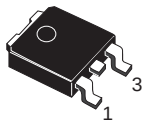
STGD3NB60KD

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

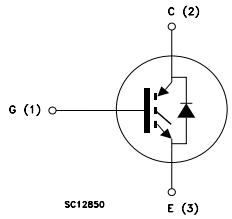
TYPE	V_{CES}	$V_{CE(sat)\ (Max)}$ @25°C	I_C(#) @100°C
STGD3NB60KD	600 V	< 2.8 V	6 A

- HIGH INPUT IMPEDANCE (VOLTAGE DRIVEN)
- LOW GATE CHARGE
- OFF LOSSES INCLUDE TAIL CURRENT
- HIGH FREQUENCY OPERATION
- SHORT CIRCUIT RATED
- LATCH CURRENT FREE OPERATION
- CO-PACKAGED WITH TURBOSWITCH™ ANTIPARALLEL DIODE



DPAK

INTERNAL SCHEMATIC DIAGRAM



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

ORDERING INFORMATION

SALES TYPE	MARKING	PACKAGE	PACKAGING
STGD3NB60KDT4	GD3NB60KD	DPAK	TAPE & REEL

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°C(#)	10	A
I_C	Collector Current (continuous) at T_C = 100°C(#)	6	A
I_{CM} (▪)	Collector Current (pulsed)	24	A
Tsc	Short Circuit Withstand	10	µs
P_{TOT}	Total Dissipation at T_C = 25°C	50	W
	Derating Factor	0.4	W/°C
T_{stg}	Storage Temperature	–55 to 150	°C
T_j	Operating Junction Temperature		

(▪) Pulse width limited by safe operating area

THERMAL DATA

Rthj-case	Thermal Resistance Junction-case Max	2.5	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	100	°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			50	µA
		V_{CE} = Max Rating, T_C = 125 °C			100	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	5		7	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	V_{GE} = 15V, I_C = 3 A		2.4	2.8	V
		V_{GE} = 15V, I_C = 3 A, Tj =125°C		1.9		V

(#) Calculated according to the iterative formula:

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

ELECTRICAL CHARACTERISTICS (CONTINUED)
DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs}	Forward Transconductance	V_{CE} = 25 V , 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 5.6		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		14 3.3 8	19	nC nC nC
tscw	Short Circuit Withstand Time	V_{ce} = 0.5 BVces , V_{GE} = 15 V, Tj = 125°C , R_G = 10 Ω	10			µs

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 = 3 A R_G = 10Ω , V_{GE} = 15 V		13.5 4.5		ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{CC}= 480 V, I_C = 7 A, R_G=10Ω V_{GE} = 15 V,Tj = 125°C		500		A/µs
Eon	Turn-on Switching Losses			30		µJ

SWITCHING OFF

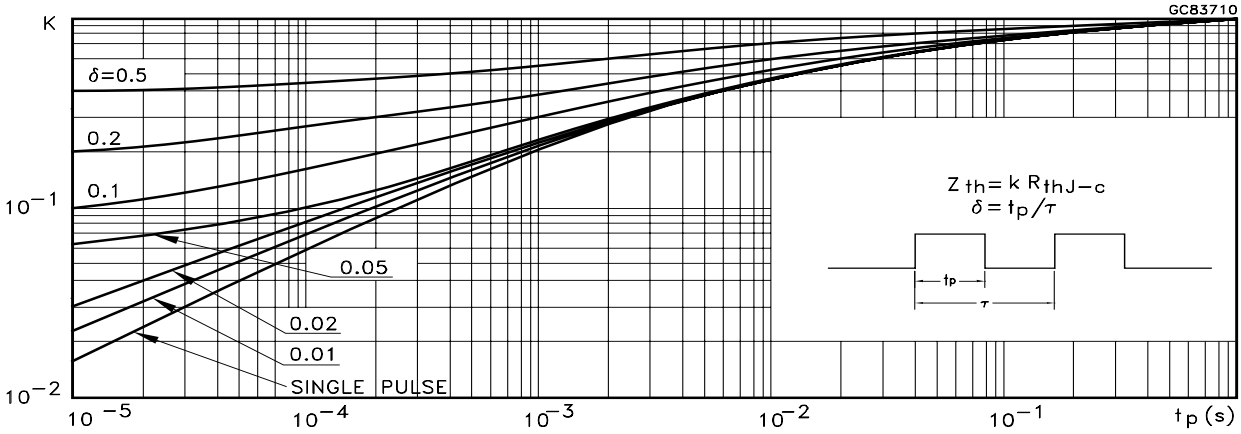
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_c	Cross-over Time	V_{cc} = 480 V, I_C =3 A, R_{GE} = 10 Ω , V_{GE} = 15 V		86		ns
$t_r(V_{off})$	Off Voltage Rise Time			20		ns
$t_{d(off)}$	Delay Time			32		ns
t_f	Fall Time			85		ns
E_{off}(**)	Turn-off Switching Loss			50		µJ
E_{ts}	Total Switching Loss			78		µJ
t_c	Cross-over Time	V_{cc} = 480 V, I_C = 3 A, R_{GE} = 10 Ω , V_{GE} = 15 V Tj = 125 °C		190		ns
$t_r(V_{off})$	Off Voltage Rise Time			55		ns
$t_{d(off)}$	Delay Time			90		ns
t_f	Fall Time			130		ns
E_{off}(**)	Turn-off Switching Loss			110		µJ
E_{ts}	Total Switching Loss			140		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)

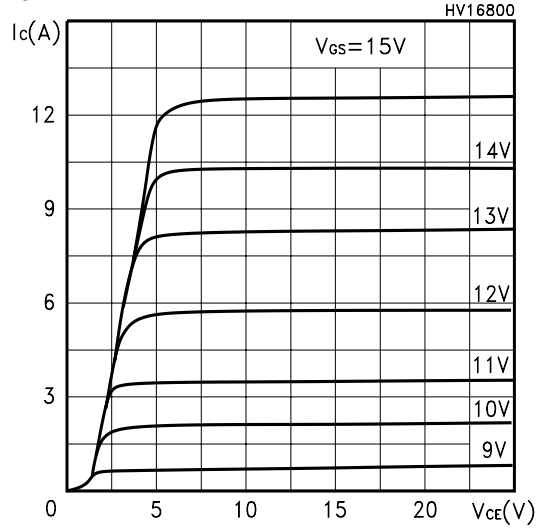
COLLECTOR-EMITTER DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_f I_{fm}	Forward Current Forward Current pulsed				1.5 12	A A
V_f	Forward On-Voltage	I_f = 1.5 A I_f = 1.5 A, Tj = 125 °C		1.6 1.3	2.1	V V
t_{rr} Q_{rr} I_{rrm}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_f = 1.5 A ,V_R = 35 V, Tj = 125°C, di/dt = 100 A/µs		95 110 2.7		ns nC A

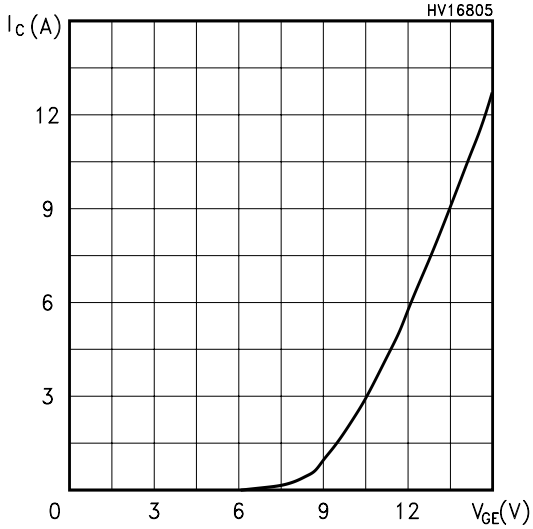
Thermal Impedance



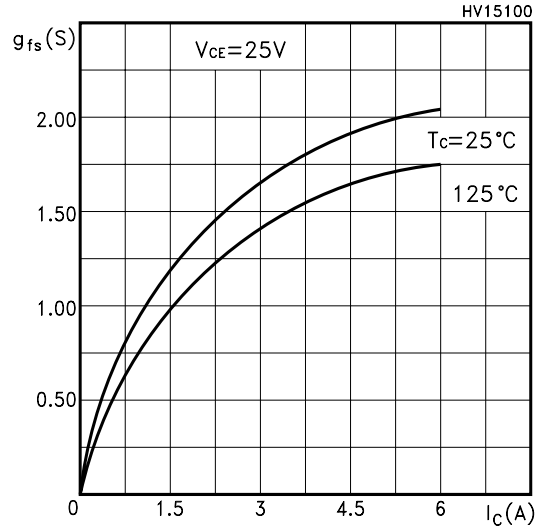
Output Characteristics



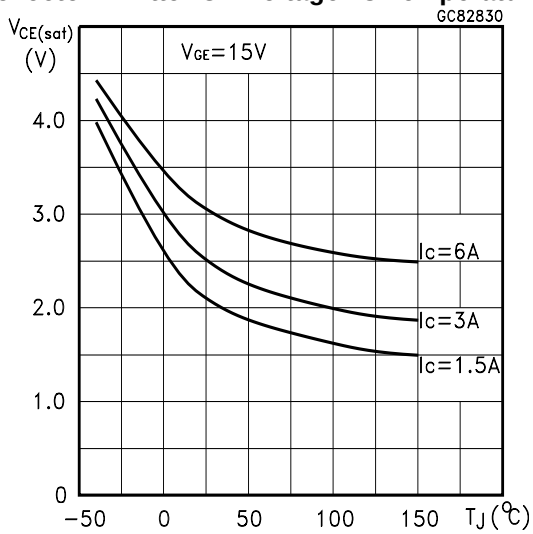
Transfer Characteristics



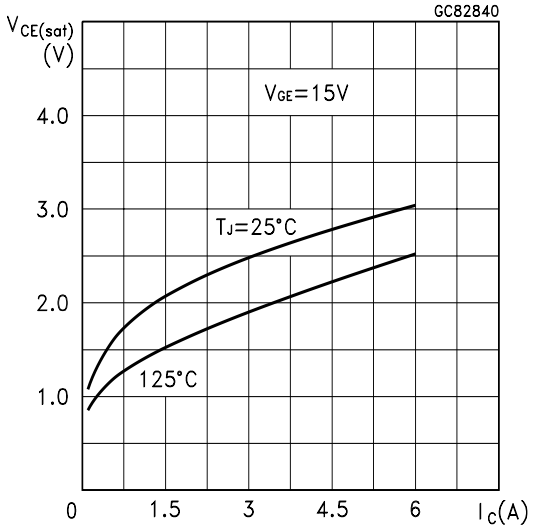
Transconductance



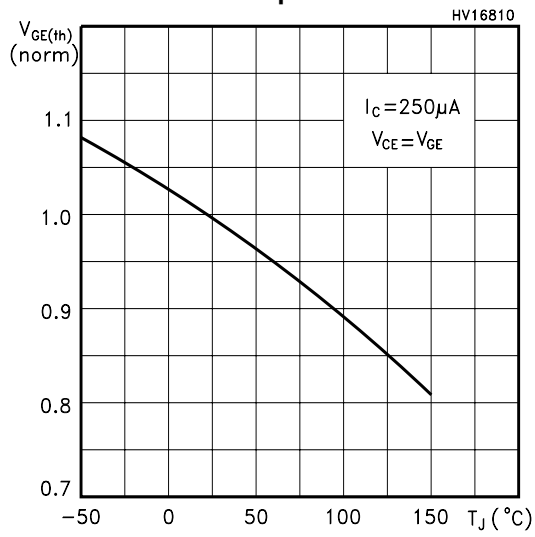
Collector-Emitter On Voltage vs Temperature



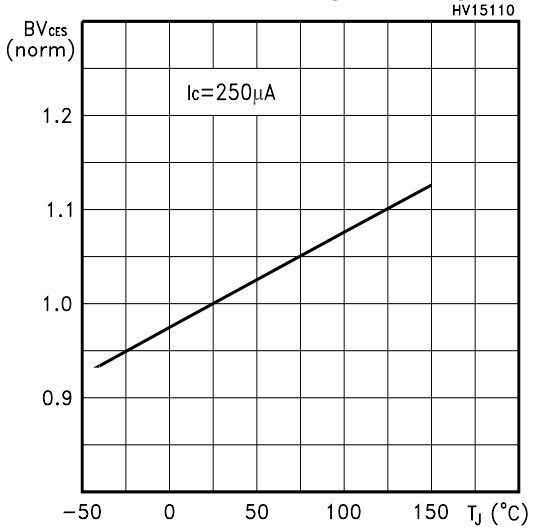
Collector-Emitter On Voltage vs Collettor Current



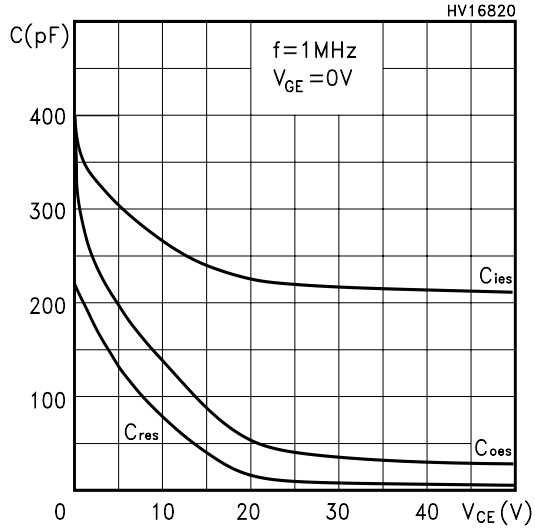
Gate Threshold vs Temperature



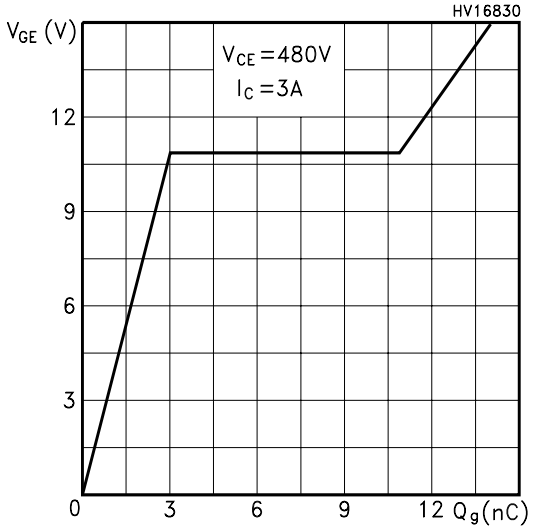
Normalized Breakdown Voltage vs Temperature



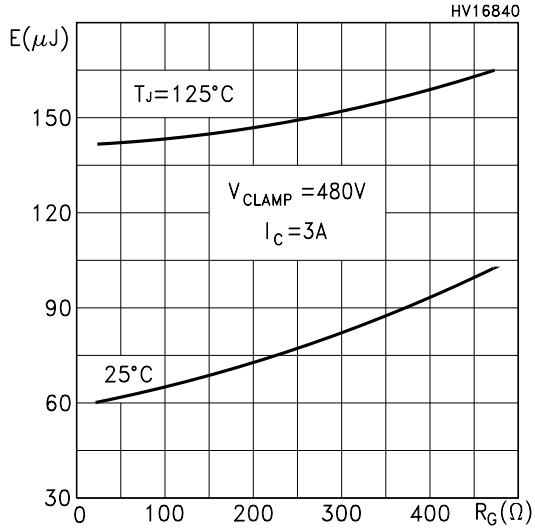
Capacitance Variations



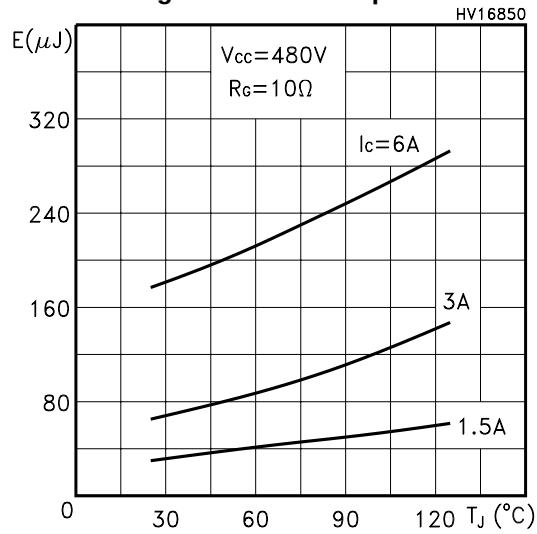
Gate Charge vs Gate-Emitter Voltage



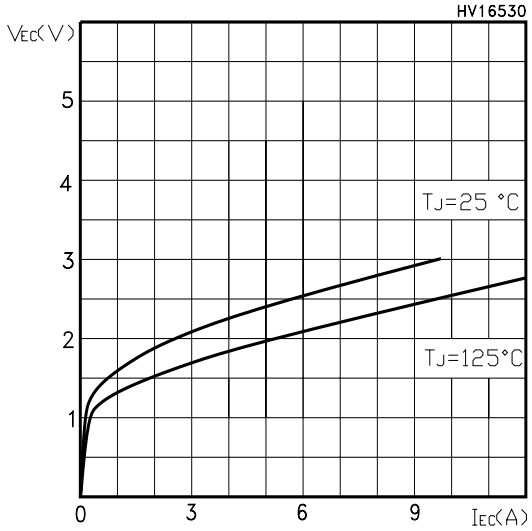
Total Switching Losses vs Gate Resistance



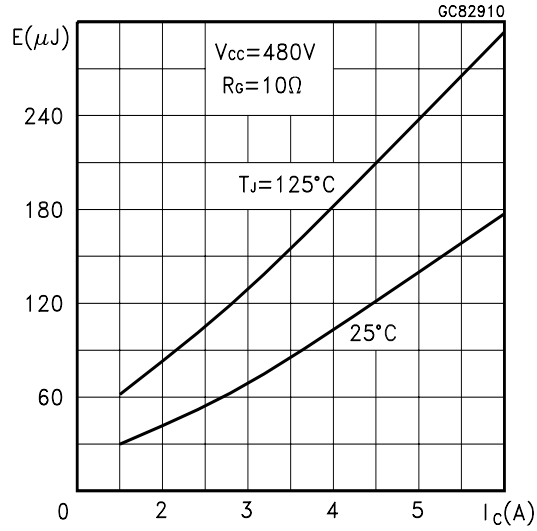
Total Switching Losses vs Temperature



Emitter-collector Diode Characteristics



Total Switching Losses vs Collector Current



Switching Off Safe Operating Area

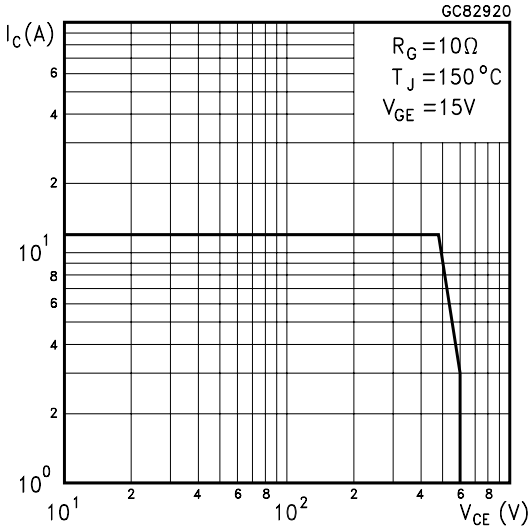


Fig. 1: Gate Charge test Circuit

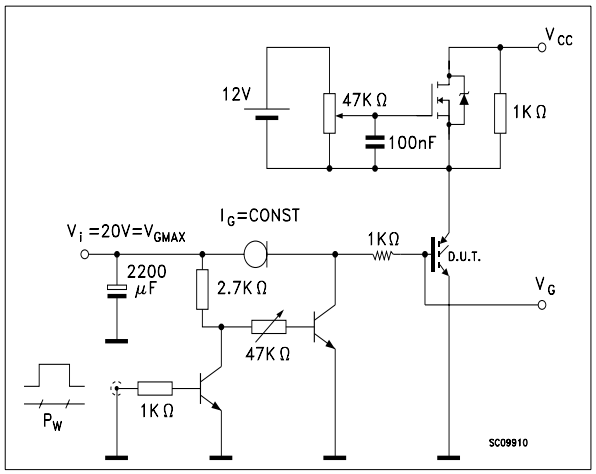
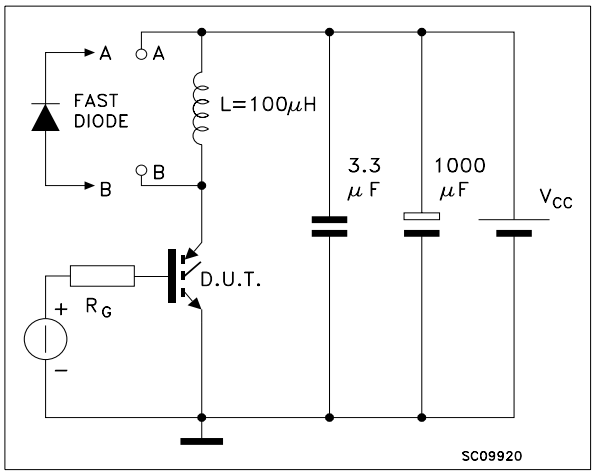
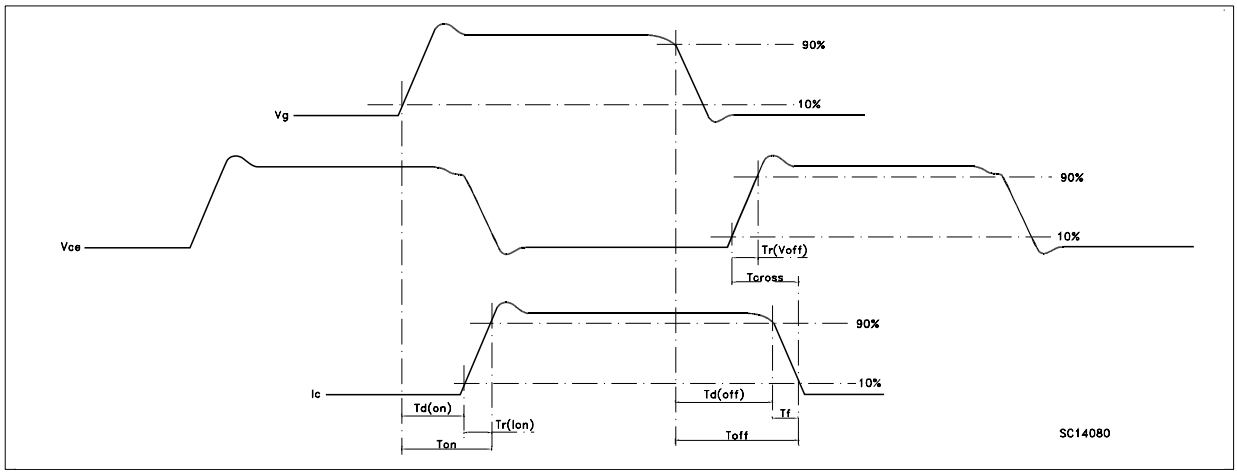


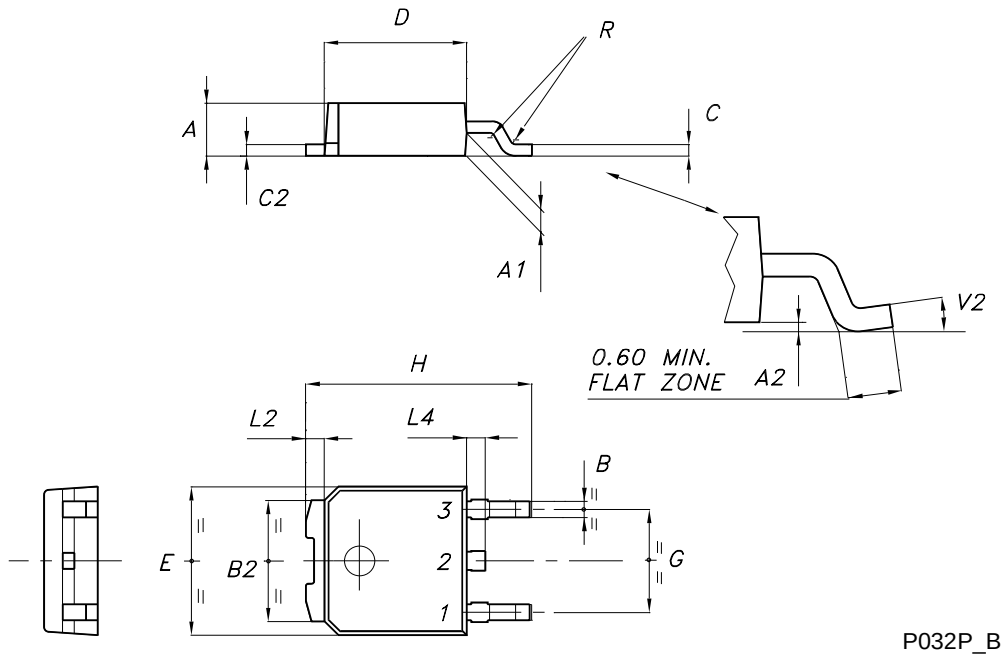
Fig. 2: Test Circuit For Inductive Load Switching





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^o		8^o	0^o		0^o



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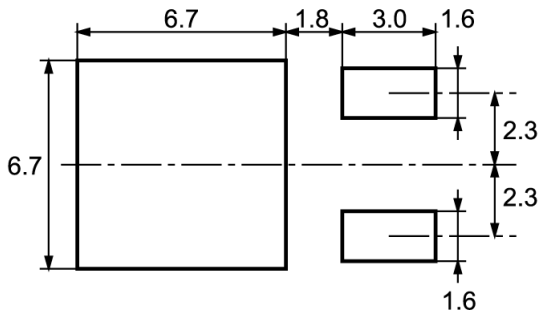
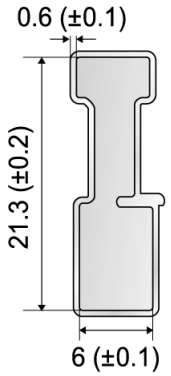
DPAK FOOTPRINT



All dimensions are in millimeters

TUBE SHIPMENT (no suffix)*



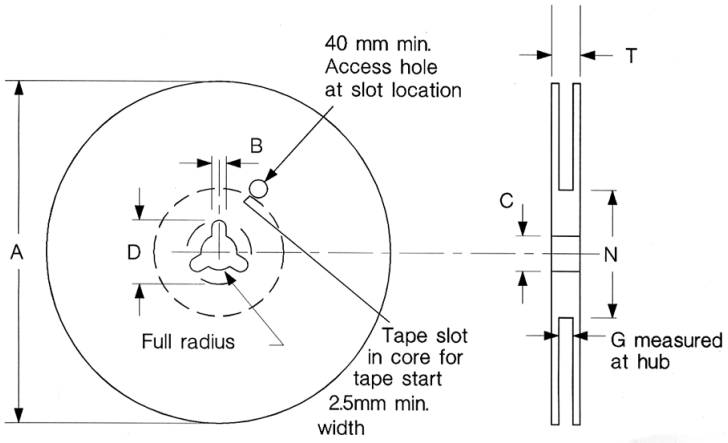
BASE QTY
75

BULK QTY
3000

Tube length 532 (±0.5)

All dimensions are in millimeters

TAPE AND REEL SHIPMENT (suffix "T4")*



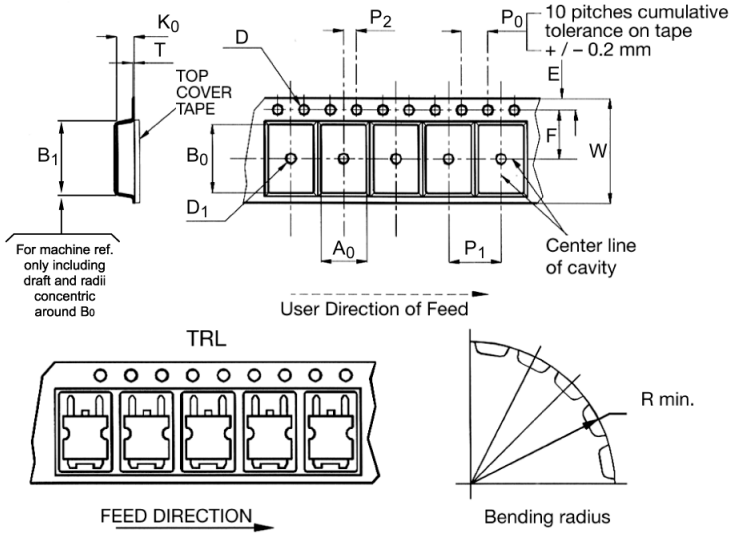
REEL MECHANICAL DATA

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		0.795	
G	16.4	18.4	0.645	0.724
N	50		1.968	
T		22.4		0.881

BASE QTY	BULK QTY
2500	2500

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



* Customer sales type