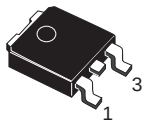
STGD3NB60KD

N-CHANNEL 3A - 600V - DPAK
SHORT CIRCUIT PROOF PowerMESH™ IGBT

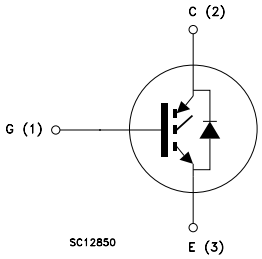
TYPE	V_{CES}	$V_{CE(sat)}$	I_C
STD3NB60KD	600 V	< 2.8 V	3 A

- HIGH INPUT IMPEDANCE (VOLTAGE DRIVEN)
- LOW ON-VOLTAGE DROP (V_{cesat})
- LOW ON-LOSSES
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- OFF LOSSES INCLUDE TAIL CURRENT
- VERY 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

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	6	A
I_C	Collector Current (continuous) at T_C = 100°C	3	A
I_{CM} (▪)	Collector Current (pulsed)	24	A
Tsc	Short Circuit Withstand	10	µs
P_{TOT}	Total Dissipation at T_C = 25°C	35	W
	Derating Factor	0.28	W/°C
T_{stg}	Storage Temperature	–65 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	3.57	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	100	°C/W
Rthc-h	Thermal Resistance Case-heatsink Typ	0.5	°C/W

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

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{BR(CES)}$	Collectro-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			10	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 = 250µA	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

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs}	Forward Transconductance	V_{CE} = 25 V , I_C =3 A	1.3	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		235 33 6.6		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		21 6 7.6	27	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		16 30		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		400		A/µs
Eon	Turn-on Switching Losses			37		µJ

ELECTRICAL CHARACTERISTICS (CONTINUED)

SWITCHING OFF

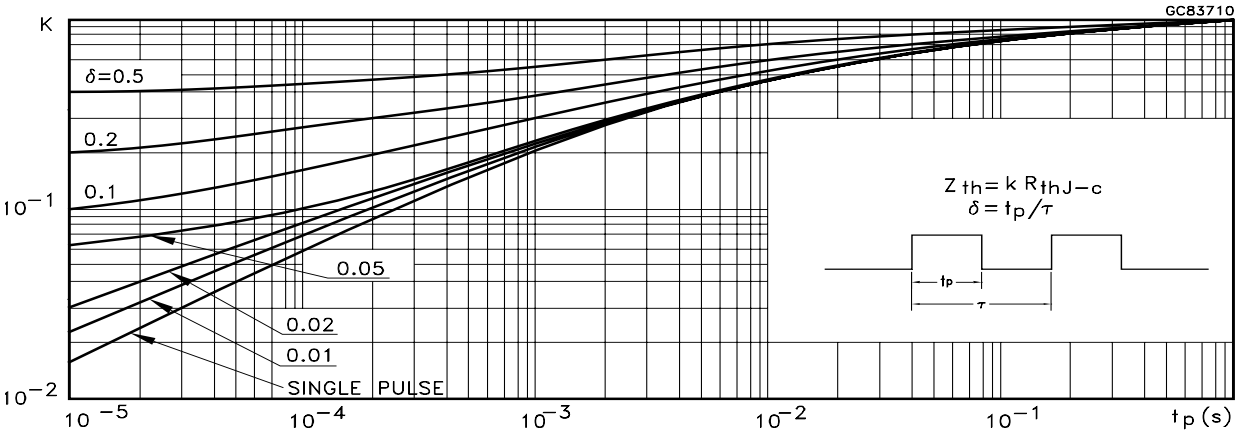
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_c	Cross-over Time	V_{cc} = 480 V, I_C =3 A, R_{GE} = 10 Ω , V_{GE} = 15 V		90		ns
$t_r(V_{off})$	Off Voltage Rise Time			36		ns
$t_{d(off)}$	Delay Time			53		ns
t_f	Fall Time			70		ns
E_{off}(**)	Turn-off Switching Loss			33		µJ
E_{ts}	Total Switching Loss			65		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		180		ns
$t_r(V_{off})$	Off Voltage Rise Time			82		ns
$t_{d(off)}$	Delay Time			58		ns
t_f	Fall Time			110		ns
E_{off}(**)	Turn-off Switching Loss			88		µJ
E_{ts}	Total Switching Loss			125		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)

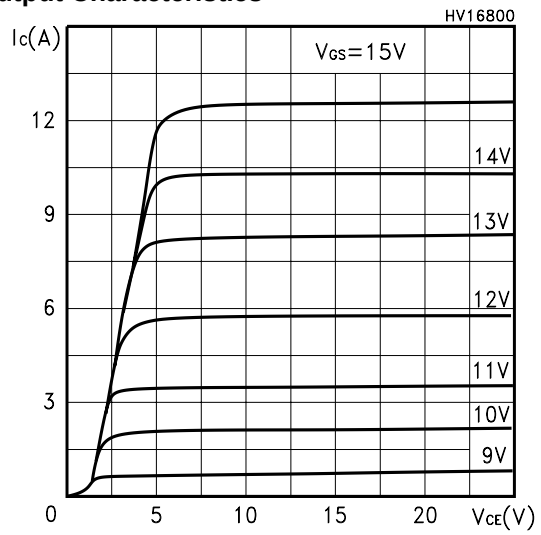
COLLECTOR-EMITTER DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_f I_{fm}	Forward Current Forward Current pulsed				1 8	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	V V
t_{rr} Q_{rr} I_{rrm}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_f = 1.5 A ,V_R = 200 V, Tj = 125°C, di/dt = 100 A/µs		90 100 2.7		ns nC A

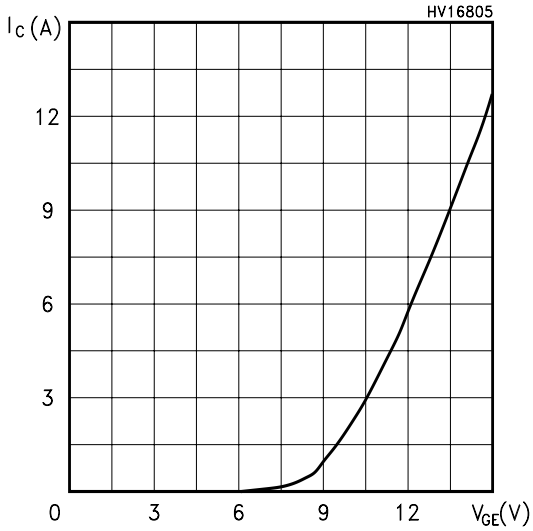
Thermal Impedance



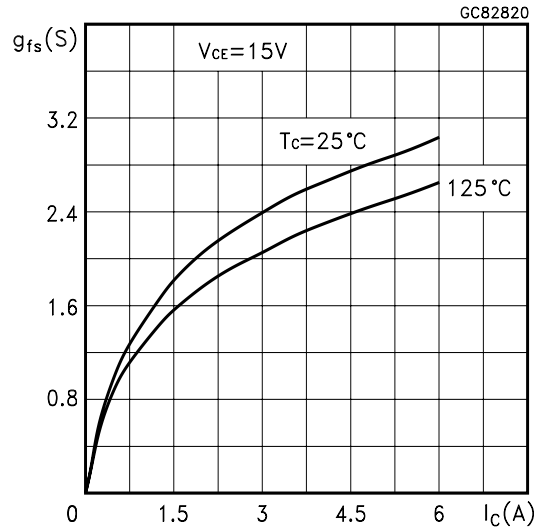
Output Characteristics



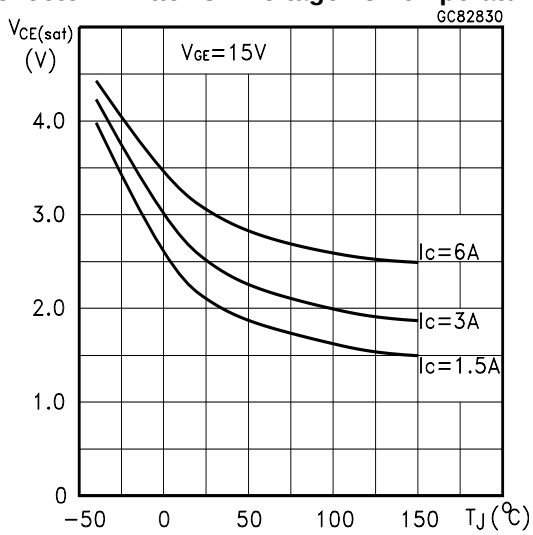
Transfer Characteristics



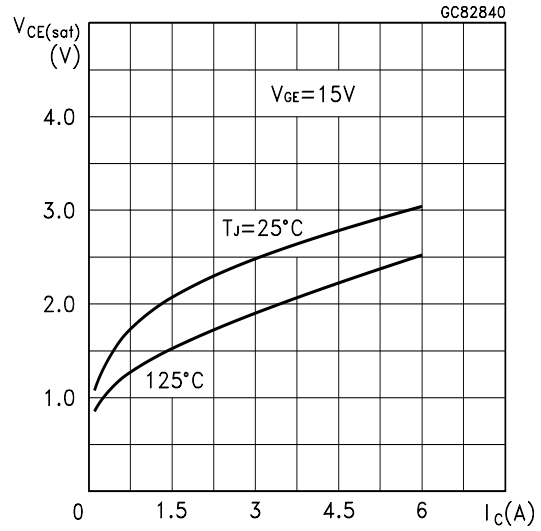
Transconductance



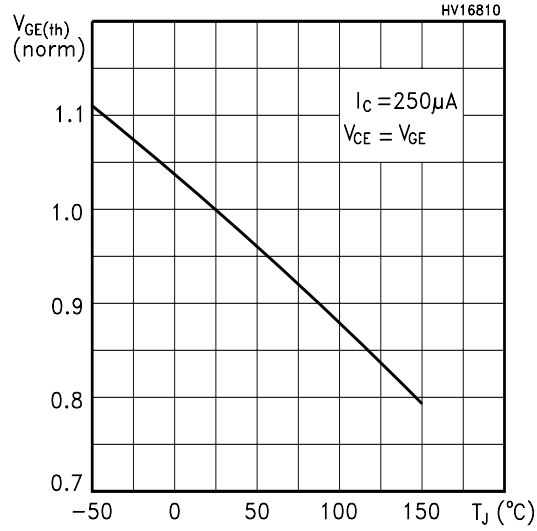
Collector-Emitter On Voltage vs Temperature



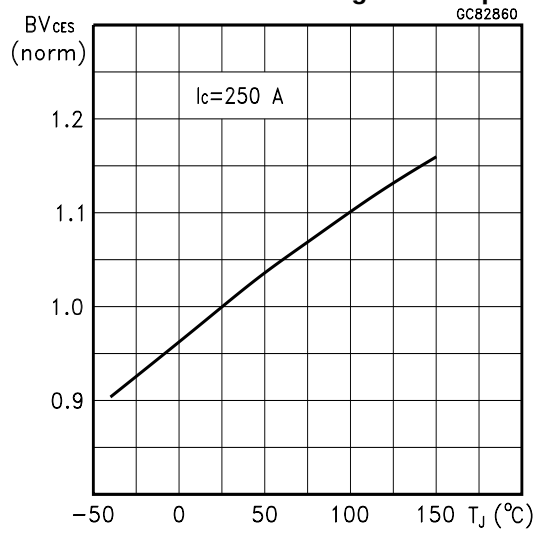
Collector-Emitter On Voltage vs Collettor Current



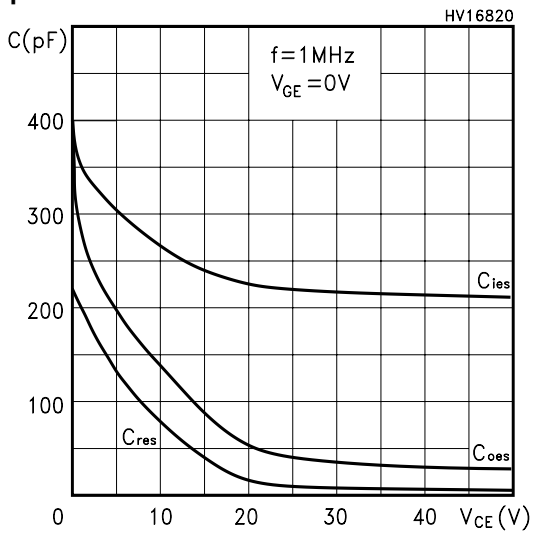
Gate Threshold vs Temperature



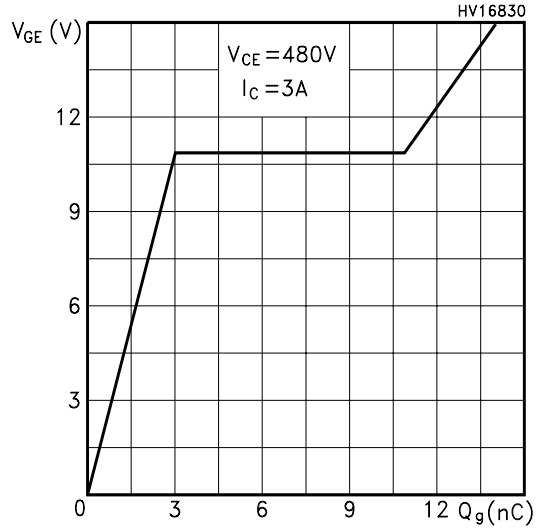
Normalized Breakdown Voltage vs Temperature



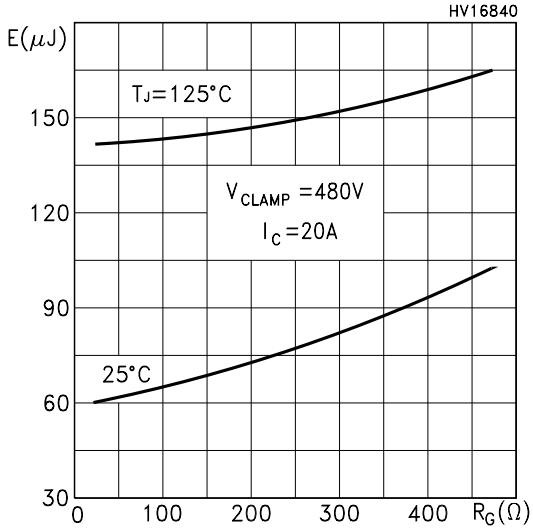
Capacitance Variations



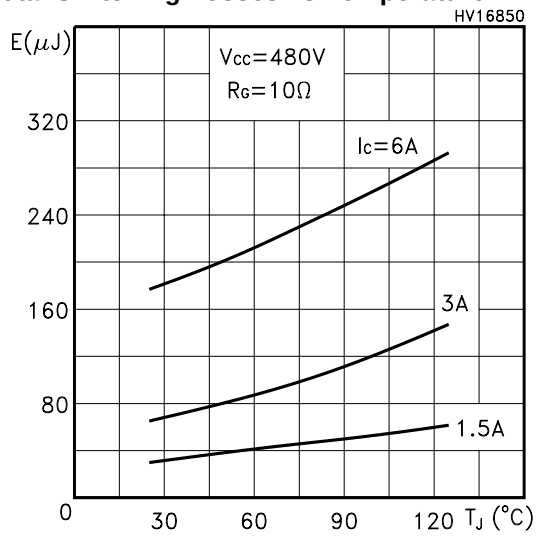
Gate Charge vs Gate-Emitter Voltage



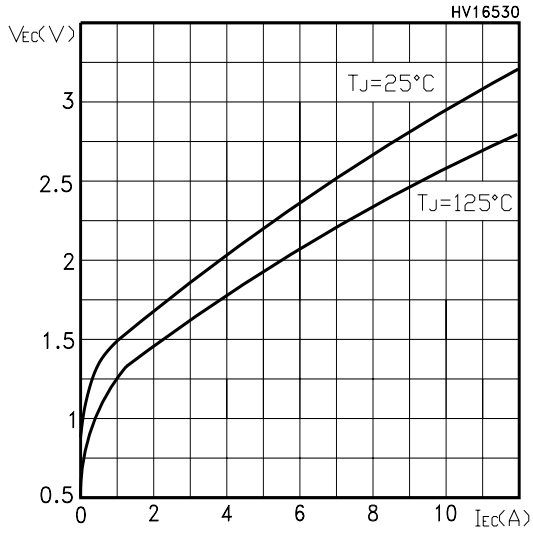
Total Switching Losses vs Gate Resistance



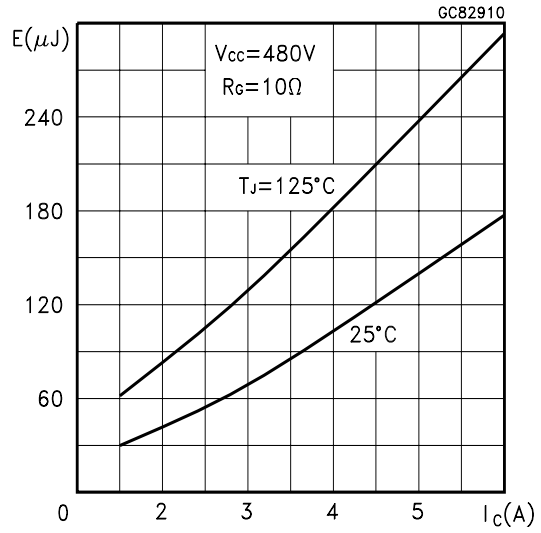
Total Switching Losses vs Temperature



Emitter-collector Diode Characteristics



Total Switching Losses vs Collector Current



Switching Off Safe Operating Area

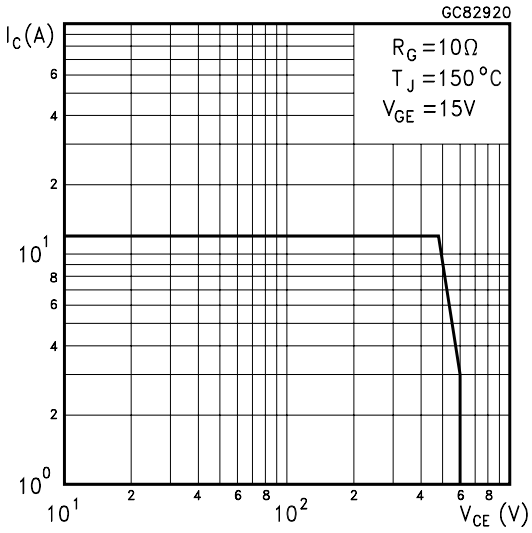


Fig. 1: Gate Charge test Circuit

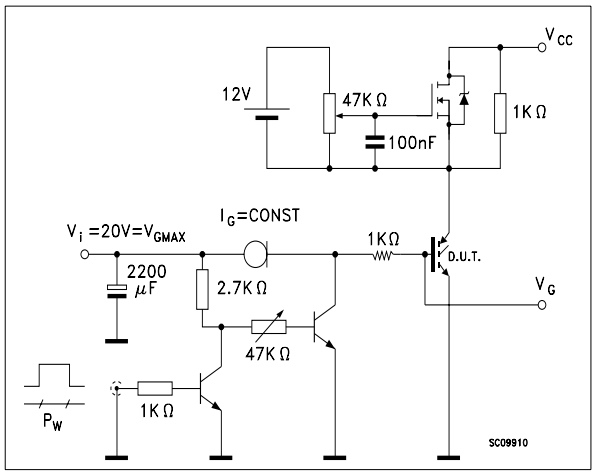
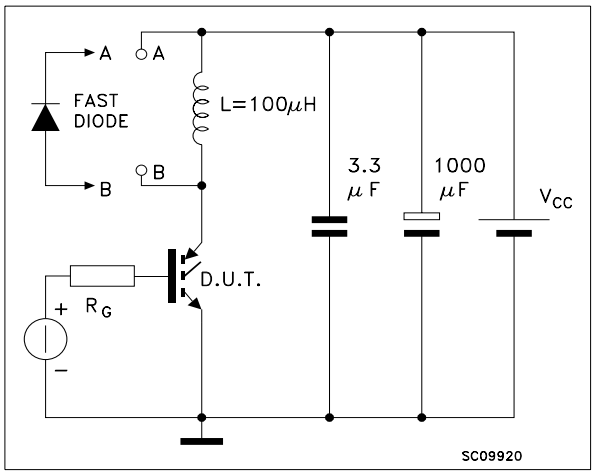
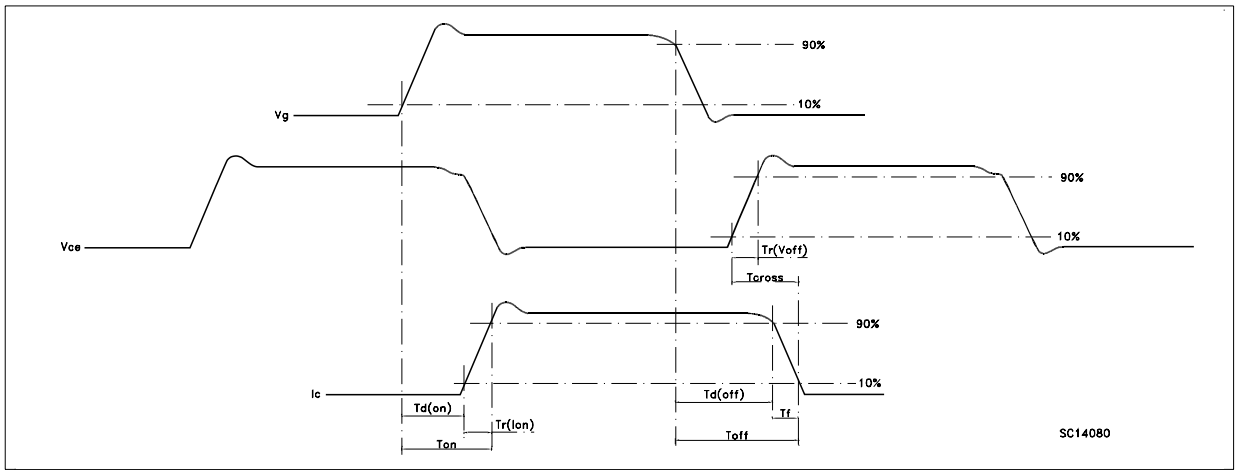


Fig. 2: Test Circuit For Inductive Load Switching





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