



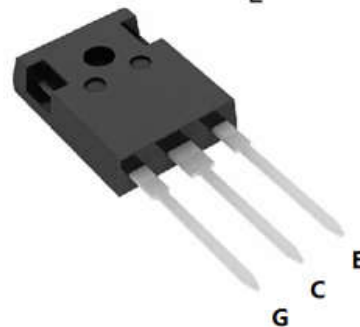
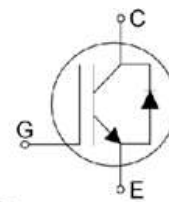
# SPT25N120U1

**1200V /25A Trench Field Stop IGBT**

## FEATURES

- High breakdown voltage to 1200V for improved reliability
- Trench-Stop Technology offering :
  - High speed switching
  - High ruggedness, temperature stable
  - Short circuit withstand time – 10μs
  - Low  $V_{CEsat}$
  - Easy parallel switching capability due to positive temperature coefficient in  $V_{CEsat}$
- Enhanced avalanche capability

$V_{CE}$	1200	V
$I_C$	25	A
$V_{CE(SAT)} I_C=25A$	2.05	V



## APPLICATION

- Uninterruptible Power Supplies
- Solar inverter
- Welding
- PFC applications

Product	Package	Packaging
SPT25N120U1	TO247	Tube



## Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-Emitter Breakdown Voltage	$V_{CE}$	1200	V
DC collector current, limited by $T_{jmax}$ $T_C = 25^\circ\text{C}$ $T_C = 100^\circ\text{C}$	$I_C$	50 25	A
Diode Forward current, limited by $T_{jmax}$ $T_C = 25^\circ\text{C}$ $T_C = 100^\circ\text{C}$	$I_F$	50 25	A
Continuous Gate-emitter voltage	$V_{GE}$	$\pm 20$	V
Transient Gate-emitter voltage	$V_{GE}$	$\pm 30$	V
Turn off safe operating area $V_{CE} \leq 1200\text{V}$ , $T_j \leq 150^\circ\text{C}$	-	75	A
Pulsed collector current, $V_{GE} = 15\text{V}$ , $t_p$ limited by $T_{jmax}$	$I_{CM}$	75	A
Short Circuit Withstand Time, $V_{GE} = 15\text{V}$ , $V_{CE} \leq 600\text{V}$	$T_{sc}$	10	$\mu\text{s}$
Power dissipation, $T_j = 25^\circ\text{C}$	$P_{tot}$	210	W
Operating junction temperature	$T_j$	-40...+150	$^\circ\text{C}$
Storage temperature	$T_s$	-55...+150	$^\circ\text{C}$
Soldering temperature, wave soldering 1.6mm (0.063in.) from case for 10s	-	260	$^\circ\text{C}$

## Thermal Resistance

Parameter	Symbol	Max. Value	Unit
IGBT thermal resistance, junction - case	$R_{\theta(j-c)}$	0.61	K/W
Diode thermal resistance, junction - case	$R_{\theta(j-c)}$	1.2	K/W



Thermal resistance, junction - ambient	$R_{\theta(j-a)}$	40	K/W
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**Electrical Characteristics of the IGBT** ( $T_j = 25^\circ\text{C}$  unless otherwise specified) :

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
<b>Static</b>						
Collector-Emitter breakdown voltage	$BV_{CES}$	$V_{GE}=0V, I_C=250\mu A$	1200	-	-	V
Gate threshold voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}, I_C=250\mu A$	5.4	6.0	6.6	V
Collector-Emitter Saturation voltage	$V_{CE(sat)}$	$V_{GE}=15V, I_C=25A$ $T_j = 25^\circ\text{C}$ $T_j = 150^\circ\text{C}$	- -	2.05 2.65	2.45 -	V
Zero gate voltage collector current	$I_{CES}$	$V_{CE} = 1200V, V_{GE} = 0V$ $T_j = 25^\circ\text{C}$ $T_j = 150^\circ\text{C}$	- -	- -	100 1000	$\mu A$
Gate-emitter leakage current	$I_{GES}$	$V_{CE} = 0V, V_{GE} = \pm 20V$	-	-	100	nA
Transconductance	$g_{fs}$	$V_{CE}=20V, I_C=25A$	-	13	-	S

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
<b>Dynamic</b>						
Input capacitance	$C_{ies}$	$V_{CE} = 25V, V_{GE} = 0V,$ $f = 1\text{MHz}$	-	1865	-	pF
Output capacitance	$C_{oes}$		-	70	-	
Reverse transfer capacitance	$C_{res}$		-	45	-	
Gate charge	$Q_G$	$V_{CC} = 960V, I_C = 25A,$ $V_{GE} = 15V$	-	137	-	nC
Short circuit collector current	$I_{C(SC)}$	$V_{GE}=15V, t_{SC} \leq 10\mu s$ $V_{CC}=600V,$ $T_{j, start}=25^\circ\text{C}$	-	140	-	A



**Switching Characteristic, Inductive Load**

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
<b>Dynamic , at T<sub>j</sub> = 25° C</b>						
Turn-on delay time	t <sub>d(on)</sub>	V <sub>CC</sub> = 600V, I <sub>C</sub> = 25A, V <sub>GE</sub> = 0/15V, R <sub>g</sub> =42Ω	-	62	-	ns
Rise time	t <sub>r</sub>		-	22	-	ns
Turn-on energy	E <sub>on</sub>		-	3.3	-	mJ
Turn-off delay time	t <sub>d(off)</sub>		-	297	-	ns
Fall time	t <sub>f</sub>		-	94	-	ns
Turn-off energy	E <sub>off</sub>		-	0.65	-	mJ

**Electrical Characteristics of the DIODE**

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
<b>Dynamic , at T<sub>j</sub> = 25° C</b>						
Diode Forward Voltage	V <sub>FM</sub>	I <sub>F</sub> = 25A	-	3.1	-	V
Reverse Recovery Time	T <sub>rr</sub>	I <sub>F</sub> = 25A, di/dt= 600A/μs	-	420	-	nS
Reverse Recovery Current	I <sub>rr</sub>		-	17	-	A
Reverse Recovery Charge	Q <sub>rr</sub>		-	2570	-	nC



Fig. 1 FBSOA characteristics

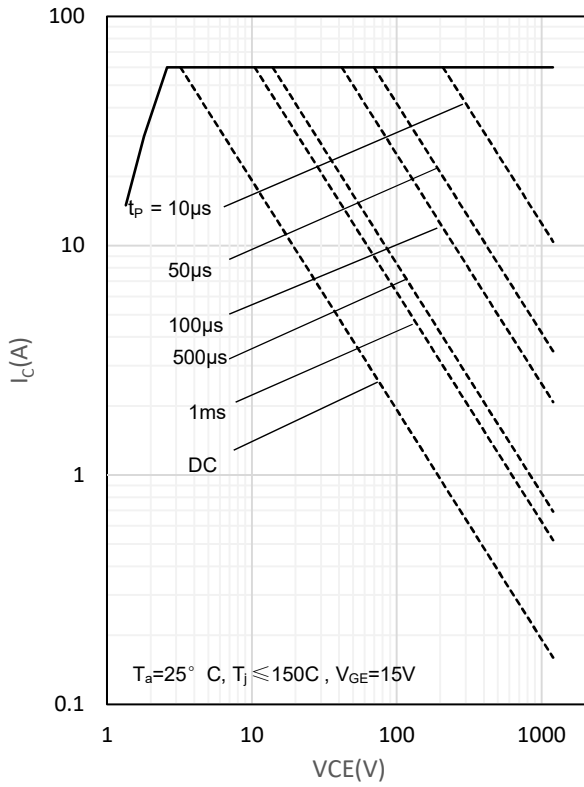


Fig. 2 Load Current vs. Frequency

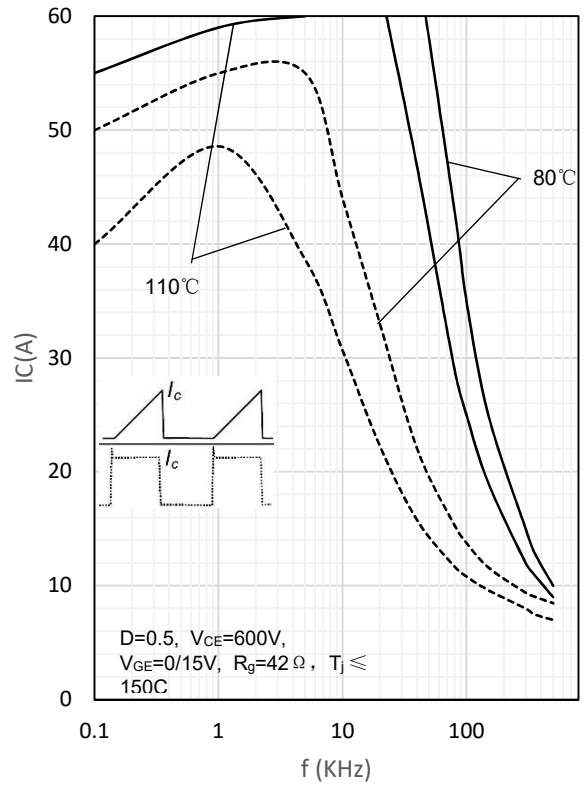


Fig. 3 Output characteristics

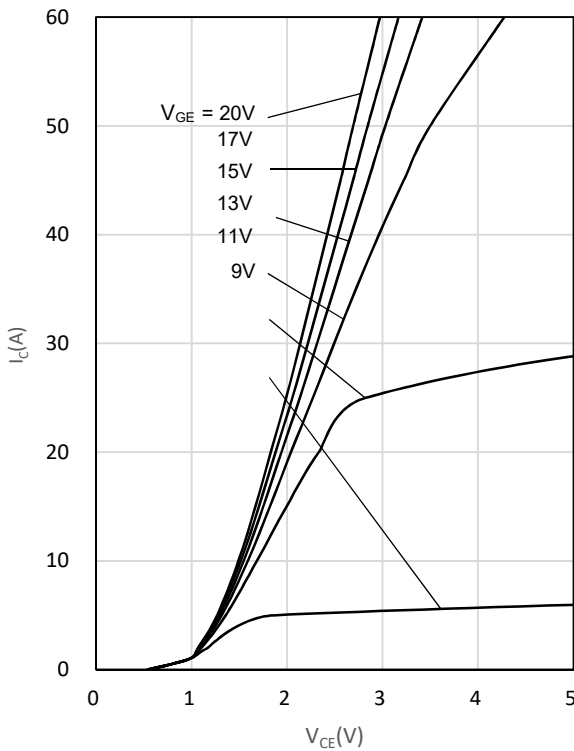


Fig. 4 Saturation voltage characteristics

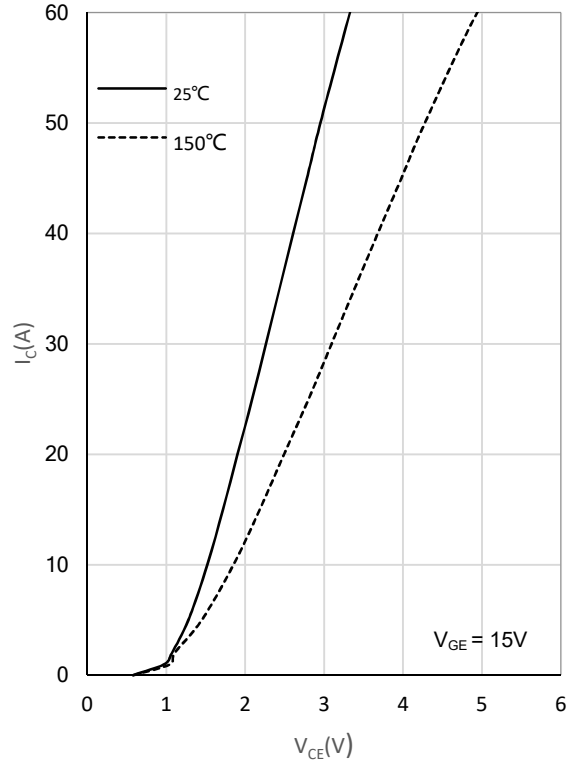




Fig. 5 Switching times vs. gate resistor

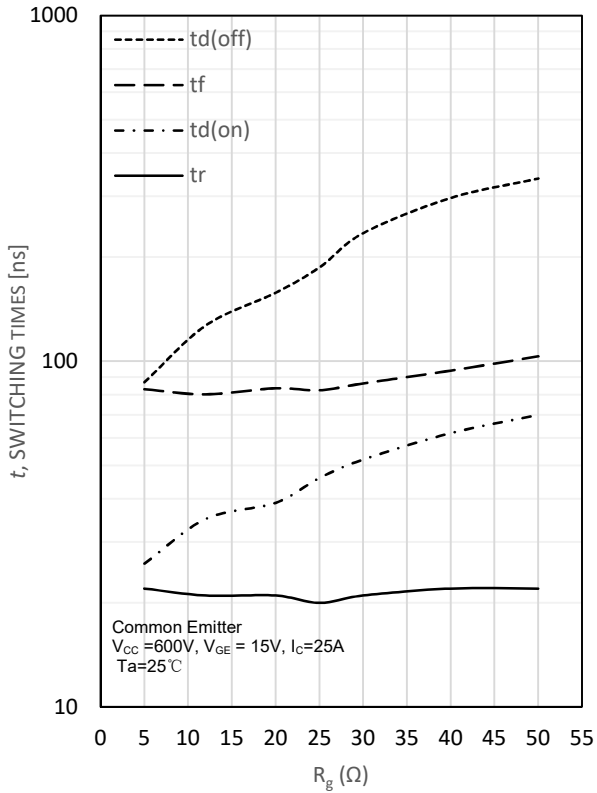


Fig. 6 Switching times vs. collector current

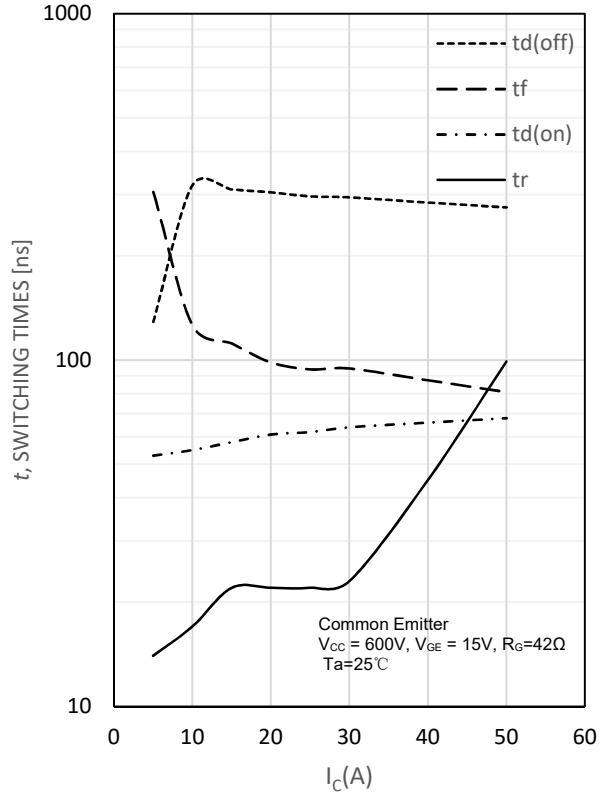


Fig. 7 Switching loss vs. gate resistor

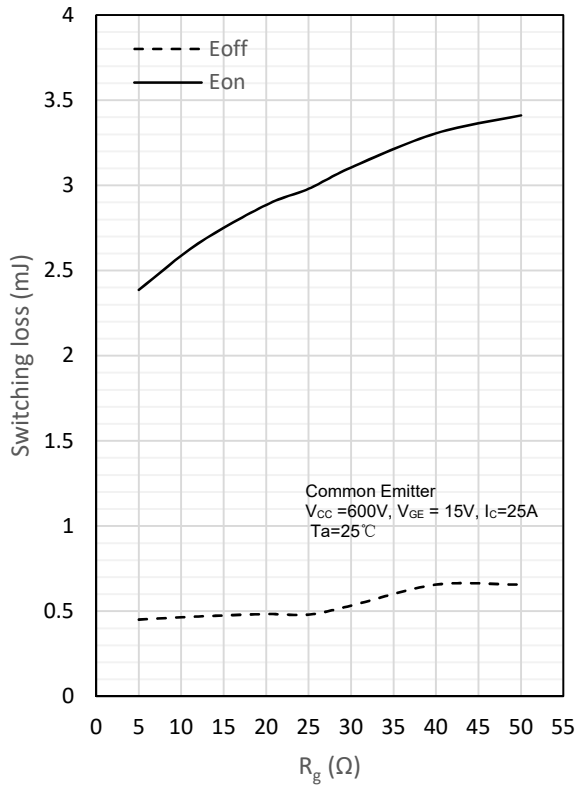


Fig. 8 Switching loss vs. collector current

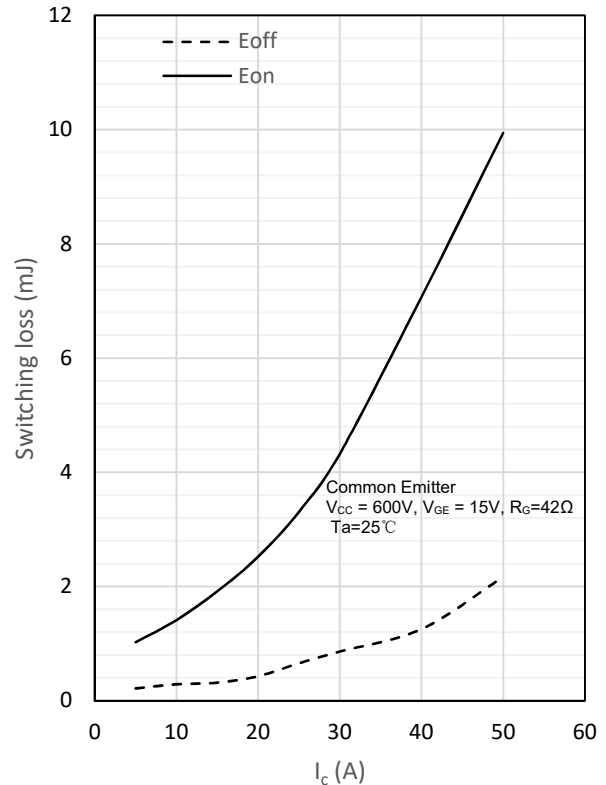




Fig. 9 Gate charge characteristics

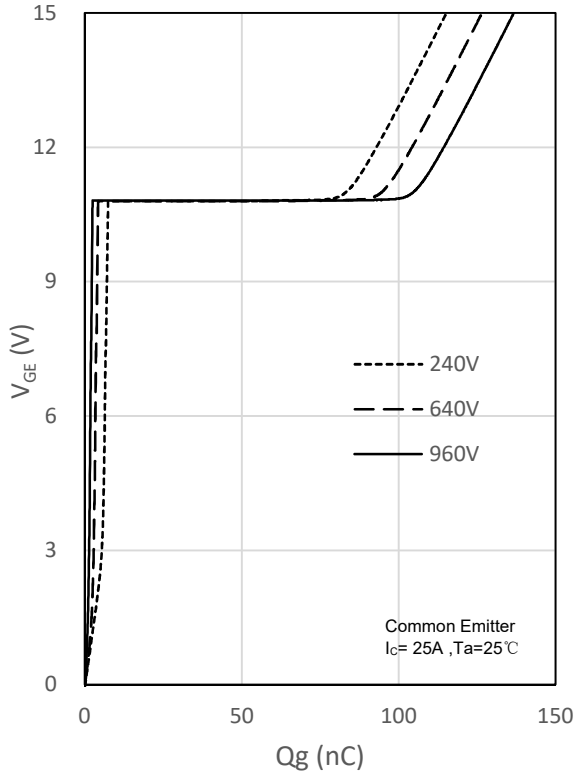
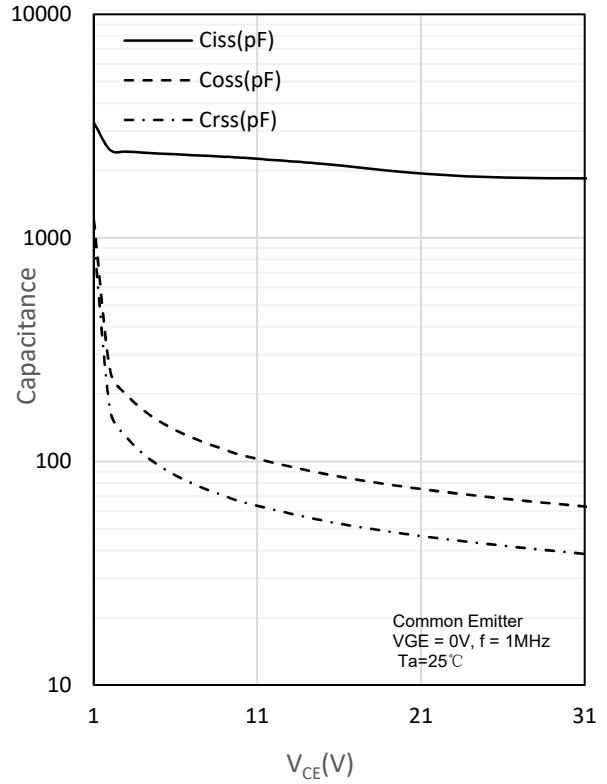
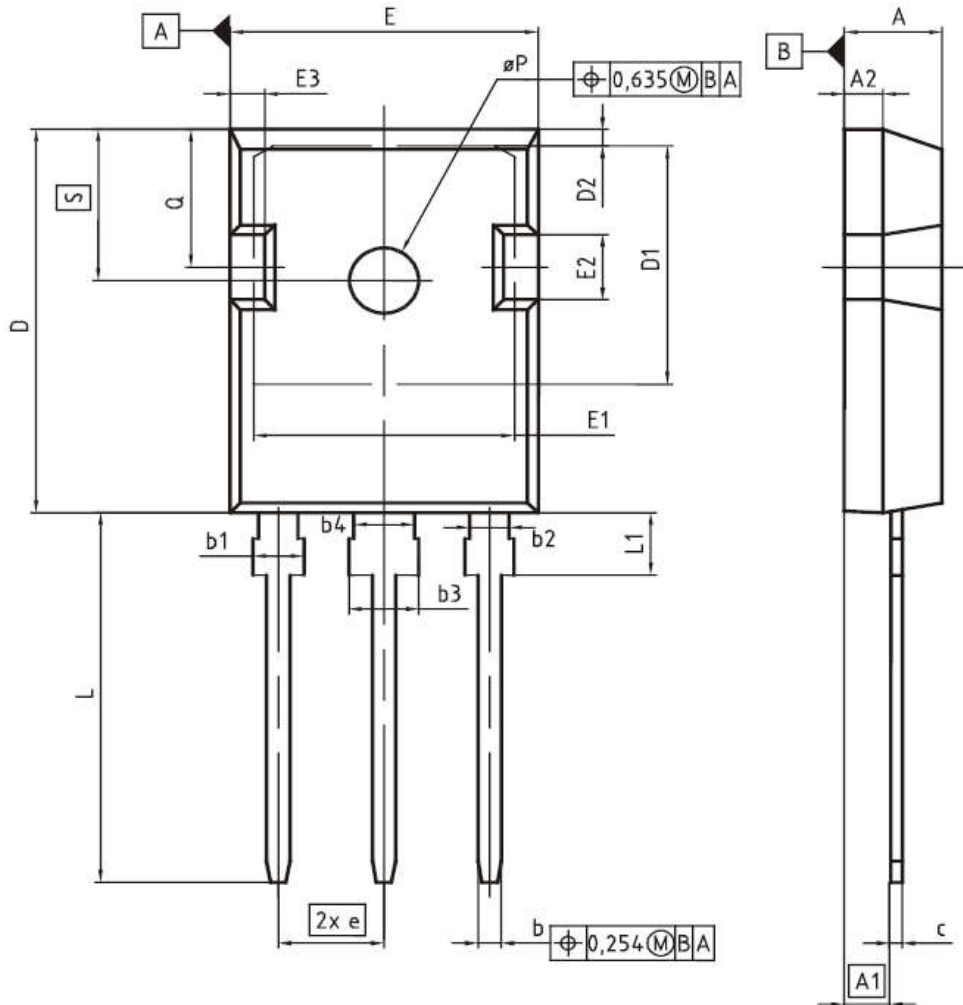


Fig. 10 Capacitance characteristics





**PG-TO247-3**



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.83	5.21	0.190	0.205
A1	2.27	2.54	0.089	0.100
A2	1.85	2.16	0.073	0.085
b	1.07	1.33	0.042	0.052
b1	1.90	2.41	0.075	0.095
b2	1.90	2.16	0.075	0.085
b3	2.87	3.38	0.113	0.133
b4	2.87	3.13	0.113	0.123
c	0.55	0.68	0.022	0.027
D	20.80	21.10	0.819	0.831
D1	16.25	17.65	0.640	0.695
D2	0.95	1.35	0.037	0.053
E	15.70	16.13	0.618	0.635
E1	13.10	14.15	0.516	0.557
E2	3.68	5.10	0.145	0.201
E3	1.00	2.60	0.039	0.102
e	5.44 (BSC)		0.214 (BSC)	
N	3		3	
L	19.80	20.32	0.780	0.800
L1	4.10	4.47	0.161	0.176
øP	3.50	3.70	0.138	0.146
Q	5.49	6.00	0.216	0.236
S	6.04	6.30	0.238	0.248