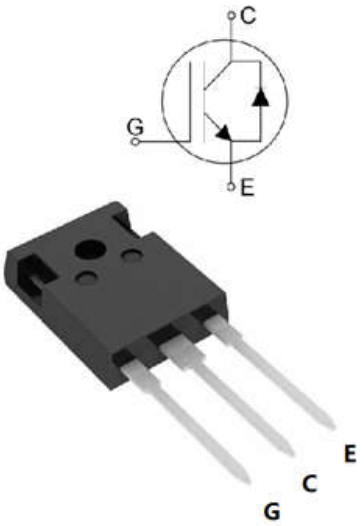
HMG50N65T

650V /50A Trench Field Stop IGBT

H&M Semi 650V Trench Field Stop IGBTs offer low switching losses, high energy efficiency and high avalanche ruggedness for motion control, solar application and welding machine.

V_{CE}	**650**	**V**
I_C	**50**	**A**
$V_{CE(SAT)}$ I_C=50A	**1.8**	**V**



FEATURES

- High breakdown voltage up to 650V for improved reliability
- Trench-Stop Technology offering :
  - High speed switching
  - High ruggedness, temperature stable
  - Short circuit withstand time – 5μs
  - Low V_{CEsat}
  - Easy parallel switching capability due to positive temperature coefficient in V_{CEsat}
- Enhanced avalanche capability

APPLICATION

- Uninterruptible Power Supplies
- Inverter
- Welding Converters
- PFC applications
- Converter with high switching frequency

Product	Package	Packaging
HMG50N65T	TO247	Tube

Maximum Ratings （T_j= 25℃ unless otherwise specified）

Parameter	Symbol	Value	Unit
Collector-Emitter Breakdown Voltage	V_{CE}	650	V
DC collector current, limited by T_{jmax} T_C = 25°C T_C = 100°C	I_C	 100 50	A
Diode Forward current, limited by T_{jmax} T_C = 25°C T_C = 100°C	I_F	 100 50	A
Continuous Gate-emitter voltage	V_{GE}	±20	V
Transient Gate-emitter voltage	V_{GE}	±30	V
Turn off safe operating area V_{CE} ≤650V, T_j ≤ 150°C, t_p = 1μs	-	150	A
Pulse collector current, V_{GE} =15V, t_p limited by T_{jmax}	I_{CM}	150	A
Short Circuit Withstand Time, V_{GE}= 15V, V_{CE}≤ 400V	T_{sc}	5	μs
Power dissipation , T_j=25°C	P_{tot}	260	W
Operating junction temperature	T_j	-40...+150	°C
Storage temperature	Ts	-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)	0.48	K/W
Diode thermal resistance, junction - case	R_{θ}(j-c)	0.8	K/W
Thermal resistance, junction - ambient	R_{θ}(j-a)	40	K/W

Electrical Characteristics （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=250uA	650		-	V
		V_{GE}=0V , I_C=1mA	650			V
Gate Threshold Voltage	$V_{GE(th)}$	V_{GE}=V_{CE}, I_C=250uA	4.0	5.0	6.0	V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	V_{GE}=15V, I_C=50A T_j = 25°C T_j = 150°C	- -	1.8 2.1	2.3	V V
Zero gate voltage collector current	I_{CES}	V_{CE} = 650V, V_{GE} = 0V T_j = 25°C T_j = 150°C		0.1	40 1000	μA
Gate-emitter leakage current	I_{GES}	V_{CE} = 0V, V_{GE} = ±20V			100	nA
Transconductance	*gfs*	V_{CE} = 20V, I_C = 50A	-	30	-	S

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Dynamic						
Input capacitance	C_{ies}	V_{CE} = 30V, V_{GE} = 0V, f = 1MHz		2800		pF
Output capacitance	C_{oes}			130		
Reverse transfer capacitance	C_{res}			75		
Gate charge	Q_G	V_{CC} = 520V, I_C = 50A, V_{GE} = 15V	-	180	-	nC
Short circuit collector current	$I_{C（SC）}$	V_{GE}=15V,t_{SC}≤5us V_{CC}=400V, $T_{j,\ start}$=25°C	-	310	-	A

Switching Characteristic, Inductive Load

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Dynamic T_j=25°C						
Turn-on Delay Time	$t_{d(on)}$	V_{CC} = 400V, I_C = 50.0A, V_{GE} = 0.0/15.0V, Rg=12Ω	-	40	-	ns
Rise Time	t_r		-	22	-	ns
Turn-off Delay Time	$t_{d(off)}$		-	180	-	ns
Fall Time	t_f		-	88	-	ns
Turn-on Energy	E_{on}		-	1.9	-	mJ
Turn-off Energy	E_{off}		-	1.1	-	mJ
Dynamic T_j=150°C						
Turn-on Delay Time	$t_{d(on)}$	V_{CC} = 400V, I_C = 50.0A, V_{GE} = 0.0/15.0V, Rg=12Ω	-	40	-	ns
Rise Time	t_r		-	25	-	ns
Turn-off Delay Time	$t_{d(off)}$		-	195	-	ns
Fall Time	t_f		-	100	-	ns
Turn-on Energy	E_{on}		-	2.2	-	mJ
Turn-off Energy	E_{off}		-	1.25	-	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 = 50A	-	2.3	-	V
Reverse Recovery Time	T_{rr}	I_F= 50A, V_R = 400V, di/dt= 100A/μs,	-	20	-	ns
Reverse Recovery Current	I_{rr}		-	10	-	A
Reverse Recovery Charge	Q_{rr}		-	100	-	nC

Fig. 1 FBSOA characteristics

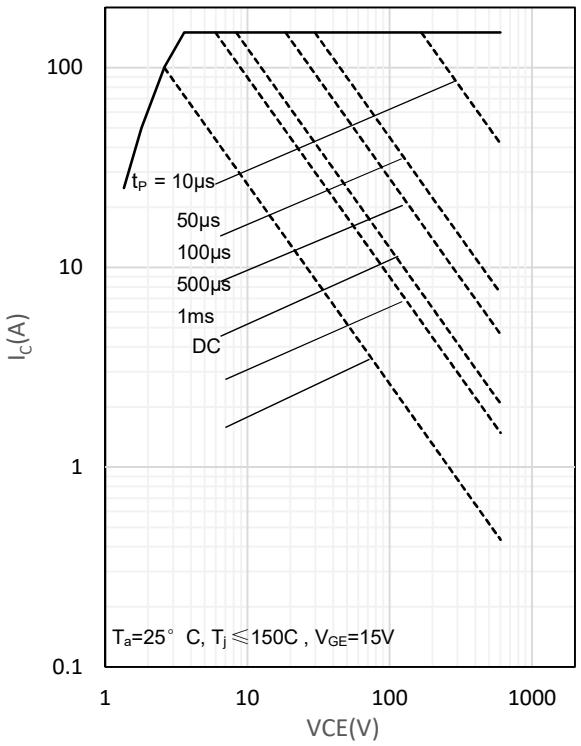


Fig. 2 Load Current vs. Frequency

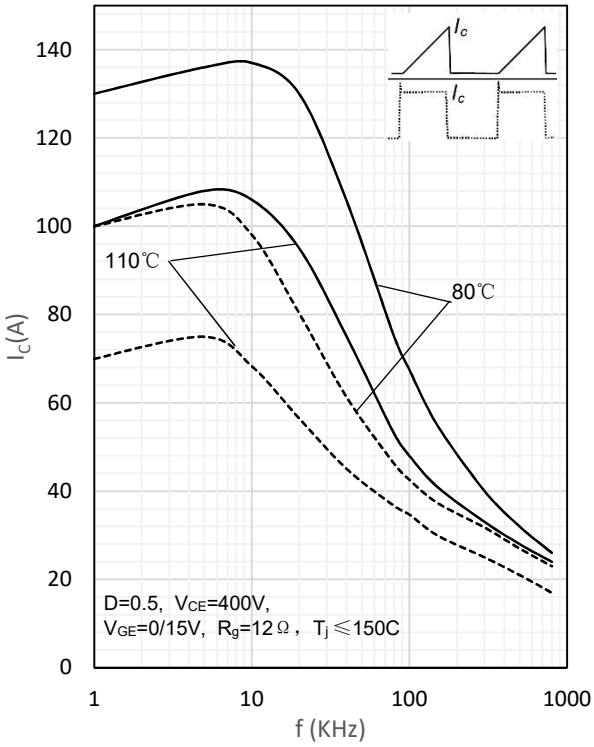


Fig. 3 Power dissipation as a function of T_C

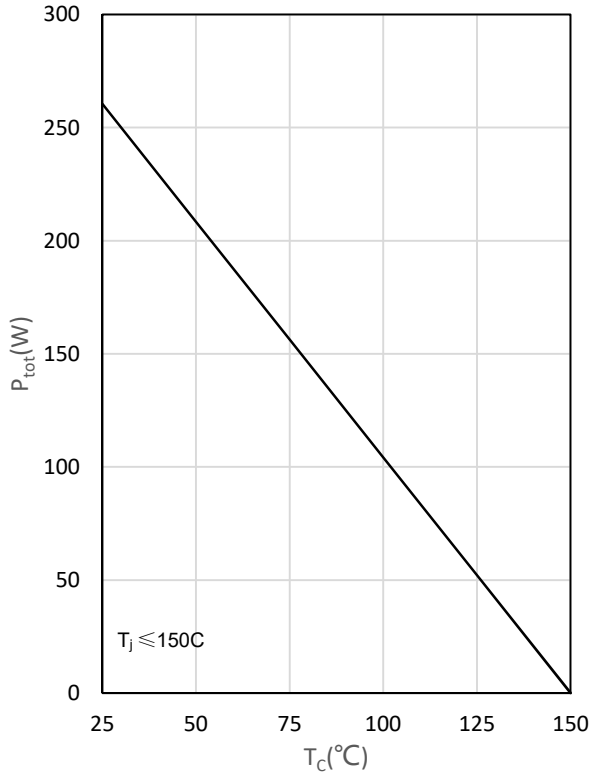


Fig. 4 collector current as a function of T_C

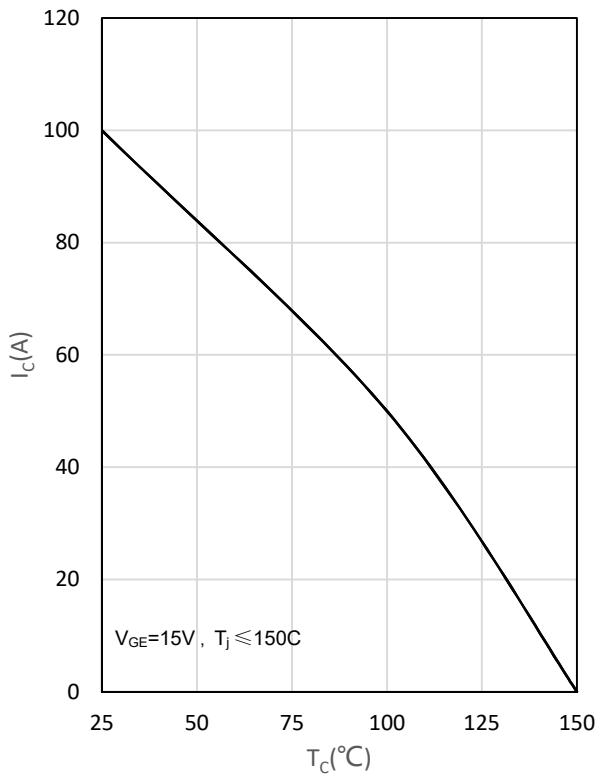


Fig. 5 Output characteristics

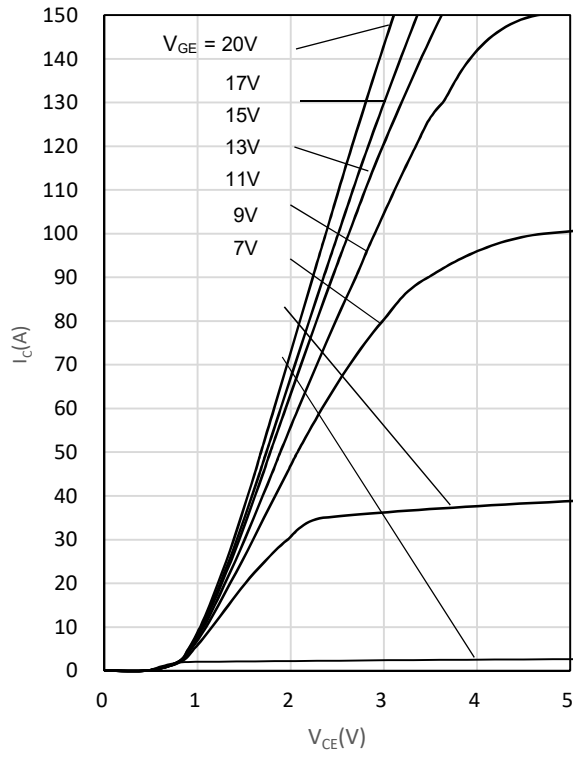


Fig. 6 Saturation voltage characteristics

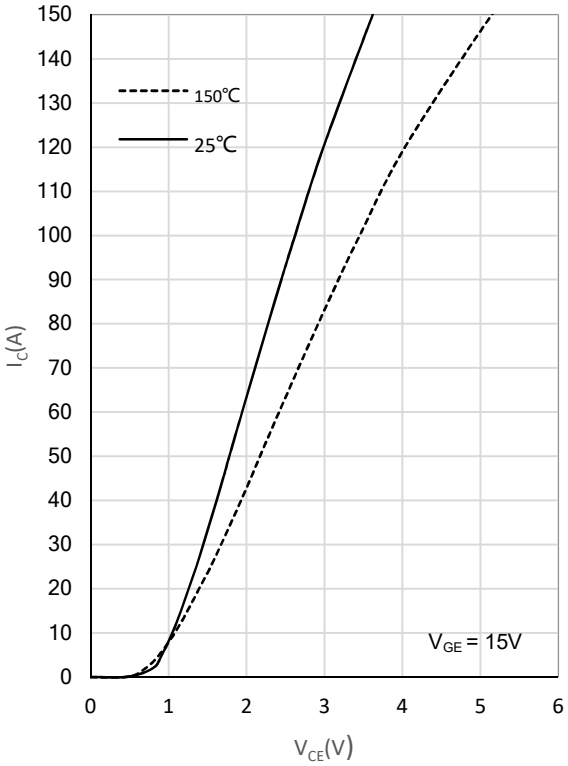


Fig. 7 Switching times vs. gate resistor

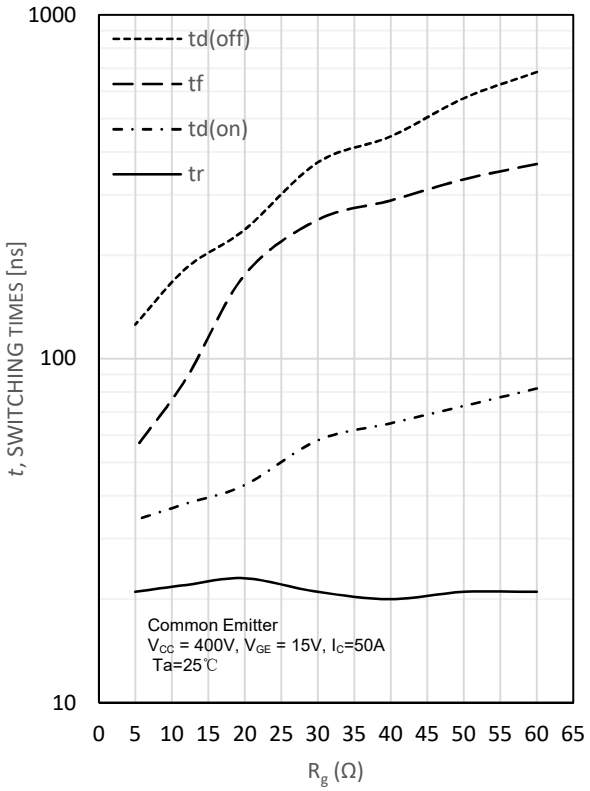


Fig. 8 Switching times vs. collector current

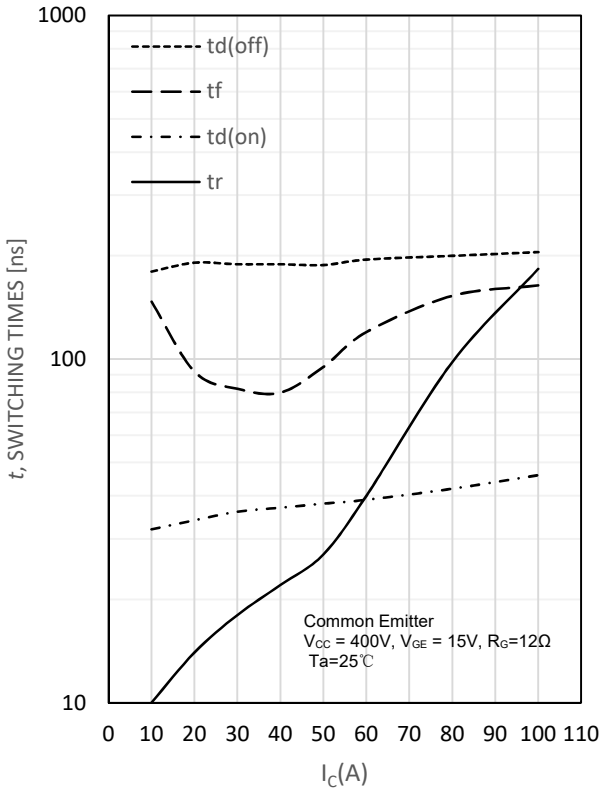


Fig. 9 Switching loss vs. gate resistor

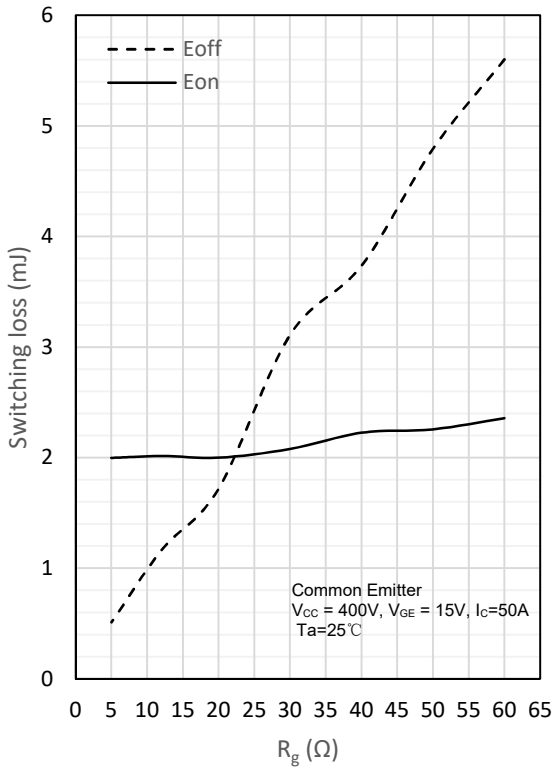


Fig. 10 Switching loss vs. collector current

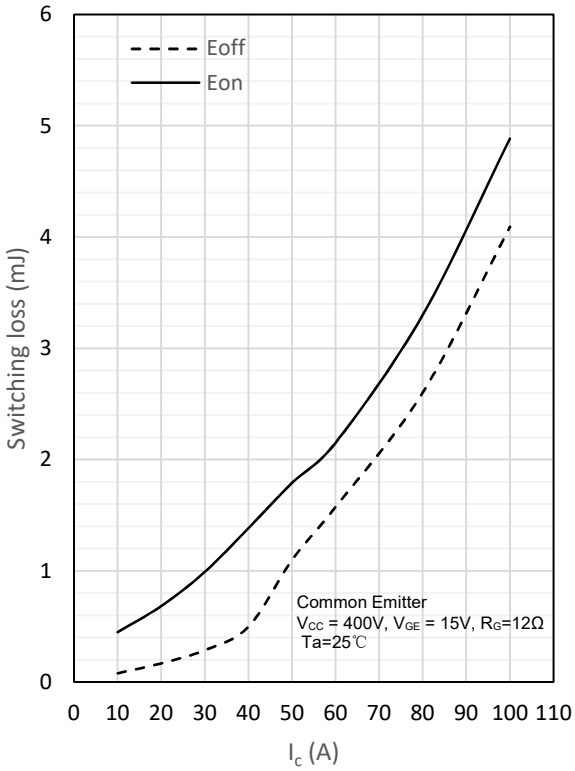


Fig. 11 Gate charge characteristics

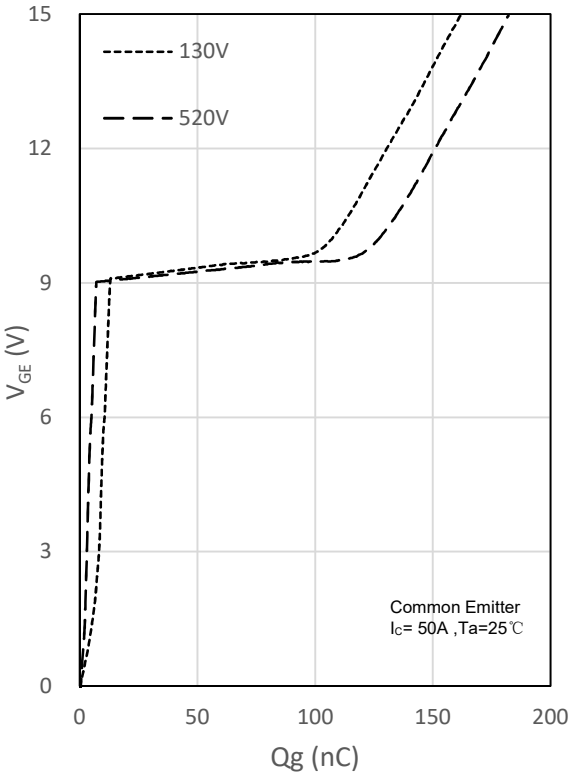
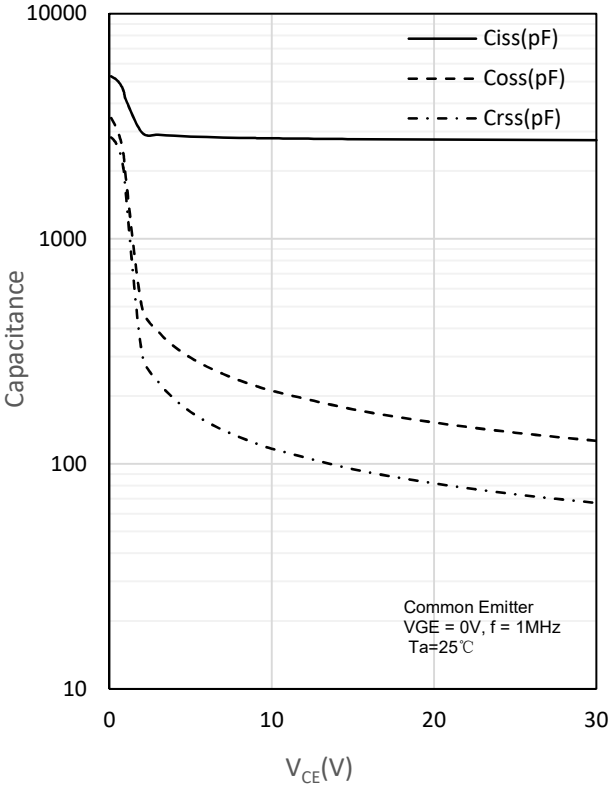


Fig. 12 Capacitance characteristics



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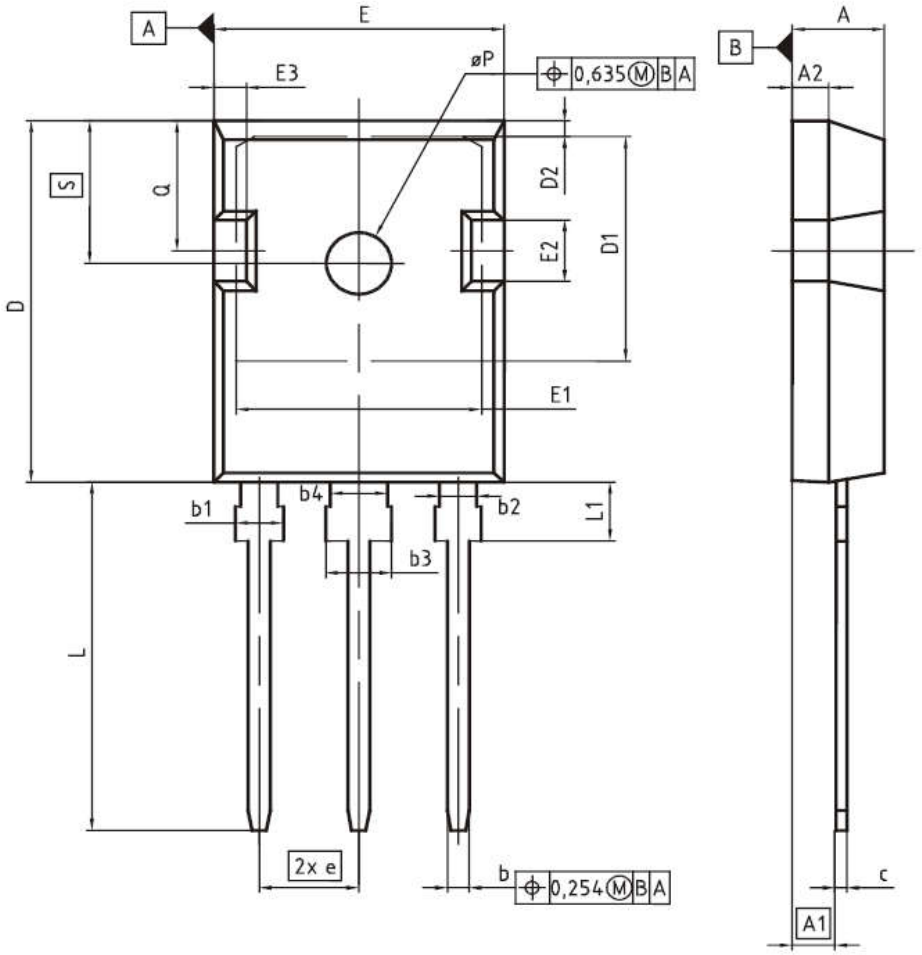

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.83	5.21	0.190	0.205
A1	2.27	2.54	0.089	0.100
A2	1.85	2.16	0.073	0.085
b	1.07	1.33	0.042	0.052
b1	1.90	2.41	0.075	0.095
b2	1.90	2.16	0.075	0.085
b3	2.87	3.38	0.113	0.133
b4	2.87	3.13	0.113	0.123
c	0.55	0.68	0.022	0.027
D	20.80	21.10	0.819	0.831
D1	16.25	17.65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