



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

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.

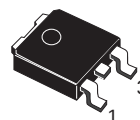
APPLICATIONS

- HIGH FREQUENCY MOTOR CONTROLS
- SMPS and PFC

ABSOLUTE MAXIMUM RATINGS

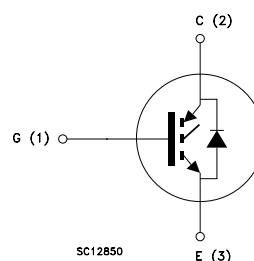
Symbol	Parameter	Value	Unit
V _{CES}	Collector-Emitter Voltage (V _{GS} = 0)	600	V
V _{ECR}	Emitter-Collector Voltage	20	V
V _{GE}	Gate-Emitter Voltage	±20	V
I _C	Collector Current (continuous) at T _C = 25°C	6	A
I _C	Collector Current (continuous) at T _C = 100°C	3	A
I _{CM} (■)	Collector Current (pulsed)	24	A
T _{sc}	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



DPAK

INTERNAL SCHEMATIC DIAGRAM



STGD3NB60KD

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 V _{CE} = Max Rating, T _C = 125 °C			10 100	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 = 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		2.4 1.9	2.8	V 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
t _{scw}	Short Circuit Withstand Time	V _{ce} = 0.5 BV _{ces} , V _{GE} = 15 V, T _J = 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, T _J = 125°C		400		A/µs
E _{on}	Turn-on Switching Losses			37		µJ

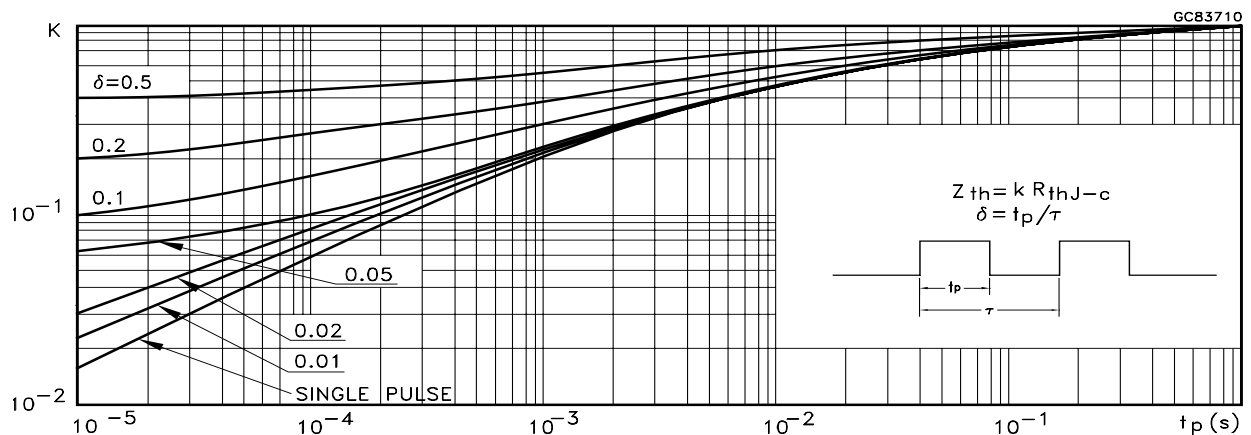
ELECTRICAL CHARACTERISTICS (CONTINUED)**SWITCHING OFF**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_c	Cross-over Time	$V_{CC} = 480 \text{ V}$, $I_C = 3 \text{ A}$, $R_{GE} = 10 \Omega$, $V_{GE} = 15 \text{ V}$		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	$V_{CC} = 480 \text{ V}$, $I_C = 3 \text{ A}$, $R_{GE} = 10 \Omega$, $V_{GE} = 15 \text{ V}$, $T_j = 125^\circ\text{C}$		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

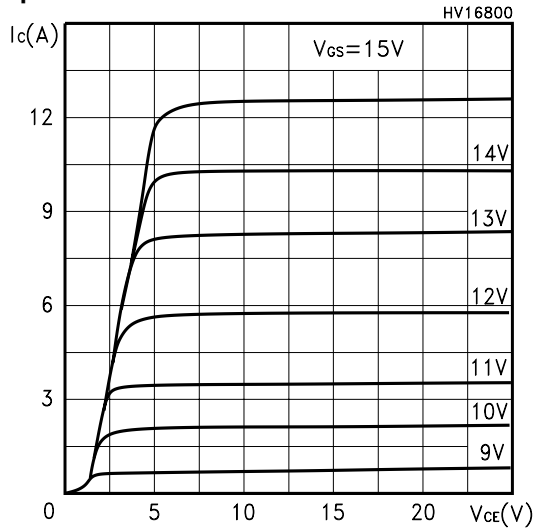
Note: 1. Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %.
 2. Pulse width limited by max. junction temperature.
 (***) Losses include Also the Tail (Jedec Standardization)

COLLECTOR-EMITTER DIODE

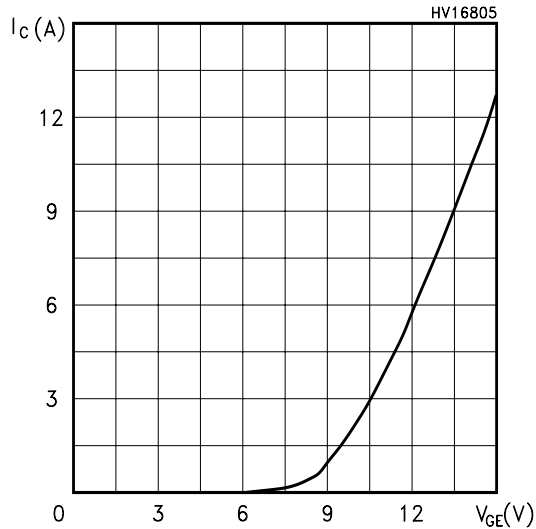
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_f	Forward Current				1	A
I_{fm}	Forward Current pulsed				8	A
V_f	Forward On-Voltage	$I_f = 1.5 \text{ A}$ $I_f = 1.5 \text{ A}$, $T_j = 125^\circ\text{C}$		1.6 1.3	2	V V
t_{rr}	Reverse Recovery Time	$I_f = 1.5 \text{ A}$, $V_R = 200 \text{ V}$, $T_j = 125^\circ\text{C}$, $di/dt = 100 \text{ A}/\mu\text{s}$		90		ns
Q_{rr}	Reverse Recovery Charge			100		nC
I_{rrm}	Reverse Recovery Current			2.7		A

Thermal Impedance

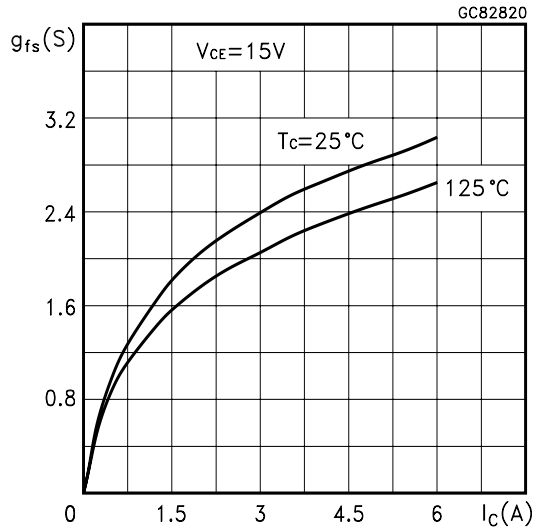
Output Characteristics



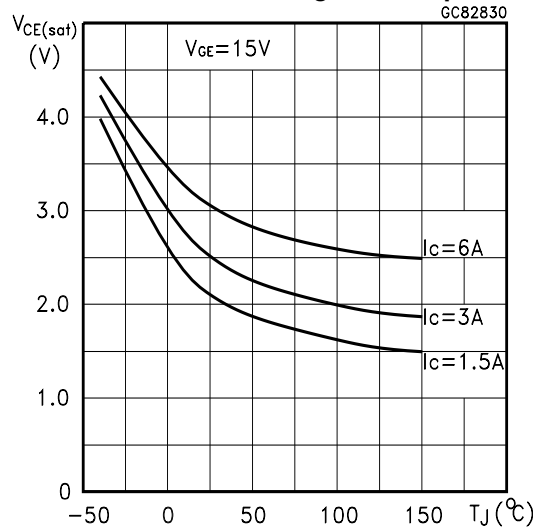
Transfer Characteristics



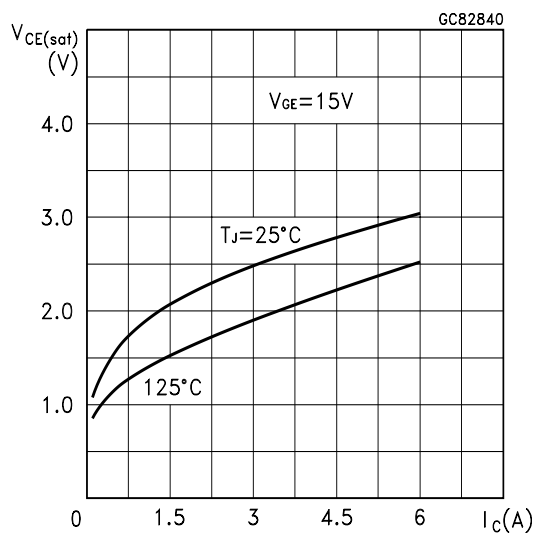
Transconductance



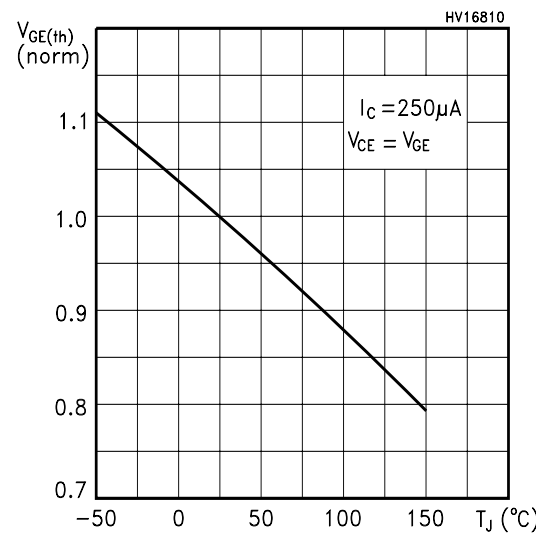
Collector-Emitter On Voltage vs Temperature



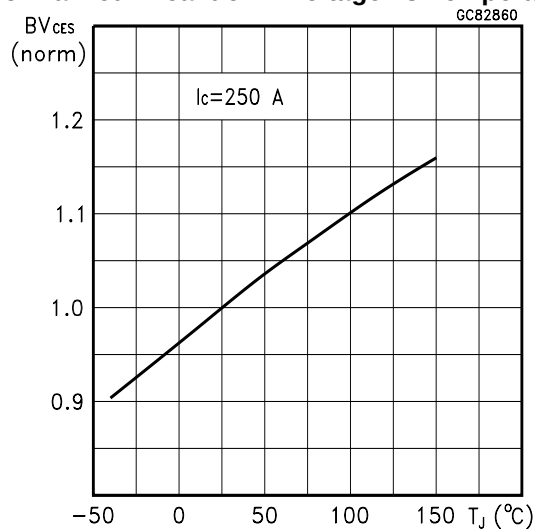
Collector-Emitter On Voltage vs Collector Current



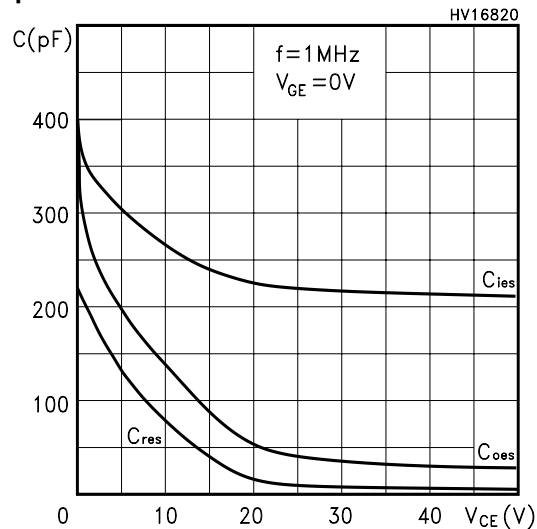
Gate Threshold vs Temperature



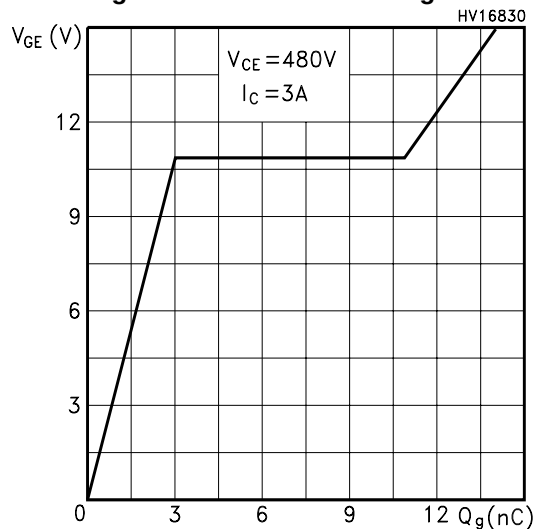
Normalized Breakdown Voltage vs Temperature



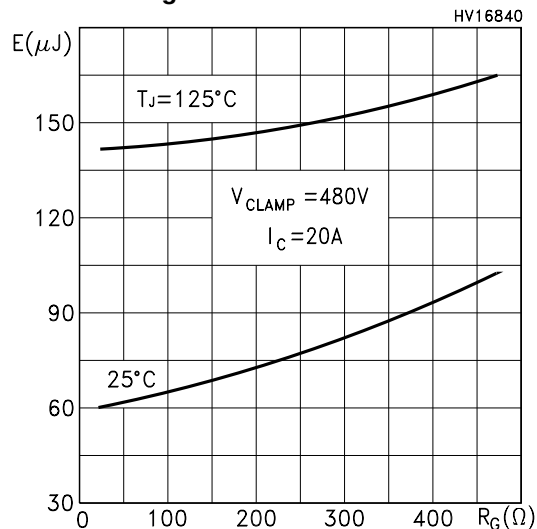
Capacitance Variations



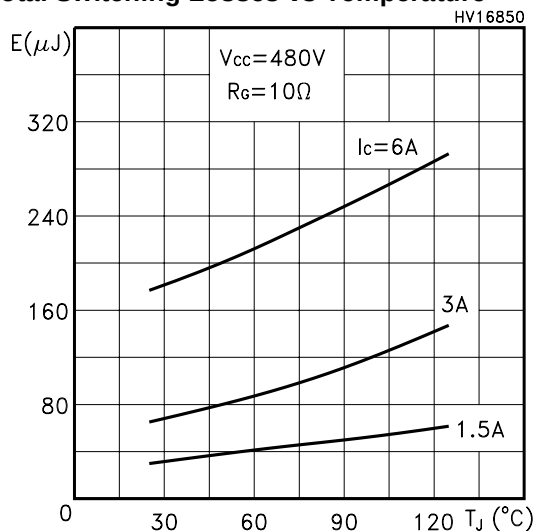
Gate Charge vs Gate-Emmitter Voltage



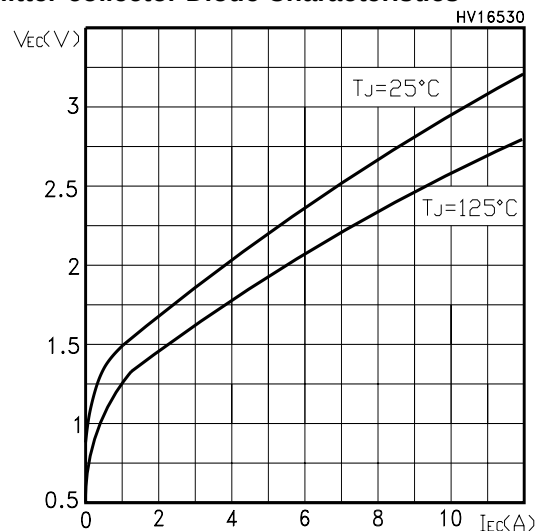
Total Switching Losses vs Gate Resistance



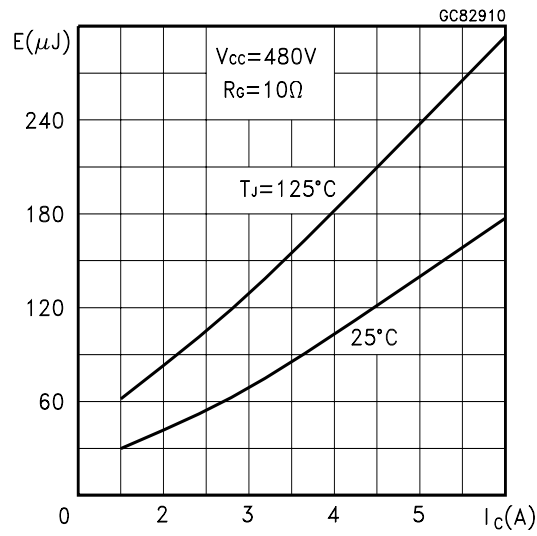
Total Switching Losses vs Temperature



Emitter-collector Diode Characteristics



Total Switching Losses vs Collector Current



Switching Off Safe Operating Area

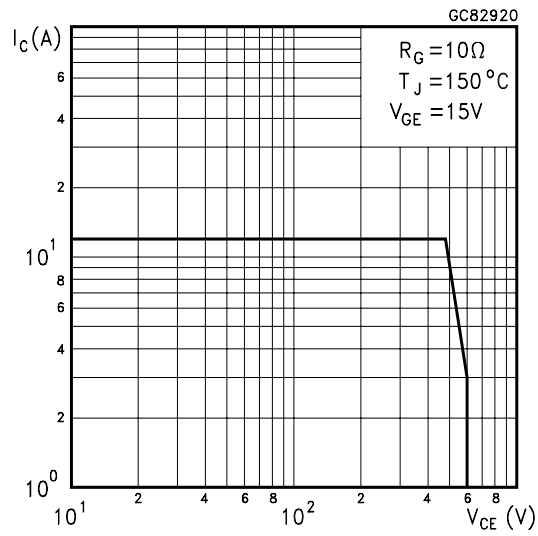
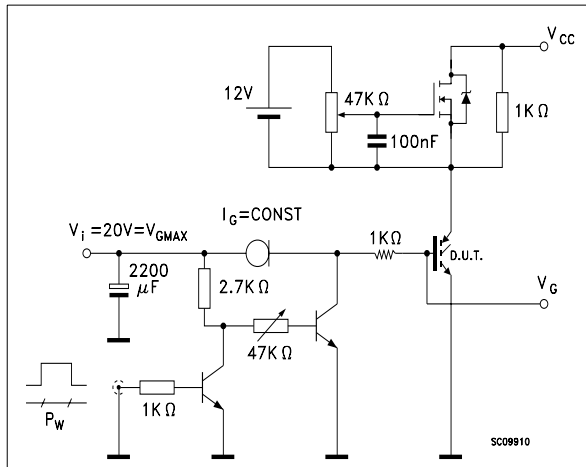
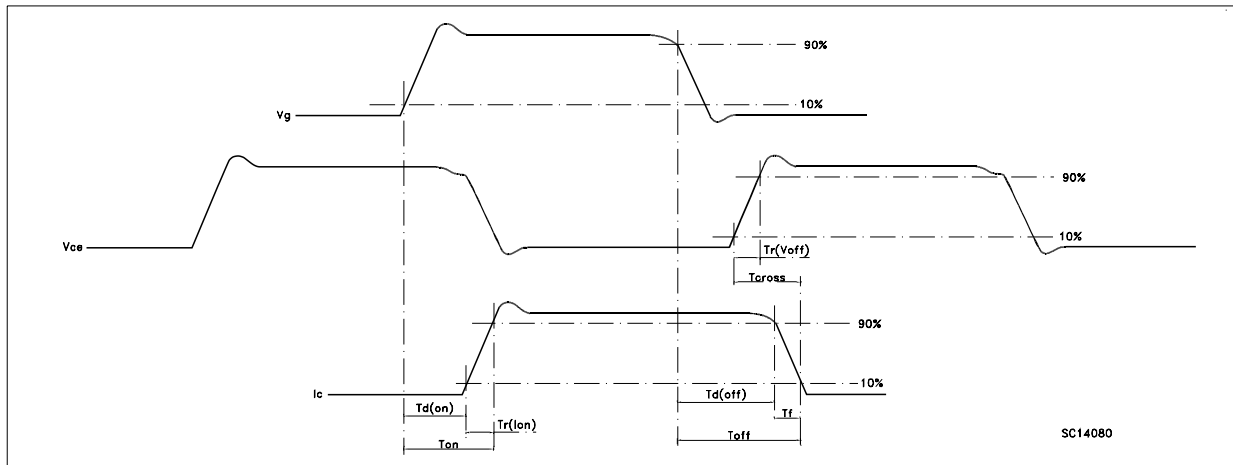
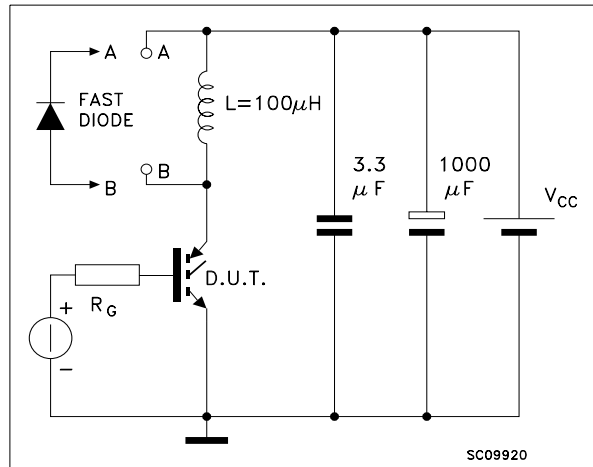
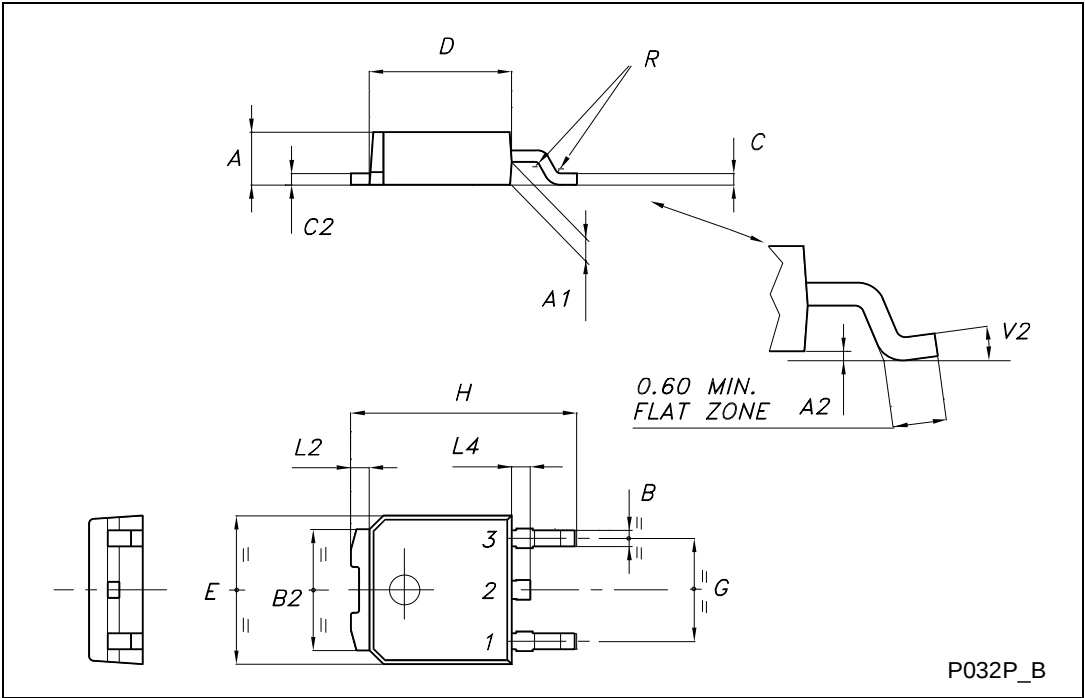


Fig. 1: Gate Charge test Circuit**Fig. 2: Test Circuit For Inductive Load Switching**

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°		8°	0°		0°



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