

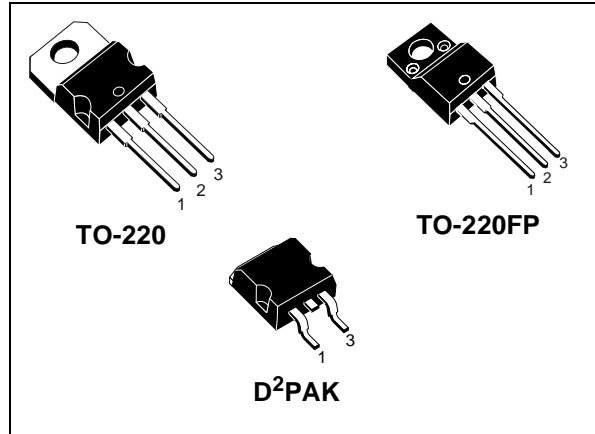


STGP3NB60KD - STGP3NB60KDFP STGB3NB60KD

N-CHANNEL 6A - 600V - TO-220/TO-220FP/D²PAK
SHORT CIRCUIT PROOF PowerMESH™ IGBT

TYPE	V _{CE(S)}	V _{CE(sat)} (Max) @ 25°C	I _c (#) @100°C
STGP3NB60KD	600 V	< 2.8 V	6 A
STGP3NB60KDFP	600 V	< 2.8 V	6 A
STGB3NB60KD	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



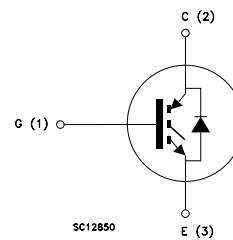
DESCRIPTION

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

INTERNAL SCHEMATIC DIAGRAM



ORDERING INFORMATION

SALES TYPE	MARKING	PACKAGE	PACKAGING
STGP3NB60KD	GP3NB60KD	TO-220	TUBE
STGP3NB60KDFP	GP3NB60KDFP	TO-220FP	TUBE
STGB3NB60KDT4	GB3NB60KD	D ² PAK	TAPE & REEL

STGP3NB60KD-STGP3NB60KDFP-STGB3NB60KD

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		TO-220 D ² PAK	TO-220FP	
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°C (#)	10		A
I _C	Collector Current (continuous) at T _C = 100°C (#)	6		A
I _{CM} (■)	Collector Current (pulsed)	24		A
P _{TOT}	Total Dissipation at T _C = 25°C	50	25	W
	Derating Factor	0.4	0.2	W/°C
V _{ISO}	Insulation Withstand Voltage A.C.	--	2500	V
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 D ² PAK	TO-220FP	
R _{thj-case}	Thermal Resistance Junction-case Max	2.5	5	°C/W
R _{thj-amb}	Thermal Resistance Junction-ambient Max	62.5		°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 μA, V _{GE} = 0	600			V
I _{CES}	Collector cut-off (V _{GE} = 0)	V _{CE} = Max Rating, T _C = 25 °C V _{CE} = Max Rating, T _C = 125 °C			50 500	μA μA
I _{GES}	Gate-Emitter Leakage Current (V _{CE} = 0)	V _{GE} = ±20V, V _{CE} = 0			±100	nA
V _{GE(th)}	Gate Threshold Voltage	V _{CE} = V _{GE} , I _C = 250μA	5		7	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°C		2.3 1.9	2.8	V V

SWITCHING PARAMETERS

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (1)	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

COLLECTOR-EMITTER DIODE

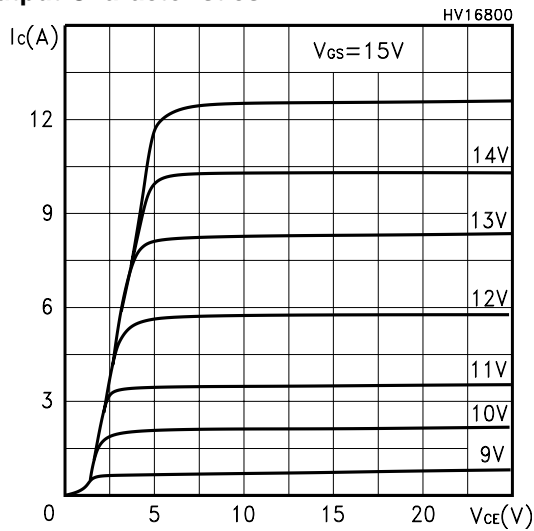
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_f I_{fm}	Forward Current Forward Current Pulsed				3 24	A A
V_f	Forward On-Voltage	$I_f = 1.5 A$ $I_f = 1.5 A, T_j = 125^\circ C$		1.2 0.95	1.8	V V
t_{rr} Q_{rr} I_{rrm}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_f = 3 A, V_R = 35 V,$ $T_j = 125^\circ C, di/dt = 100A/\mu s$		45 70 2.7		ns nC A

Note: 1. Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %.
(**)Losses include Also the Tail (Jedec Standardization)

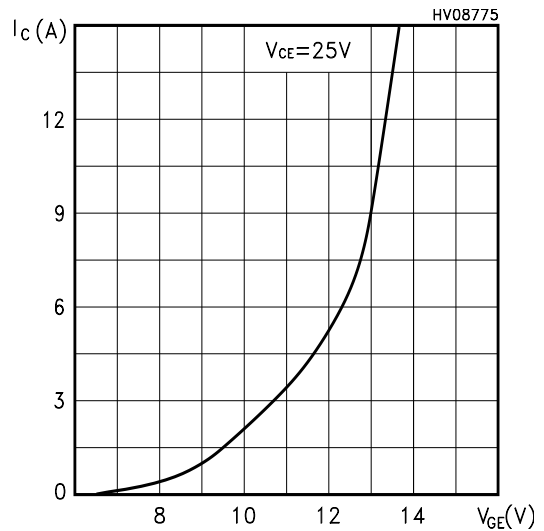
(#) Calculated according to the iterative formula:

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

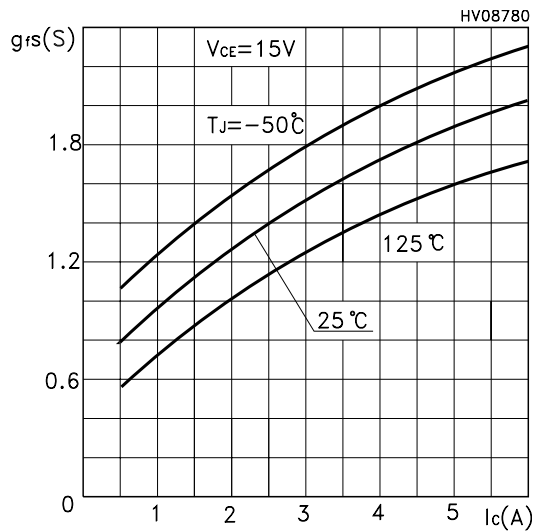
Output Characteristics



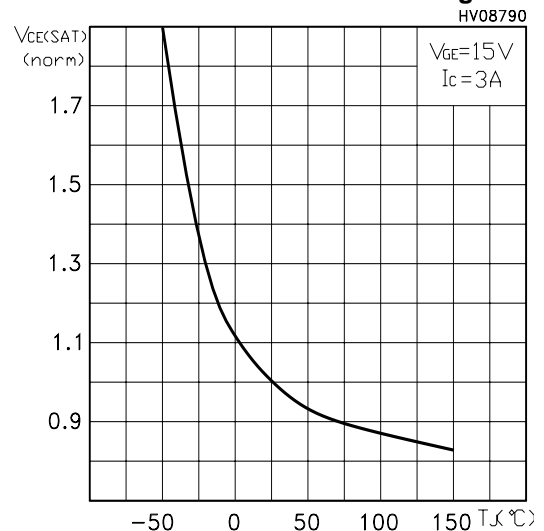
Transfer Characteristics



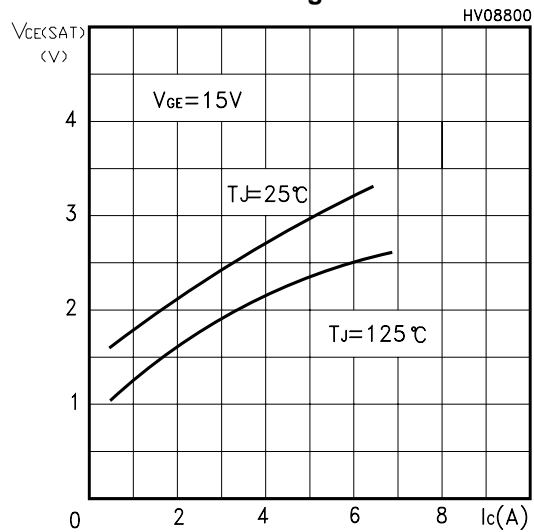
Transconductance



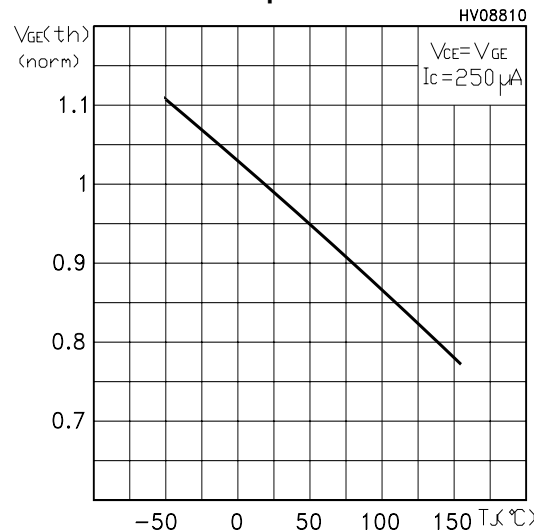
Normalized Collector-Emitter On Voltage vs Temp.



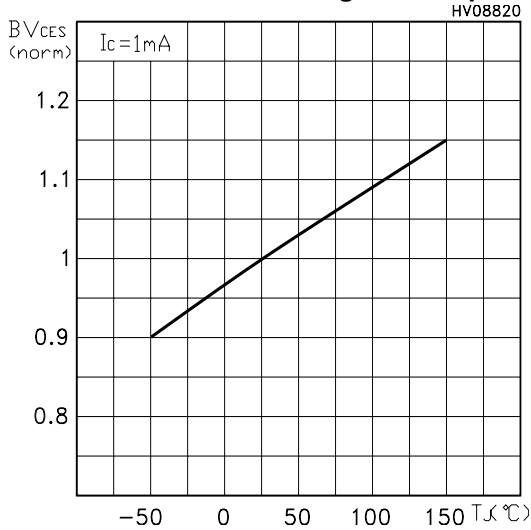
Collector-Emitter On Voltage vs Collector Current



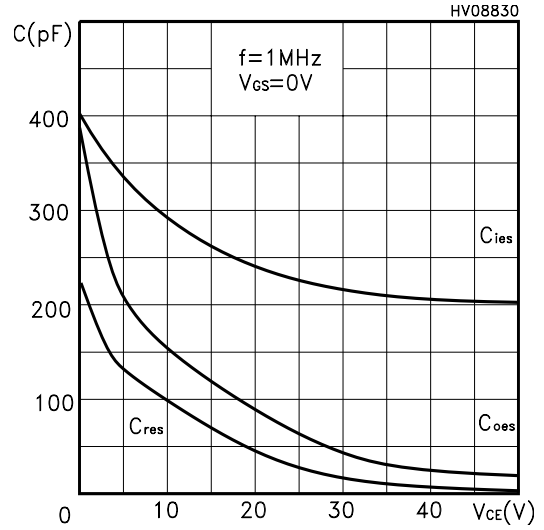
Gate Threshold vs Temperature



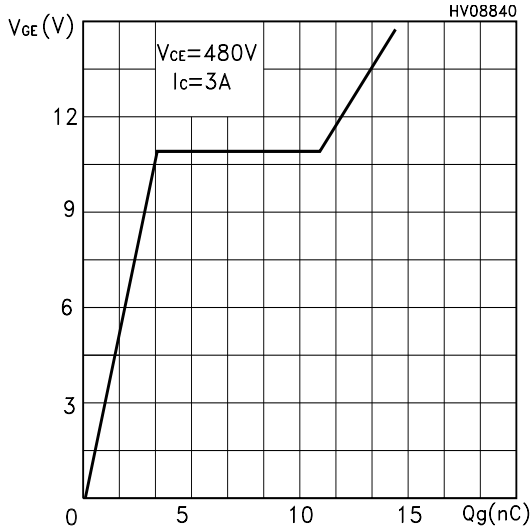
Normalized Breakdown Voltage vs Temperature



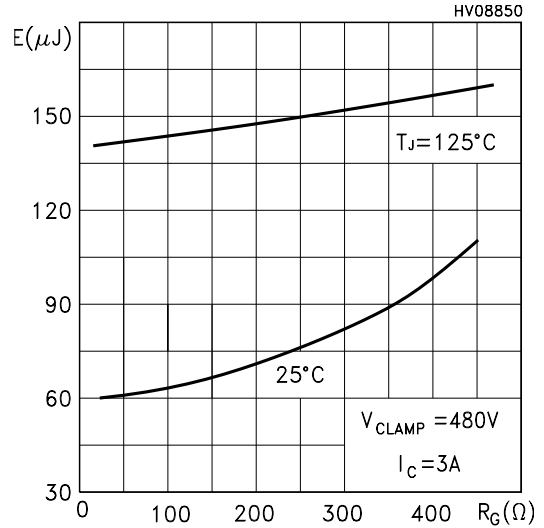
Capacitance Variations



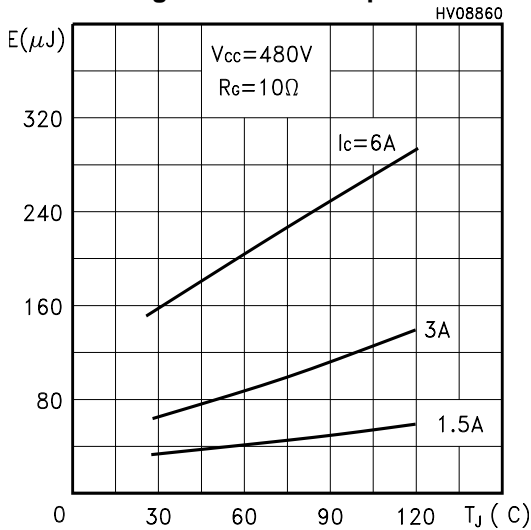
Gate Charge vs Gate-Emitter Voltage



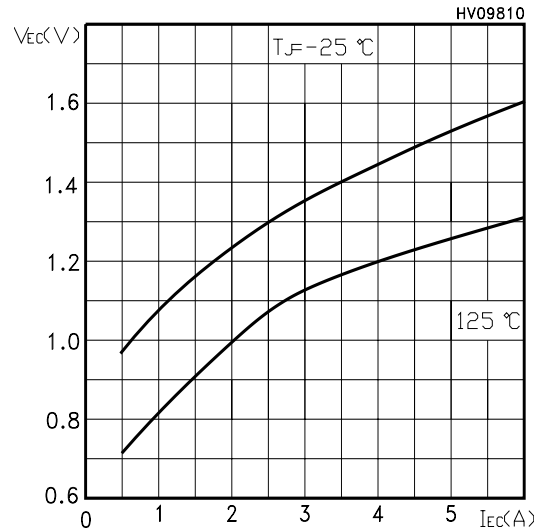
Total Switching Losses vs Gate Resistance



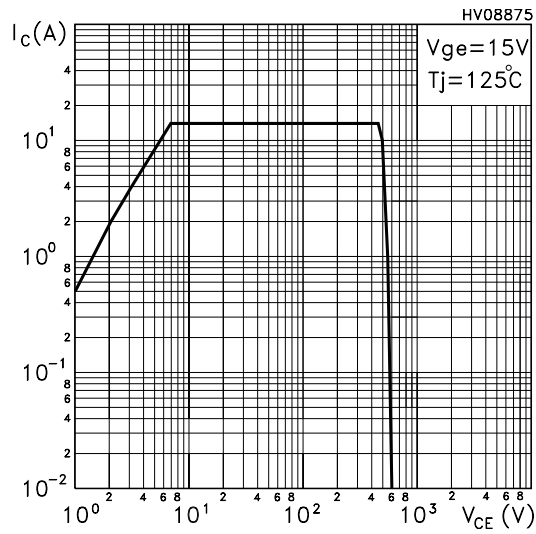
Total Switching Losses vs Temperature



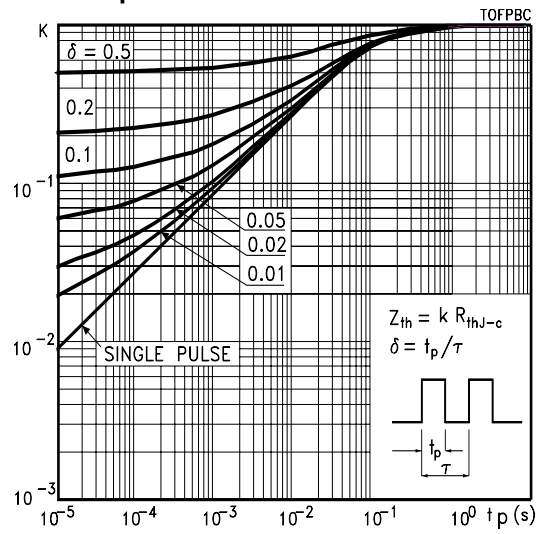
Emitter-collector Diode Characteristics



Turn-Off SOA



Thermal Impedance for TO-220FP



Thermal Impedance for TO-220 / D2PAK

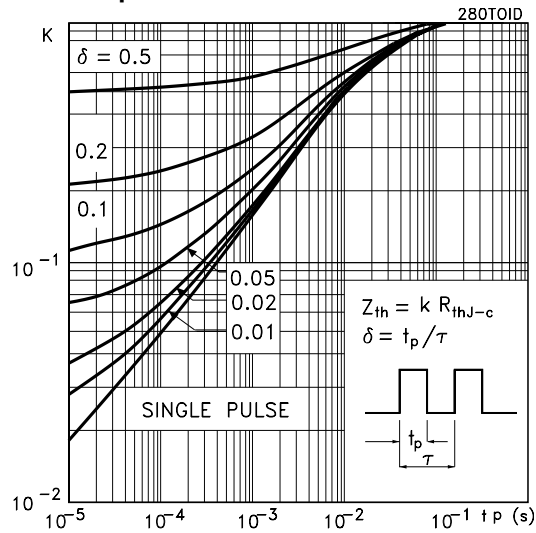


Fig. 1: Gate Charge test Circuit

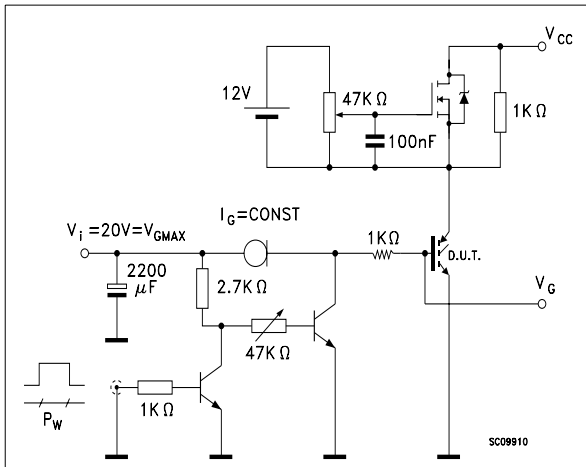
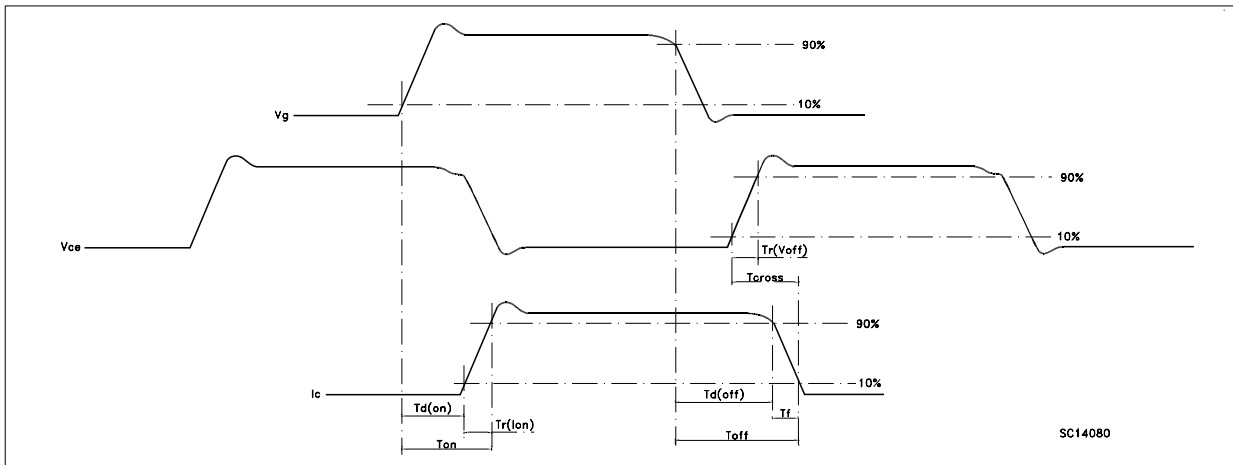
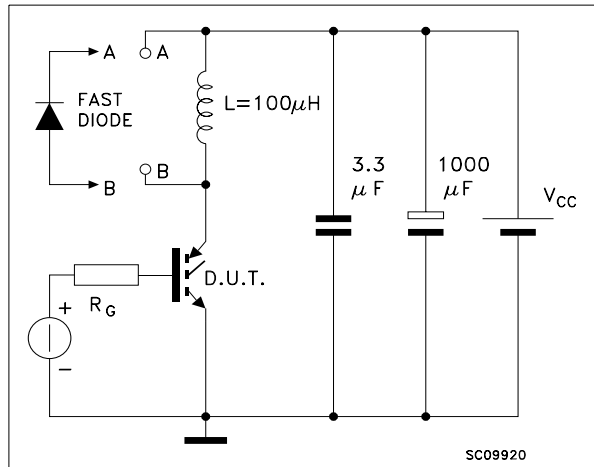
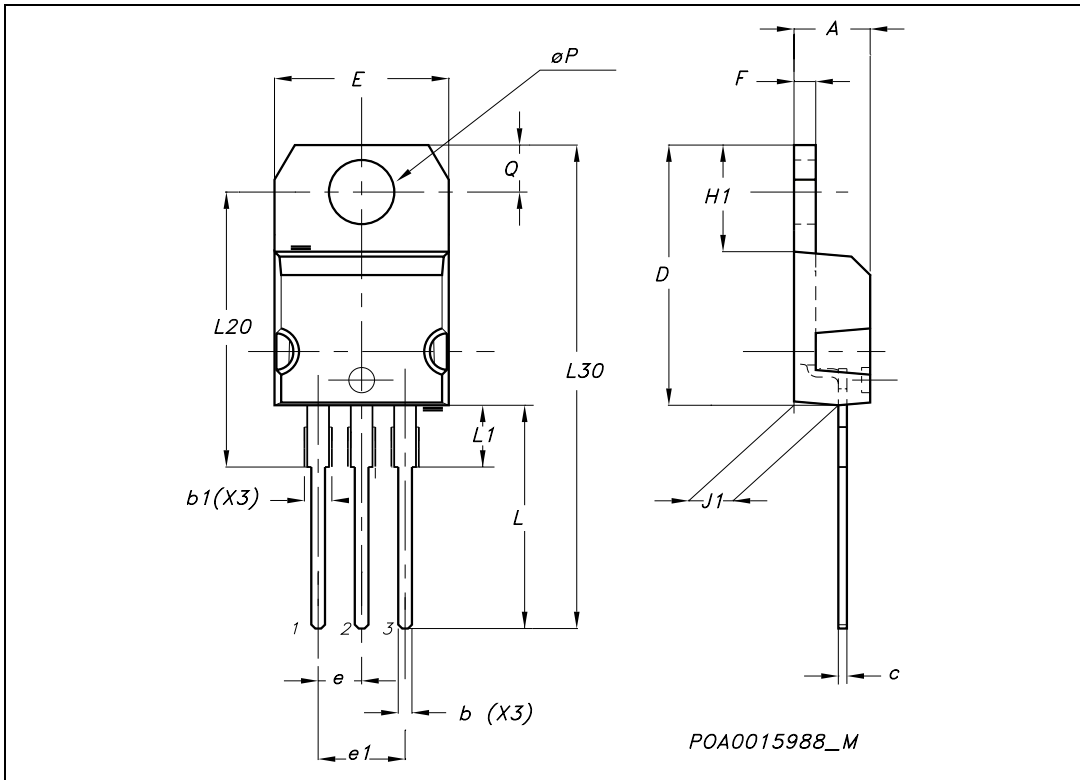


Fig. 2: Test Circuit For Inductive Load Switching



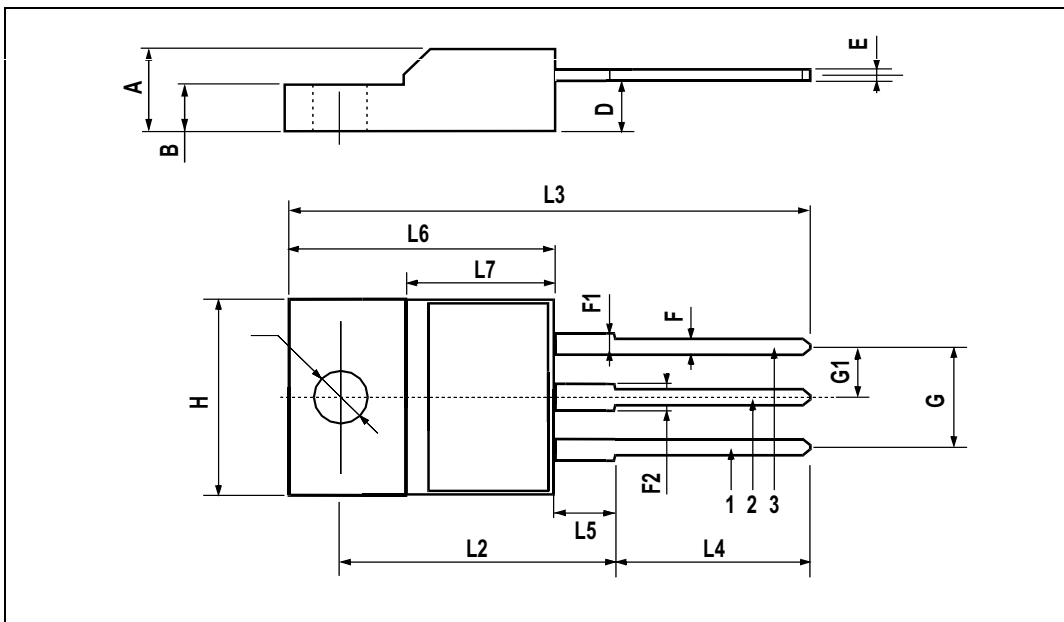
TO-220 MECHANICAL DATA

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



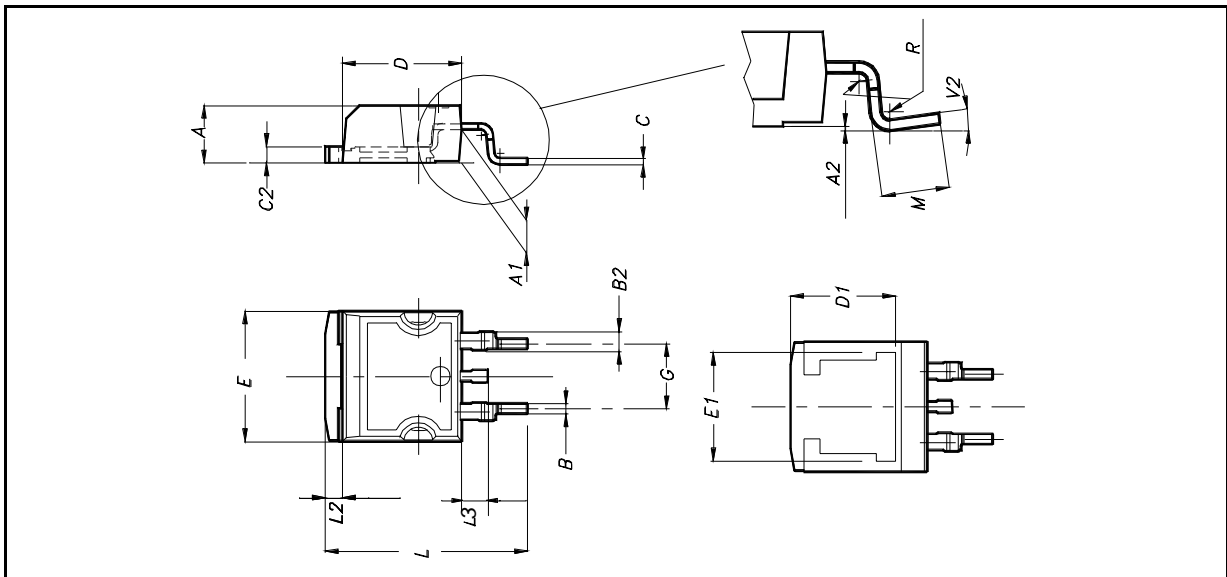
TO-220FP MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
B	2.5		2.7	0.098		0.106
D	2.5		2.75	0.098		0.108
E	0.45		0.7	0.017		0.027
F	0.75		1	0.030		0.039
F1	1.15		1.7	0.045		0.067
F2	1.15		1.7	0.045		0.067
G	4.95		5.2	0.195		0.204
G1	2.4		2.7	0.094		0.106
H	10		10.4	0.393		0.409
L2		16			0.630	
L3	28.6		30.6	1.126		1.204
L4	9.8		10.6	.0385		0.417
L5	2.9		3.6	0.114		0.141
L6	15.9		16.4	0.626		0.645
L7	9		9.3	0.354		0.366
Ø	3		3.2	0.118		0.126

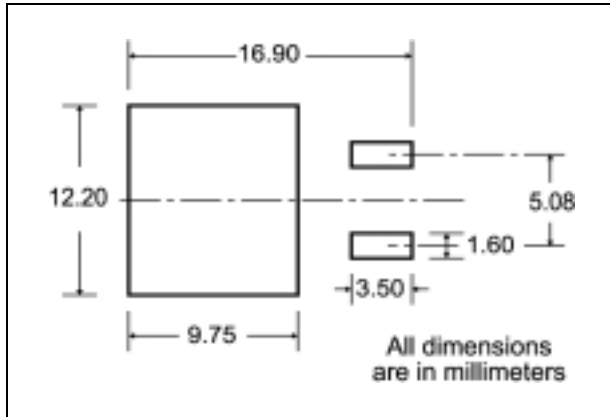


D²PAK MECHANICAL DATA

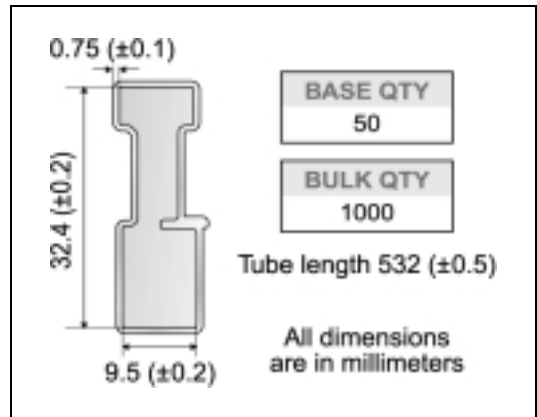
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
A2	0.03		0.23	0.001		0.009
B	0.7		0.93	0.027		0.036
B2	1.14		1.7	0.044		0.067
C	0.45		0.6	0.017		0.023
C2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1		8			0.315	
E	10		10.4	0.393		
E1		8.5			0.334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



D²PAK FOOTPRINT



TUBE SHIPMENT (no suffix)*



TAPE AND REEL SHIPMENT (suffix "T4")*

Diagram showing the tape mechanical data. It includes a circular view of the tape with dimensions A, B, C, D, and a note: "40 mm min. Access hole at slot location". A side view shows dimensions T, C, N, and G (measured at hub). A note indicates: "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

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

Diagram showing the reel mechanical data. It includes a top view of the reel with dimensions K₀, S, P₁, P₂, L, W, A₀, P₁, and a note: "10 pitches cumulative tolerance on tape +/- 0.2 mm". A side view shows dimensions B₁, B₂, and a note: "Center line of cavity". A bottom view shows the "FEED DIRECTION" and "TRL". A bending radius diagram shows "R min." and "Bending radius".

* on sales type

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