



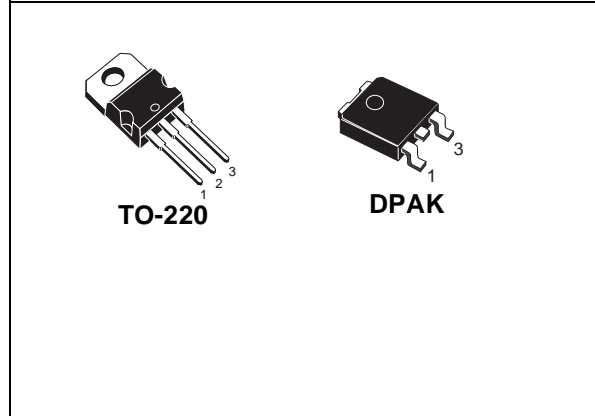
# STGP7NB60M - STGD7NB60M

N-CHANNEL 7A - 600V TO-220 / DPAK

PowerMESH™ IGBT

TYPE	V <sub>CEs</sub>	V <sub>CE(sat)</sub> (Max) @25°C	I <sub>c</sub> @100°C
STGP7NB60M	600 V	< 1.9 V	7 A
STGD7NB60M	600 V	< 1.9 V	7 A

- HIGH INPUT IMPEDANCE
- LOW ON-VOLTAGE DROP (V<sub>cesat</sub>)
- OFF LOSSES INCLUDE TAIL CURRENT
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- HIGH FREQUENCY OPERATION
- CO-PACKAGED WITH TURBOSWITCH™ ANTIPARALLEL DIODE

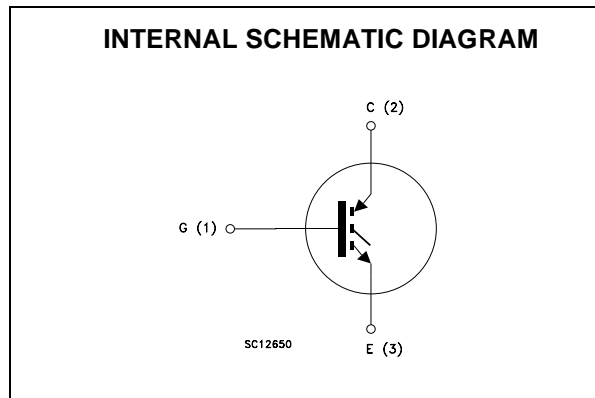


## DESCRIPTION

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 "M" identifies a family optimized to achieve very low switching times for high frequency applications (<20KHZ)

## APPLICATIONS

- MOTOR CONTROLS
- SMPS AND PFC AND BOTH HARD SWITCH AND RESONANT TOPOLOGIES



## ORDERING INFORMATION

SALES TYPE	MARKING	PACKAGE	PACKAGING
STGP7NB60M	GP7NB60M	TO-220	TUBE
STGD7NB60MT4	GD7NB60M	DPAK	TAPE & REEL

## STGP7NB60M - STGD7NB60M

### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		TO-220	DPAK	
$V_{CES}$	Collector-Emitter Voltage ( $V_{GS} = 0$ )	600		V
$V_{GE}$	Gate-Emitter Voltage	$\pm 20$		V
$I_C$	Collector Current (continuous) at $T_C = 25^\circ\text{C}$	14		A
$I_C$	Collector Current (continuous) at $T_C = 100^\circ\text{C}$	7		A
$I_{CM}$ (■)	Collector Current (pulsed)	56		A
$P_{TOT}$	Total Dissipation at $T_C = 25^\circ\text{C}$	80	70	W
	Derating Factor	0.64	0.56	W/°C
$T_{stg}$	Storage Temperature	- 55 to 150		°C
$T_j$	Max. Operating Junction Temperature	150		°C

(■) Pulse width limited by safe operating area

### THERMAL DATA

		TO-220	DPAK	
Rthj-case	Thermal Resistance Junction-case Max	1.56	1.78	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	62.5	100	°C/W

### ELECTRICAL CHARACTERISTICS ( $T_{CASE} = 25^\circ\text{C}$ UNLESS OTHERWISE SPECIFIED)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{BR(CES)}$	Collector-Emitter Breakdown Voltage	$I_C = 250\ \mu\text{A}$ , $V_{GE} = 0$	600			V
$I_{CES}$	Collector cut-off ( $V_{GE} = 0$ )	$V_{CE} = \text{Max Rating}$ , $T_C = 25^\circ\text{C}$ $V_{CE} = \text{Max Rating}$ , $T_C = 125^\circ\text{C}$			50 100	$\mu\text{A}$ $\mu\text{A}$
$I_{GES}$	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	$V_{CE} = V_{GE}$ , $I_C = 250\ \mu\text{A}$	3		5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$V_{GE} = 15\text{V}$ , $I_C = 7\ \text{A}$ $V_{GE} = 15\text{V}$ , $I_C = 7\ \text{A}$ , $T_j = 125^\circ\text{C}$		1.5 1.2	1.9	V V

**ELECTRICAL CHARACTERISTICS (CONTINUED)**

**DYNAMIC**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$g_{fs}$ (1)	Forward Transconductance	$V_{CE} = 25\text{ V}, I_C = 7\text{ A}$		5		S
$C_{ies}$	Input Capacitance	$V_{CE} = 25\text{ V}, f = 1\text{ MHz}, V_{GE} = 0$		550		pF
$C_{oes}$	Output Capacitance			85		pF
$C_{res}$	Reverse Transfer Capacitance			13		pF
$Q_g$	Total Gate Charge	$V_{CE} = 480\text{ V}, I_C = 7\text{ A},$ $V_{GE} = 15\text{ V}$		37	50	nC
$Q_{ge}$	Gate-Emitter Charge			4.2		nC
$Q_{gc}$	Gate-Collector Charge			13		nC
$I_{CL}$	Latching Current	$V_{clamp} = 480\text{ V}, V_{GE} = 15\text{ V}$ $T_J = 125^\circ\text{C}, R_G = 10\ \Omega$		28		A

**SWITCHING ON**

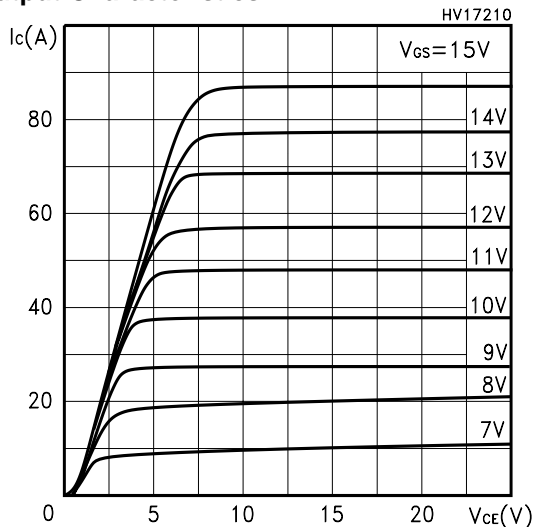
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	$V_{CC} = 480\text{ V}, I_C = 7\text{ A}, R_G = 10\ \Omega,$ $V_{GE} = 15\text{ V}$		13		ns
$t_r$	Rise Time			6		ns
$(di/dt)_{on}$	Turn-on Current Slope	$V_{CC} = 480\text{ V}, I_C = 7\text{ A}, R_G = 10\ \Omega,$ $V_{GE} = 15\text{ V}, T_J = 125^\circ\text{C}$		1000		A/ $\mu\text{s}$
$E_{on}$	Turn-on Switching Losses			50		$\mu\text{J}$

**SWITCHING OFF**

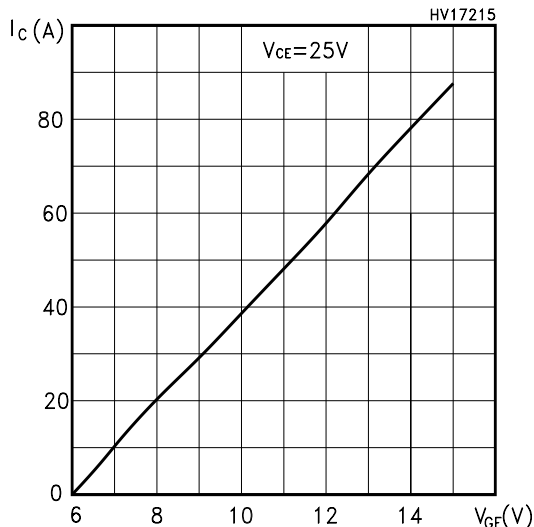
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_c$	Cross-over Time	$V_{CC} = 480\text{ V}, I_C = 7\text{ A},$ $R_G = 10\ \Omega, V_{GE} = 15\text{ V}$		340		ns
$t_r(V_{off})$	Off Voltage Rise Time			95		ns
$t_{d(off)}$	Delay Time			155		ns
$t_f$	Fall Time			240		ns
$E_{off(**)}$	Turn-off Switching Loss			455		$\mu\text{J}$
$E_{ts}$	Total Switching Loss			500		$\mu\text{J}$
$t_c$	Cross-over Time	$V_{CC} = 480\text{ V}, I_C = 7\text{ A},$ $R_G = 10\ \Omega, V_{GE} = 15\text{ V}$ $T_J = 125^\circ\text{C}$		610		ns
$t_r(V_{off})$	Off Voltage Rise Time			215		ns
$t_{d(off)}$	Delay Time			280		ns
$t_f$	Fall Time			390		ns
$E_{off(**)}$	Turn-off Switching Loss			870		$\mu\text{J}$
$E_{ts}$	Total Switching Loss			920		$\mu\text{J}$

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)

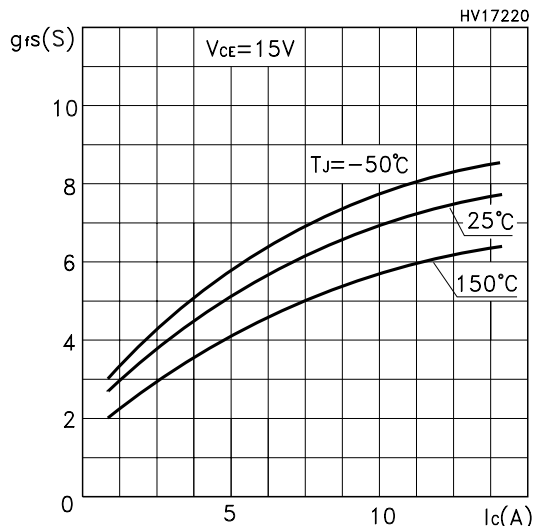
Output Characteristics



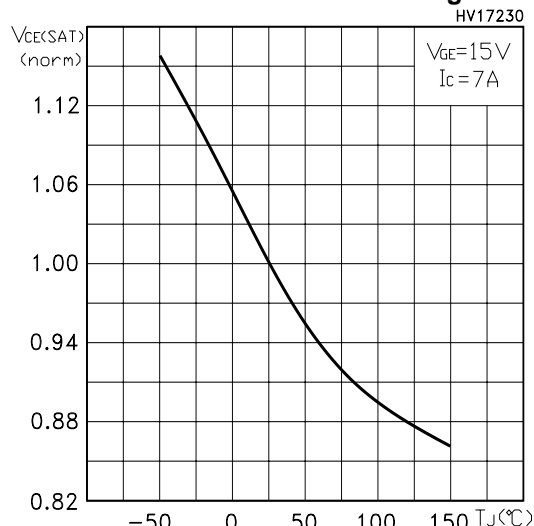
Transfer Characteristics



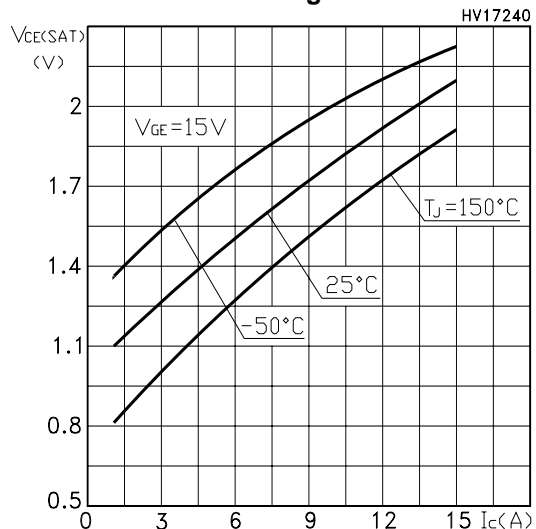
Transconductance



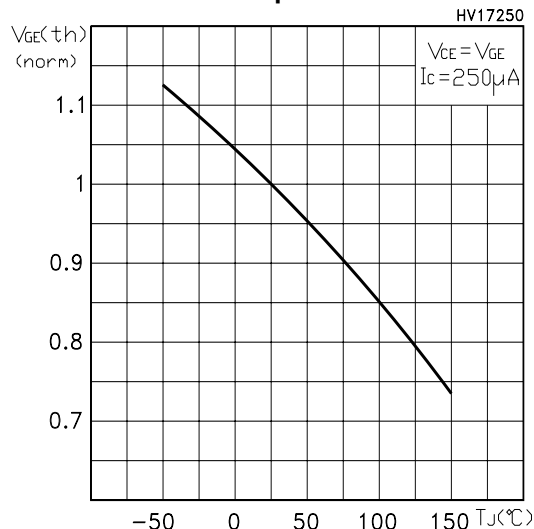
Normalized Collector-Emitter On Voltage vs Temp.



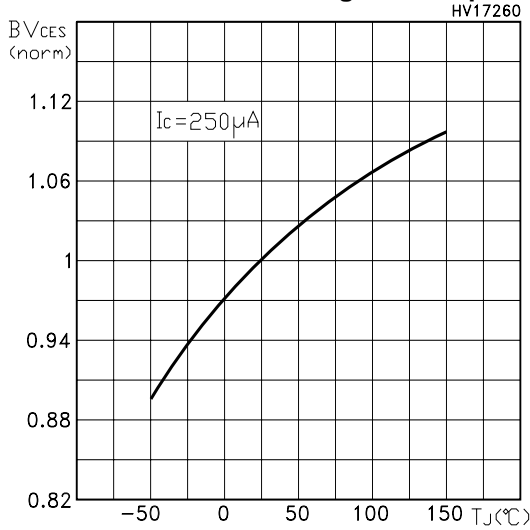
Collector-Emitter On Voltage vs Collector Current



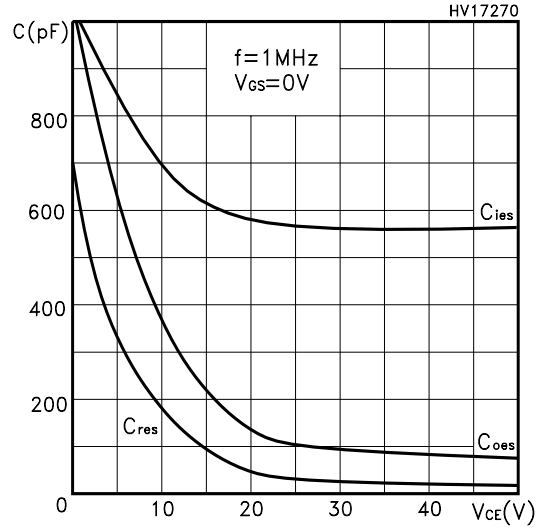
Gate Threshold vs Temperature



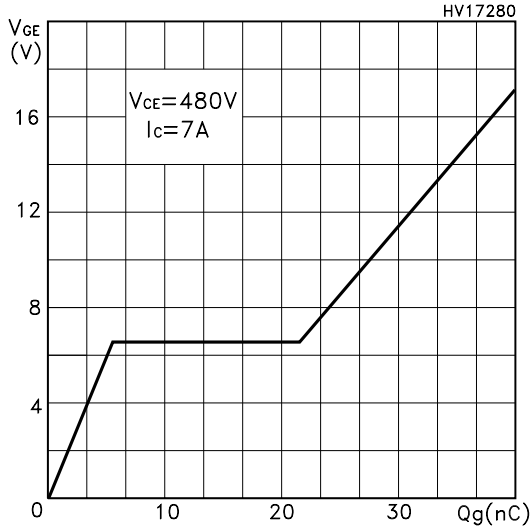
Normalized Breakdown Voltage vs Temperature



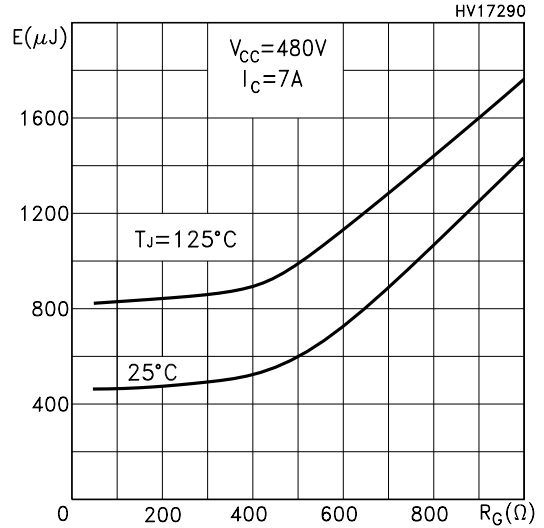
Capacitance Variations



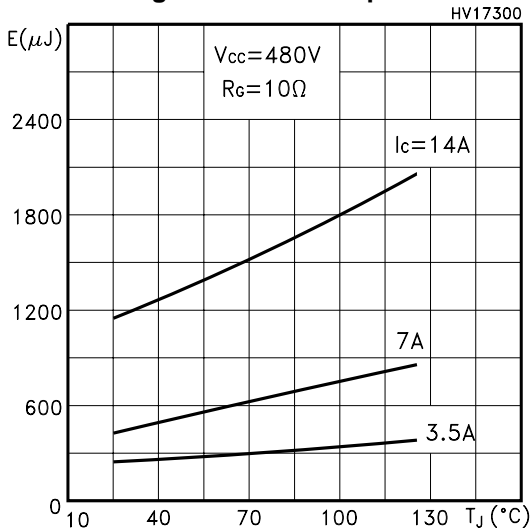
Gate Charge vs Gate-Emitter Voltage



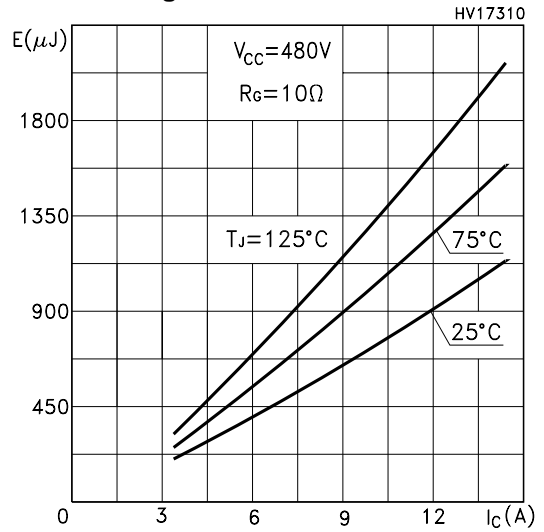
Total Switching Losses vs Gate Resistance



Total Switching Losses vs Temperature

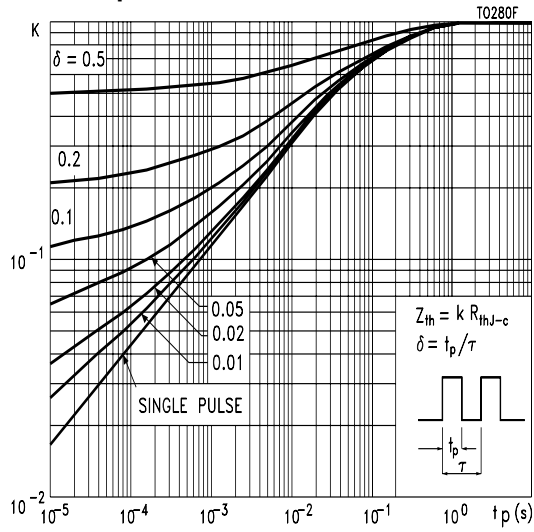


Total Switching Losses vs Collector Current

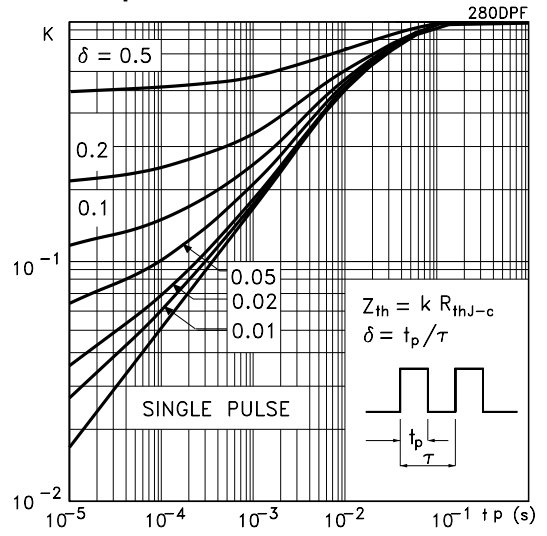


**STGP7NB60M - STGD7NB60M**

**Thermal Impedance for TO-220**



**Thermal Impedance for DPAK**



**Turn-Off SOA**

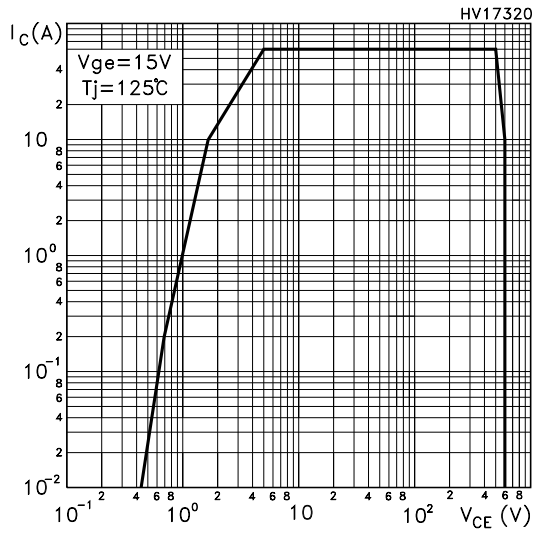


Fig. 1: Gate Charge test Circuit

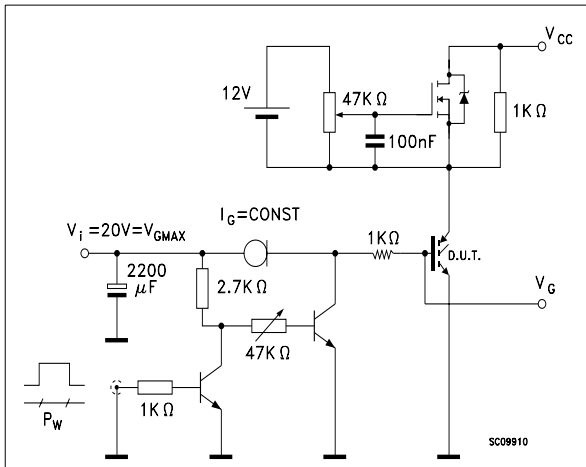
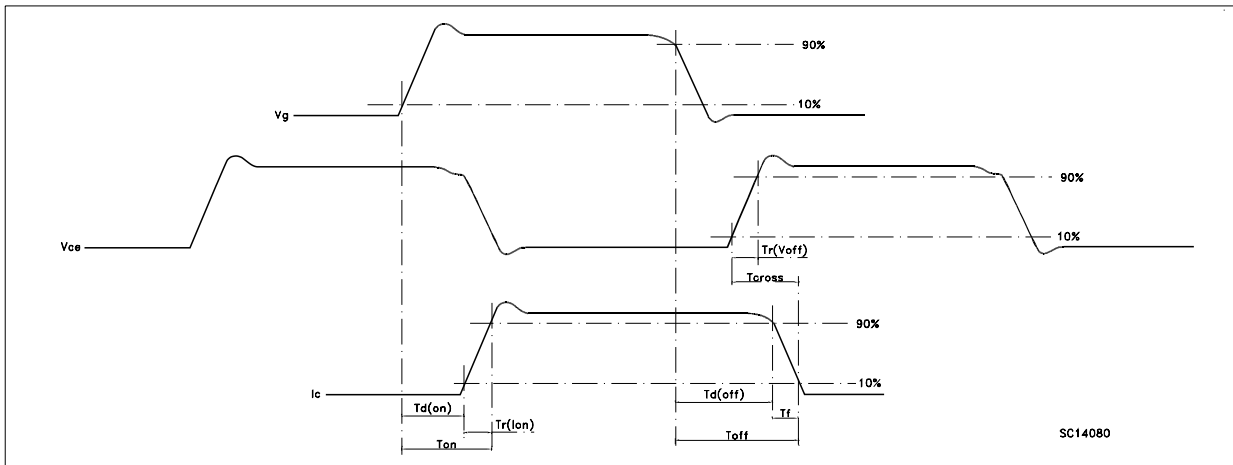
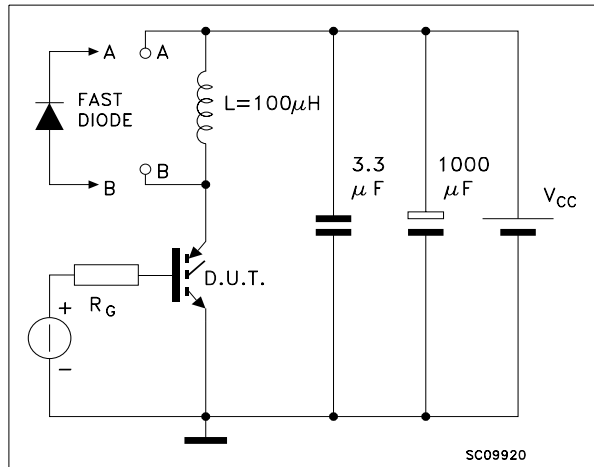
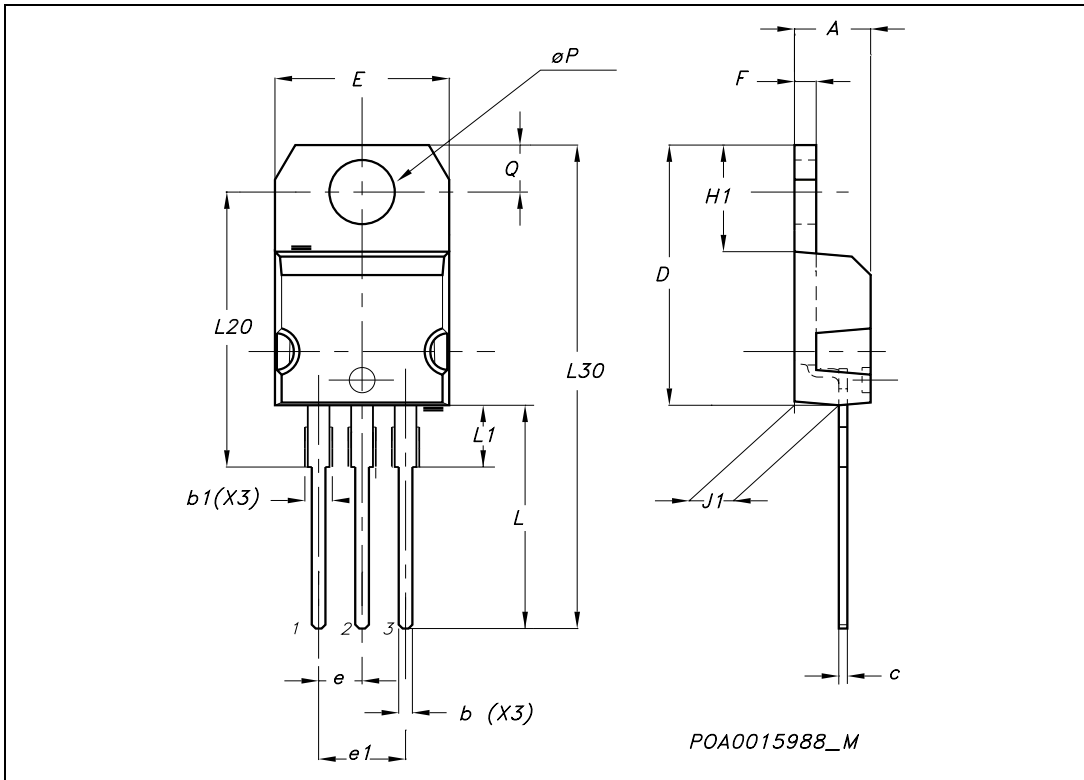


Fig. 2: Test Circuit For Inductive Load Switching (SC09920)



**TO-220 MECHANICAL DATA**

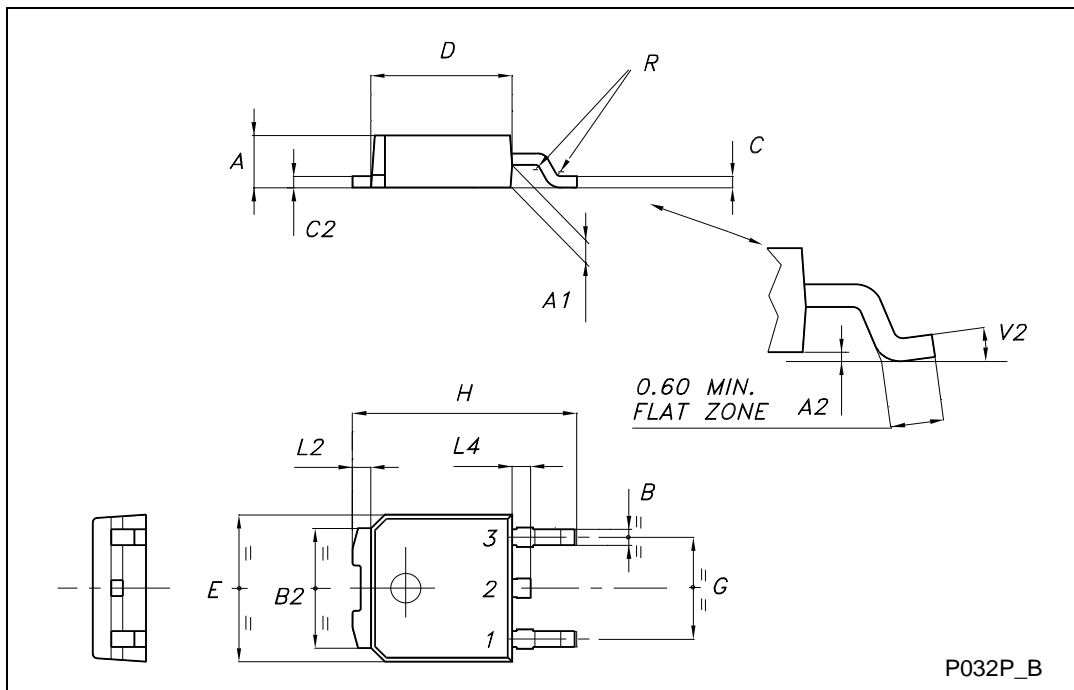
DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
b	0.61		0.88	0.024		0.034
b1	1.15		1.70	0.045		0.066
c	0.49		0.70	0.019		0.027
D	15.25		15.75	0.60		0.620
E	10		10.40	0.393		0.409
e	2.40		2.70	0.094		0.106
e1	4.95		5.15	0.194		0.202
F	1.23		1.32	0.048		0.052
H1	6.20		6.60	0.244		0.256
J1	2.40		2.72	0.094		0.107
L	13		14	0.511		0.551
L1	3.50		3.93	0.137		0.154
L20		16.40			0.645	
L30		28.90			1.137	
øP	3.75		3.85	0.147		0.151
Q	2.65		2.95	0.104		0.116



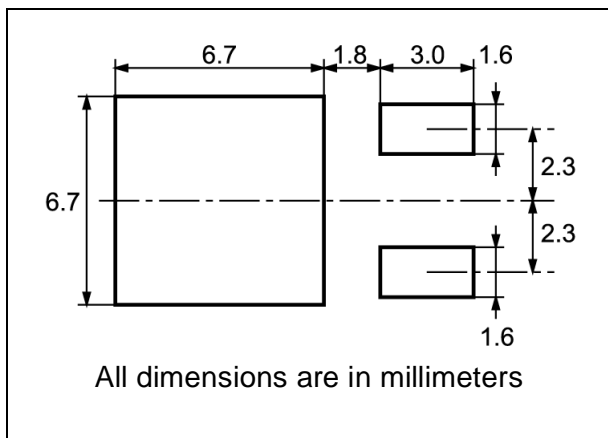


TO-252 (DPAK) MECHANICAL DATA

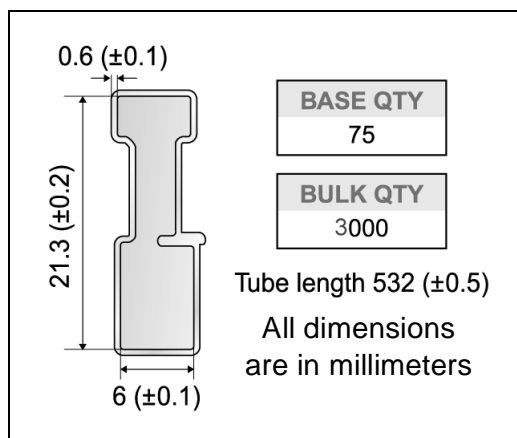
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.20		2.40	0.087		0.094
A1	0.90		1.10	0.035		0.043
A2	0.03		0.23	0.001		0.009
B	0.64		0.90	0.025		0.035
B2	5.20		5.40	0.204		0.213
C	0.45		0.60	0.018		0.024
C2	0.48		0.60	0.019		0.024
D	6.00		6.20	0.236		0.244
E	6.40		6.60	0.252		0.260
G	4.40		4.60	0.173		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°



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

<b>BASE QTY</b>	<b>BULK QTY</b>
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

\* on sales type 1071



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