

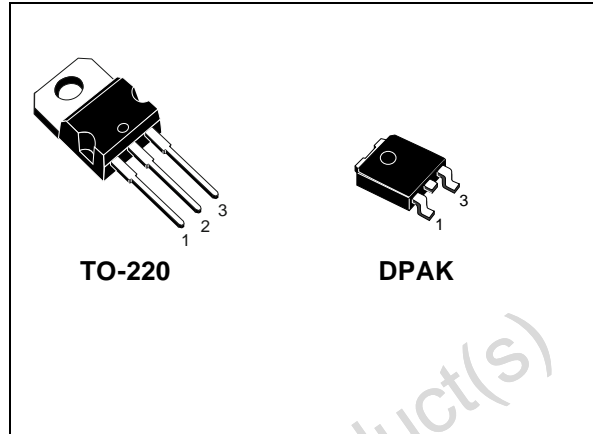


STGP3NB60K STGD3NB60K

N-CHANNEL 6A - 600V - TO-220 / DPAK SHORT CIRCUIT PROOF PowerMESH™ IGBT

TYPE	V _{CE(S)}	V _{CE(sat)} (Max) @ 25°C	I _C (#) @100°C
STGP3NB60K	600 V	< 2.8 V	6 A
STGD3NB60K	600 V	< 2.8 V	6 A

- HIGH INPUT IMPEDANCE (VOLTAGE DRIVEN)
- LOW ON-VOLTAGE DROP (V_{cesat})
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- OFF LOSSES INCLUDE TAIL CURRENT
- HIGH FREQUENCY OPERATION
- SHORT CIRCUIT RATED

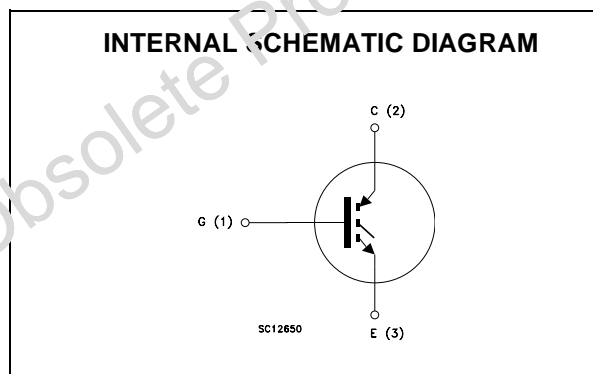


DESCRIPTION

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 "K" identifies a family optimized for high frequency motor control applications with short circuit withstand capability.

APPLICATIONS

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



ORDERING INFORMATION

SALES TYPE	MARKING	PACKAGE	PACKAGING
STGP3NB60K	GP3NB60K	TO-220	TUBE
STGD3NB60KT4	GD3NB60K	DPAK	TAPE & REEL

STGP3NB60K - STGD3NB60K

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CES}	Collector-Emitter Voltage ($V_{GS} = 0$)	600	V
V_{ECR}	Emitter-Collector Voltage	20	V
V_{GE}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current (continuous) at $T_C = 25^\circ\text{C}$ (#)	10	A
I_C	Collector Current (continuous) at $T_C = 100^\circ\text{C}$ (#)	6	A
I_{CM} (#)	Collector Current (pulsed)	24	A
P_{TOT}	Total Dissipation at $T_C = 25^\circ\text{C}$	50	W
	Derating Factor	0.4	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	2.5		°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	62.5	100	°C/W

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

MAIN PARAMETERS

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 ($V_{GE} = 0$)	$V_{CE} = \text{Max Rating}$, $T_C = 25^\circ\text{C}$ $V_{CE} = \text{Max Rating}$, $T_C = 125^\circ\text{C}$			50 500	μA μA
I_{GES}	Gate-Emitter Leakage Current ($V_{CE} = 0$)	$V_{GE} = \pm 20\text{V}$, $V_{CE} = 0$			± 100	nA
$V_{GE(th)}$	Gate Threshold Voltage	$V_{CE} = V_{GE}$, $I_C = 250\mu\text{A}$	5		7	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$V_{GE} = 15\text{V}$, $I_C = 3 \text{ A}$ $V_{GE} = 15\text{V}$, $I_C = 3 \text{ A}$, $T_j = 125^\circ\text{C}$		2.3 1.9	2.8	V V

SWITCHING PARAMETERS

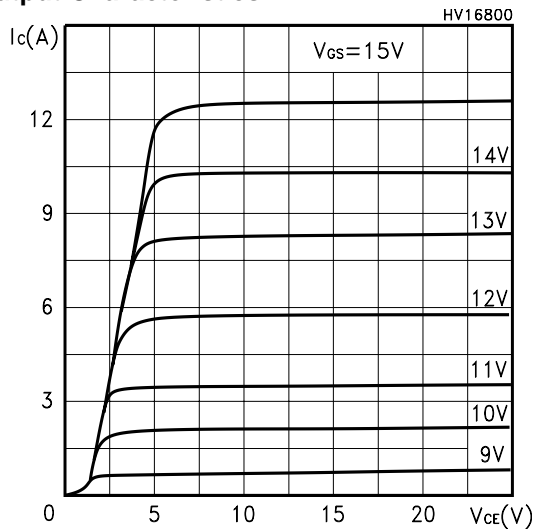
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs}	Forward Transconductance	$V_{CE} = 25V, I_C = 3 A$		2.4		S
C_{ies} C_{oes} C_{res}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{CE} = 25V, f = 1 MHz, V_{GE} = 0$		220 50 5.8		pF pF pF
Q_g Q_{ge} Q_{gc}	Total Gate Charge Gate-Emitter Charge Gate-Collector Charge	$V_{CE} = 480V, I_C = 3 A,$ $V_{GE} = 15V$		14 3.3 7.5	18	nC nC nC
tscw	Short Circuit Withstand Time	$V_{ce} = 0.5 V_{BR(CES)}, V_{GE}=15V,$ $T_j = 125^\circ C, R_G = 10 \Omega$	10			μs
$t_{d(on)}$ t_r	Turn-on Delay Time Rise Time	$V_{CC} = 480 V, I_C = 3 A$ $R_G = 10\Omega, V_{GE} = 15 V$		14 5		ns ns
$(di/dt)_{on}$ E _{on}	Turn-on Current Slope Turn-on Switching Losses	$V_{CC}= 480 V, I_C = 3 A R_G=10\Omega$ $V_{GE} = 15 V, T_j = 125^\circ C$		520 30		A/ μs 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	$V_{CC} = 480 V, I_C = 3 A,$ $R_{GE} = 10 \Omega, V_{GE} = 15 V$ $T_j = 25^\circ C$		90 20 33 100 58 85		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	$V_{CC} = 480 V, I_C = 3 A,$ $R_{GE} = 10 \Omega, V_{GE} = 15 V$ $T_j = 125^\circ C$		190 54 90 130 111 195		ns ns ns ns μJ μJ

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)

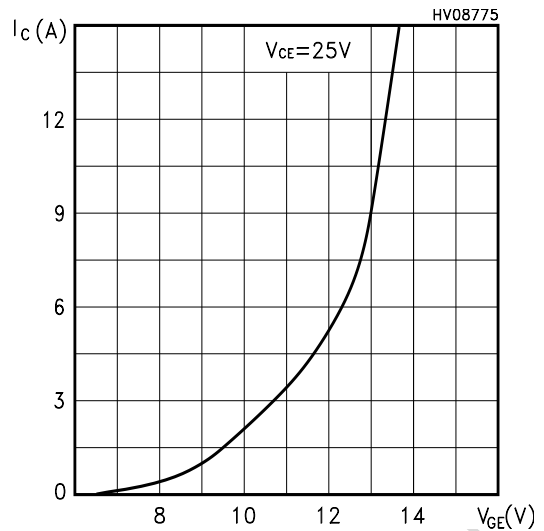
(#) Calculated according to the iterative formula:

$$I_C(T_C) = \frac{T_{JMAX} - T_C}{R_{THJ-C} \times V_{CESAT(MAX)}(T_C, I_C)}$$

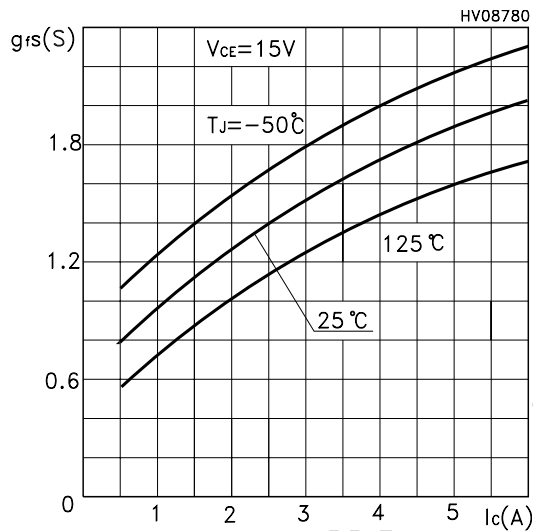
Output Characteristics



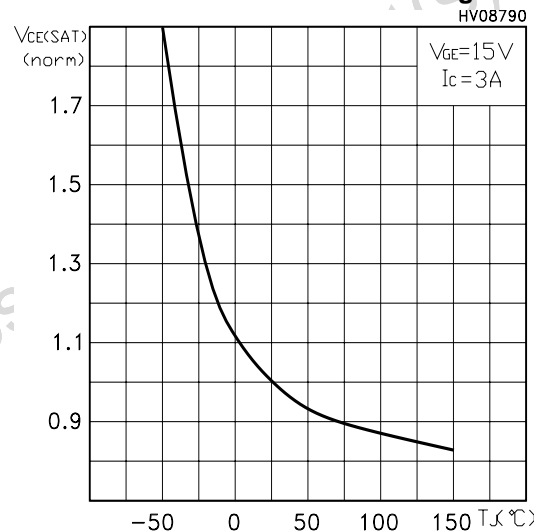
Transfer Characteristics



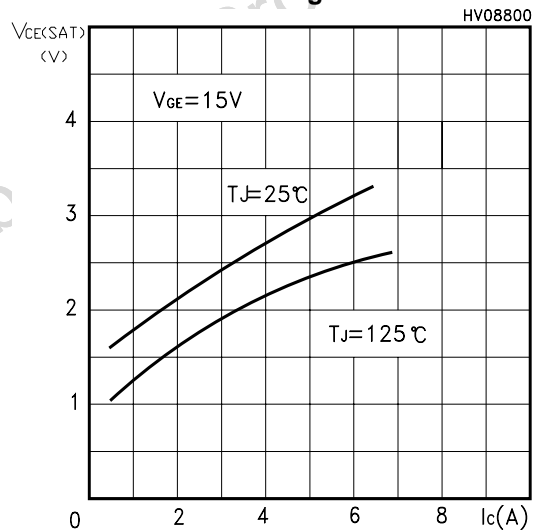
Transconductance



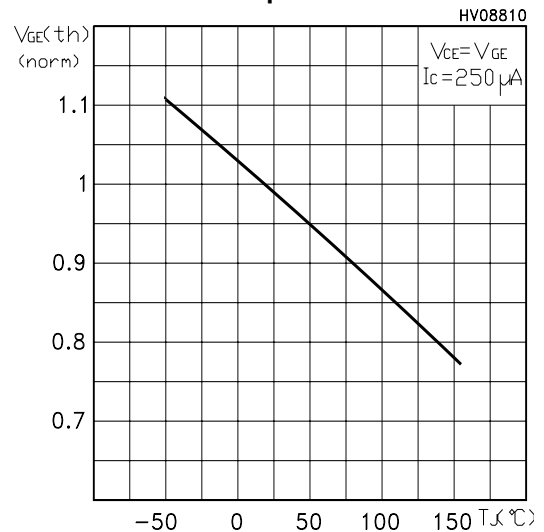
Normalized Collector-Emitter On Voltage vs Temp.



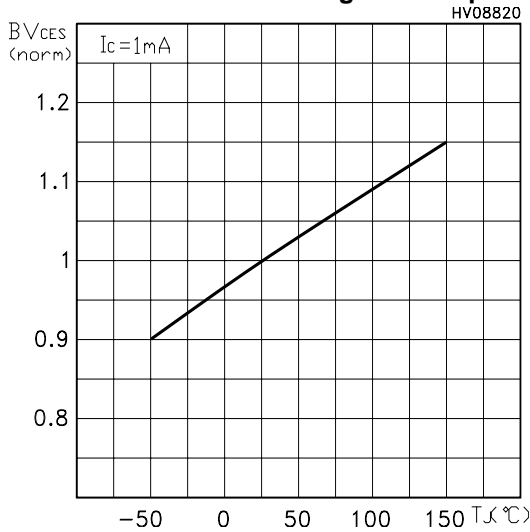
Collector-Emitter On Voltage vs Collector Current



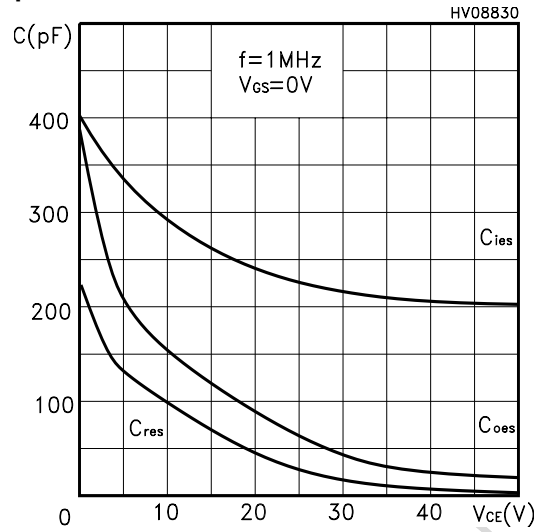
Gate Threshold vs Temperature



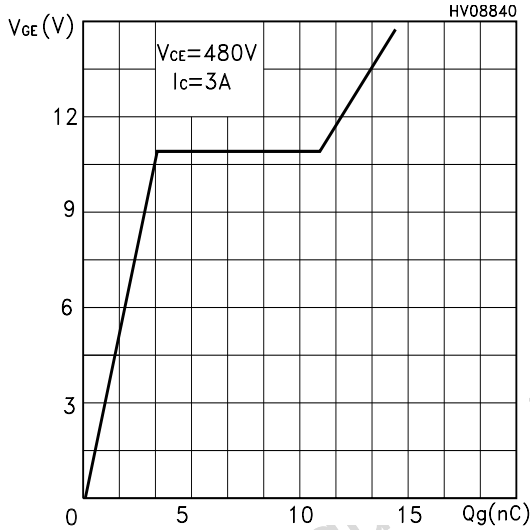
Normalized Breakdown Voltage vs Temperature



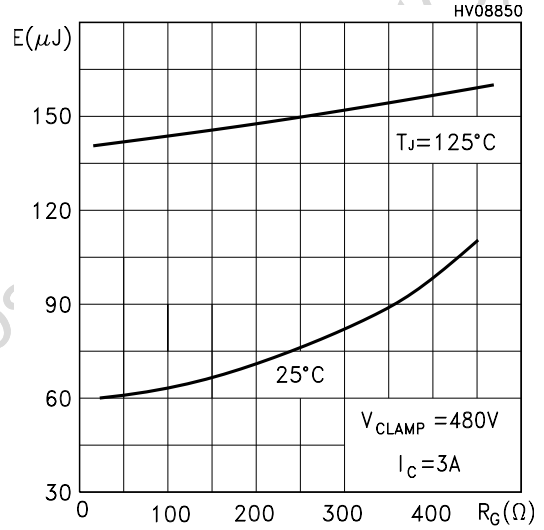
Capacitance Variations



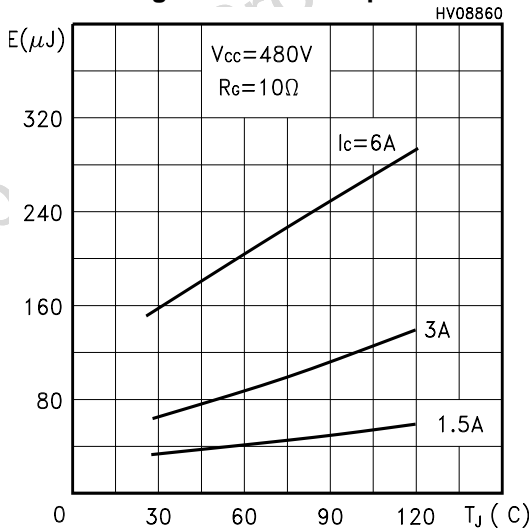
Gate Charge vs Gate-Emitter Voltage



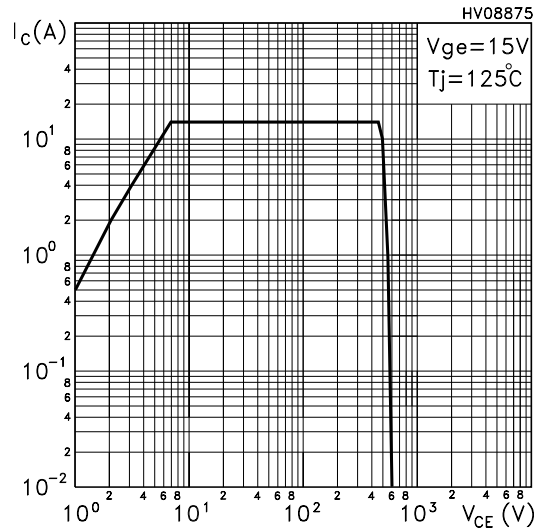
Total Switching Losses vs Gate Resistance



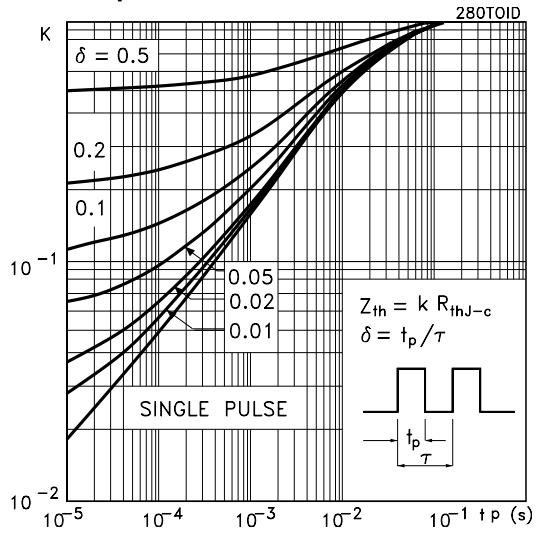
Total Switching Losses vs Temperature



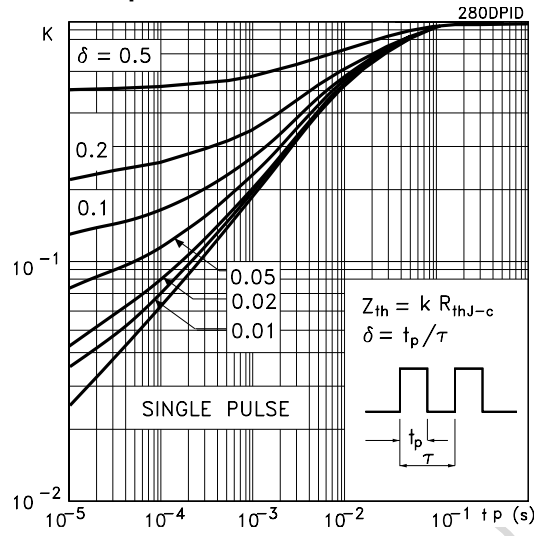
Turn-Off SOA



Thermal Impedance for TO-220



Thermal Impedance for DPAK



Obsolete Product(s) - Obsolete Product(s)

Fig. 1: Gate Charge test Circuit

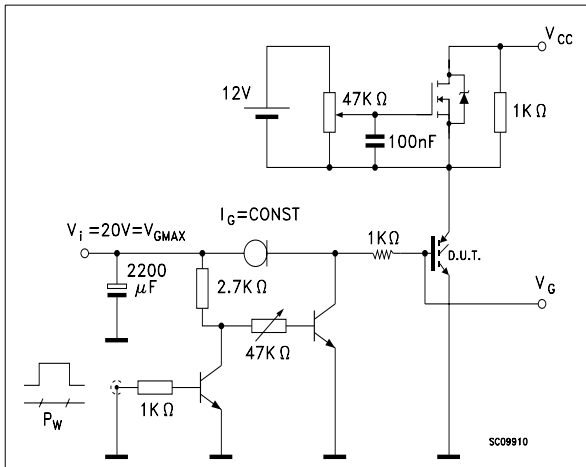
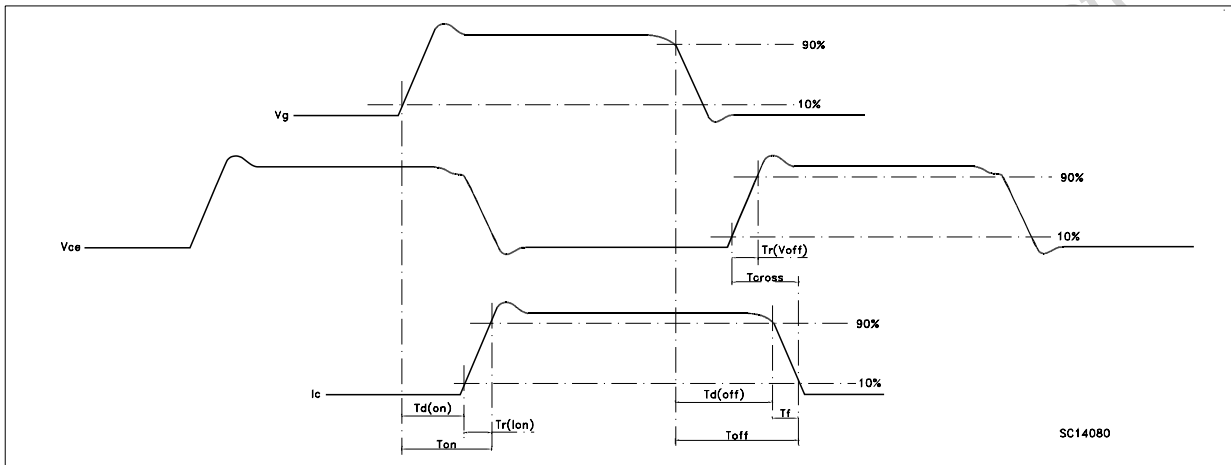
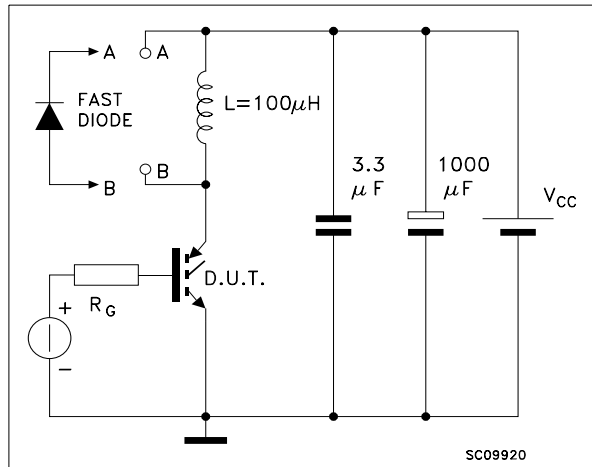


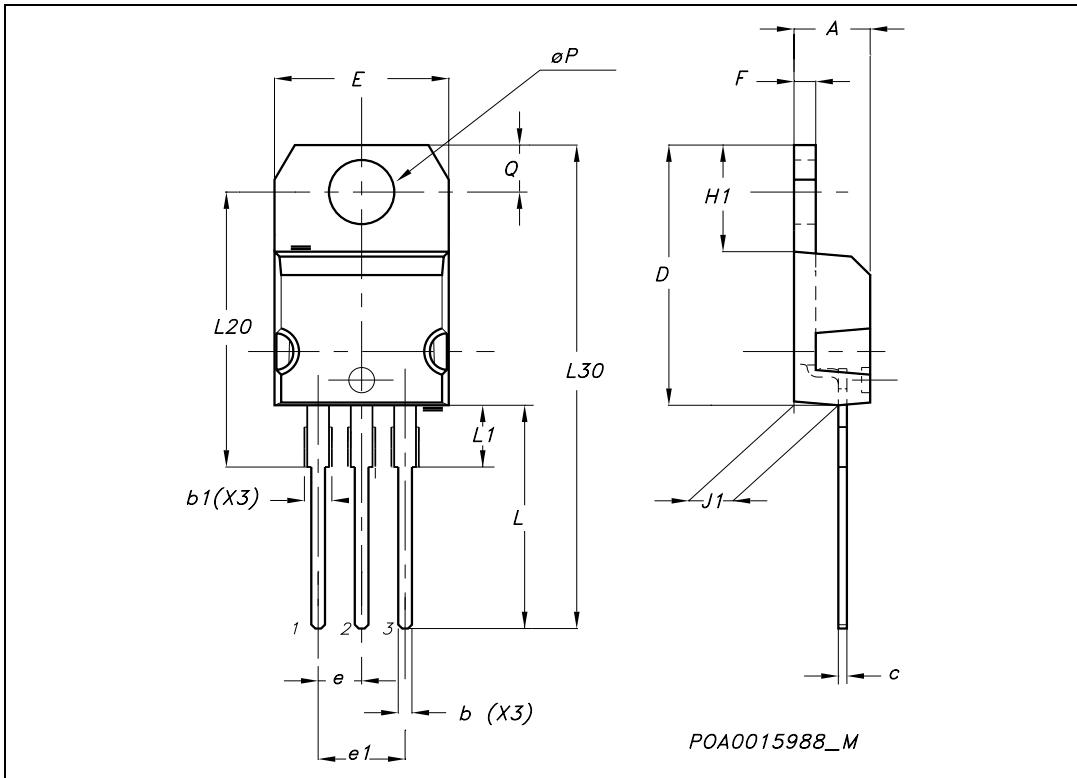
Fig. 2: Test Circuit For Inductive Load Switching



Obsolete Product

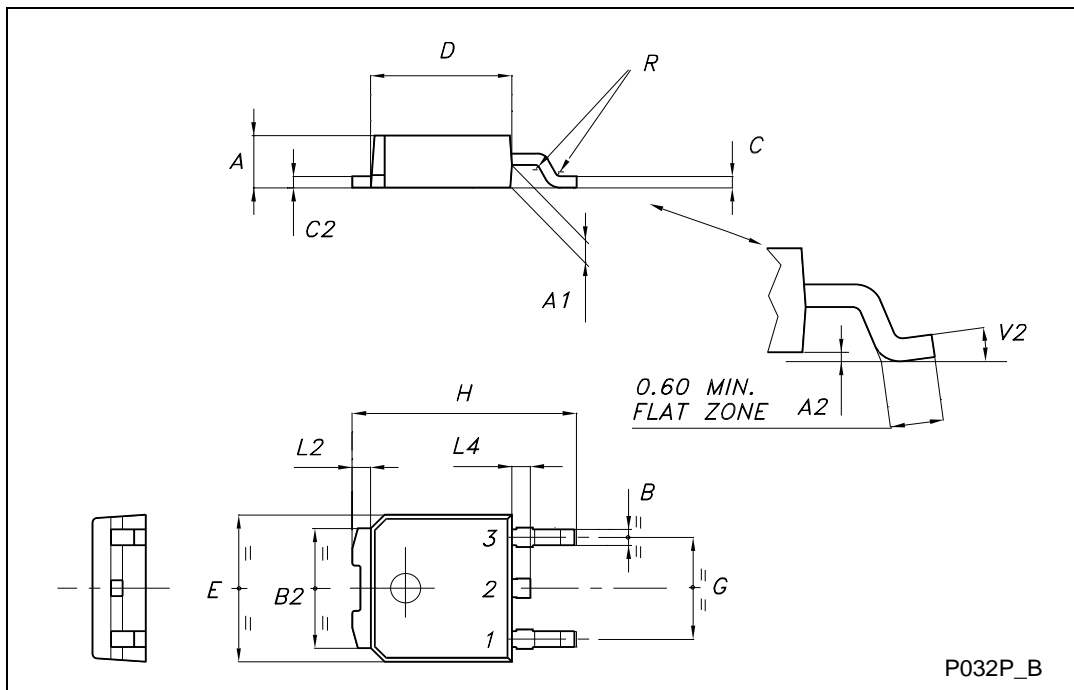
TO-220 MECHANICAL DATA

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

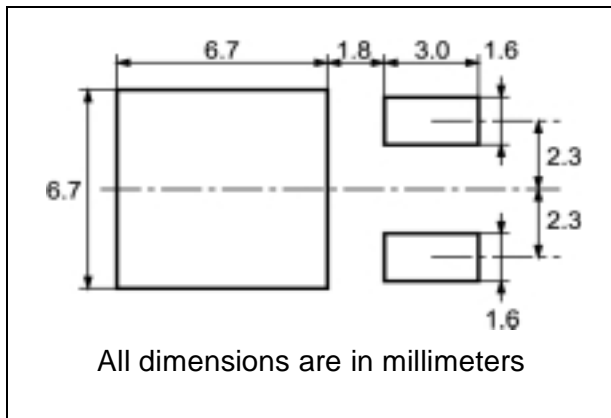


TO-252 (DPAK) MECHANICAL DATA

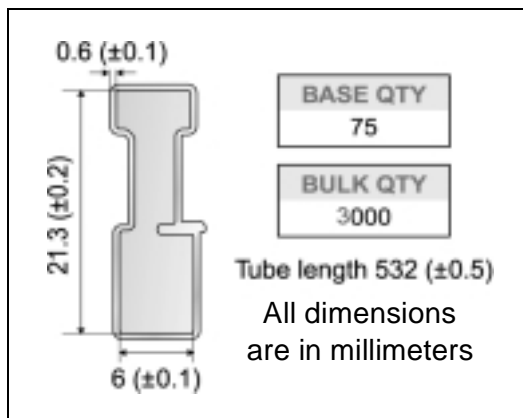
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.20		2.40	0.087		0.094
A1	0.90		1.10	0.035		0.043
A2	0.03		0.23	0.001		0.009
B	0.64		0.90	0.025		0.035
B2	5.20		5.40	0.204		0.213
C	0.45		0.60	0.018		0.024
C2	0.48		0.60	0.019		0.024
D	6.00		6.20	0.236		0.244
E	6.40		6.60	0.252		0.260
G	4.40		4.60	0.173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

Diagram showing the tape and reel shipment dimensions. The tape slot in the core for tape start is 25 mm min. width. The full radius is shown. The access hole at the slot location is 40 mm min. The dimensions A, B, C, D, G, N, and T are indicated. G is measured at the hub.

40 mm min. Access hole at slot location

Full radius

Tape slot in core for tape start 25mm 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

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

BASE QTY
2500

BULK QTY
2500

For machine ref only including draft and radii concentric around B0

TOP COVER TAPE

10 pitches cumulative tolerance on tape + / - 0.2 mm

User Direction of Feed

Center line of cavity

TRL

FEED DIRECTION

Bending radius R min.

* on sales type

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