

### Silicon Carbide Schottky Diode

- Worlds first 600V Schottky diode
- Revolutionary semiconductor material - Silicon Carbide
- Switching behavior benchmark
- No reverse recovery
- No temperature influence on the switching behavior
- Ideal diode for Power Factor Correction up to 800W<sup>1)</sup>
- No forward recovery
- Pb-free lead plating; RoHS compliant
- Qualified according to JEDEC<sup>0)</sup> for target applications

### thinQ!<sup>TM</sup> SiC Schottky Diode

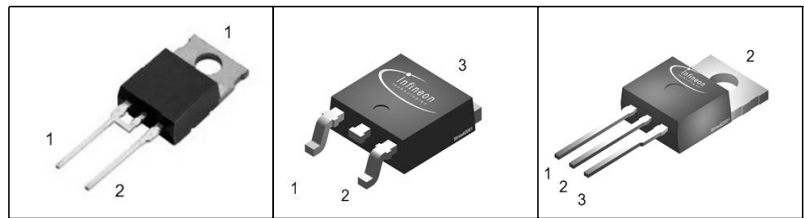
#### Product Summary

$V_{RRM}$	600	V
$Q_C$	13	nC
$I_F$	4	A

PG-TO220-2-2.

P-TO252

P-TO220



Type	Package	Ordering Code	Marking	Pin 1	Pin 2	Pin 3
SDP04S60	P-TO220-3	Q67040-S4369	D04S60	n.c.	C	A
SDD04S60	P-TO252-3	Q67040-S4368	D04S60	n.c.	A	C
SDT04S60	PG-TO220-2-2.	Q67040-S4445	D04S60	C	A	

#### Maximum Ratings, at $T_j = 25^\circ\text{C}$ , unless otherwise specified

Parameter	Symbol	Value	Unit
Continuous forward current, $T_C=100^\circ\text{C}$	$I_F$	4	A
RMS forward current, $f=50\text{Hz}$	$I_{FRMS}$	5.6	
Surge non repetitive forward current, sine halfwave $T_C=25^\circ\text{C}$ , $t_p=10\text{ms}$	$I_{FSM}$	12.5	
Repetitive peak forward current $T_j=150^\circ\text{C}$ , $T_C=100^\circ\text{C}$ , $D=0.1$	$I_{FRM}$	18	
Non repetitive peak forward current $t_p=10\mu\text{s}$ , $T_C=25^\circ\text{C}$	$I_{FMAX}$	40	
$i^2t$ value, $T_C=25^\circ\text{C}$ , $t_p=10\text{ms}$	$\int i^2 dt$	0.78	A <sup>2</sup> s
Repetitive peak reverse voltage	$V_{RRM}$	600	V
Surge peak reverse voltage	$V_{RSM}$	600	
Power dissipation, $T_C=25^\circ\text{C}$	$P_{tot}$	36.5	W
Operating and storage temperature	$T_j, T_{stg}$	-55... +175	$^\circ\text{C}$

### Thermal Characteristics

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Characteristics</b>					
Thermal resistance, junction - case	$R_{thJC}$	-	-	4.1	K/W
Thermal resistance, junction - ambient, leaded	$R_{thJA}$	-	-	62	
SMD version, device on PCB:	$R_{thJA}$				
PG-TO252-3-1: @ min. footprint		-	-	75	
PG-TO252-3-1: @ 6 cm <sup>2</sup> cooling area <sup>2)</sup>		-	-	50	

### Electrical Characteristics, at $T_j = 25^\circ\text{C}$ , unless otherwise specified

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Static Characteristics</b>					
Diode forward voltage	$V_F$				V
$I_F=4\text{A}, T_j=25^\circ\text{C}$		-	1.7	1.9	
$I_F=4\text{A}, T_j=150^\circ\text{C}$		-	2	2.4	
Reverse current	$I_R$				$\mu\text{A}$
$V_R=600\text{V}, T_j=25^\circ\text{C}$		-	15	200	
$V_R=600\text{V}, T_j=150^\circ\text{C}$		-	40	1000	

<sup>0</sup>J-STD20 and JESD22

<sup>1</sup>CCM,  $V_{IN} = 85\text{VAC}$ ,  $T_j = 150^\circ\text{C}$ ,  $T_C = 100^\circ\text{C}$ ,  $\eta = 93\%$ ,  $\Delta I_{IN} = 30\%$

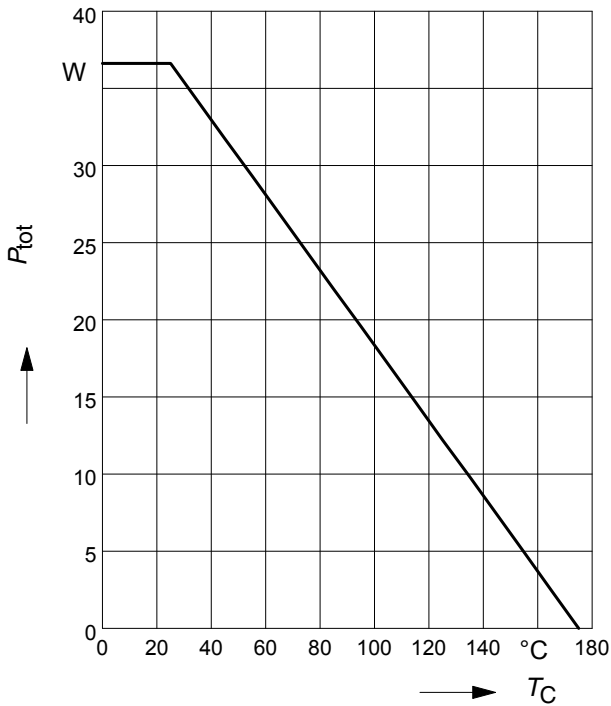
<sup>2</sup>Device on 40mm\*40mm\*1.5mm epoxy PCB FR4 with 6cm<sup>2</sup> (one layer, 70  $\mu\text{m}$  thick) copper area for drain connection. PCB is vertical without blown air.

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>AC Characteristics</b>					
Total capacitive charge $V_R=400\text{V}$ , $I_F=4\text{A}$ , $di_F/dt=200\text{A}/\mu\text{s}$ , $T_j=150\text{ }^\circ\text{C}$	$Q_C$	-	13	-	nC
Switching time $V_R=400\text{V}$ , $I_F=4\text{A}$ , $di_F/dt=200\text{A}/\mu\text{s}$ , $T_j=150\text{ }^\circ\text{C}$	$t_{rr}$	-	n.a.	-	ns
Total capacitance $V_R=0\text{V}$ , $T_C=25\text{ }^\circ\text{C}$ , $f=1\text{MHz}$ $V_R=300\text{V}$ , $T_C=25\text{ }^\circ\text{C}$ , $f=1\text{MHz}$ $V_R=600\text{V}$ , $T_C=25\text{ }^\circ\text{C}$ , $f=1\text{MHz}$	$C$	-	150 10 7	-	pF

### 1 Power dissipation

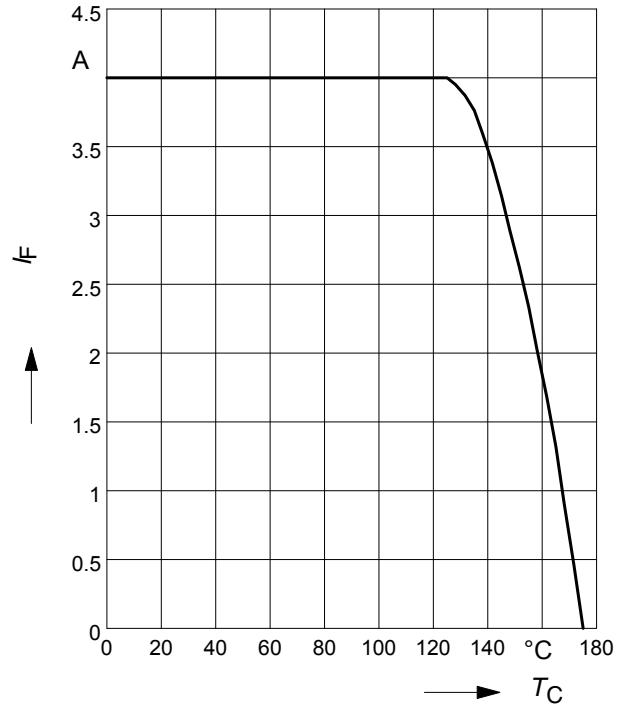
$$P_{\text{tot}} = f(T_C)$$



### 2 Diode forward current

$$I_F = f(T_C)$$

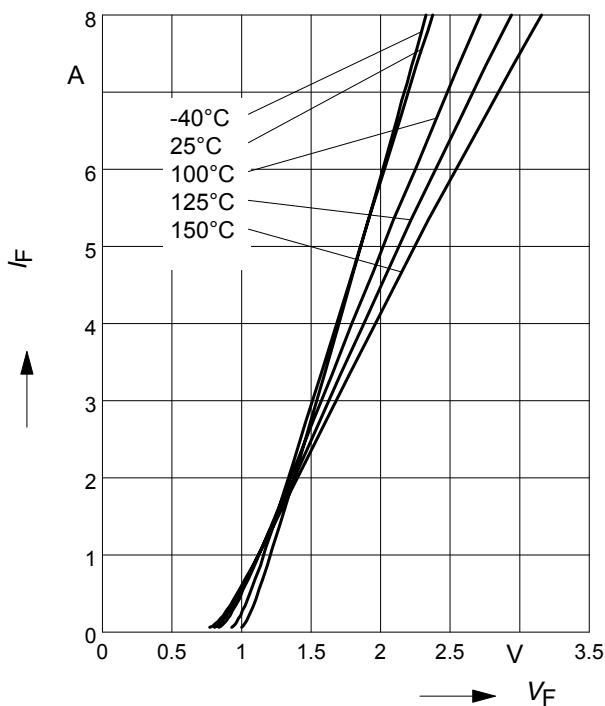
parameter:  $T_j \leq 175^\circ\text{C}$



### 3 Typ. forward characteristic

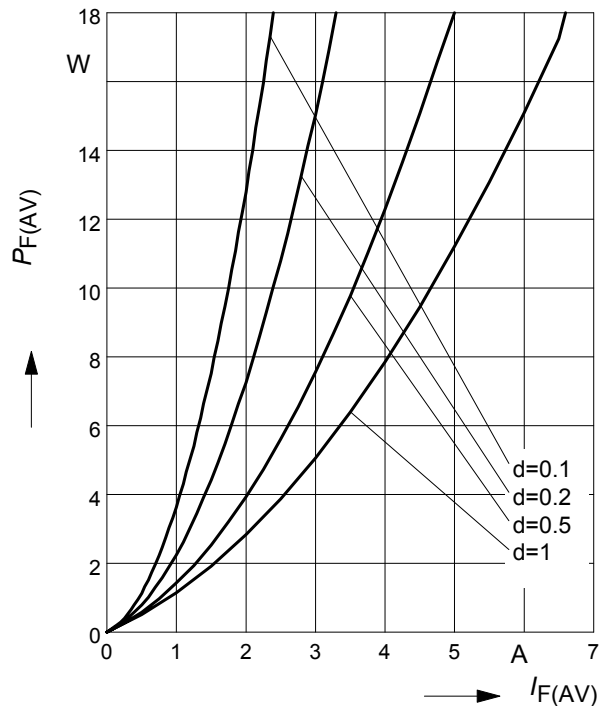
$$I_F = f(V_F)$$

parameter:  $T_j$ ,  $t_p = 350 \mu\text{s}$



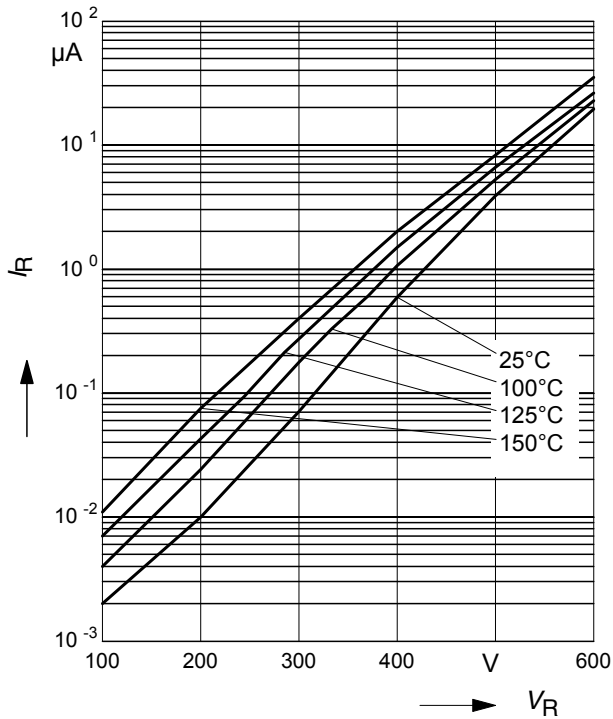
### 4 Typ. forward power dissipation vs. average forward current

$$P_{F(AV)} = f(I_F) \quad T_C = 100^\circ\text{C}, d = t_p/T$$



**5 Typ. reverse current vs. reverse voltage**

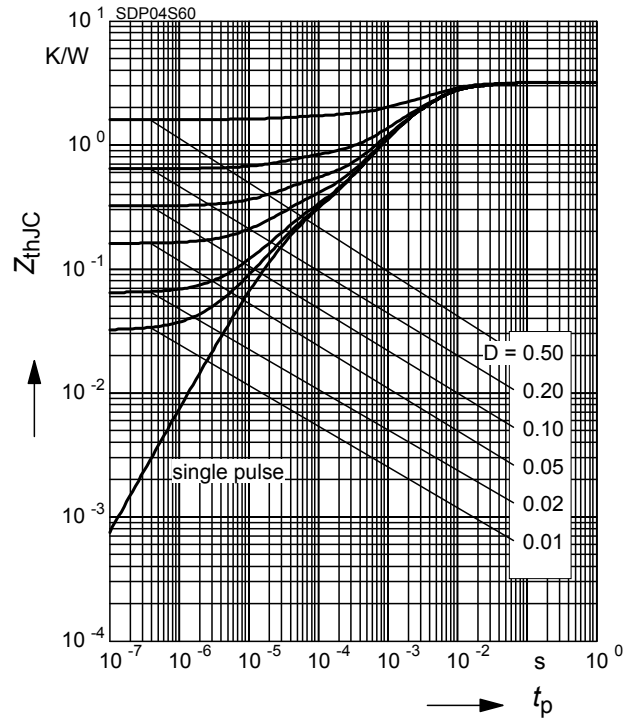
$$I_R = f(V_R)$$



**6 Transient thermal impedance**

$$Z_{thJC} = f(t_p)$$

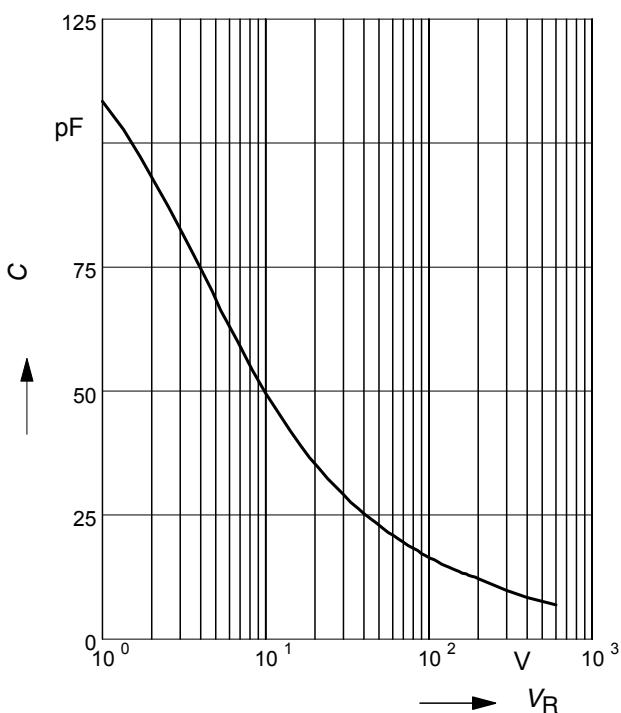
parameter :  $D = t_p/T$



**7 Typ. capacitance vs. reverse voltage**

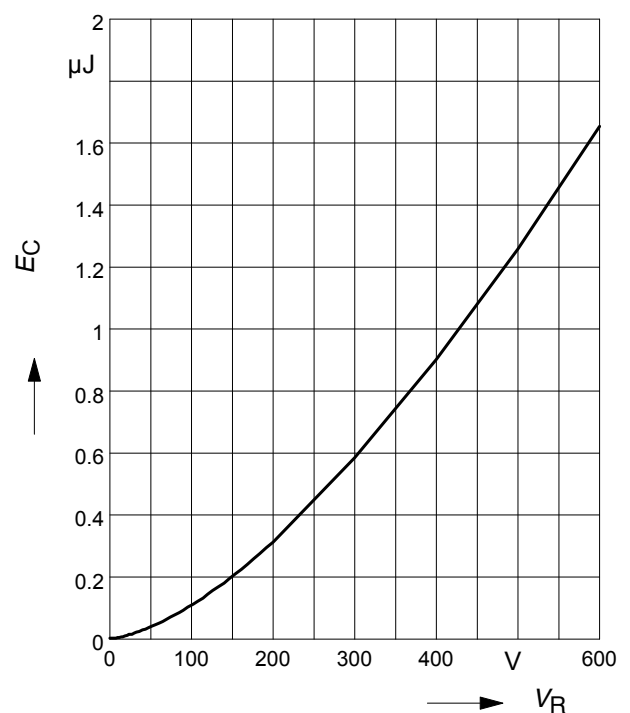
$$C = f(V_R)$$

parameter:  $T_C = 25\text{ }^\circ\text{C}$ ,  $f = 1\text{ MHz}$



**8 Typ. C stored energy**

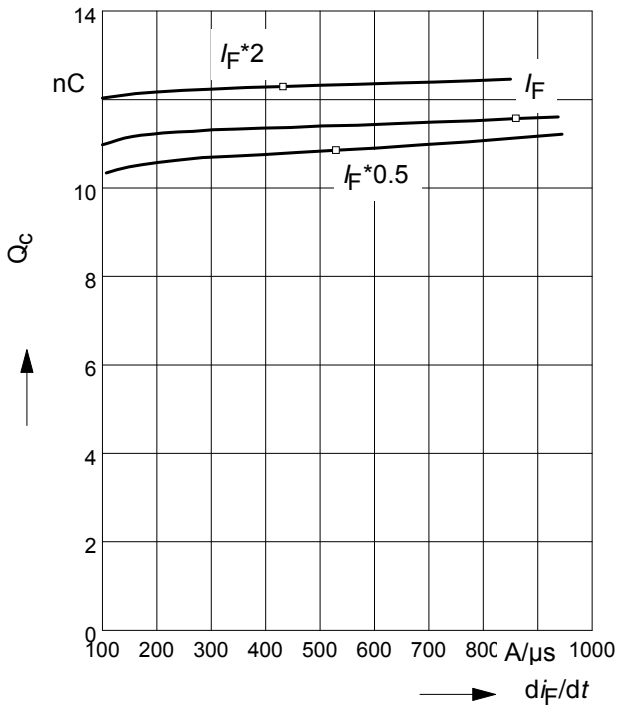
$$E_C = f(V_R)$$



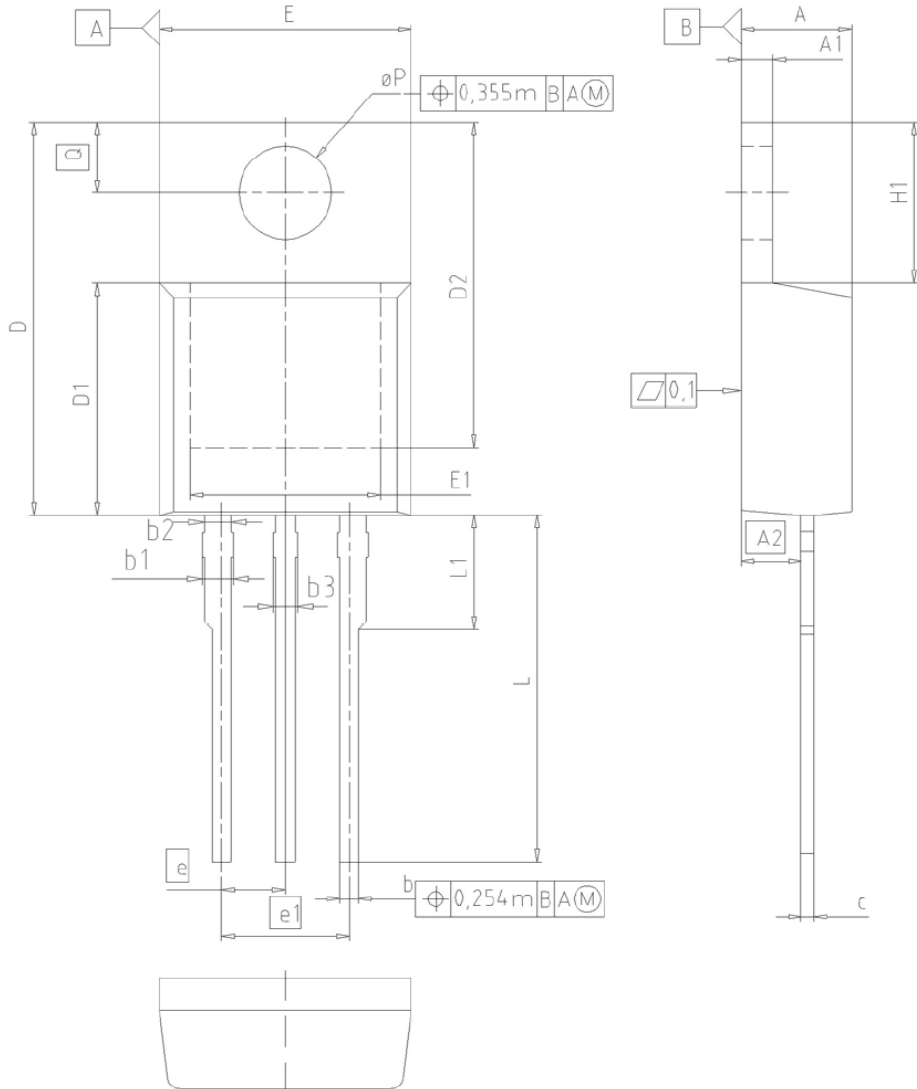
**9 Typ. capacitive charge vs. current slope**

$$Q_C = f(di_F/dt)$$

parameter:  $T_j = 150\text{ }^\circ\text{C}$



P-TO220-3-1, P-TO220-3-21



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.30	4.57	0.169	0.180
A1	1.17	1.40	0.046	0.055
A2	2.15	2.72	0.085	0.107
b	0.65	0.86	0.026	0.034
b1	0.95	1.40	0.037	0.055
b2	0.95	1.15	0.037	0.045
b3	0.65	1.15	0.026	0.045
c	0.33	0.60	0.013	0.024
D	14.81	15.95	0.583	0.628
D1	8.51	9.45	0.335	0.372
D2	12.19	13.10	0.480	0.516
E	9.70	10.36	0.382	0.408
E1	6.50	8.60	0.256	0.339
e	2.54		0.100	
e1	5.08		0.200	
N	3		3	
H1	5.90	6.90	0.232	0.272
L	13.00	14.00	0.512	0.551
L1	-	4.80	-	0.189
$\phi P$	3.60	3.89	0.142	0.153
Q	2.60	3.00	0.102	0.118

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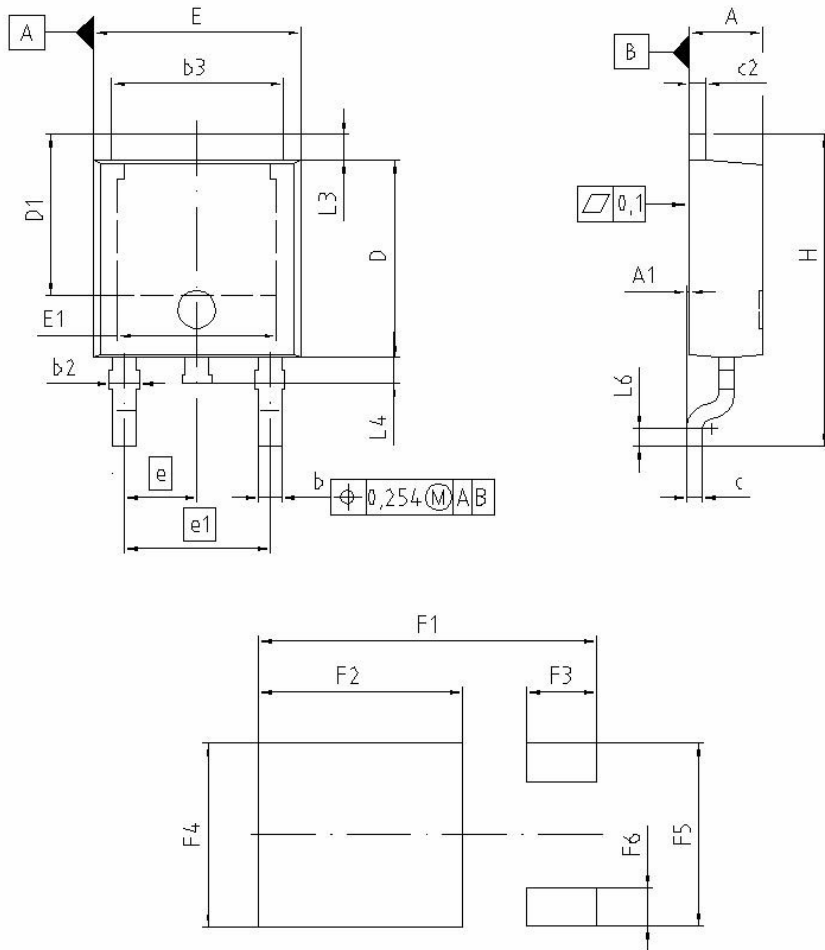
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P-TO252-3-1, P-TO252-3-11, P-TO252-3-21 (D-Pak)



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.159	2.413	0.085	0.095
A1	0.000	0.150	0.000	0.006
b	0.635	0.889	0.025	0.035
b2	0.650	1.150	0.026	0.045
b3	5.004	5.500	0.197	0.217
c	0.457	0.580	0.018	0.023
c2	0.460	0.980	0.018	0.039
D	5.969	6.223	0.235	0.245
D1	5.020	5.842	0.198	0.230
E	6.400	6.731	0.252	0.265
E1	4.850	5.207	0.191	0.205
e	2.286		0.090	
e1	4.572		0.180	
N	3		3	
H	9.400	10.480	0.370	0.413
L3	0.900	1.143	0.035	0.045
L4	0.584	0.950	0.023	0.037
L6	0.510	0.686	0.020	0.027
F1	10.500	10.700	0.413	0.421
F2	6.300	6.500	0.248	0.256
F3	2.100	2.300	0.083	0.091
F4	5.700	5.900	0.224	0.232
F5	5.660	5.860	0.222	0.231
F6	1.100	1.300	0.043	0.051

REFERENCE  
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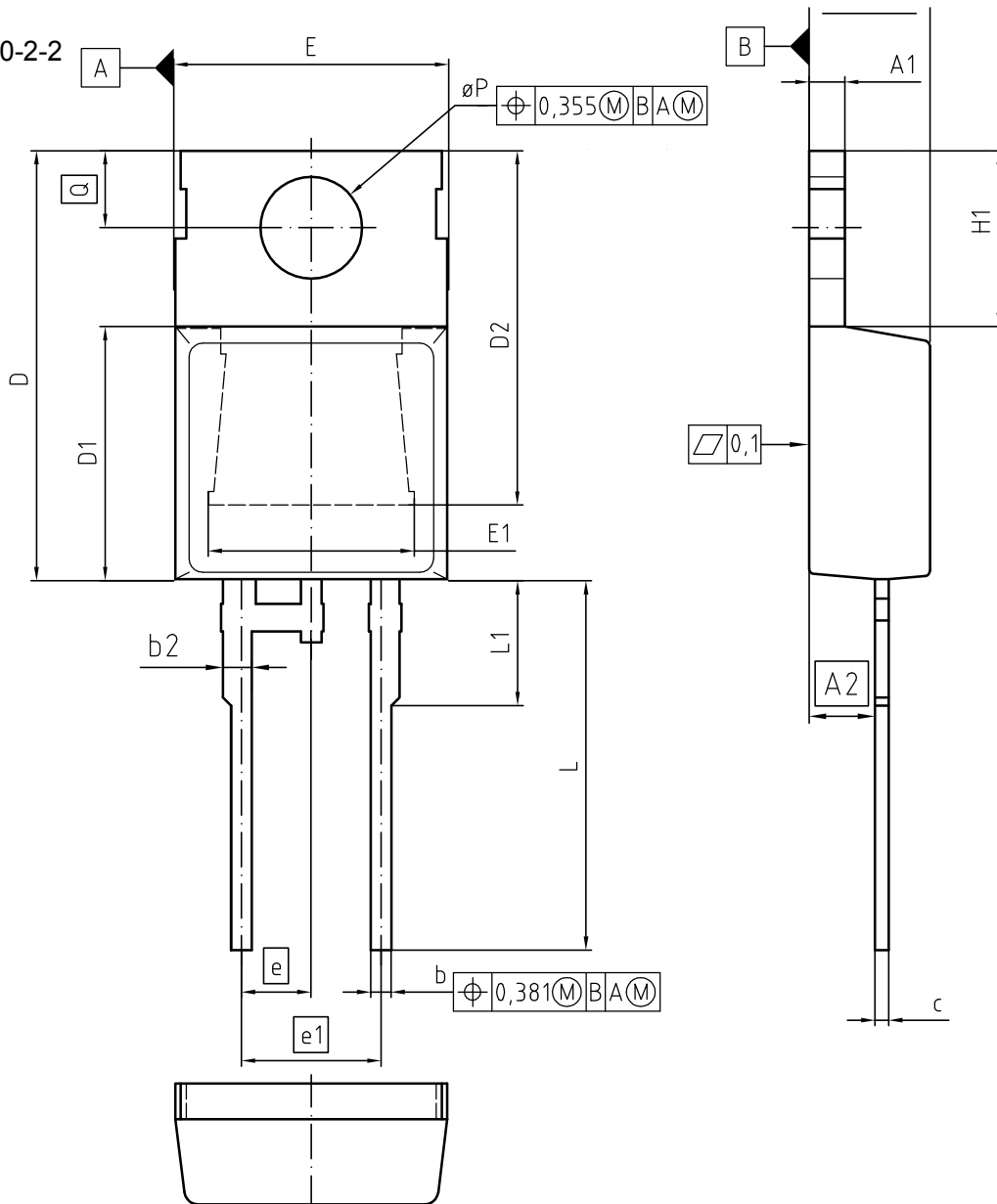
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FILE  
TO252\_1



PG-TO-220-2-2



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.191	4.699	0.165	0.185
A1	1.170	1.400	0.046	0.055
A2	2.215	2.718	0.087	0.107
b	0.635	0.889	0.025	0.035
b2	0.950	1.651	0.037	0.065
c	0.330	0.635	0.013	0.025
D	14.808	15.950	0.583	0.628
D1	8.509	9.450	0.335	0.372
D2	12.850	14.245	0.506	0.561
E	9.677	10.363	0.381	0.408
E1	6.500	8.788	0.256	0.346
e	2.540		0.100	
e1	5.080		0.200	
N	2		2	
H1	5.900	6.900	0.232	0.272
L	12.700	14.000	0.500	0.551
L1	3.048	4.800	0.120	0.189
$\phi P$	3.550	3.886	0.140	0.153
Q	2.540	3.048	0.100	0.120

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02

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