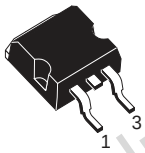
STGB3NB60SD

N-CHANNEL 3A - 600V D^2PAK
Power MESH™ IGBT

TYPE	V_{CES}	$V_{CE(sat)}$	I_C
STGB3NB60SD	600 V	<1.5 V	3 A

- HIGH INPUT IMPEDANCE (VOLTAGE DRIVEN)
- VERY LOW ON-VOLTAGE DROP (V_{cesat})
- HIGH CURRENT CAPABILITY
- OFF LOSSES INCLUDE TAIL CURRENT
- INTEGRATED FREEWHEELING DIODE
- SURFACE-MOUNTING D^2PAK (TO-263) POWER PACKAGE IN TAPE & REEL (SUFFIX "T4")

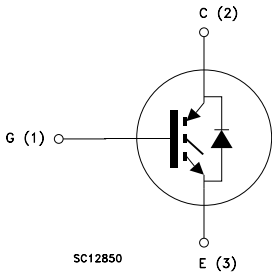


D^2PAK
TO-263
(suffix"T4")

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 "S" identifies a family optimized to achieve minimum on-voltage drop for low frequency applications (<1kHz).

INTERNAL SCHEMATIC DIAGRAM



APPLICATIONS

- GAS DISCHARGE LAMP
- STATIC RELAYS
- MOTOR CONTROL

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 (continuos) at T_c=25°C	6	A
I_C	Collector Current (continuos)at T_c=100°C	3	A
I_{CM}(•)	Collector Current (pulsed)	25	A
P_{tot}	Total Dissipation at T_c = 25°C	70	W
	Derating Factor	0.46	W/°C
T_{stg}	Storage Temperature	–60 to 175	°C
T_j	Max. Operating Junction Temperature	175	°C

(•)Pulse width limited by safe operating area.

THERMAL DATA

$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	2.14	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	62.5	°C/W
$R_{thc\text{-}sink}$	Thermal Resistance Case-sink	Typ	0.5	°C/W

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{BR(CES)}$	Collector-Emitter Breakdown Voltage	I_D = 250 µA V_{GE} = 0	600			V
I_{CES}	Collector cut-off (V_{GE} = 0)	V_{CE} = Max Rating T_j = 25 °C V_{CE} = Max Rating T_j = 125 °C			10 100	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20V V_{CE} = 0			±100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GE(th)}$	Gate Threshold Voltage	V_{CE} = V_{GE} I_C = 250 µA	2.5		5	V
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage	V_{GE} = 15 V I_C = 1.5 A V_{GE} = 15 V I_C = 3 A V_{GE} = 15 V I_D = 3 A T_j = 125 °C		1 1.2 1.1	1.5	V V V

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs}	Forward Transconductance	V_{CE} = 25 V I_C = 3 A	1.7	2.5		S
C_{ies}	Input Capacitance	V_{CE} = 25V f = 1 MHz V_{GE} = 0		255	330	pF
C_{oes}	Output Capacitance			30	40	pF
C_{res}	Reverse Transfer Capacitances			5.6	7	pF
Q_G	Total Gate Charge	V_{CE}=480V I_C=3 A V_{GE}=15 V		18		nC
Q_{GE}	Gate-Emitter Charge			5.4		nC
Q_{GC}	Gate-Collector Charge			5.5		nC
I_{CL}	Latching Current	V_{clamp} = 480 V R_G = 1 KΩ T_j=150 °C	12			A

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	DelayTime Rise Time	V_{CC} = 480 V I_C = 3 A V_{GE} = 15 V R_G = 1 kΩ		125 150		ns ns
$(di/dt)_{on}$ E_{on}	Turn-on Current Slope Turn-on Switching Losses	V_{CC} = 480 V I_C = 3 A V_{GE} = 15 V R_G = 1 kΩ T_j=125 °C		50 1100		A/µs µJ

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING OFF

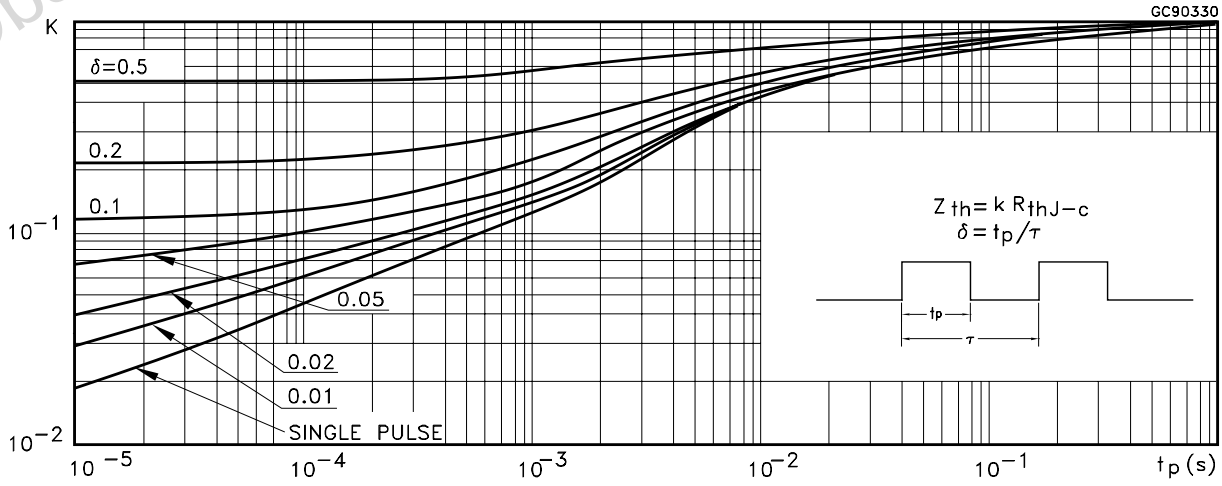
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_c	Cross-Over Time	V_{CC} = 480 V I_C = 3 A		1.8		µs
$t_{r(Voff)}$	Off Voltage Rise Time	R_{GE} = 1 kΩ V_{GE} = 15 V		1.0		µs
$t_{d(Voff)}$	Delay Time			3.4		µs
t_f	Fall Time			0.72		µs
E_{off}(**)	Turn-off Switching Loss			1.15		mJ
t_c	Cross-Over Time	V_{CC} = 480 V I_C = 3 A		2.8		µs
$t_{r(Voff)}$	Off Voltage Rise Time	R_{GE} = 1 kΩ V_{GE} = 15 V		1.45		µs
$t_{d(Voff)}$	Delay Time	T_j = 125 °C		3.6		µs
t_f	Fall Time			1.2		µs
E_{off}(**)	Turn-off Switching Loss			1.8		mJ

COLLECTOR-EMITTER DIODE

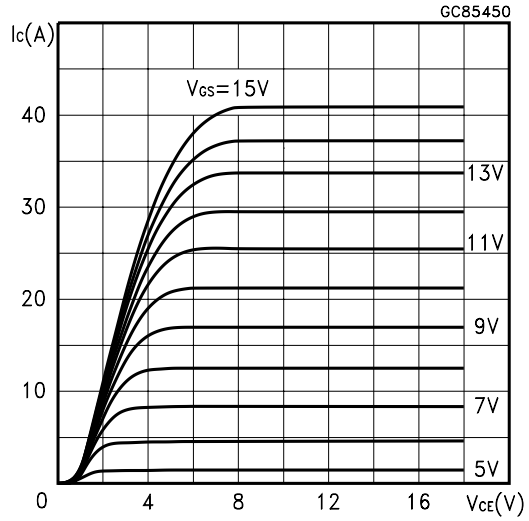
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_f	Forward Current				3	A
I_{fm}	Forward Current pulsed				25	A
V_f	Forward On-Voltage	I_f = 3 A		1.55	1.9	V
		I_f = 1 A		1.15		V
t_{rr}	Reverse Recovery Time	I_f = 3 A V_R = 200 V		1700		ns
Q_{rr}	Reverse Recovery Charge	di/dt = 100 A/µs T_j = 125 °C		4500		nC
I_{rrm}	Reverse Recovery Current			9.5		A

(•)Pulse width limited by max. junction temperature
(*)Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %.
(**)Losses Include Also The Tail (Jedec Standardization)

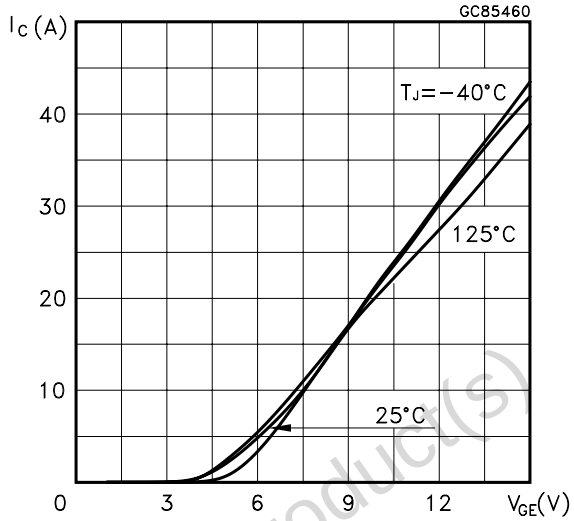
Thermal Impedance



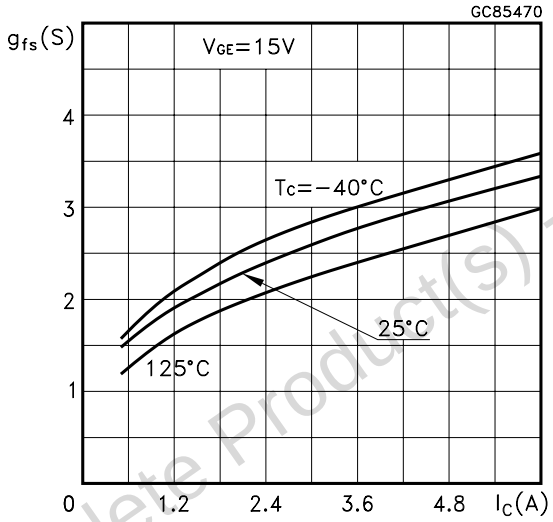
Output Characteristics



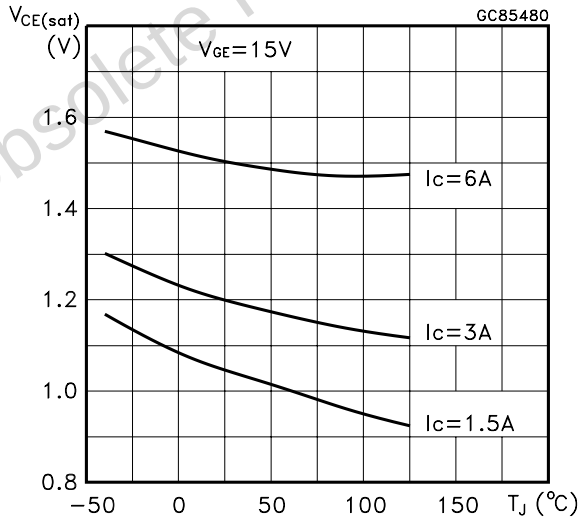
Transfer Characteristics



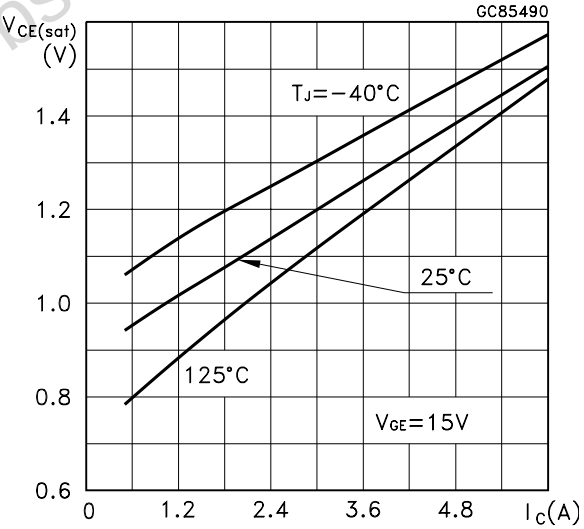
Transconductance



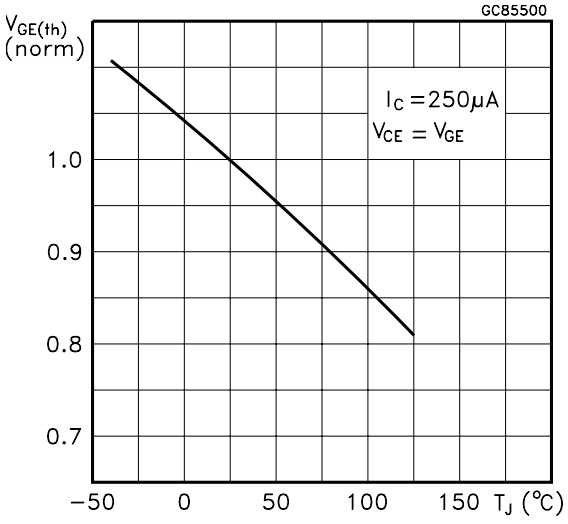
Collector-Emitter on Voltage vs Temperature



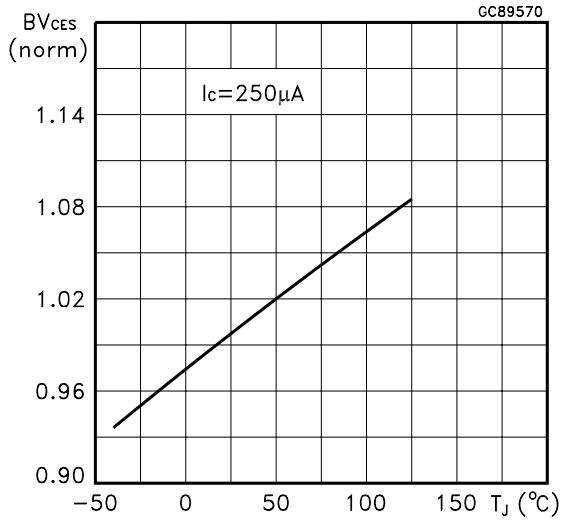
Collector-Emiter on Voltage vs Collector Current



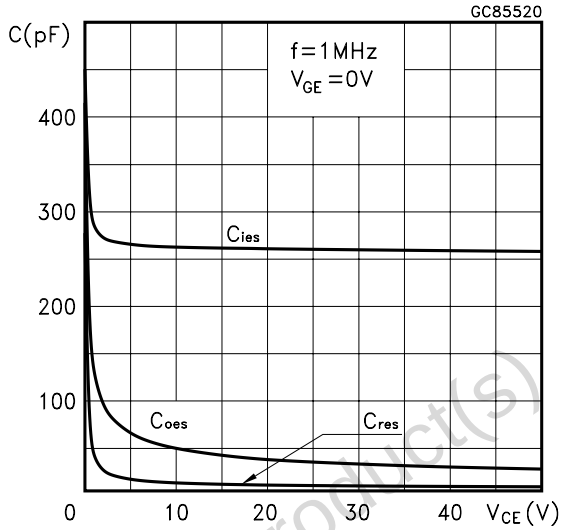
Gate Threshold vs Temperature



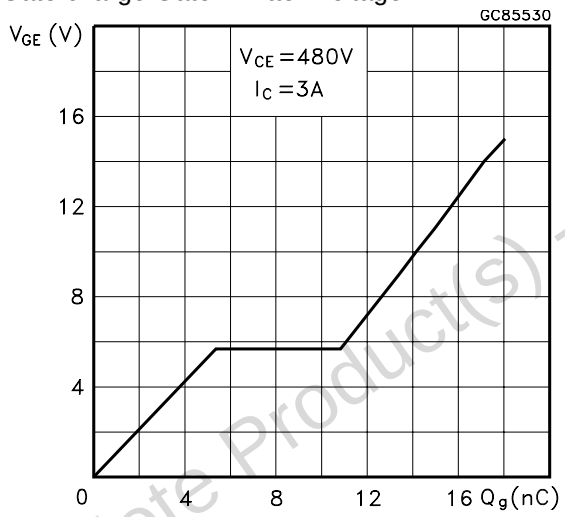
Normalized Breakdown Voltage vs Temperature



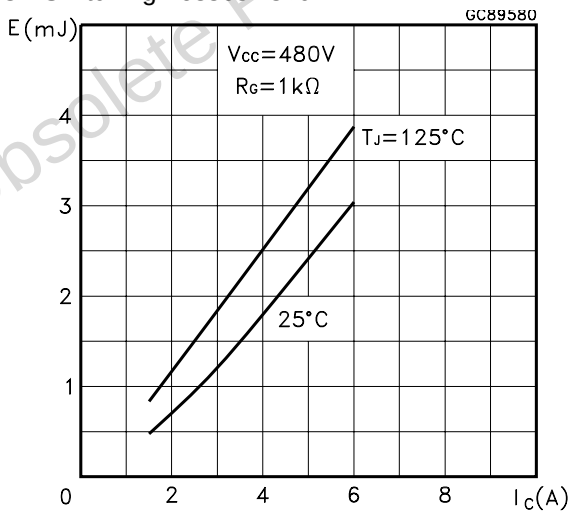
Capacitance Variations



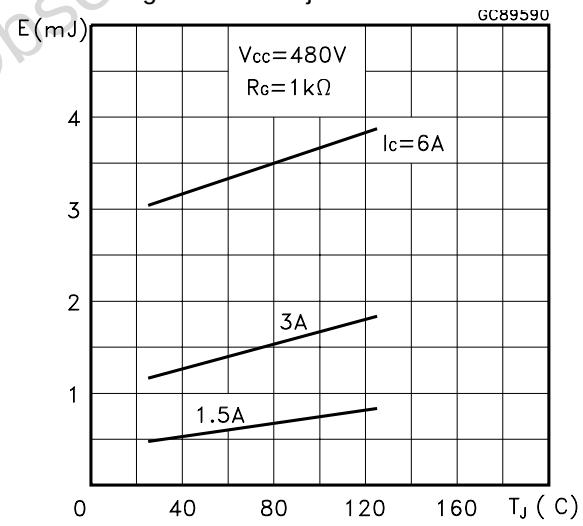
Gate charge Gate-Emitter Voltage



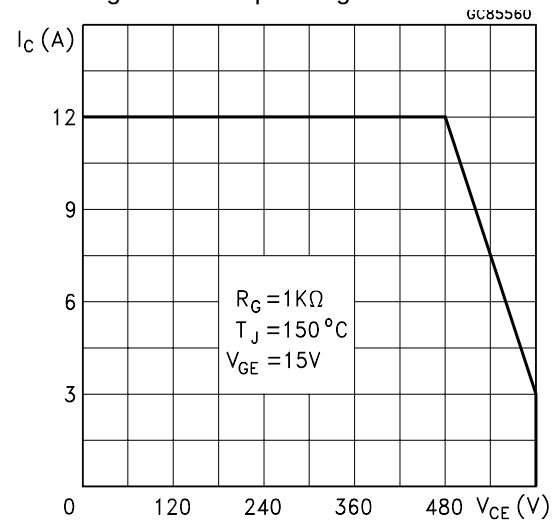
Off Switching Losses vs Ic



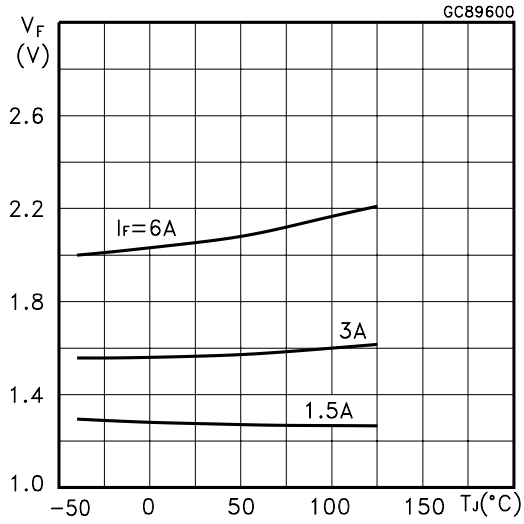
Off Switching Losses vs Tj



Switching Off Safe Operating Area



Diode Forward vs Tj



Diode Forward Voltage

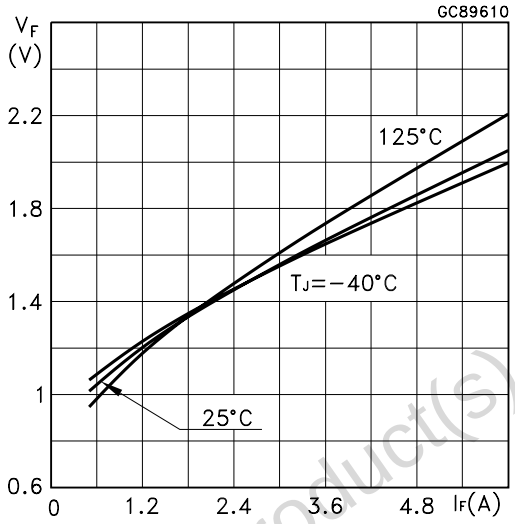


Fig. 1: Gate Charge test Circuit

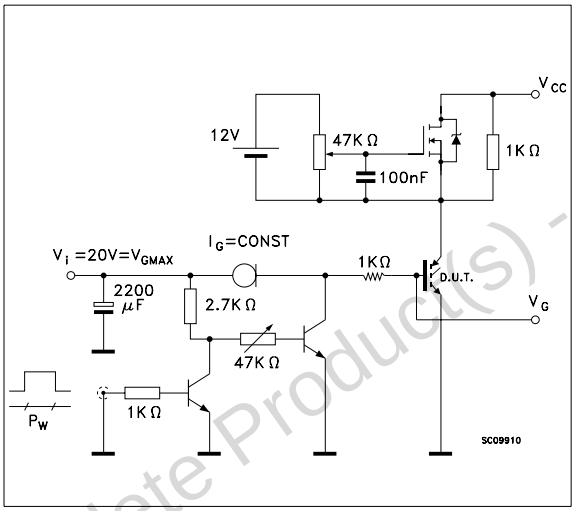


Fig. 2 Test Circuit For Inductive Load Switching

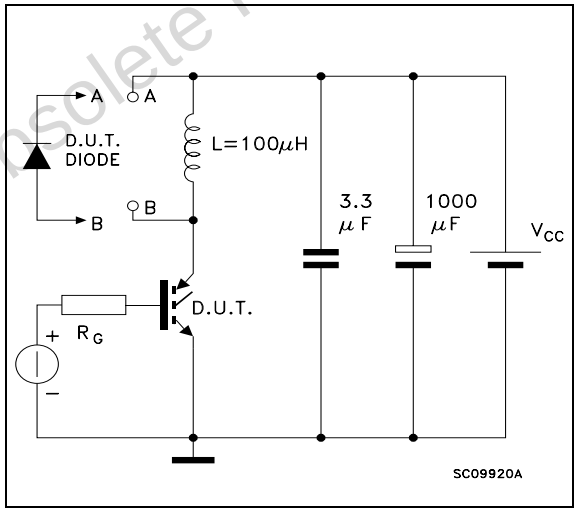
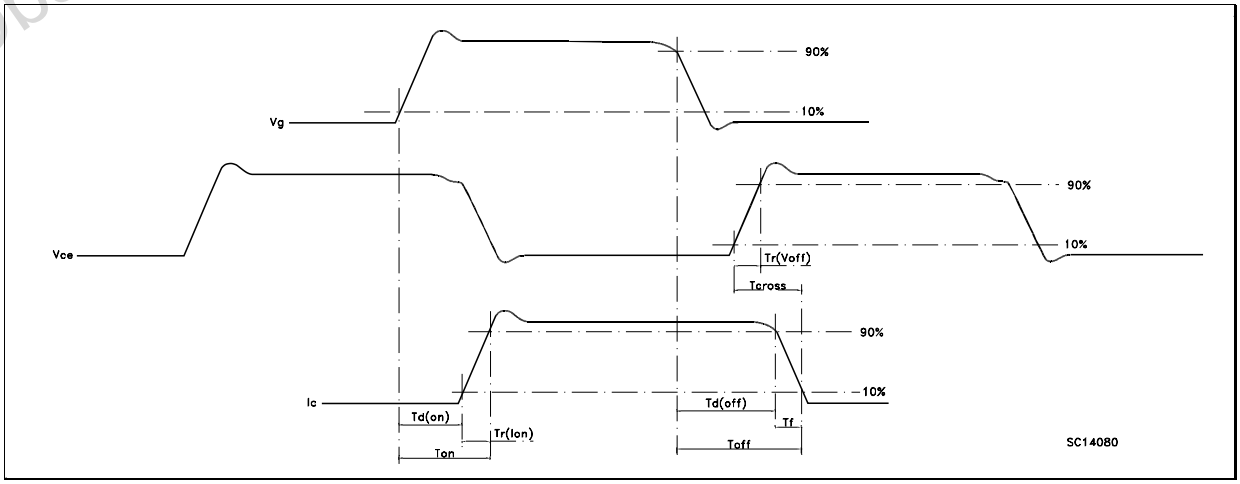


Fig. 3: Switching Waveforms



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	0º		8º