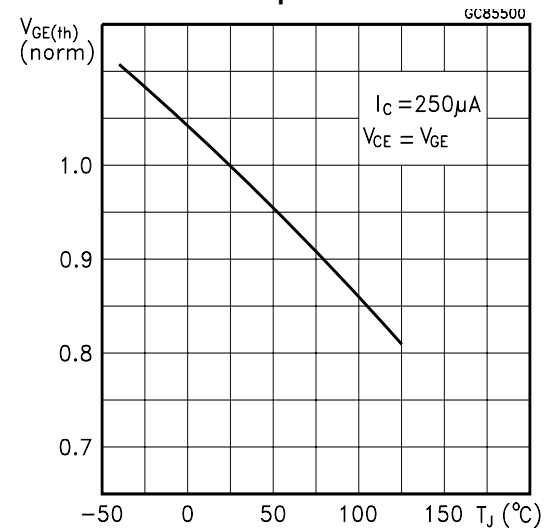
Collector-Emitter On Voltage vs Temperature



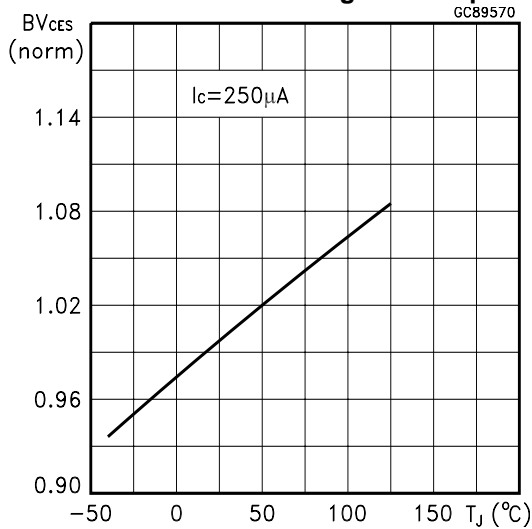
Collector-Emitter On Voltage vs Collector Current



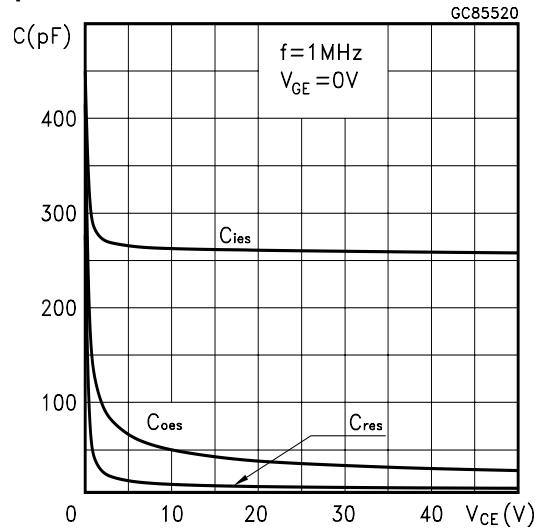
Gate Threshold vs Temperature



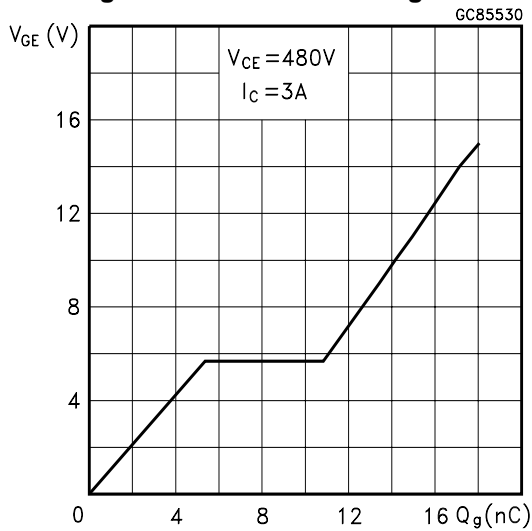
Normalized Breakdown Voltage vs Temperature



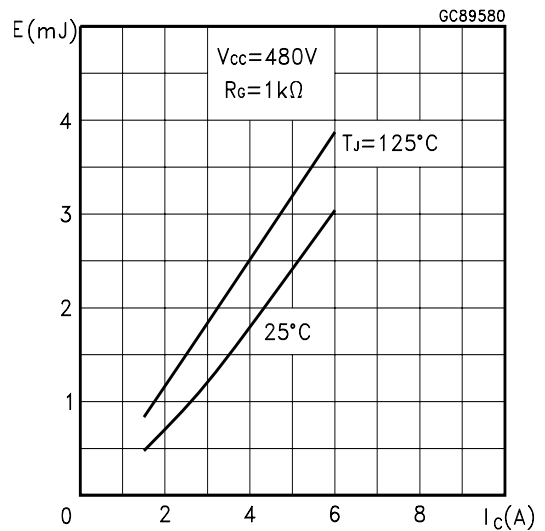
Capacitance Variations



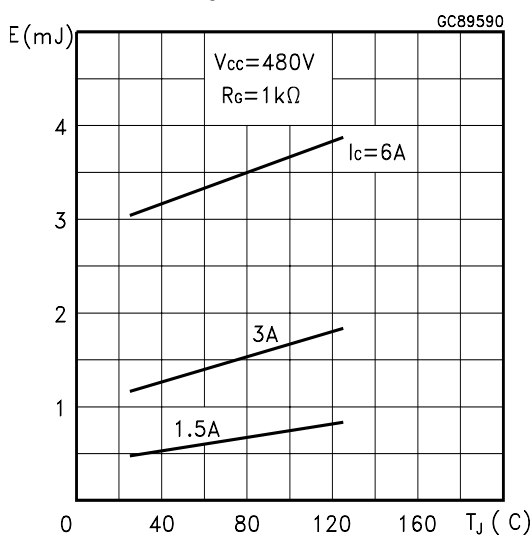
Gate Charge vs Gate-Emitter Voltage



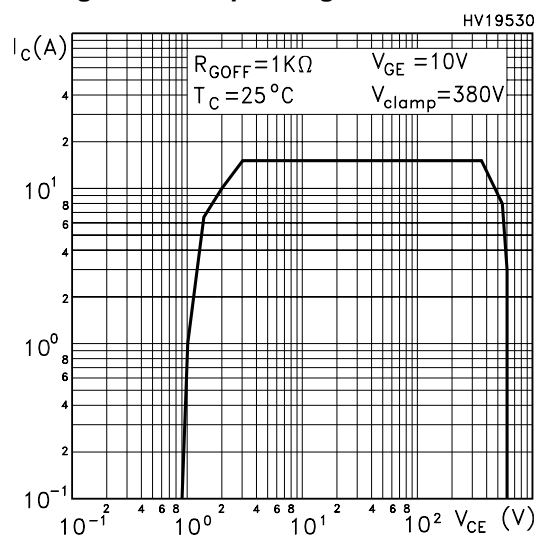
Off Losses vs Collector Current



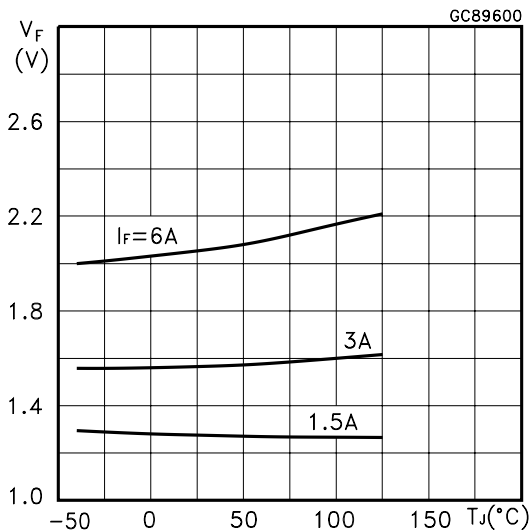
Off Losses vs Temperature



Switching Off Safe Operating Area



Diode Forward Voltage vs Tj



Diode Forward Voltage

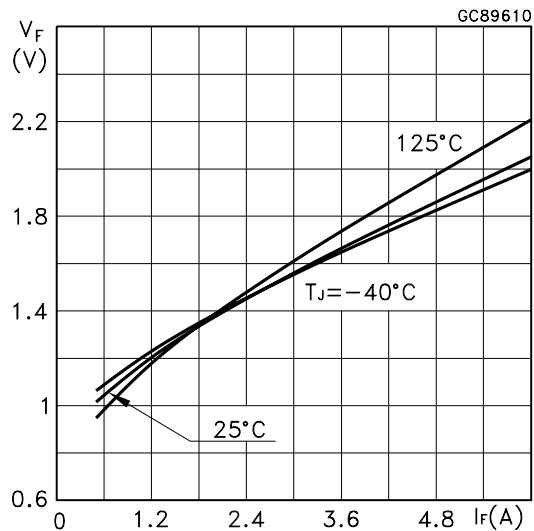


Fig. 1: Gate Charge test Circuit

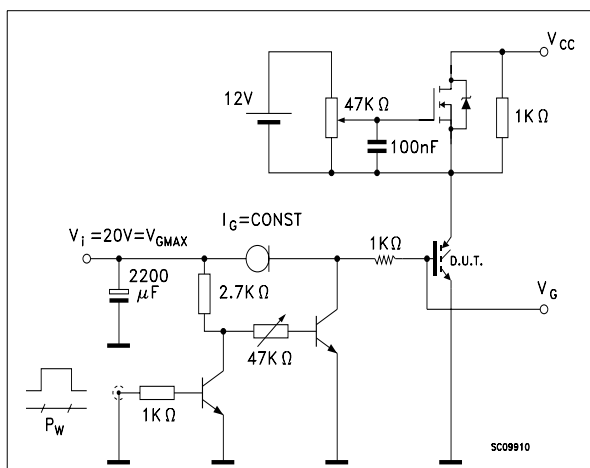
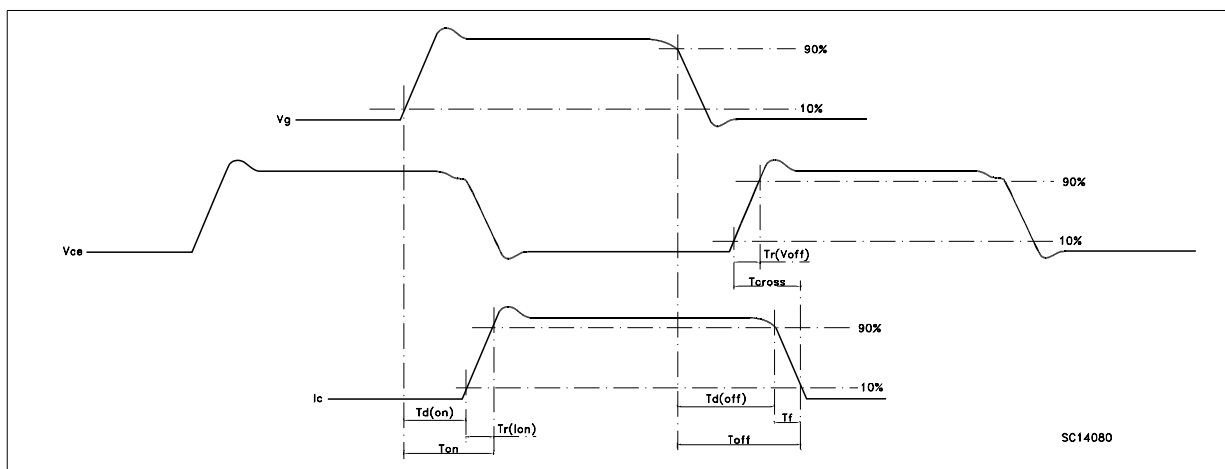
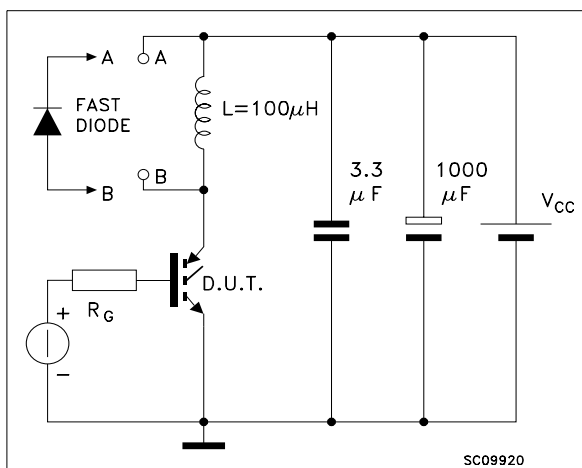
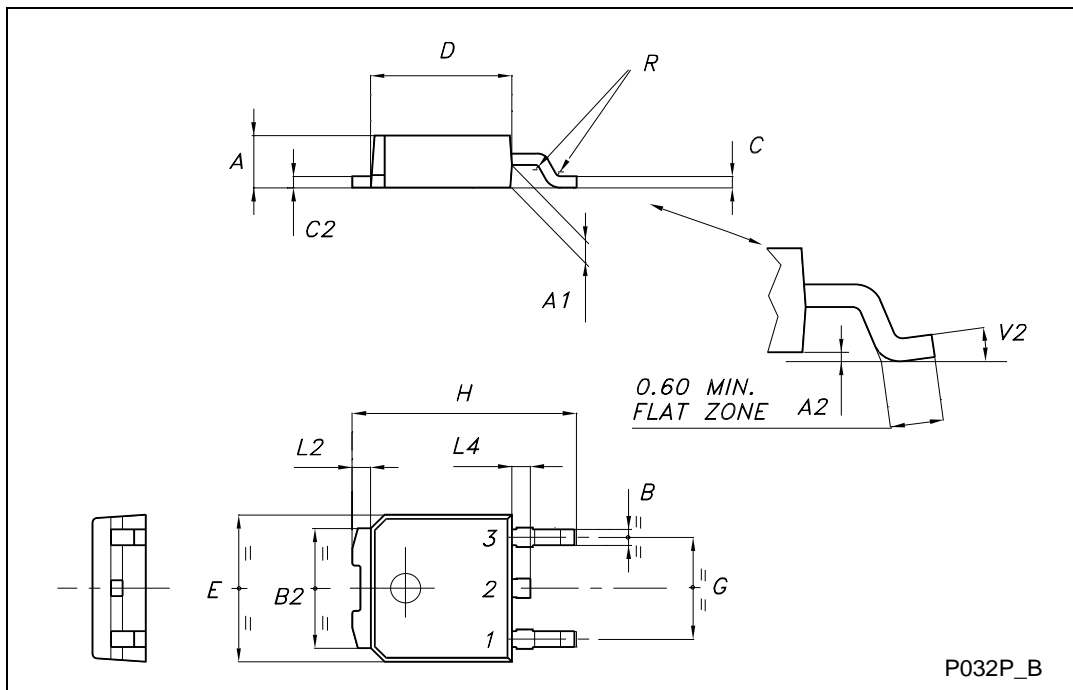


Fig. 2: Test Circuit For Inductive Load Switching



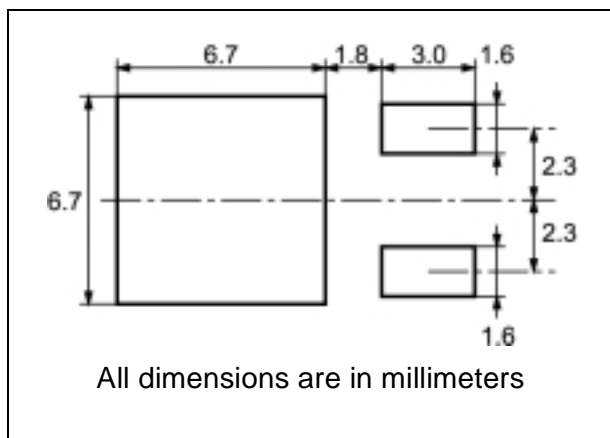
TO-252 (DPAK) MECHANICAL DATA

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°

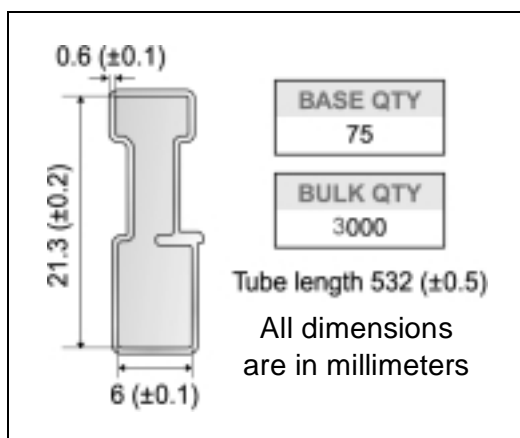


P032P\_B

**DPAK FOOTPRINT**



**TUBE SHIPMENT (no suffix)\***



**TAPE AND REEL SHIPMENT (suffix "T4")\***

40 mm min. Access hole at slot location  
Full radius  
Tape slot in core for tape start 2.5mm min. width  
G measured at hub

**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		0.795	
G	16.4	18.4	0.645	0.724
N	50		1.968	
T		22.4		0.881

BASE QTY	BULK QTY
2500	2500

**TAPE MECHANICAL DATA**

DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A0	6.8	7	0.267	0.275
B0	10.4	10.6	0.409	0.417
B1		12.1		0.476
D	1.5	1.6	0.059	0.063
D1	1.5		0.059	
E	1.65	1.85	0.065	0.073
F	7.4	7.6	0.291	0.299
K0	2.55	2.75	0.100	0.108
P0	3.9	4.1	0.153	0.161
P1	7.9	8.1	0.311	0.319
P2	1.9	2.1	0.075	0.082
R	40		1.574	
W	15.7	16.3	0.618	0.641

10 pitches cumulative tolerance on tape +/- 0.2 mm  
Center line of cavity  
User Direction of Feed  
FEED DIRECTION  
Bending radius R min.

\* on sales type



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