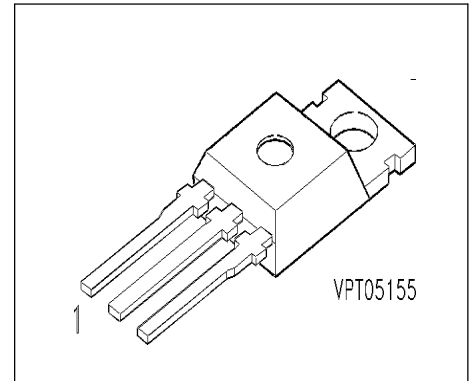


## IGBT

- Low forward voltage drop
- High switching speed
- Low tail current
- Latch-up free
- Avalanche rated



Pin 1	Pin 2	Pin 3
G	C	E

Type	$V_{CE}$	$I_C$	Package	Ordering Code
SGP04N60	600V	4A	TO-220 AB	Q67040-A . . . .

### Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	$V_{CE}$	600	V
Collector-gate voltage	$V_{CGR}$	600	
$R_{GE} = 20 \text{ k}\Omega$			
Gate-emitter voltage	$V_{GE}$	$\pm 20$	
DC collector current	$I_C$		A
$T_C = 25 \text{ }^\circ\text{C}$		10	
$T_C = 100 \text{ }^\circ\text{C}$		4	
Pulsed collector current, $t_p = 1 \text{ ms}$	$I_{Cpuls}$		
$T_C = 25 \text{ }^\circ\text{C}$		20	
$T_C = 100 \text{ }^\circ\text{C}$		8	
Avalanche energy, single pulse	$E_{AS}$		mJ
$I_C = 4 \text{ A}$ , $V_{CC} = 50 \text{ V}$ , $R_{GE} = 25 \text{ }\Omega$		4	
$L = 500 \text{ }\mu\text{H}$ , $T_j = 25 \text{ }^\circ\text{C}$			
Power dissipation	$P_{tot}$		W
$T_C = 25 \text{ }^\circ\text{C}$		50	

*Preliminary data*

**Maximum Ratings**

Parameter	Symbol	Values	Unit
Chip or operating temperature	$T_j$	-55 ... + 150	°C
Storage temperature	$T_{stg}$	-55 ... + 150	
IEC climatic category, DIN IEC 68-1	-	55 / 150 / 56	-

**Thermal Resistance**

Thermal resistance, junction - case	$R_{thJC}$	≤ 2.5	K/W
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**Electrical Characteristics**, at  $T_j = 25\text{ °C}$ , unless otherwise specified

Parameter	Symbol	Values			Unit
		min.	typ.	max.	

**Static Characteristics**

Collector-emitter breakdown voltage $V_{GE} = 0\text{ V}$ , $I_C = 0.5\text{ mA}$ , $T_j = -55\text{ °C}$	$V_{(BR)CES}$	600	-	-	V
Gate threshold voltage $V_{GE} = V_{CE}$ , $I_C = 0.2\text{ mA}$ , $T_j = 25\text{ °C}$ $V_{GE} = V_{CE}$ , $I_C = 0.2\text{ mA}$ , $T_j = 150\text{ °C}$	$V_{GE(th)}$	3 2	4 3	5 -	
Collector-emitter saturation voltage $V_{GE} = 15\text{ V}$ , $I_C = 4\text{ A}$ , $T_j = 25\text{ °C}$ $V_{GE} = 15\text{ V}$ , $I_C = 4\text{ A}$ , $T_j = 150\text{ °C}$	$V_{CE(sat)}$	1.6 -	2 2.3	2.5 2.8	
Zero gate voltage collector current $V_{CE} = 600\text{ V}$ , $V_{GE} = 0\text{ V}$ , $T_j = 25\text{ °C}$ $V_{CE} = 600\text{ V}$ , $V_{GE} = 0\text{ V}$ , $T_j = 150\text{ °C}$	$I_{CES}$	- -	- -	20 500	μA
Gate-emitter leakage current $V_{GE} = 25\text{ V}$ , $V_{CE} = 0\text{ V}$	$I_{GES}$	-	-	100	nA

**Electrical Characteristics**, at  $T_j = 25\text{ °C}$ , unless otherwise specified

Parameter	Symbol	Values			Unit
		min.	typ.	max.	

**AC Characteristics**

Transconductance $V_{CE} = 20\text{ V}, I_C = 4\text{ A}$	$g_{fs}$	0.8	3.2	-	S
Input capacitance $V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$	$C_{iss}$	-	270	340	pF
Output capacitance $V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$	$C_{oss}$	-	30	40	
Reverse transfer capacitance $V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$	$C_{rss}$	-	18	23	

*Preliminary data*

**Electrical Characteristics, at  $T_j = 25\text{ °C}$ , unless otherwise specified**

Parameter	Symbol	Values			Unit
		min.	typ.	max.	

**Switching Characteristics, Inductive Load at  $T_j = 150\text{ °C}$**

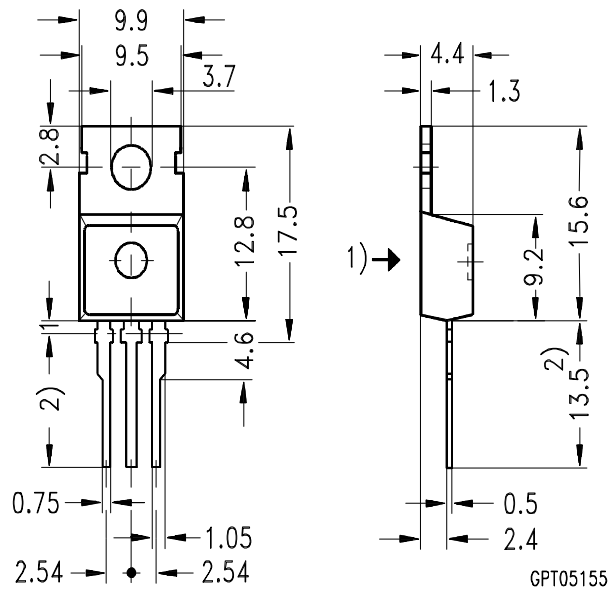
Turn-on delay time $V_{CC} = 400\text{ V}$ , $V_{GE} = 15\text{ V}$ , $I_C = 4\text{ A}$ $R_{Gon} = 67\ \Omega$	$t_{d(on)}$	-	20	30	ns
Rise time $V_{CC} = 400\text{ V}$ , $V_{GE} = 15\text{ V}$ , $I_C = 4\text{ A}$ $R_{Gon} = 67\ \Omega$	$t_r$	-	20	30	
Turn-off delay time $V_{CC} = 400\text{ V}$ , $V_{GE} = 15\text{ V}$ , $I_C = 4\text{ A}$ $R_{Goff} = 67\ \Omega$	$t_{d(off)}$	-	260	390	
Fall time $V_{CC} = 400\text{ V}$ , $V_{GE} = 15\text{ V}$ , $I_C = 4\text{ A}$ $R_{Goff} = 67\ \Omega$	$t_f$	-	100	150	
Total turn-on loss energy * $V_{CC} = 400\text{ V}$ , $V_{GE} = 15\text{ V}$ , $I_C = 4\text{ A}$ $R_{Gon} = 67\ \Omega$ , $T_j = 150\text{ °C}$	$E_{on}$	-	0.2	0.26	mJ
Total turn-off loss energy $V_{CC} = 400\text{ V}$ , $V_{GE} = 15\text{ V}$ , $I_C = 4\text{ A}$ $R_{Goff} = 67\ \Omega$ , $T_j = 150\text{ °C}$	$E_{off}$	-	0.1	0.13	
Total Gate Charge $V_{CC} = 480\text{ V}$ , $V_{GE} = 15\text{ V}$ , $I_C = 4\text{ A}$	$Q_{G(on)}$	-	24	36	nC

\* includes the reverse recovery losses caused by the FWD of the BUP410D

**Package Outlines**

Dimensions in mm

Weight:



- 1) punch direction, burr max. 0.04
- 2) dip tinning
- 3) max. 14.5 by dip tinning press burr max. 0.05