



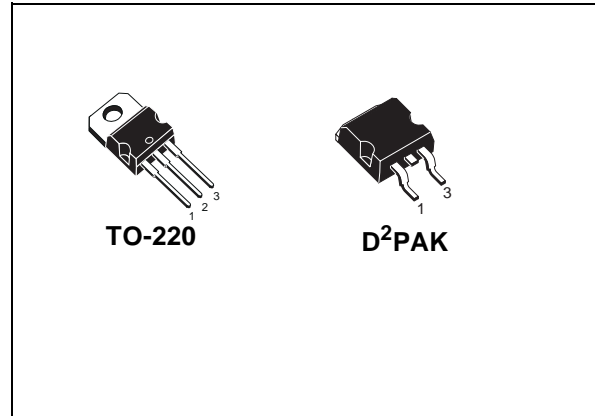
STGP7NB60FD - STGB7NB60FD

N-CHANNEL 7A - 600V TO-220 / D²PAK

PowerMESH™ IGBT

TYPE	V _{CES}	V _{CE(sat)} (Max) @25°C	I _c @100°C
STGP7NB60FD	600 V	< 2.4 V	7 A
STGB7NB60FD	600 V	< 2.4 V	7 A

- HIGH INPUT IMPEDANCE
- LOW ON-VOLTAGE DROP (V_{cesat})
- OFF LOSSES INCLUDE TAIL CURRENT
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- HIGH FREQUENCY OPERATION
- CO-PACKAGED WITH TURBOSWITCH™ ANTIPARALLEL DIODE



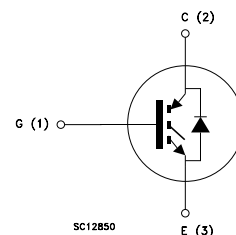
DESCRIPTION

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 "F" identifies a family optimized to achieve very low switching times for high frequency applications (<40KHZ)

APPLICATIONS

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

INTERNAL SCHEMATIC DIAGRAM



ORDERING INFORMATION

SALES TYPE	MARKING	PACKAGE	PACKAGING
STGP7NB60FD	GP7NB60FD	TO-220	TUBE
STGB7NB60FDT4	GB7NB60FD	D ² PAK	TAPE & REEL

STGP7NB60FD - STGB7NB60FD**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 $T_C = 25^\circ\text{C}$	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	W
	Derating Factor	0.64	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

$R_{thj-case}$	Thermal Resistance Junction-case Max	1.56	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient Max	62.5	°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	μA μA
I_{GES}	Gate-Emitter Leakage Current ($V_{CE} = 0$)	$V_{GE} = \pm 20\text{V}$, $V_{CE} = 0$			± 100	nA

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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	$V_{GE} = 15\text{V}$, $I_C = 7\ \text{A}$ $V_{GE} = 15\text{V}$, $I_C = 7\ \text{A}$, $T_j = 125^\circ\text{C}$		2.0 1.6	2.4	V V

STGP7NB60FD - STGB7NB60FD

ELECTRICAL CHARACTERISTICS (CONTINUED)
DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (1)	Forward Transconductance	$V_{CE} = 25 \text{ V}$, $I_C = 7 \text{ A}$		6		S
C_{ies}	Input Capacitance	$V_{CE} = 25 \text{ V}$, $f = 1 \text{ MHz}$, $V_{GE} = 0$		540		pF
C_{oes}	Output Capacitance			80		pF
C_{res}	Reverse Transfer Capacitance			13		pF
Q_g Q_{ge} Q_{gc}	Total Gate Charge Gate-Emitter Charge Gate-Collector Charge	$V_{CE} = 480 \text{ V}$, $I_C = 7 \text{ A}$, $V_{GE} = 15 \text{ V}$		37 4 18	50	nC nC nC
I_{CL}	Latching Current	$V_{clamp} = 480 \text{ V}$ $T_j = 125^\circ\text{C}$, $R_G = 10 \Omega$		28		A

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Delay Time Rise Time	$V_{CC} = 480 \text{ V}$, $I_C = 7 \text{ A}$, $R_G = 10 \Omega$, $V_{GE} = 15 \text{ V}$		17 6		ns ns
$(di/dt)_{on}$ E_{on}	Turn-on Current Slope Turn-on Switching Losses	$V_{CC} = 480 \text{ V}$, $I_C = 7 \text{ A}$, $R_G = 10 \Omega$ $V_{GE} = 15 \text{ V}$, $T_j = 125^\circ\text{C}$		890 59		A/ μs μJ

SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_c $t_r(V_{off})$ $t_{d(off)}$ t_f $E_{off(**)}$ E_{ts}	Cross-over Time Off Voltage Rise Time Delay Time Fall Time Turn-off Switching Loss Total Switching Loss	$V_{CC} = 480 \text{ V}$, $I_C = 7 \text{ A}$, $R_G = 10 \Omega$, $V_{GE} = 15 \text{ V}$		190 45 107 140 240 300		ns ns ns ns μJ μJ
t_c $t_r(V_{off})$ $t_{d(off)}$ t_f $E_{off(**)}$ E_{ts}	Cross-over Time Off Voltage Rise Time Delay Time Fall Time Turn-off Switching Loss Total Switching Loss	$V_{CC} = 480 \text{ V}$, $I_C = 7 \text{ A}$, $R_G = 10 \Omega$, $V_{GE} = 15 \text{ V}$ $T_j = 125^\circ\text{C}$		410 195 204 650 565 625		ns ns ns ns μJ μJ

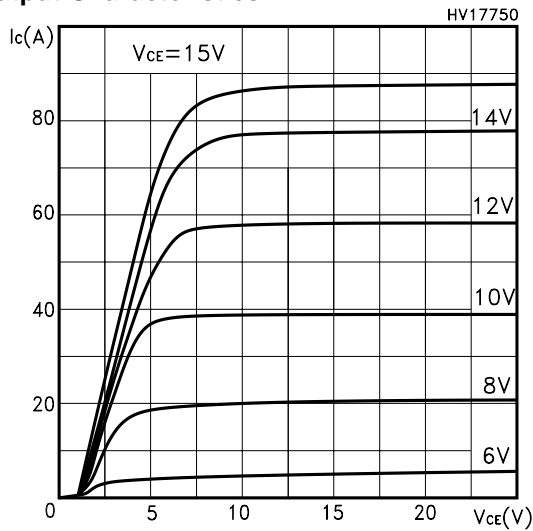
COLLECTOR-EMITTER DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_f I_{fm}	Forward Current Forward Current pulsed				7 56	A A
V_f	Forward On-Voltage	$I_f = 3.5 \text{ A}$ $I_f = 3.5 \text{ A}$, $T_j = 125^\circ\text{C}$		1.4 1.1	1.9	V V
t_{rr} Q_{rr} I_{rrm}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_f = 7 \text{ A}$, $V_R = 40 \text{ V}$, $T_j = 125^\circ\text{C}$, $di/dt = 100 \text{ A}/\mu\text{s}$		50 70 2.7		ns nC A

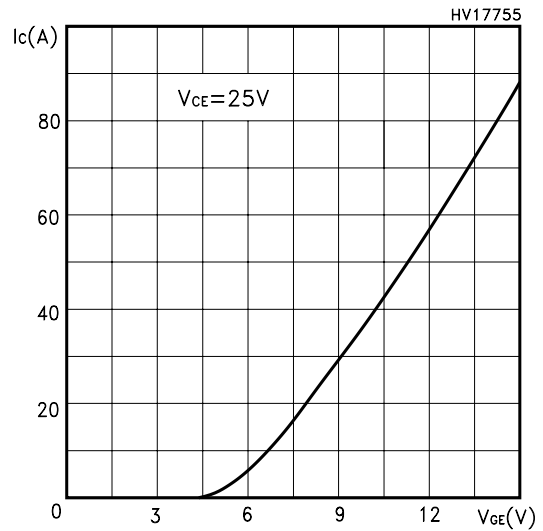
Note: 1. Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %.
2. Pulse width limited by max. junction temperature.
(**)Losses include Also the Tail (Jedec Standardization)

STGP7NB60FD - STGB7NB60FD

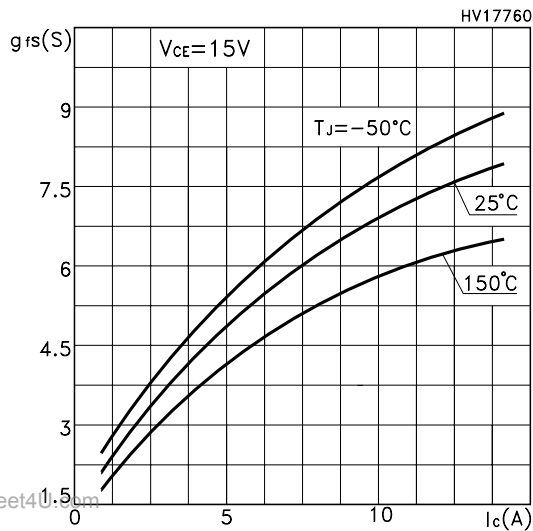
Output Characteristics



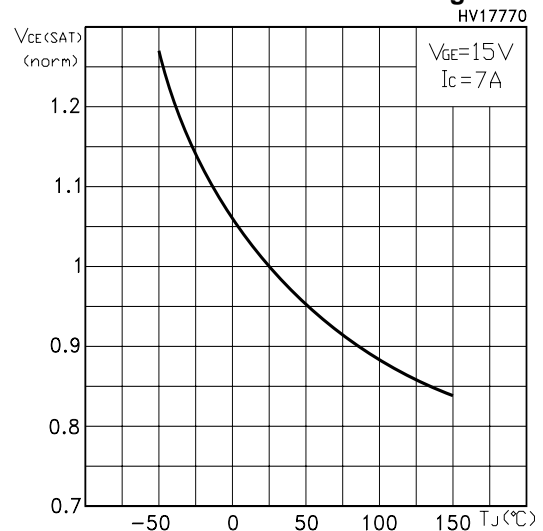
Transfer Characteristics



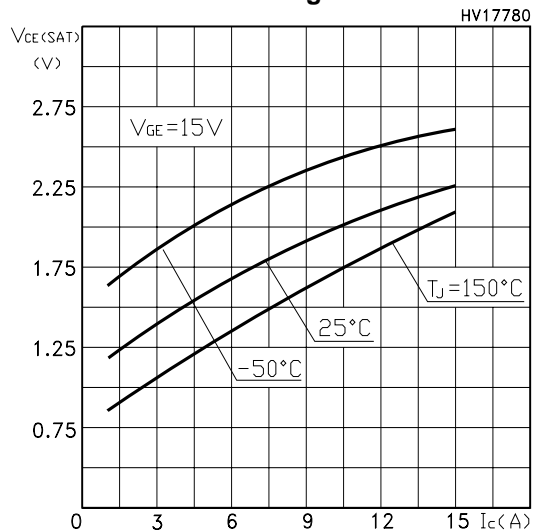
Transconductance



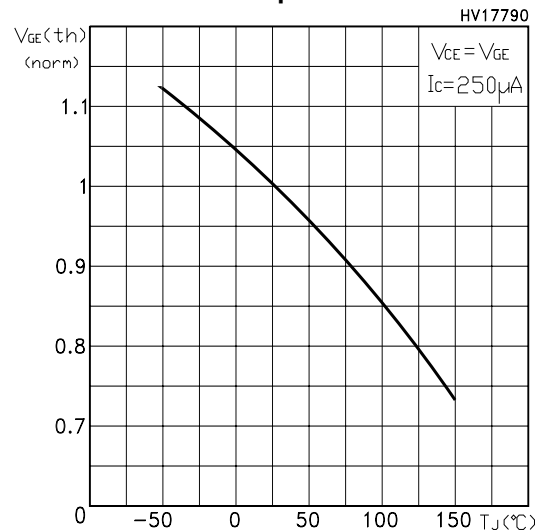
Normalized Collector-Emitter On Voltage vs Temp.



Collector-Emitter On Voltage vs Collector Current

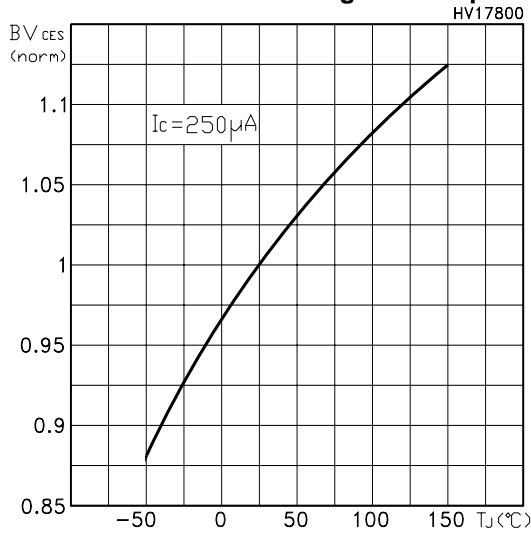


Gate Threshold vs Temperature

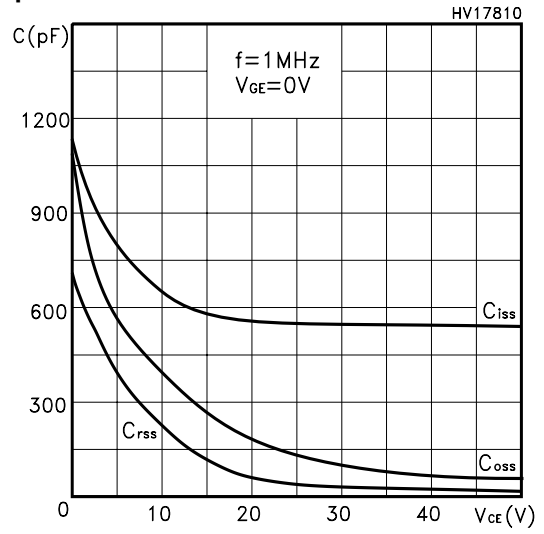


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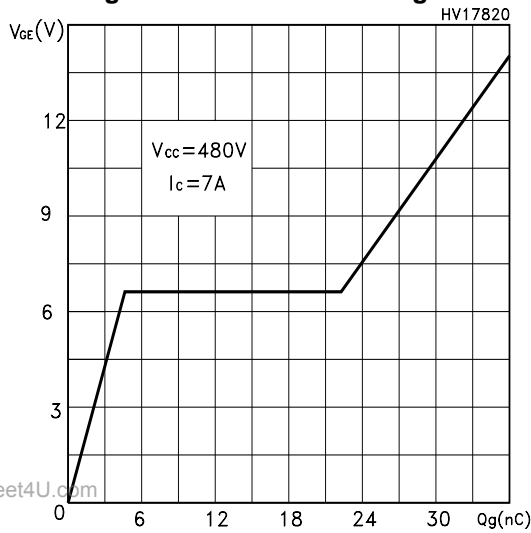
Normalized Breakdown Voltage vs Temperature



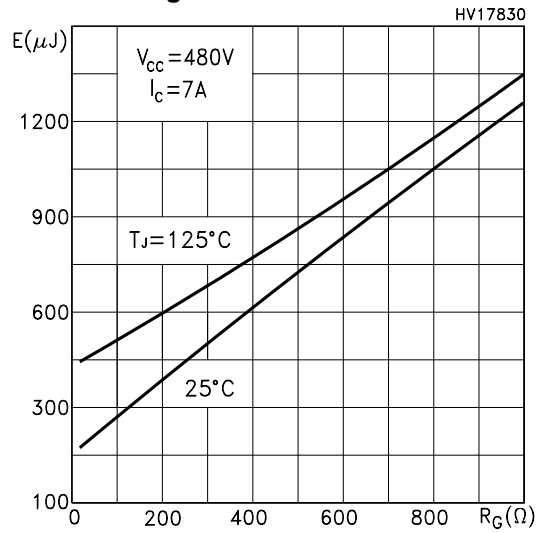
Capacitance Variations



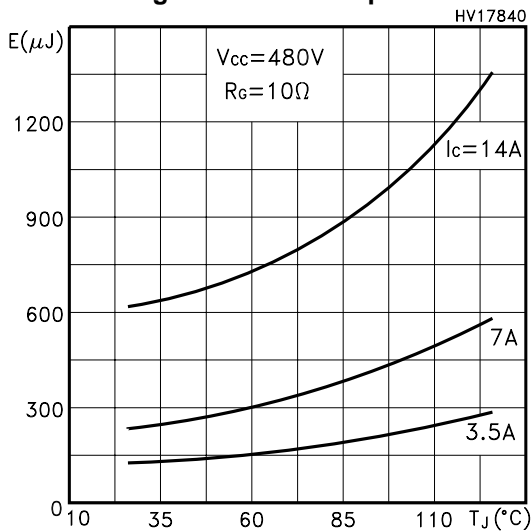
Gate Charge vs Gate-Emitter Voltage



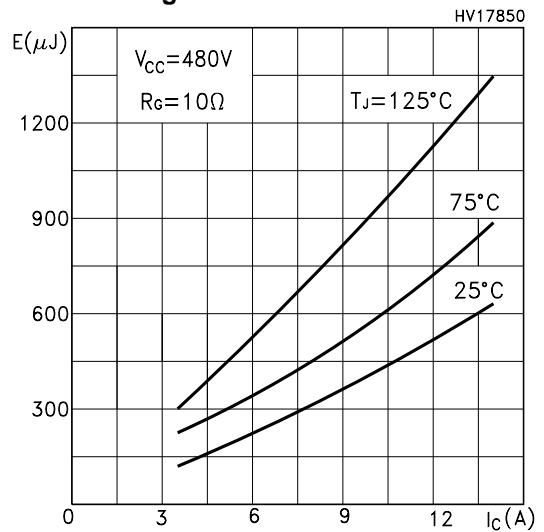
Total Switching Losses vs Gate Resistance



Total Switching Losses vs Temperature



Total Switching Losses vs Collector Current

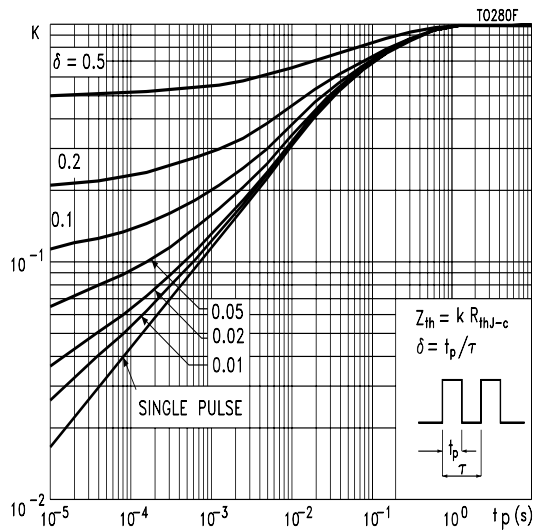


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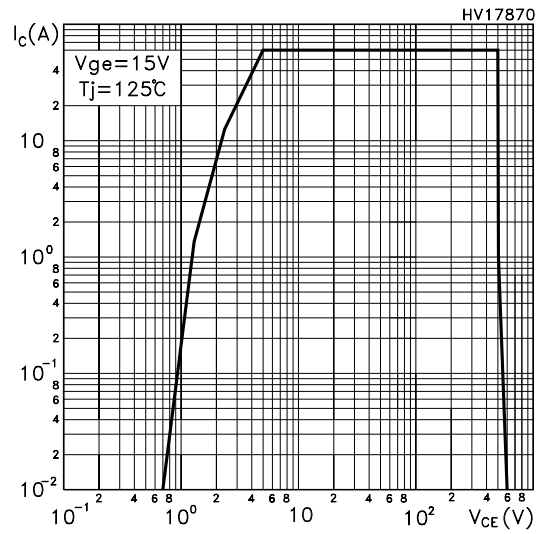


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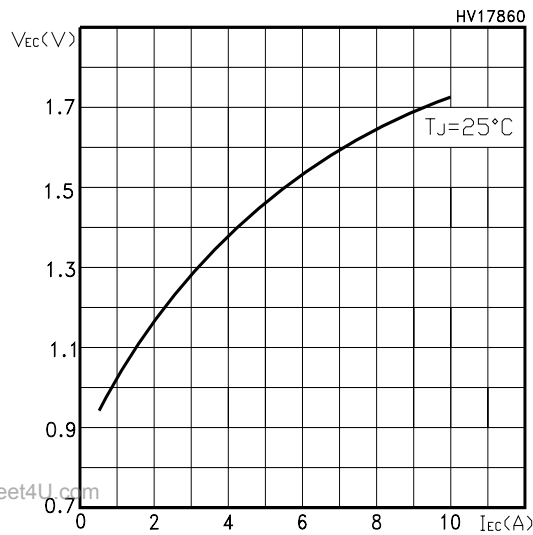
Thermal Impedance for TO-220/D²PAK



Turn-Off SOA



Emitter-Collector Diode Characteristics



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Fig. 1: Gate Charge test Circuit

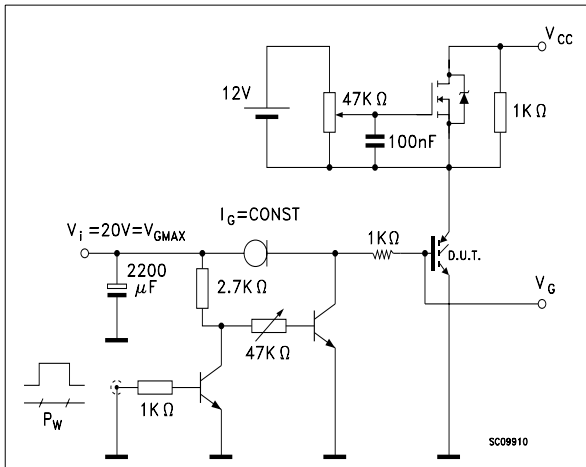
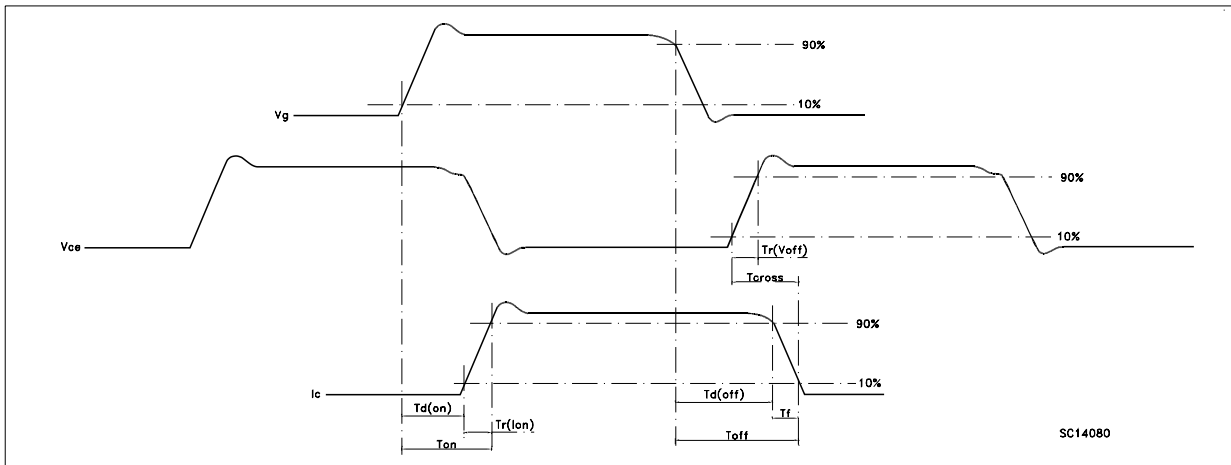
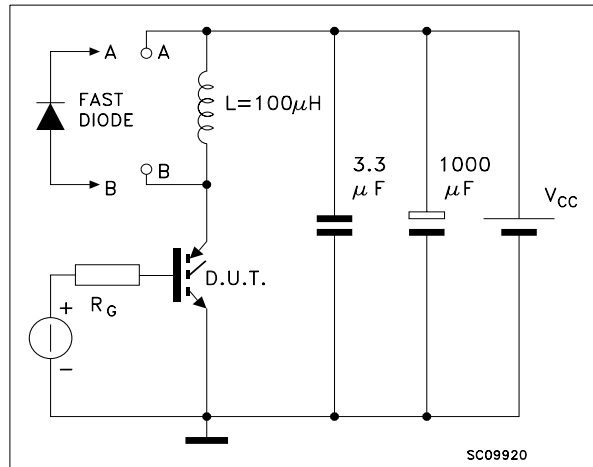


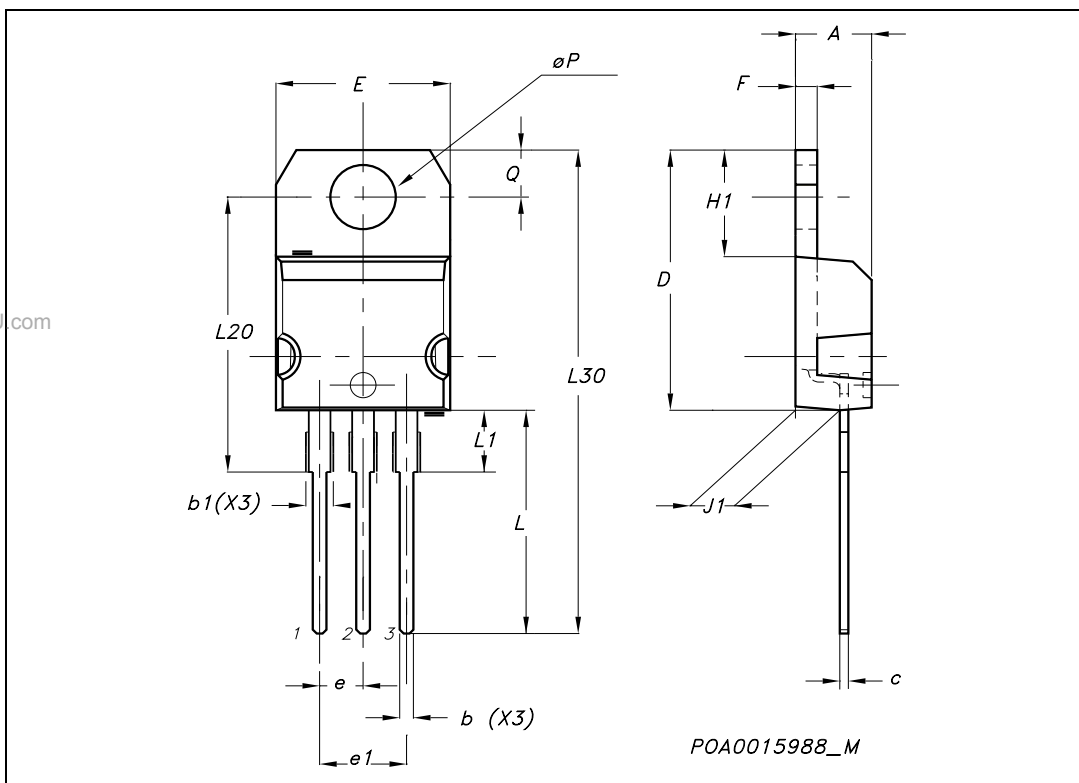
Fig. 2: Test Circuit For Inductive Load Switching



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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



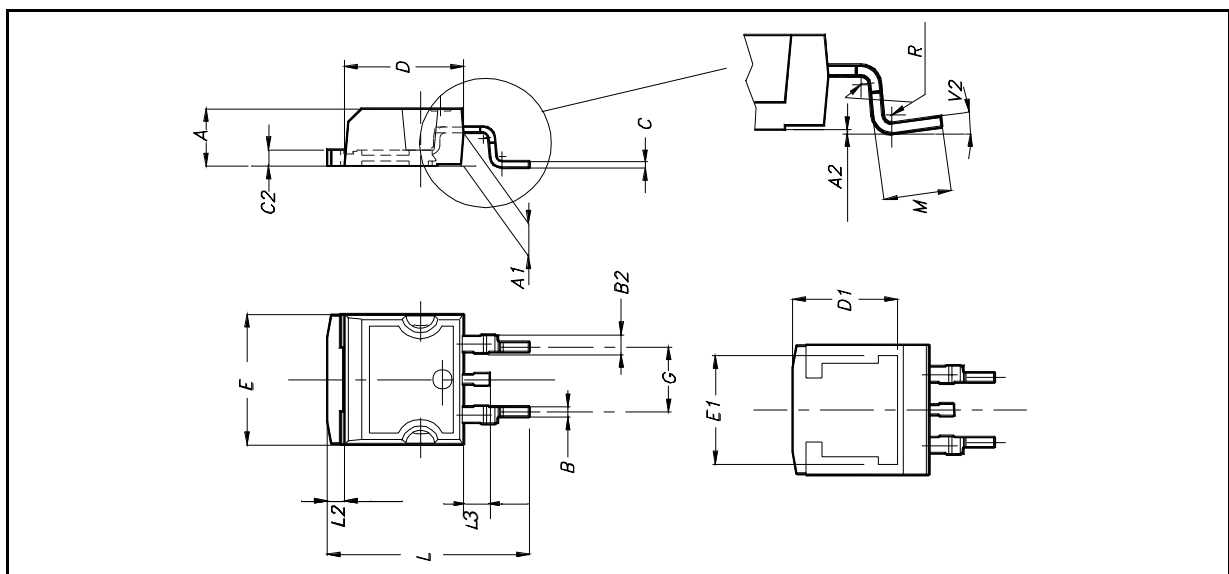
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D²PAK MECHANICAL DATA

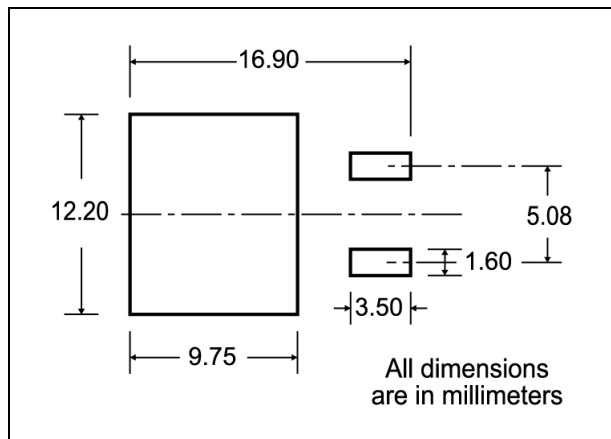
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
A2	0.03		0.23	0.001		0.009
B	0.7		0.93	0.027		0.036
B2	1.14		1.7	0.044		0.067
C	0.45		0.6	0.017		0.023
C2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1		8			0.315	
E	10		10.4	0.393		
E1		8.5			0.334	
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°		4°			

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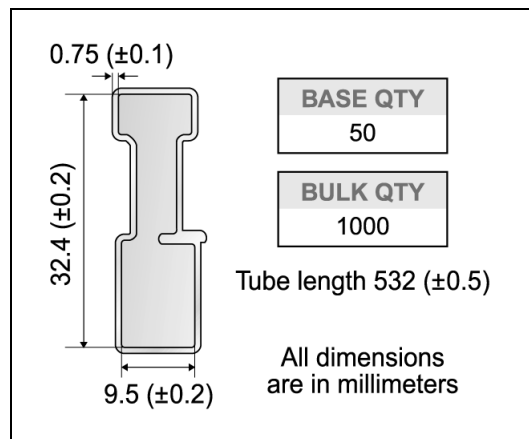


STGP7NB60FD - STGB7NB60FD

D²PAK 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

TAPE MECHANICAL DATA

DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A0	10.5	10.7	0.413	0.421
B0	15.7	15.9	0.618	0.626
D	1.5	1.6	0.059	0.063
D1	1.59	1.61	0.062	0.063
E	1.65	1.85	0.065	0.073
F	11.4	11.6	0.449	0.456
K0	4.8	5.0	0.189	0.197
P0	3.9	4.1	0.153	0.161
P1	11.9	12.1	0.468	0.476
P2	1.9	2.1	0.075	0.082
R	50		1.574	
T	0.25	0.35	0.0098	0.0137
W	23.7	24.3	0.933	0.956

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	24.4	26.4	0.960	1.039
N	100		3.937	
T		30.4		1.197

BASE QTY	BULK QTY
1000	1000

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

STGP7NB60FD - STGB7NB60FD

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