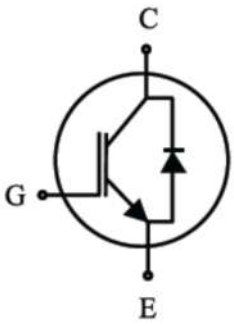
SPT40N120T1B

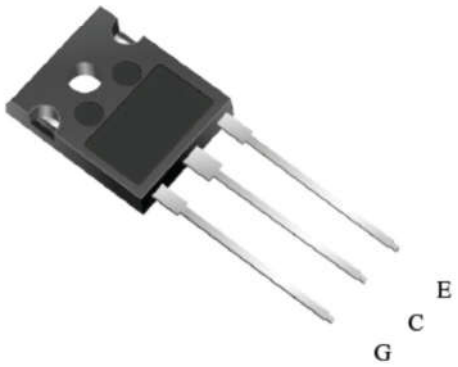
1200V /40A Trench Field Stop IGBT

V_{CE}	**1200**	**V**
I_C	**40**	**A**
$V_{CE(SAT)}$ I_C=40A	**1.7**	**V**

FEATURES

- High breakdown voltage to 1200V for improved reliability
- Trench-Stop Technology offering :
  - very tight parameter distribution
  - high ruggedness, temperature stable behavior
  - Short circuit withstand time – 10μs
  - High ruggedness, temperature stable
  - Low $V_{CE(SAT)}$
  - Easy parallel switching capability due to positive temperature coefficient in $V_{CE(SAT)}$
- Enhanced avalanche capability





APPLICATION

- Frequency Converters
- Motor Drive

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-Emitter Breakdown Voltage	V_{CE}	1200	V
DC collector current, limited by T_{jmax} T_C = 25°C T_C = 100°C	I_C	80 40	A
Diode Forward current, limited by T_{jmax} T_C = 25°C T_C = 100°C	I_F	80 40	A
Pulsed Collector Current, limited by T_{jmax}	I_{Cpuls}	160	A
Turn off safe operating area V_{CE} ≤1200V, T_j ≤ 150°C	-	160	A
Diode Pulsed Current, limited by T_{jmax}	I_{Fpuls}	160	A
Short Circuit Withstand Time, V_{GE}= 15V, V_{CE}≤ 600V	T_{sc}	10	μs
Power dissipation , T_j=25℃	P_{tot}	416	W
Operating junction temperature	T_j	-40...+150	°C
Storage temperature	T_s	-55...+150	°C
Soldering temperature, wave soldering 1.6mm (0.063in.) from case for 10s	-	260	°C

Thermal Resistance

Parameter	Symbol	Max. Value	Unit
IGBT thermal resistance, junction - case	R_{θ}(j-c)	0.3	K/W
Diode thermal resistance, junction - case	R_{θ}(j-c)	0.6	K/W
Thermal resistance, junction - ambient	R_{θ}(j-a)	40	K/W

Electrical Characteristics of the IGBT（T_j= 25℃ unless otherwise specified）：

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Static						
Collector-Emitter breakdown voltage	BV_{CES}	V_{GE}=0V , I_C=250μA	1200	1300	-	V
Gate threshold voltage	$V_{GE(th)}$	V_{GE}=V_{CE}, I_C=250μA	5.1	5.8	6.4	V
Collector-Emitter Saturation voltage	$V_{CE(sat)}$	V_{GE}=15V, I_C=40A T_j = 25°C T_j = 150°C	 - -	 1.7 2.1	 2.1 -	V
Zero gate voltage collector current	I_{CES}	V_{CE} = 1200V, V_{GE} = 0V T_j = 25°C T_j = 150°C	 - -	 - -	 10 2500	μA
Gate-emitter leakage current	I_{GES}	V_{CE} = 0V, V_{GE} = 20V	-	-	100	nA
Transconductance	g_{fs}	V_{CE}=20V, I_C=15A	-	15	-	S

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Dynamic						
Input capacitance	C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz	-	4400	-	pF
Output capacitance	C_{oes}		-	180	-	
Reverse transfer capacitance	C_{res}		-	100	-	
Gate charge	Q_G	V_{CC} = 960V, I_C = 40A, V_{GE} = 15V	-	270	-	nC
Short circuit collector current	$I_{C(SC)}$	V_{GE}=15V,t_{SC}≤10us V_{CC}=600V, $T_{j,\ start}$=25°C	-	240	-	A

Switching Characteristic, Inductive Load

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Dynamic , at T_j = 25° C						
Turn-on delay time	$td_{(on)}$	V_{CC} = 600V, I_C = 40A, V_{GE} = 0/15V, R_g=12Ω	-	55	-	ns
Rise time	t_r		-	20	-	ns
Turn-on energy	E_{on}		-	2.4	-	mJ
Turn-off delay time	$td_{(off)}$		-	230	-	ns
Fall time	t_f		-	160	-	ns
Turn-off energy	E_{off}		-	1.5	-	mJ

Electrical Characteristics of the DIODE（T_j= 25℃ unless otherwise specified）

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Dynamic						
Diode Forward Voltage	V_{FM}	I_F = 40A	-	3.5	-	V
Reverse Recovery Time	T_{rr}	I_F= 40A, V_R = 600V, di/dt= 400A/μs,	-	190	-	ns
Reverse Recovery Current	I_{rr}		-	6	-	A
Reverse Recovery Charge	Q_{rr}		-	530	-	nC

Fig. 1 FBSOA characteristics

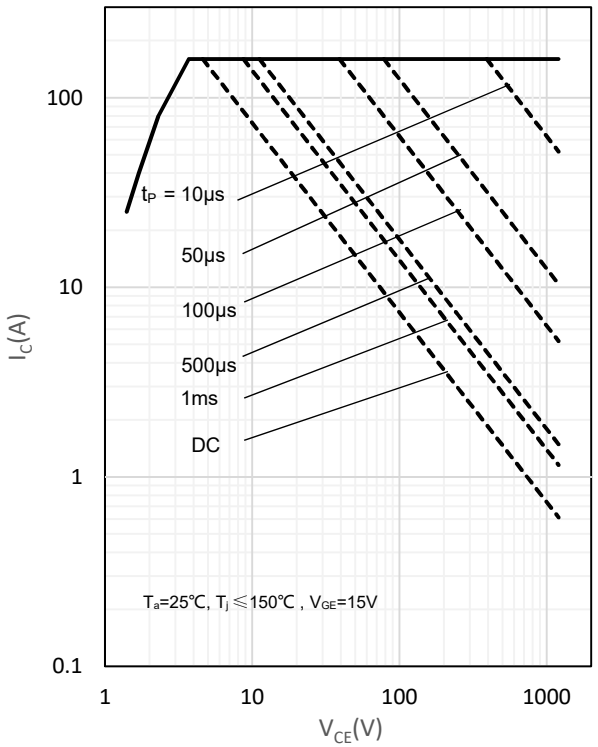


Fig. 2 Load Current vs. Frequency

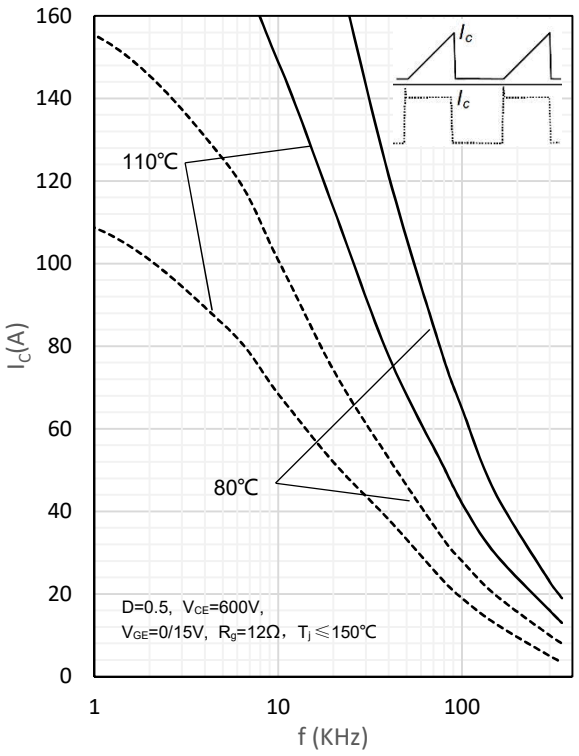


Fig. 3 Power dissipation as a function of T_C

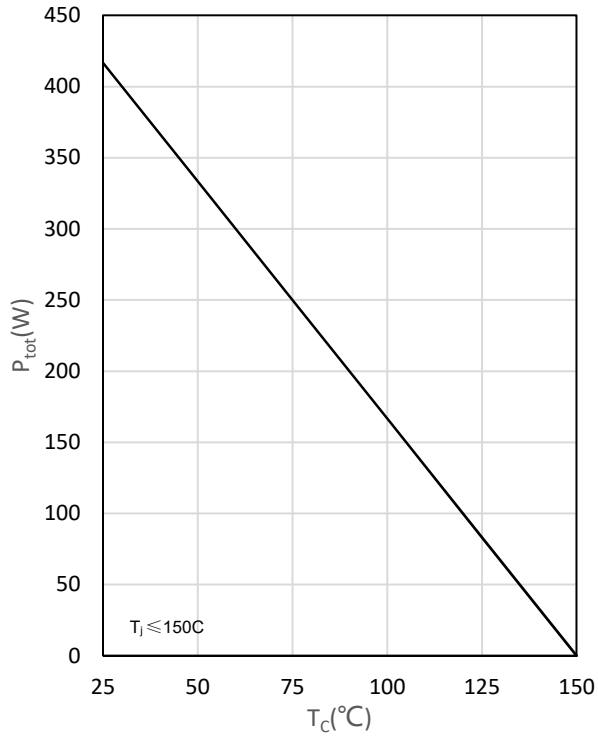


Fig. 4 Short circuit time and current vs.V_{GE}

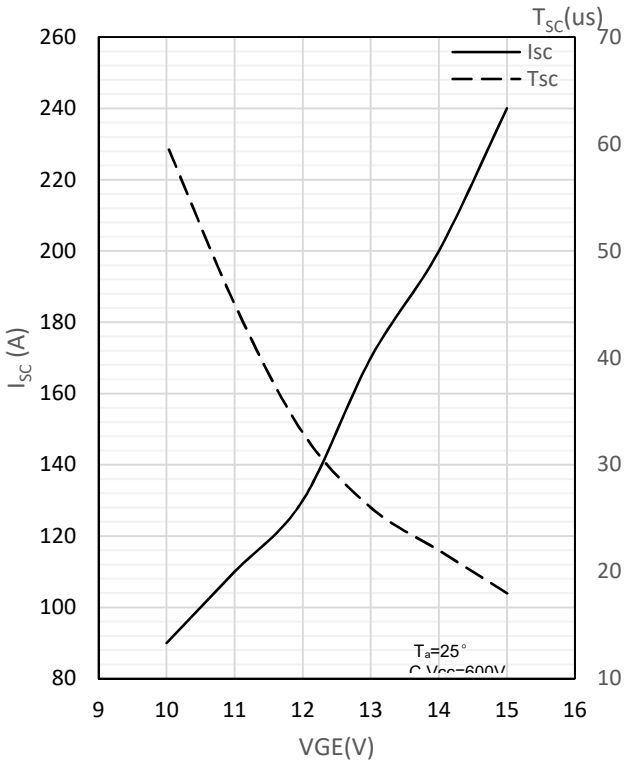


Fig. 5 Output characteristics

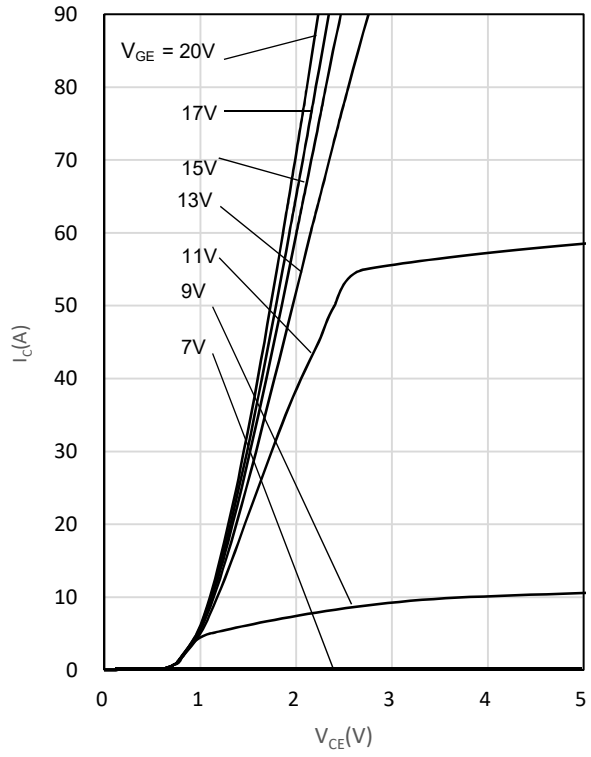


Fig. 6 Saturation voltage characteristics

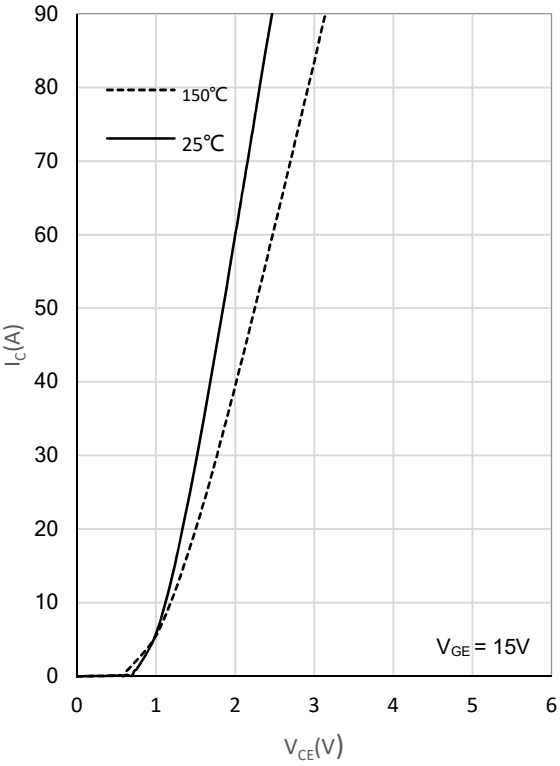


Fig. 7 Switching times vs. gate resistor

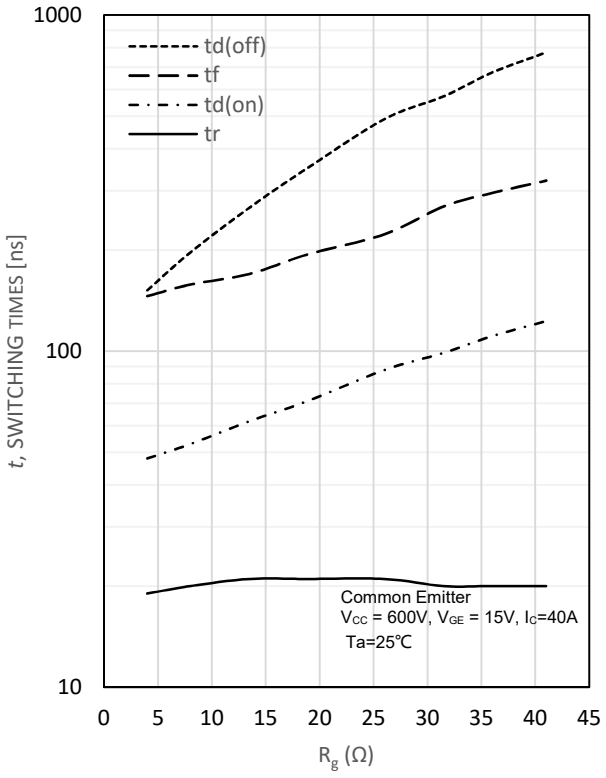


Fig. 8 Switching times vs. collector current

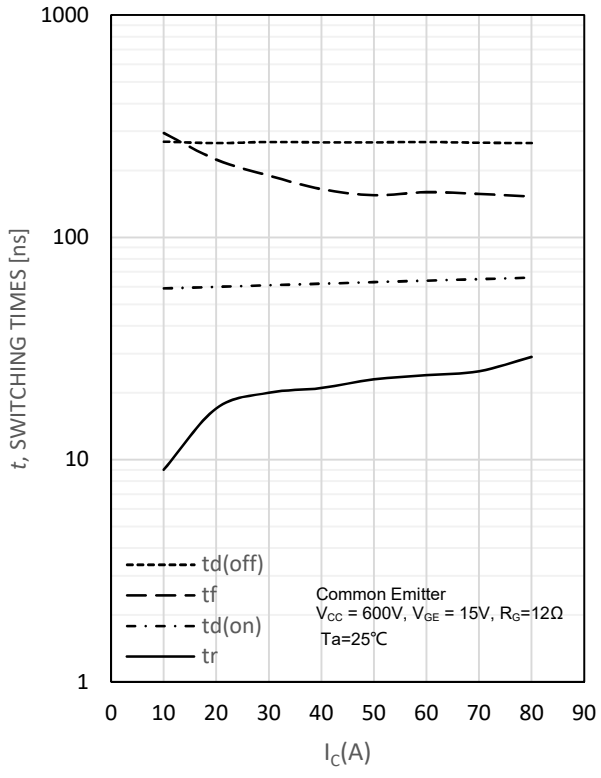


Fig. 9 Switching loss vs. gate resistor

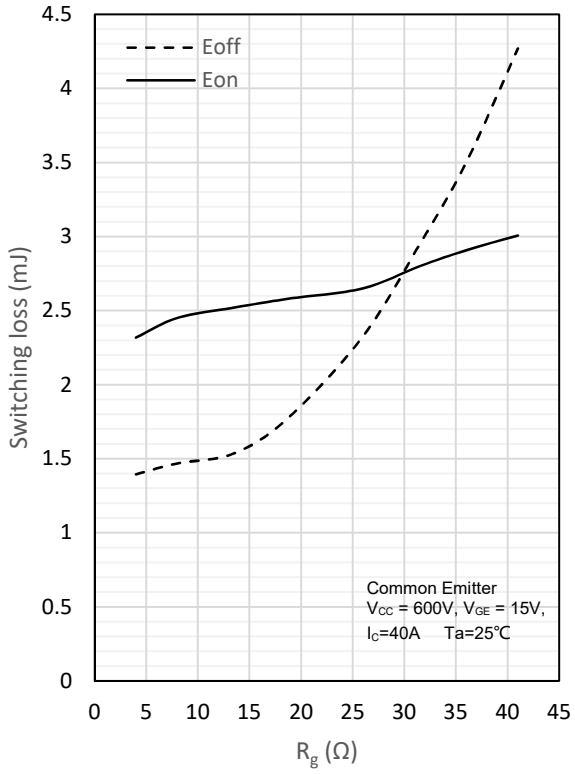


Fig. 10 Switching loss vs. collector current

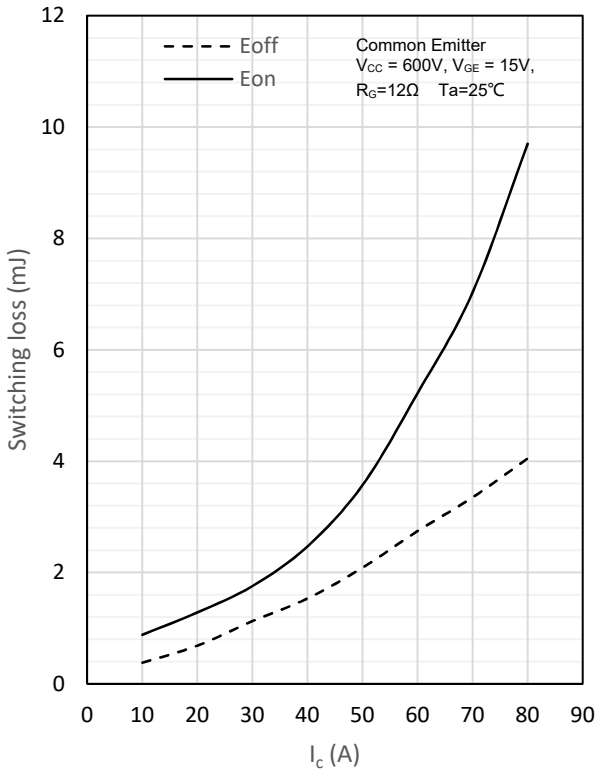


Fig. 11 Gate charge characteristics

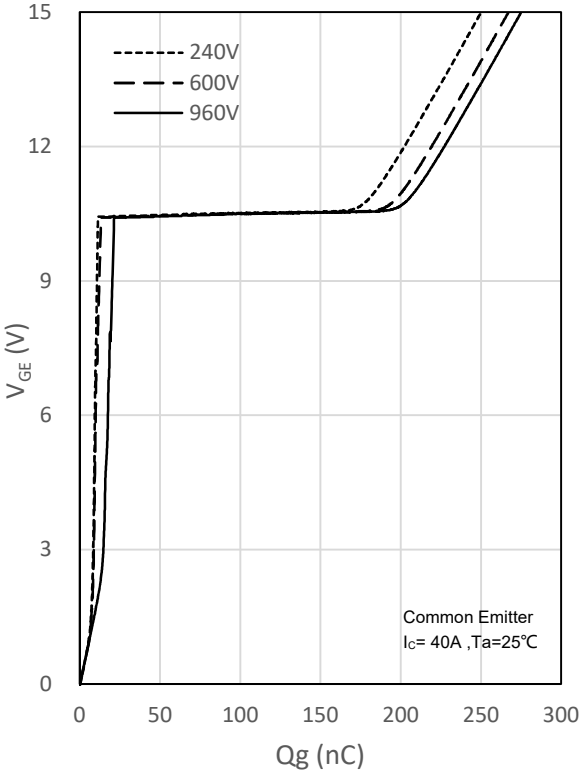
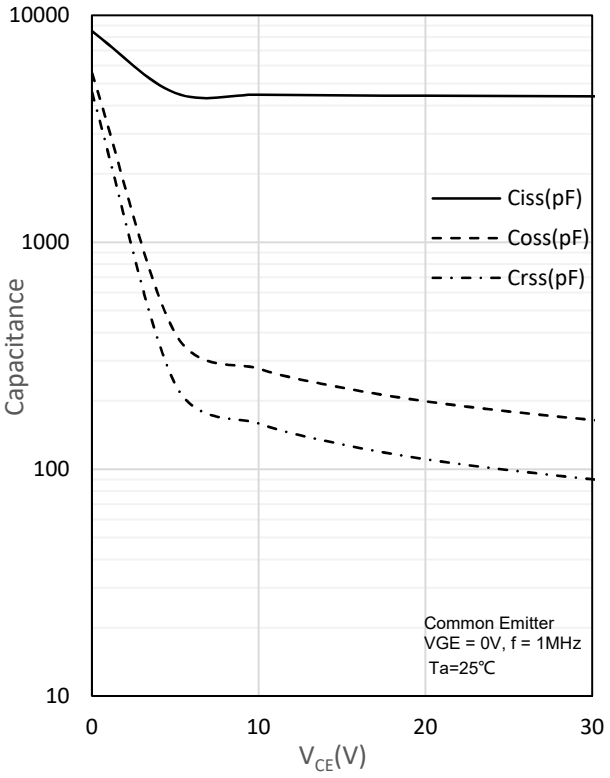


Fig. 12 Capacitance characteristics



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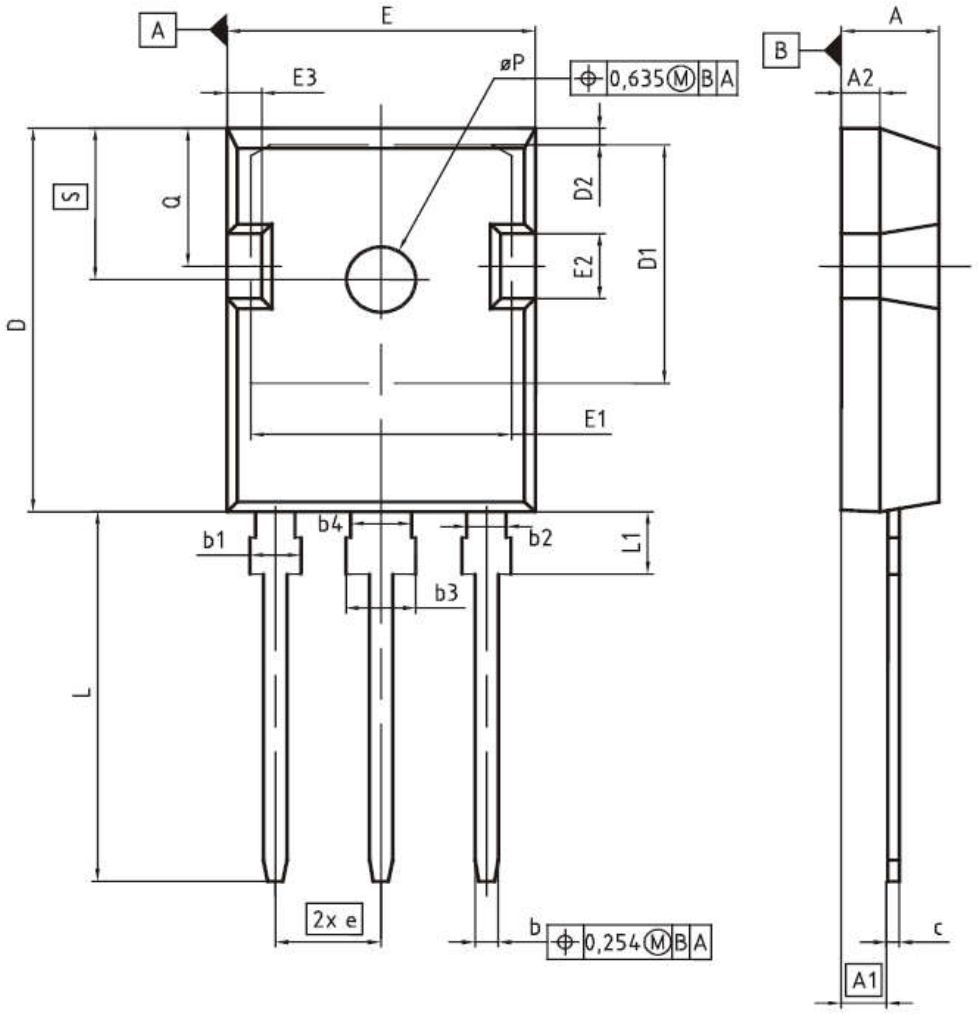

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.83	5.21	0.190	0.205
A1	2.27	2.54	0.089	0.100
A2	1.85	2.16	0.073	0.085
b	1.07	1.33	0.042	0.052
b1	1.90	2.41	0.075	0.095
b2	1.90	2.16	0.075	0.085
b3	2.87	3.38	0.113	0.133
b4	2.87	3.13	0.113	0.123
c	0.55	0.68	0.022	0.027
D	20.80	21.10	0.819	0.831
D1	16.25	17.65	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

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