

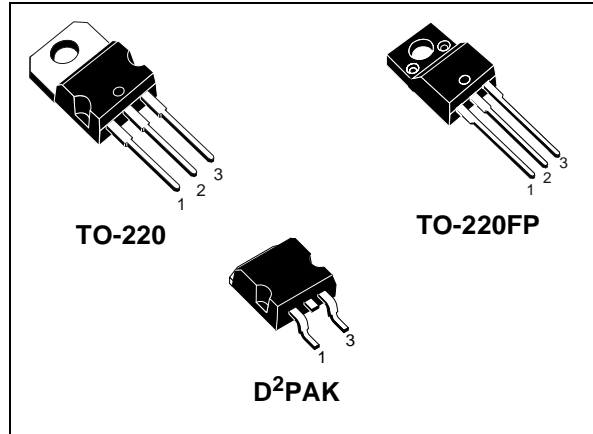


STGP3NB60KD - STGP3NB60KDFP STGB3NB60KD

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



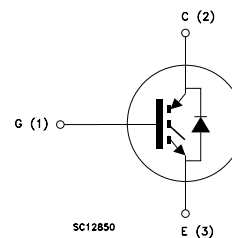
DESCRIPTION

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

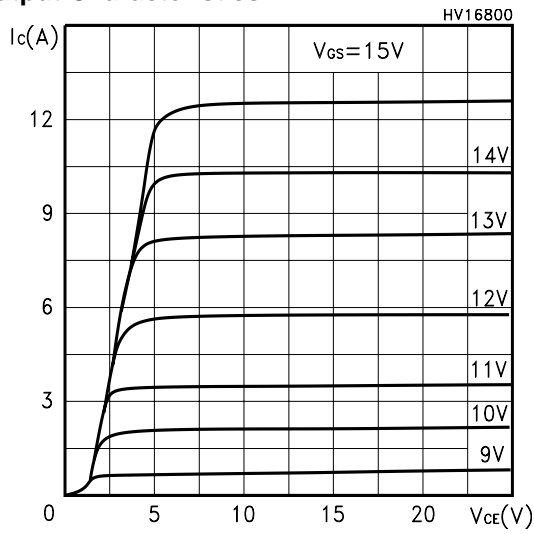
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_f I_{fm}	Forward Current Forward Current Pulsed				3 24	A A
V_f	Forward On-Voltage	$I_f = 1.5 A$ $I_f = 1.5 A, T_j = 125^\circ C$		1.2 0.95	1.8	V V
t_{rr} Q_{rr} I_{rrm}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_f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

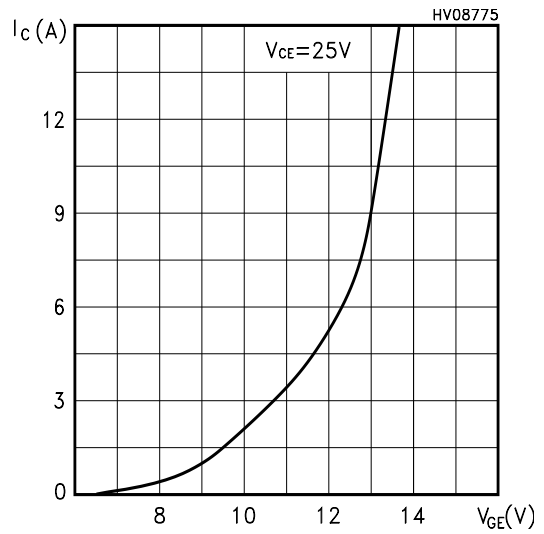
(#) Calculated according to the iterative formula:

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

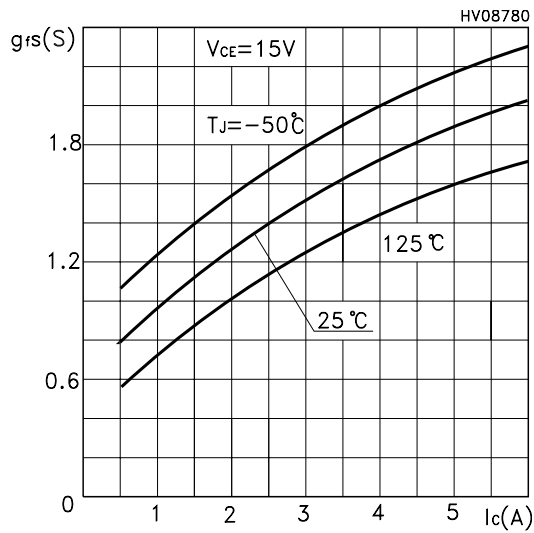
Output Characteristics



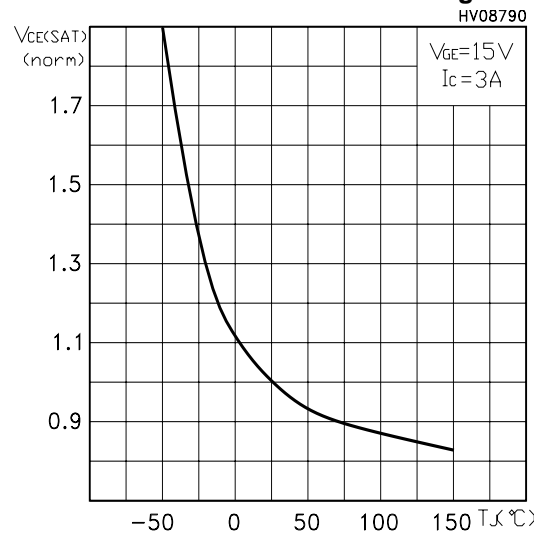
Transfer Characteristics



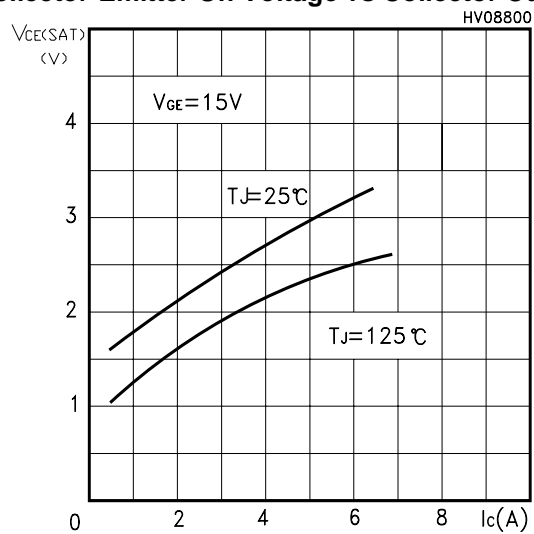
Transconductance



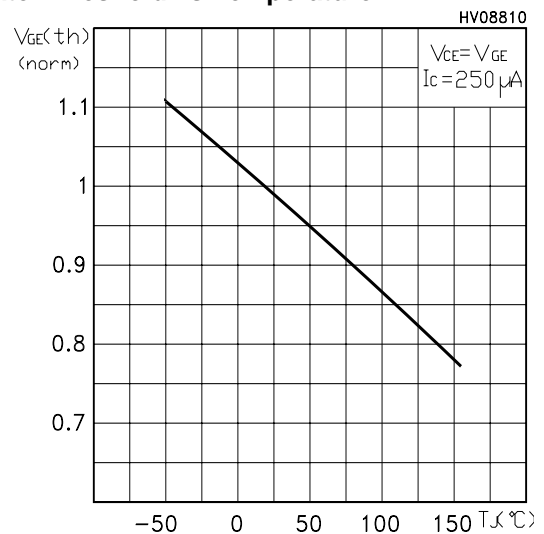
Normalized Collector-Emitter On Voltage vs Temp.



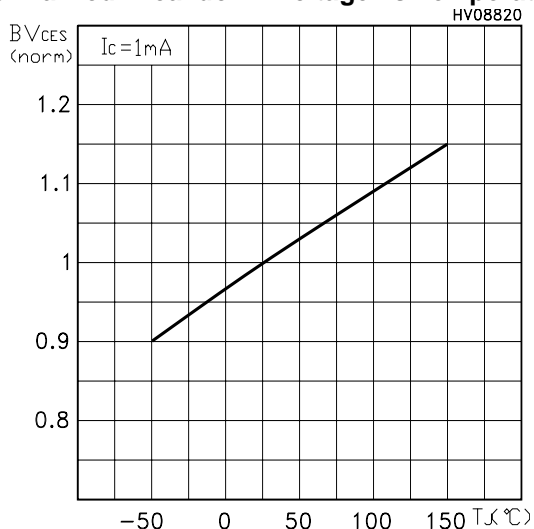
Collector-Emitter On Voltage vs Collector Current



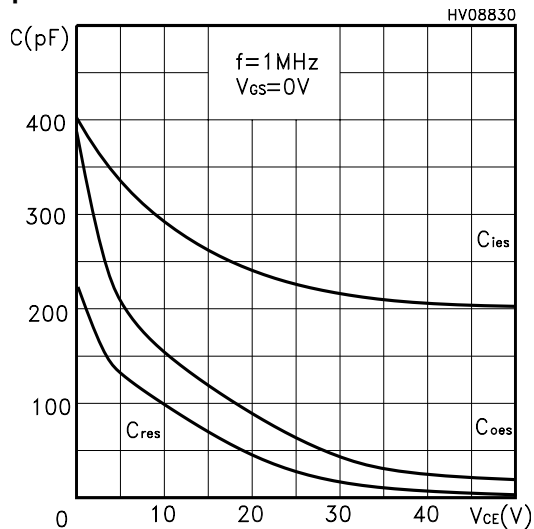
Gate Threshold vs Temperature



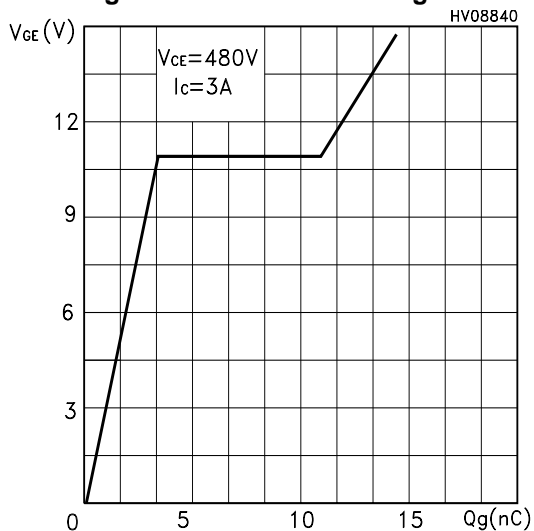
Normalized Breakdown Voltage vs Temperature



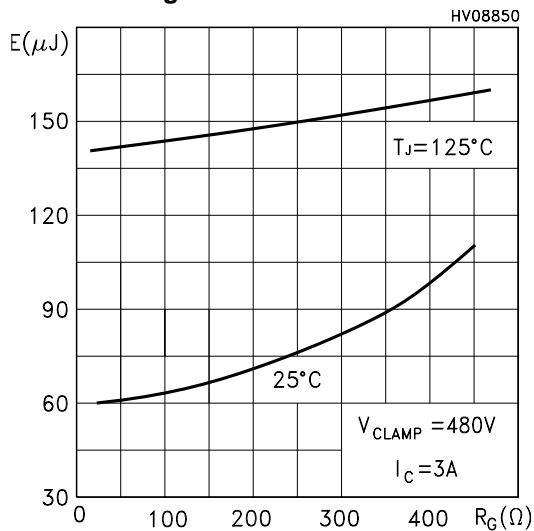
Capacitance Variations



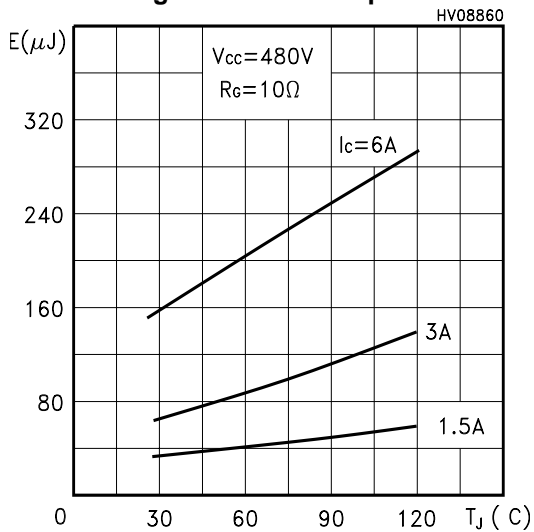
Gate Charge vs Gate-Emitter Voltage



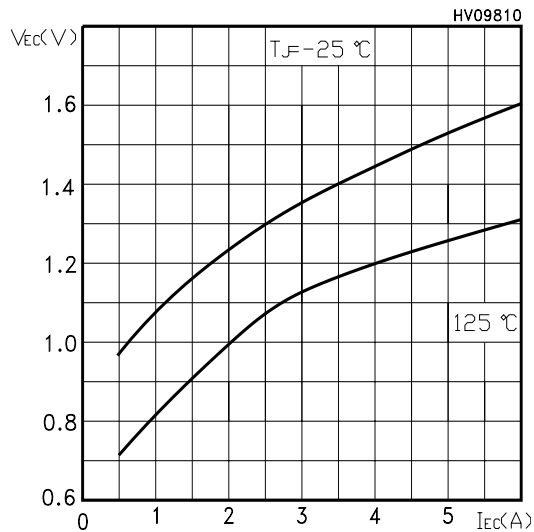
Total Switching Losses vs Gate Resistance



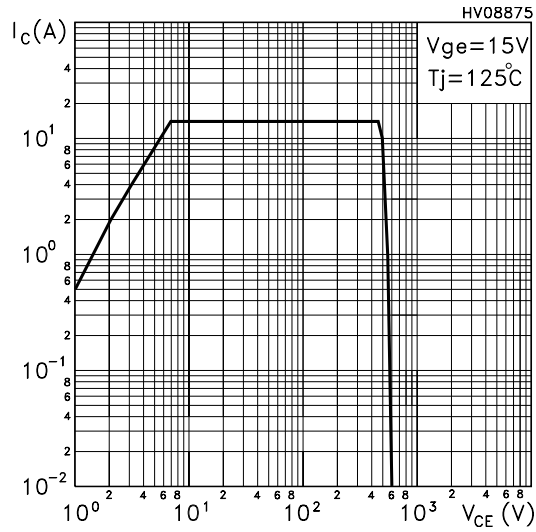
Total Switching Losses vs Temperature



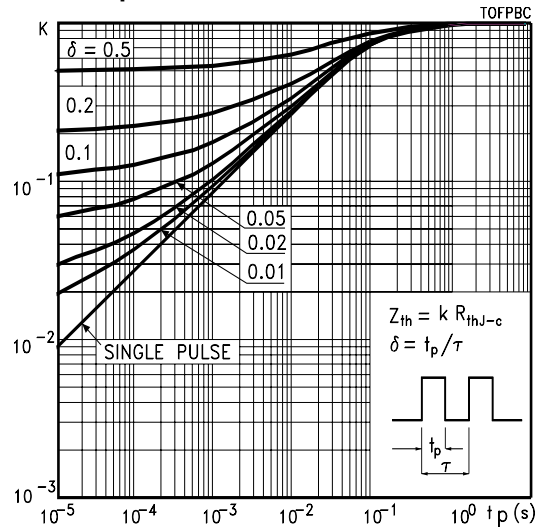
Emitter-collector Diode Characteristics



Turn-Off SOA



Thermal Impedance for TO-220FP



Thermal Impedance for TO-220 / D2PAK

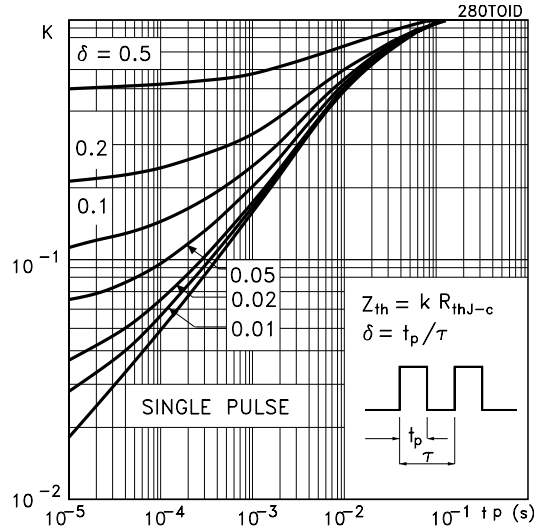


Fig. 1: Gate Charge test Circuit

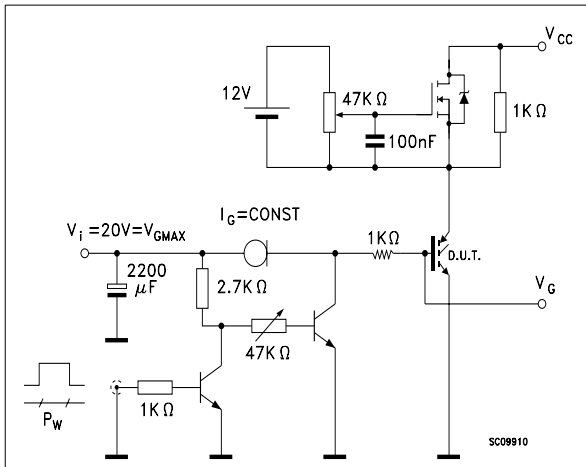
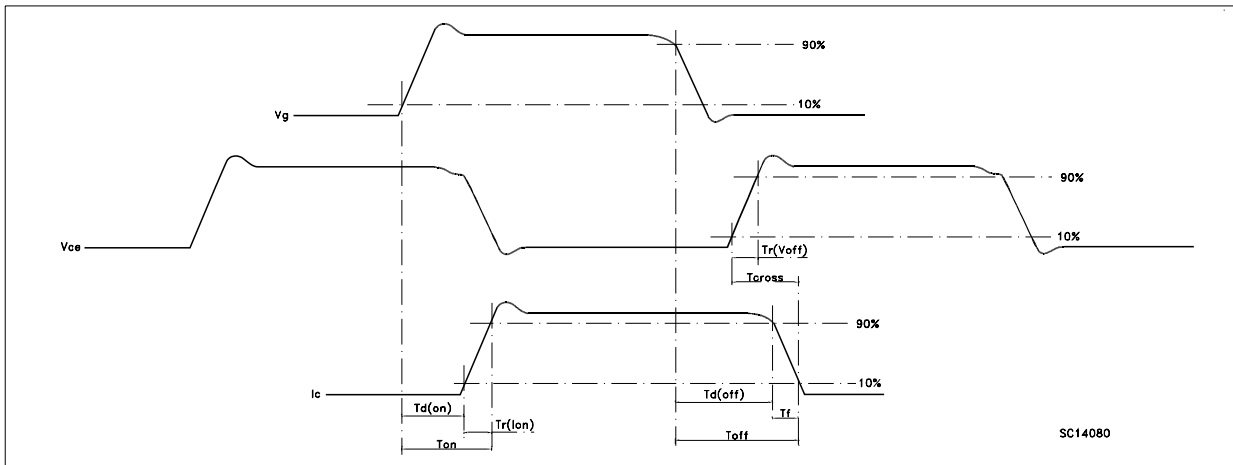
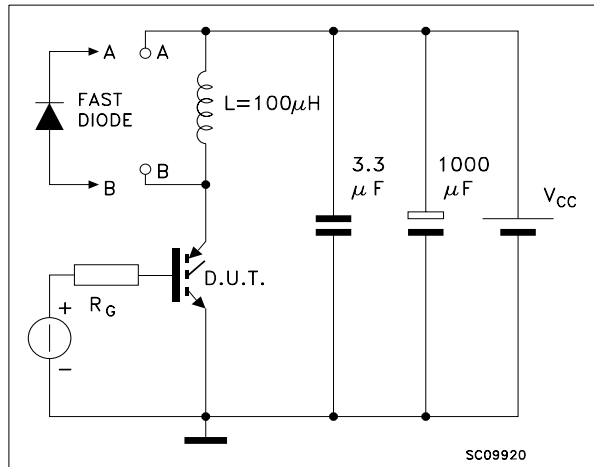
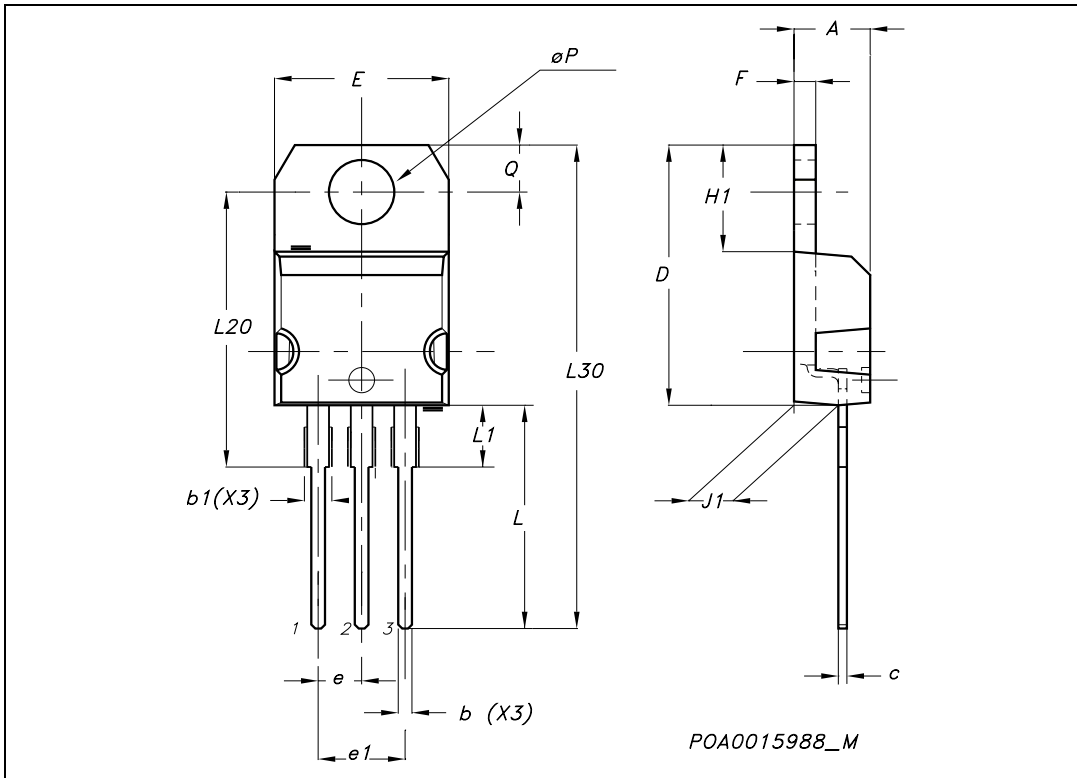


Fig. 2: Test Circuit For Inductive Load Switching



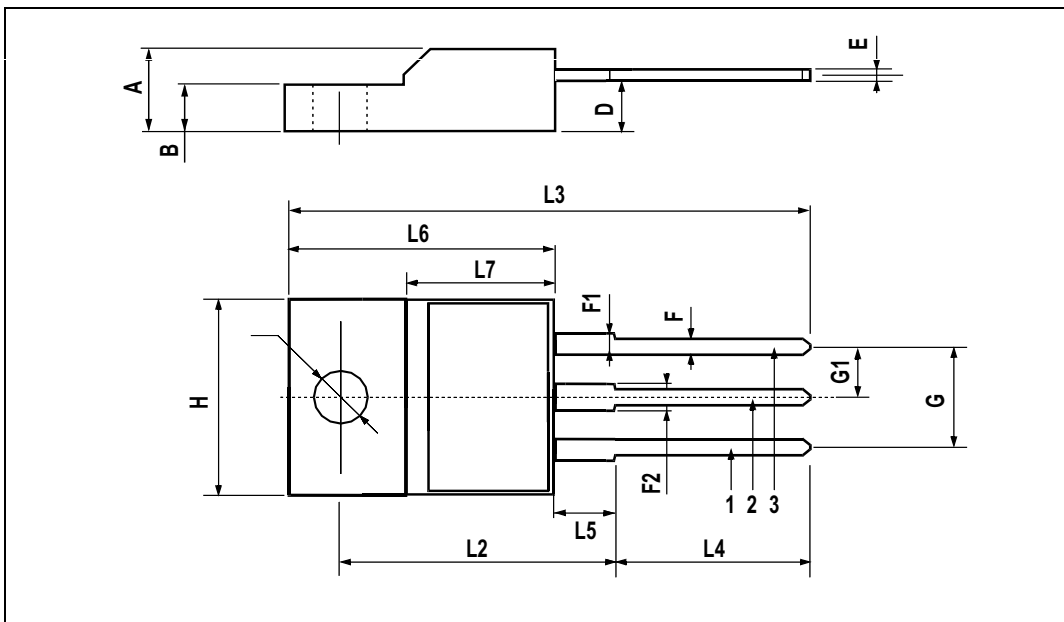
TO-220 MECHANICAL DATA

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



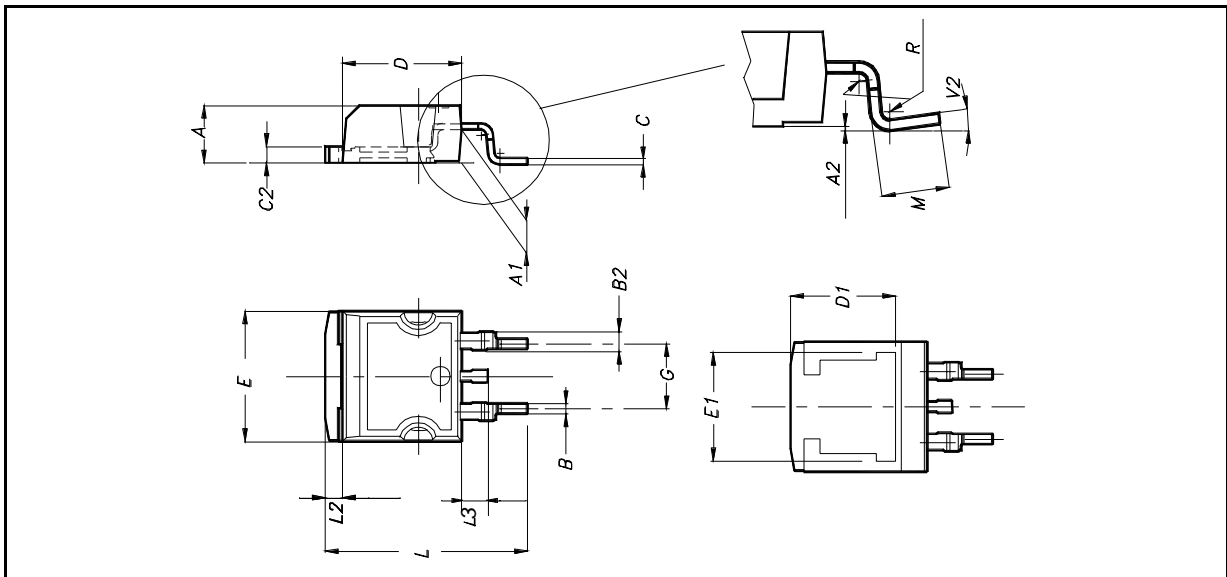
TO-220FP MECHANICAL DATA

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
∅	3		3.2	0.118		0.126

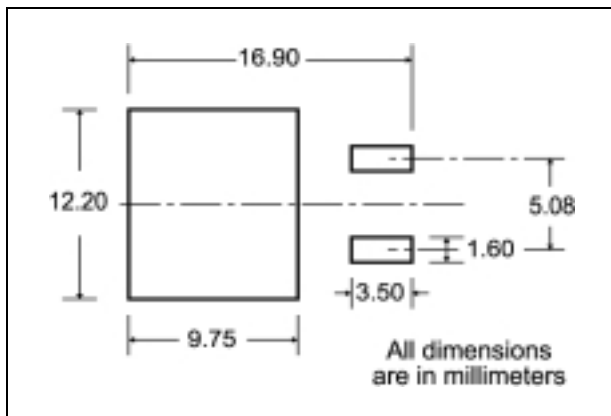


D²PAK MECHANICAL DATA

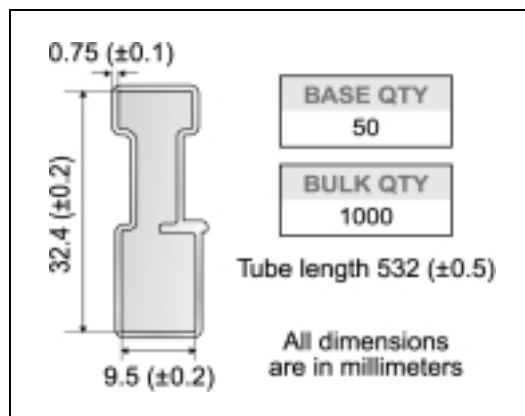
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
A2	0.03		0.23	0.001		0.009
B	0.7		0.93	0.027		0.036
B2	1.14		1.7	0.044		0.067
C	0.45		0.6	0.017		0.023
C2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1		8			0.315	
E	10		10.4	0.393		
E1		8.5			0.334	
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. The tape slot in the core for tape start is 2.5 mm min. width. The full radius is indicated. The access hole at the slot location is 40 mm min. The dimensions A, B, C, D, G, and T are labeled. G is measured at the 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	24.4	26.4	0.960	1.039
N	100		3.937	
T		30.4		1.197

BASE QTY	BULK QTY
1000	1000

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

Diagram showing the tape and reel shipment details. The top cover tape is shown with dimensions K₀, B, P₁, P₂, L, and W. The center line of the cavity is indicated. The user direction of feed is shown. The TRL (Tape Reel Length) is shown with dimensions A₀, P₁, and P₂. The bending radius is shown as R min.

* on sales type

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