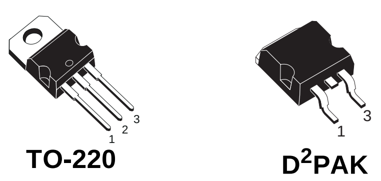
STGP3NB60MD - STGB3NB60MD

N-CHANNEL 3A - 600V TO-220 / D^{2}PAK
PowerMESH™ IGBT

TYPE	V_{CES}	$V_{CE(sat)}$ (Max) @25°C	I_C @100°C
STGP3NB60MD	600 V	< 1.9 V	3 A
STGB3NB60MD	600 V	< 1.9V	3 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



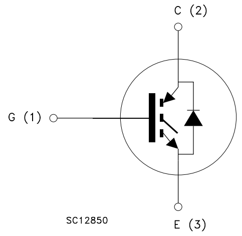
DESCRIPTION

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

APPLICATIONS

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

INTERNAL SCHEMATIC DIAGRAM



ORDERING INFORMATION

SALES TYPE	MARKING	PACKAGE	PACKAGING
STGP3NB60MD	GP3NB60MD	TO-220	TUBE
STGB3NB60MDT4	GB3NB60MD	D^{2}PAK	TAPE & REEL

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°C	6	A
I_C	Collector Current (continuous) at T_C = 100°C	3	A
I_{CM} (■)	Collector Current (pulsed)	24	A
P_{TOT}	Total Dissipation at T_C = 25°C	68	W
	Derating Factor	0.55	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

Rthj-case	Thermal Resistance Junction-case Max	1.8	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	62.5	°C/W

ELECTRICAL CHARACTERISTICS (T_{CASE} = 25 °C UNLESS OTHERWISE SPECIFIED)

OFF

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			50 100	µA µA
I_{GES}	Gate-Emitter Leakage Current (V_{CE} = 0)	V_{GE} = ± 20V , V_{CE} = 0			±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 µA	3		5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	V_{GE} = 15V, I_C = 3 A V_{GE} = 15V, I_C= 3 A, Tj =125°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} = 15 V, Ic = 3 A		5		S
C_{ies} C_{oes} C_{res}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{CE} = 25V, f = 1 MHz, V_{GE} = 0		240 33 6		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		15 2.2 8	20	nC nC nC
I_{CL}	Latching Current	V_{clamp} = 480V, R_G =10 Ω Tj = 125°C		20		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 V, I_C = 3A, R_G = 10Ω V_{GE} = 15 V		10 4		ns ns
$(di/dt)_{on}$ Eon	Turn-on Current Slope Turn-on Switching Losses	V_{CC}= 480 V, I_C = 3A, R_G= 10Ω V_{GE} = 15 V,Tj =125°C		570 30		A/µs µJ

SWITCHING OFF

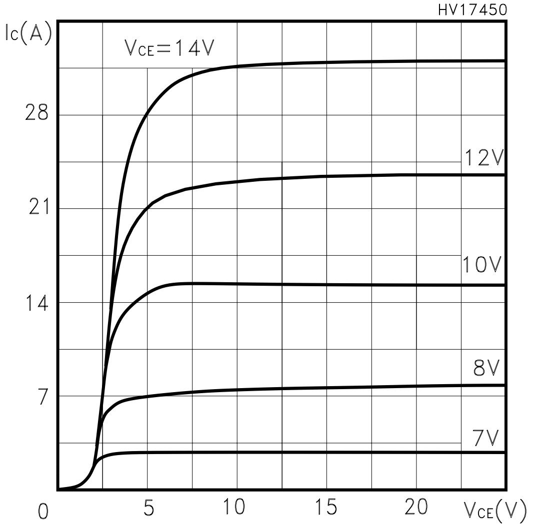
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_c	Cross-over Time	V_{cc} = 480 V, I_C = 3 A, R_G = 10 Ω , V_{GE} = 15 V		330		ns
$t_r(V_{off})$	Off Voltage Rise Time			85		ns
$t_d(_{off})$	Delay Time			120		ns
t_f	Fall Time			240		ns
E_{off}(**)	Turn-off Switching Loss			175		µJ
E_{ts}	Total Switching Loss			205		µJ
t_c	Cross-over Time	V_{cc} = 480 V, I_C = 3 A, R_G = 10 Ω , V_{GE} = 15 V Tj = 125 °C		810		ns
$t_r(V_{off})$	Off Voltage Rise Time			270		ns
$t_d(_{off})$	Delay Time			344		ns
t_f	Fall Time			515		ns
E_{off}(**)	Turn-off Switching Loss			458		µJ
E_{ts}	Total Switching Loss			488		µJ

COLLECTOR-EMITTER DIODE

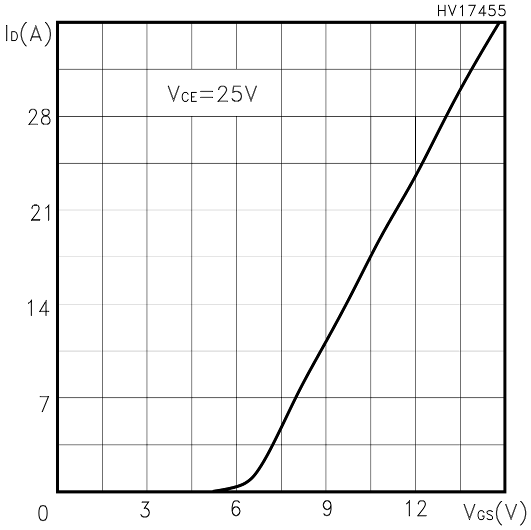
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_f I_{fm}	Forward Current Forward Current pulsed				3 24	A A
V_f	Forward On-Voltage	I_f = 1.5 A I_f = 1.5 A, Tj = 125 °C		1.4 1.1	1.9	V V
t_{rr} Q_{rr} I_{rrm}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_f = 3 A ,V_R = 35 V, Tj =125°C, di/dt = 100 A/µs		45 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)

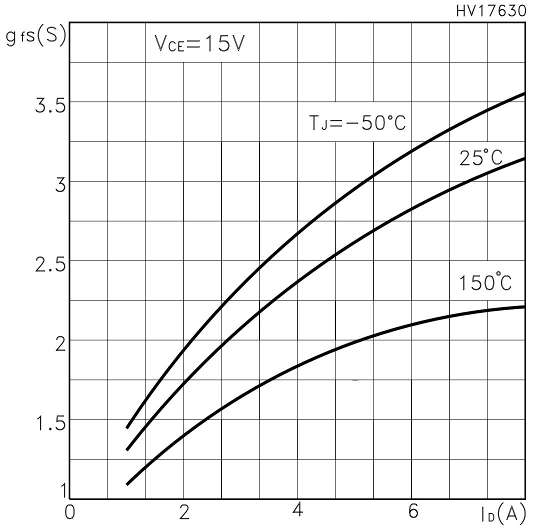
Output Characteristics



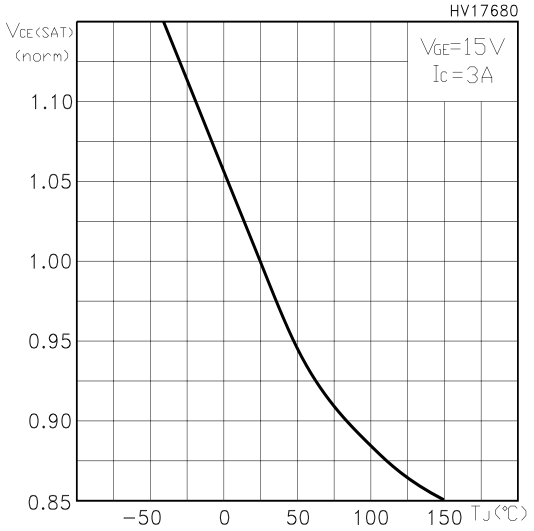
Transfer Characteristics



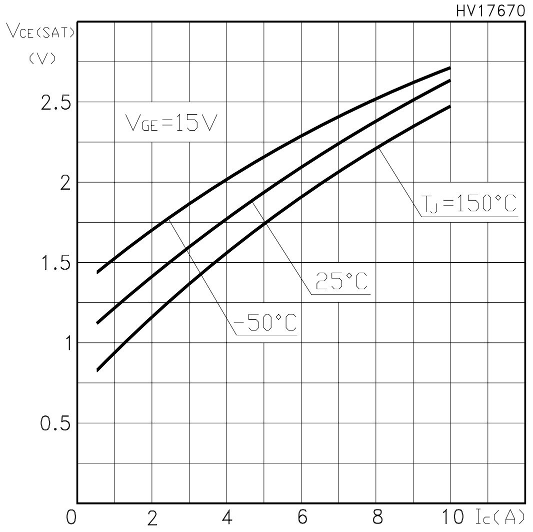
Transconductance



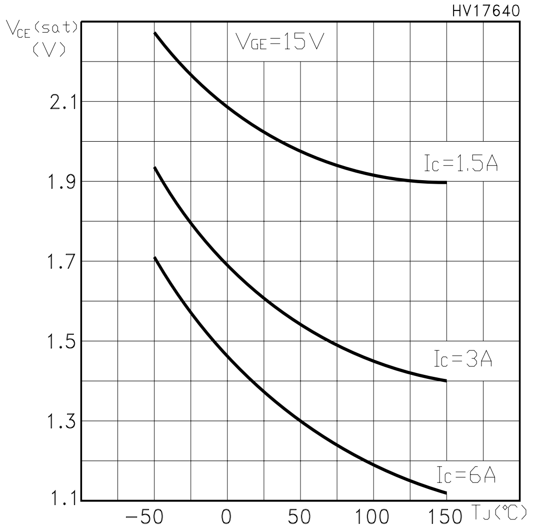
Normalized Collector-Emitter On Voltage vs Temp.



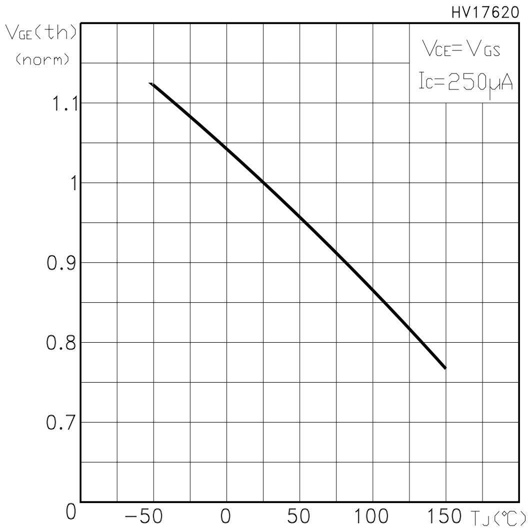
Collector-Emitter On Voltage vs Collector Current



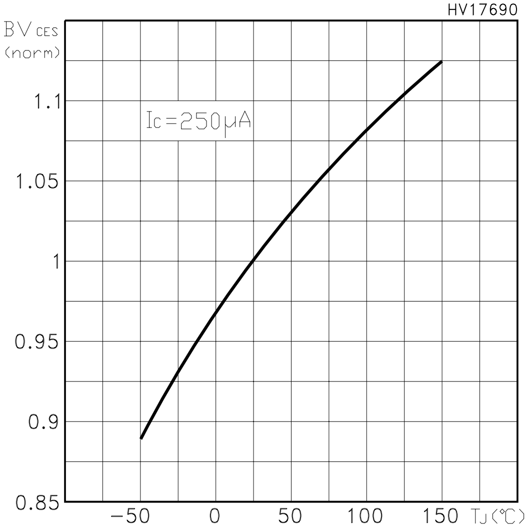
Collector-Emitter On Voltage vs Temperature



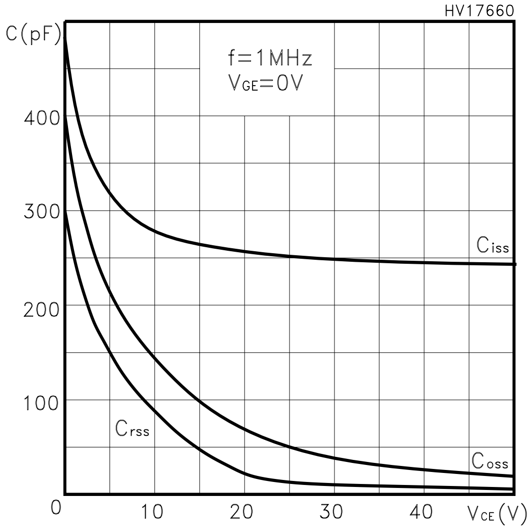
Gate Threshold vs Temperature



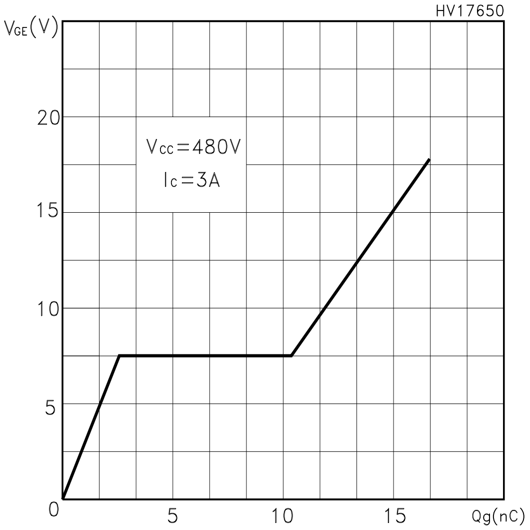
Normalized Breakdown Voltage vs Temperature



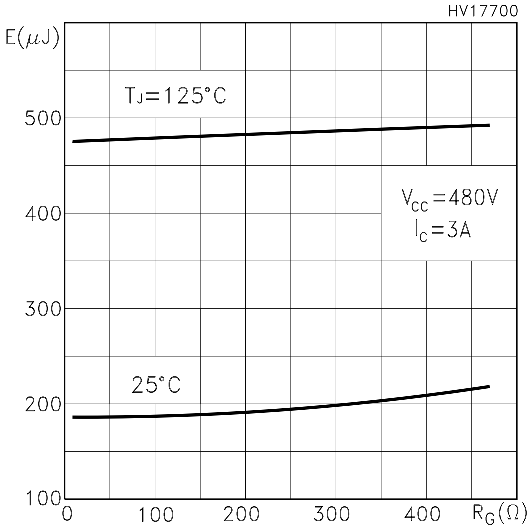
Capacitance Variations



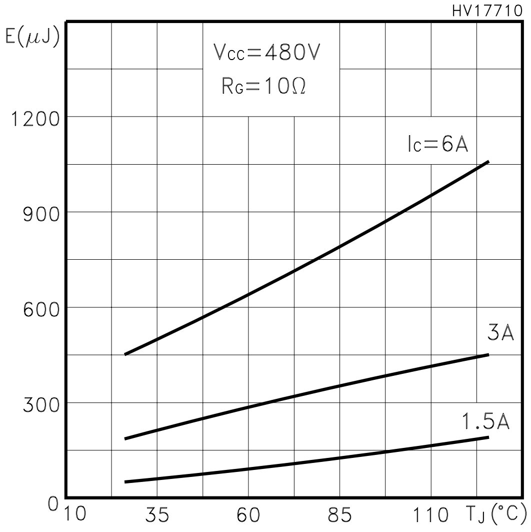
Gate Charge vs Gate-Emitter Voltage



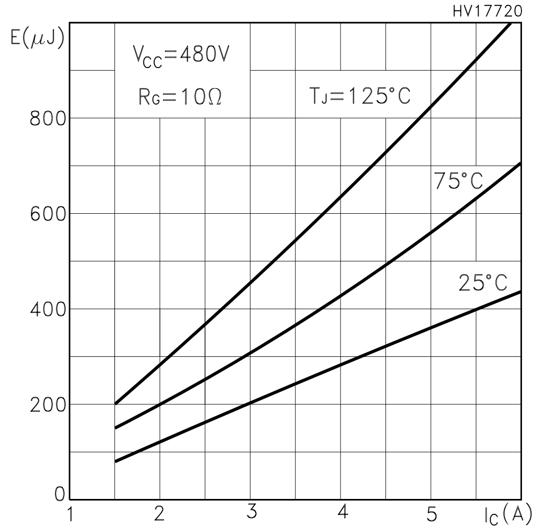
Total Switching Losses vs Gate Resistance



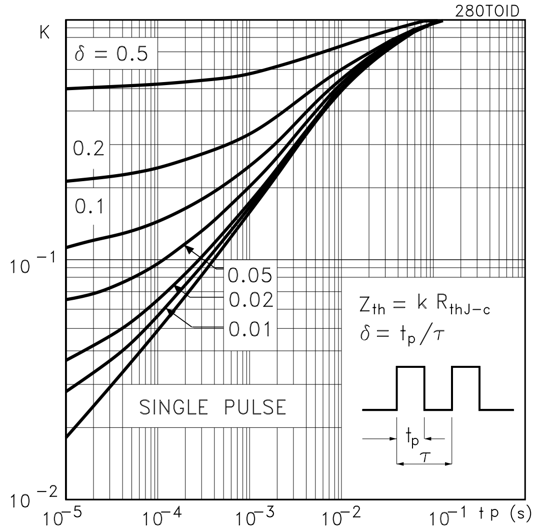
Total Switching Losses vs Temperature



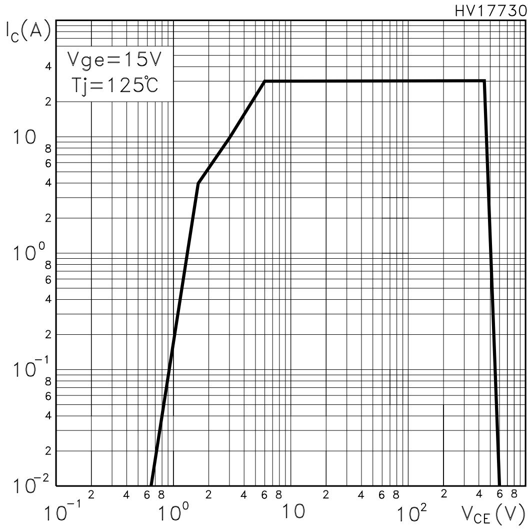
Total Switching Losses vs Collector Current



Thermal Impedance for TO-220/D²PAK



Turn-Off SOA



Emitter-Collector Diode Characteristics

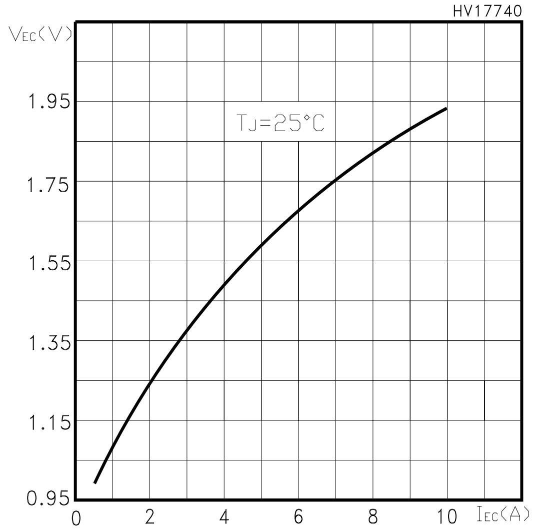


Fig. 1: Gate Charge test Circuit

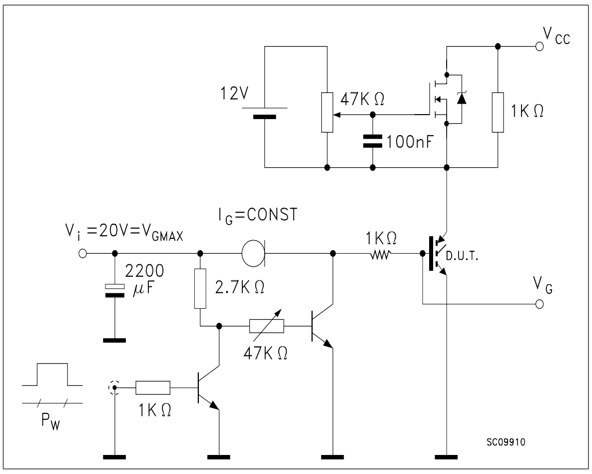
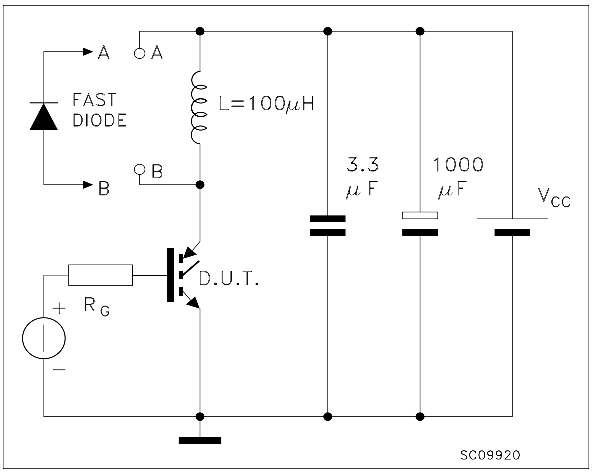
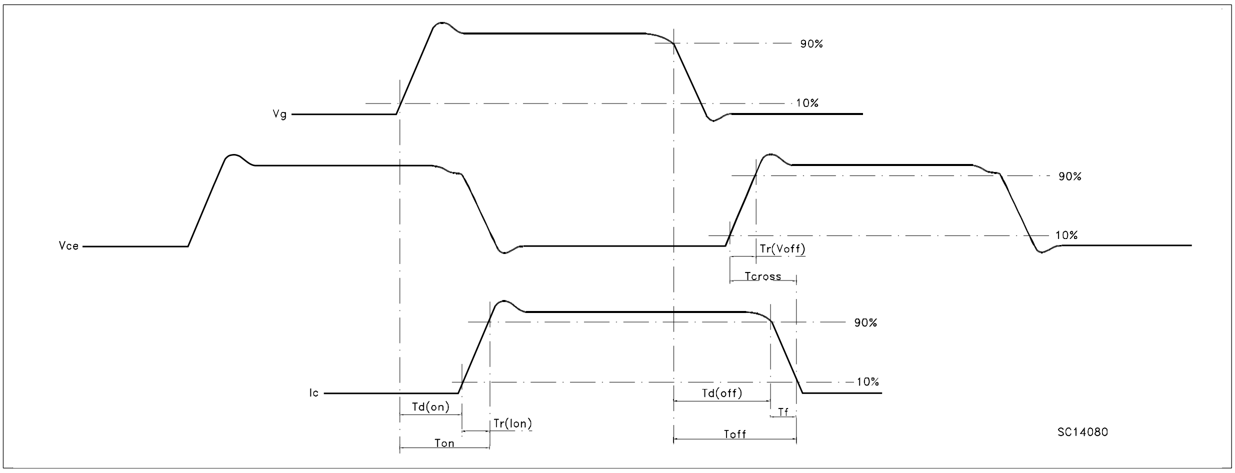


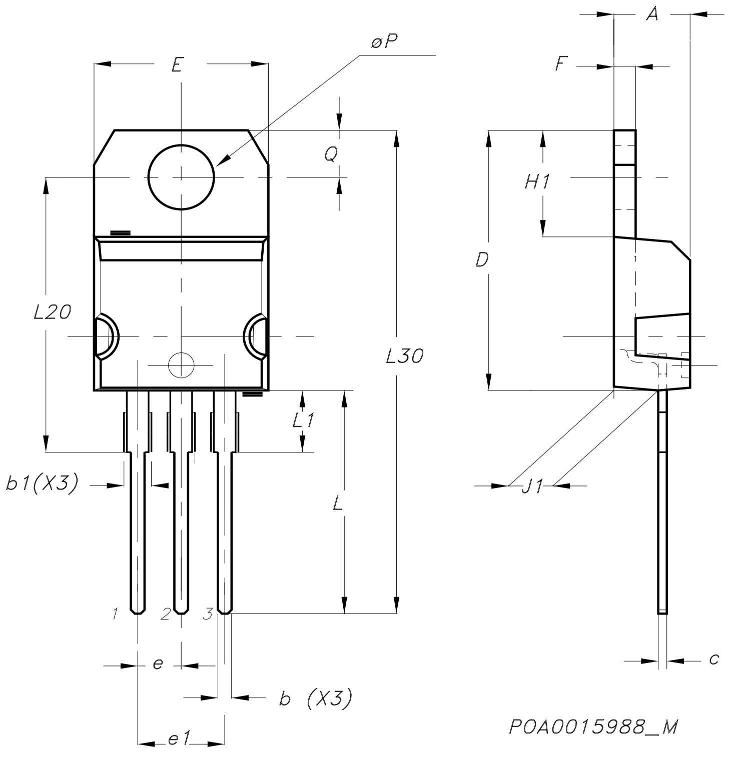
Fig. 2: Test Circuit For Inductive Load Switching





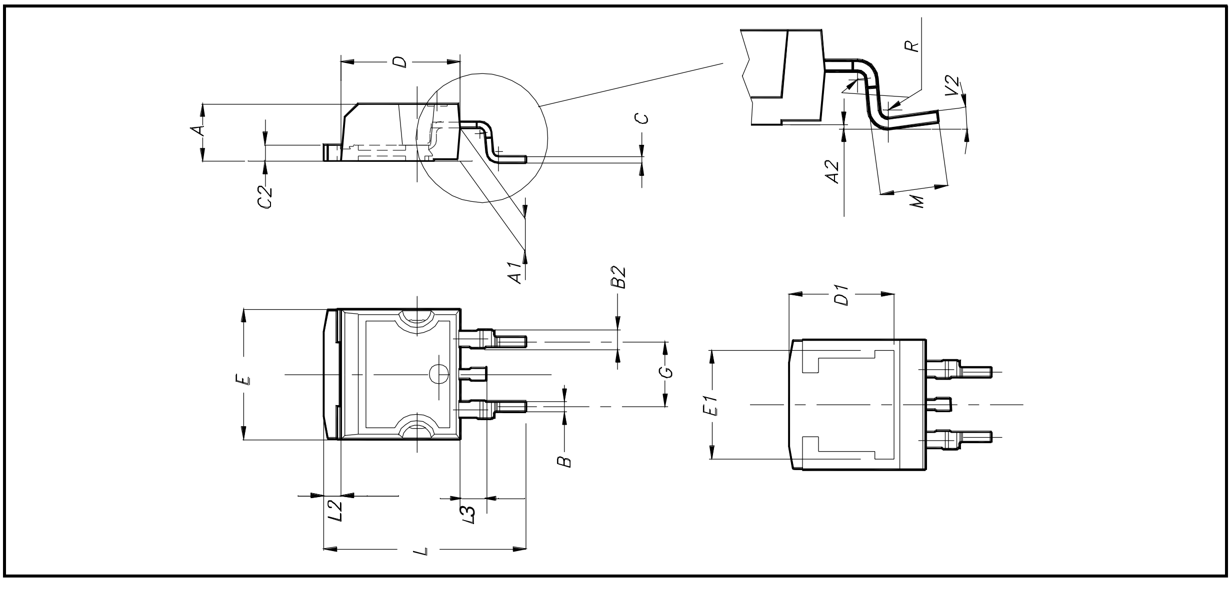
TO-220 MECHANICAL DATA

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

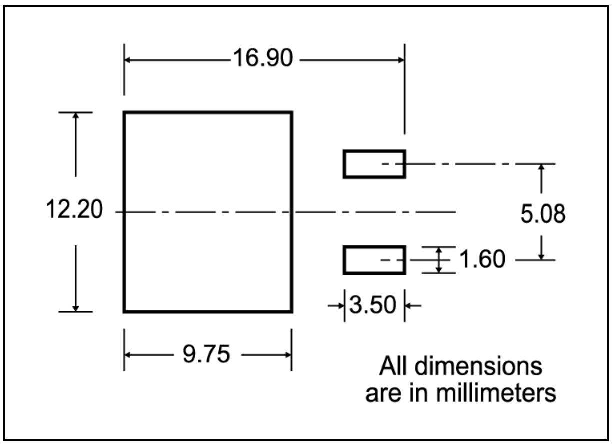


D^{2}PAK MECHANICAL DATA

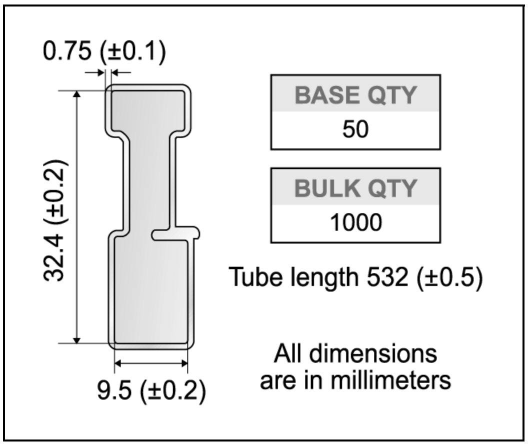
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
A2	0.03		0.23	0.001		0.009
B	0.7		0.93	0.027		0.036
B2	1.14		1.7	0.044		0.067
C	0.45		0.6	0.017		0.023
C2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1		8			0.315	
E	10		10.4	0.393		
E1		8.5			0.334	
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	0º		4º			



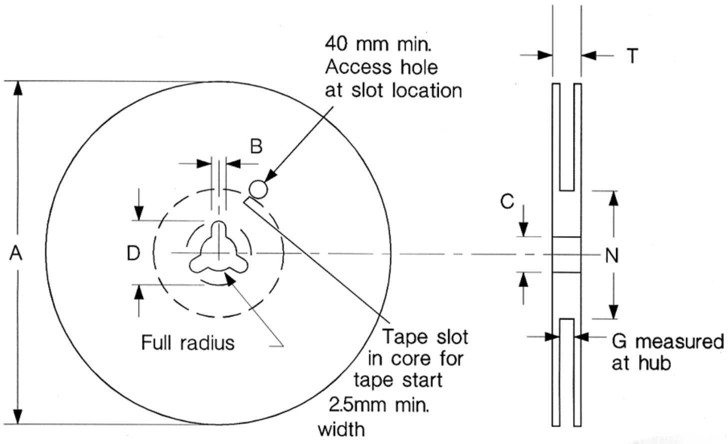
D^{2}PAK FOOTPRINT



TUBE SHIPMENT (no suffix)*



TAPE AND REEL SHIPMENT (suffix ”T4”)*



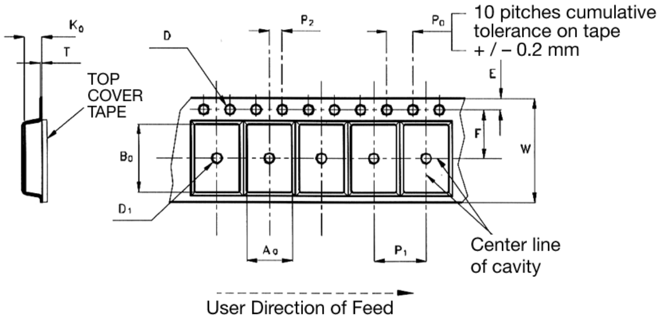
REEL MECHANICAL DATA

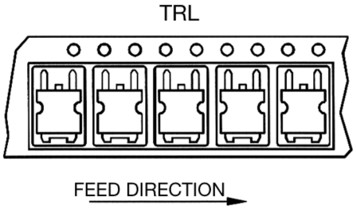
DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A		330		12.992
B	1.5		0.059	
C	12.8	13.2	0.504	0.520
D	20.2		0795	
G	24.4	26.4	0.960	1.039
N	100		3.937	
T		30.4		1.197

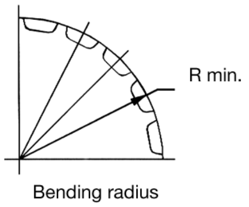
BASE QTY	BULK QTY
1000	1000

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
W	23.7	24.3	0.933	0.956







* on sales type