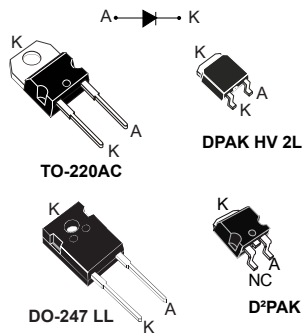


## 1200 V power Schottky silicon carbide diode



### Features

- No or negligible reverse recovery
- Switching behavior independent of temperature
- Robust high voltage periphery
- Operating from -40 °C to 175 °C
- Low  $V_F$
- ECOPACK<sup>®</sup>2 compliant

### Description

The SiC diode, available in TO-220AC, DPAK HV, D<sup>2</sup>PAK and DO-247 LL, is an ultrahigh performance power Schottky rectifier. It is manufactured using a silicon carbide substrate. The wide band-gap material allows the design of a low  $V_F$  Schottky diode structure with a 1200 V rating. Due to the Schottky construction, no recovery is shown at turn-off and ringing patterns are negligible. The minimal capacitive turn-off behavior is independent of temperature. Especially suited for use in PFC and secondary side applications, this ST SiC diode will boost the performance in hard switching conditions. This rectifier will enhance the performance of the targeted application. Its high forward surge capability ensures a good robustness during transient phases.

#### Product status

STPSC10H12

**Table 1. Device summary**

Symbol	Value
$I_{F(AV)}$	10 A
$V_{RRM}$	1200 V
$T_j$ (max)	175 °C
$V_F$ (typ)	1.35 V

# 1 Characteristics

**Table 2. Absolute ratings (limiting values at 25 °C, unless otherwise specified)**

Symbol	Parameter		Value	Unit	
$V_{RRM}$	Repetitive peak reverse voltage ( $T_j = -40\text{ °C}$ to $+175\text{ °C}$ )		1200	V	
$I_{F(RMS)}$	Forward rms current		25	A	
$I_{F(AV)}$	Average forward current	TO-220AC, DPAK HV 2L, D <sup>2</sup> PAK, $T_C = 155\text{ °C}^{(1)}$ , DC current	10	A	
		DO-247 LL, $T_C = 150\text{ °C}^{(1)}$ , DC current			
$I_{FRM}$	Repetitive peak forward current	TO-220AC, DPAK HV 2L, D <sup>2</sup> PAK, $T_C = 155\text{ °C}$ , $T_j = 175\text{ °C}$ , $\delta = 0.1$	38	A	
		DO-247 LL, $T_C = 150\text{ °C}$ , $T_j = 175\text{ °C}$ , $\delta = 0.1$	42		
$I_{FSM}$	Surge non repetitive forward current	$t_p = 10\text{ ms}$ sinusoidal	$T_C = 25\text{ °C}$	71	A
			$T_C = 150\text{ °C}$	60	
		$t_p = 10\text{ }\mu\text{s}$ square	$T_C = 25\text{ °C}$	420	
$T_{stg}$	Storage temperature range		-65 to +175	°C	
$T_j$	Operating junction temperature range		-40 to +175	°C	

1. Value based on  $R_{th(j-c)}$  max.

**Table 3. Thermal parameters**

Symbol	Parameter		Typ.	Max.	Unit
$R_{th(j-c)}$	Junction to case	TO-220AC, DPAK HV 2L, D <sup>2</sup> PAK	0.65	0.9	°C/W
		DO-247 LL	0.70	0.95	

**Table 4. Static electrical characteristics**

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
$I_R^{(1)}$	Reverse leakage current	$T_j = 25\text{ °C}$	$V_R = V_{RRM}$	-	5	60	$\mu\text{A}$
		$T_j = 150\text{ °C}$		-	30	400	
$V_F^{(2)}$	Forward voltage drop	$T_j = 25\text{ °C}$	$I_F = 10\text{ A}$	-	1.35	1.50	V
		$T_j = 150\text{ °C}$		-	1.75	2.25	

1. Pulse test:  $t_p = 10\text{ ms}$ ,  $\delta < 2\%$

2. Pulse test:  $t_p = 500\text{ }\mu\text{s}$ ,  $\delta < 2\%$

To evaluate the conduction losses use the following equation:

$$P = 1.03 \times I_{F(AV)} + 0.122 I_F^2 (RMS)$$

**Table 5. Dynamic electrical characteristics**

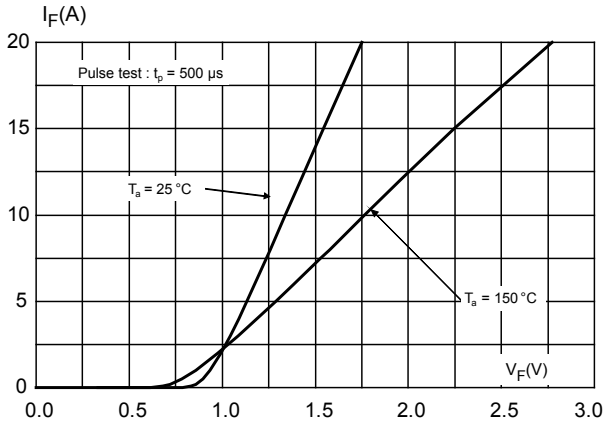
Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$Q_{Cj}^{(1)}$	Total capacitive charge	$V_R = 800 \text{ V}$	-	57	-	nC
$C_j$	Total capacitance	$V_R = 0 \text{ V}, T_c = 25 \text{ }^\circ\text{C}, F = 1 \text{ MHz}$	-	725	-	pF
		$V_R = 800 \text{ V}, T_c = 25 \text{ }^\circ\text{C}, F = 1 \text{ MHz}$	-	47	-	

1. Most accurate value for the capacitive charge:

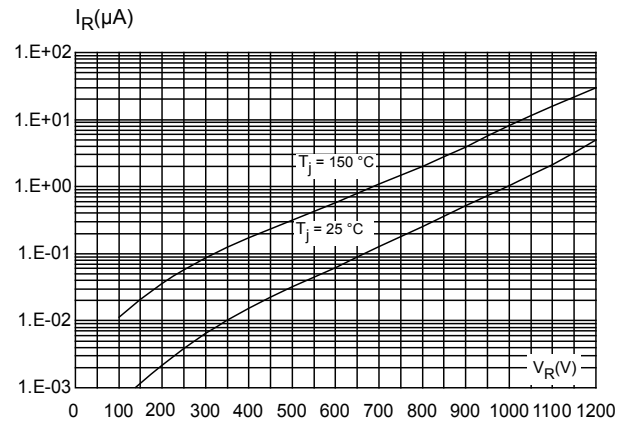
$$Q_{Cj}(V_R) = \int_0^{V_R} C_j(V) dV$$

### 1.1 Characteristics (curves)

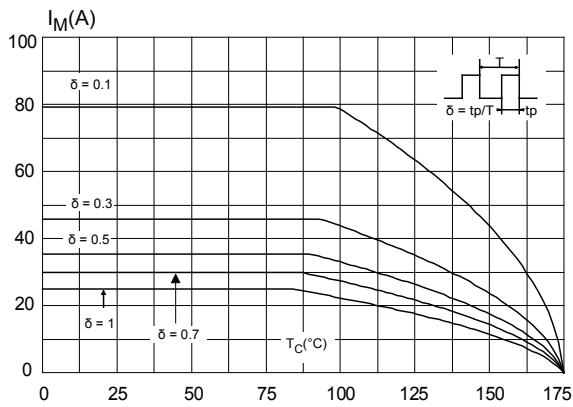
**Figure 1. Forward voltage drop versus forward current (typical values)**



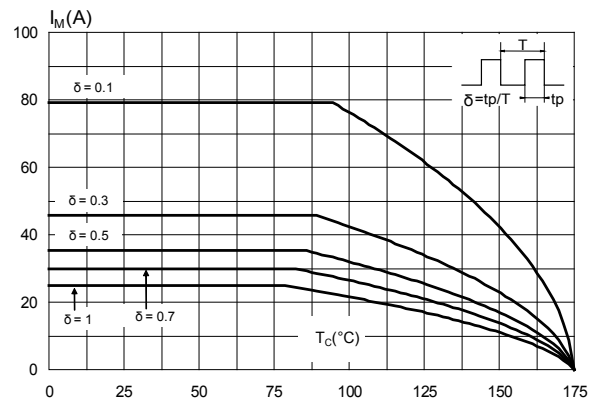
**Figure 2. Reverse leakage current versus reverse voltage applied (typical values)**



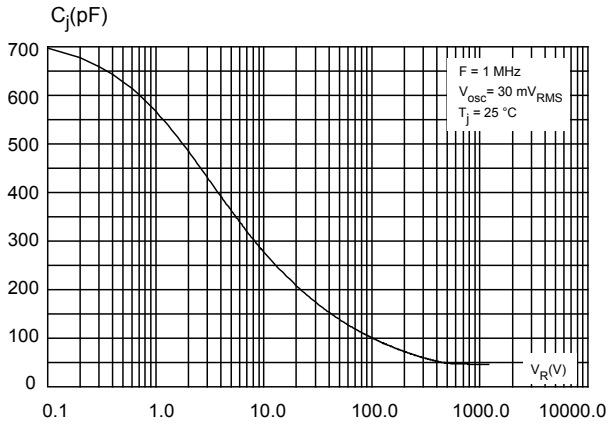
**Figure 3. Peak forward current versus case temperature (TO-220AC, DPAK HV 2L, D<sup>2</sup>PAK)**



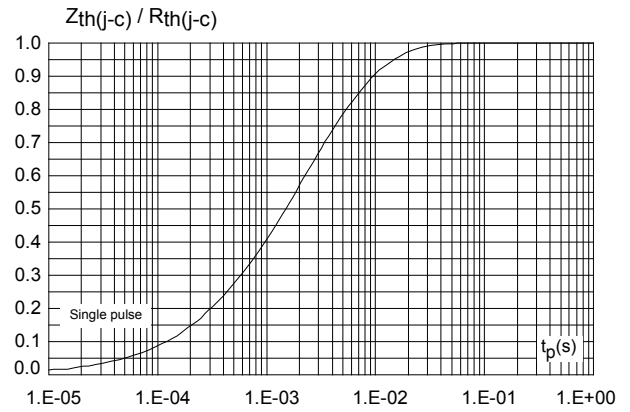
**Figure 4. Peak forward current versus case temperature (DO-247 LL)**



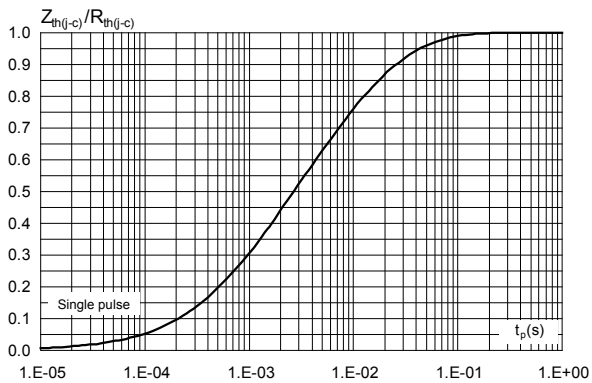
**Figure 5. Junction capacitance versus reverse voltage applied (typical values)**



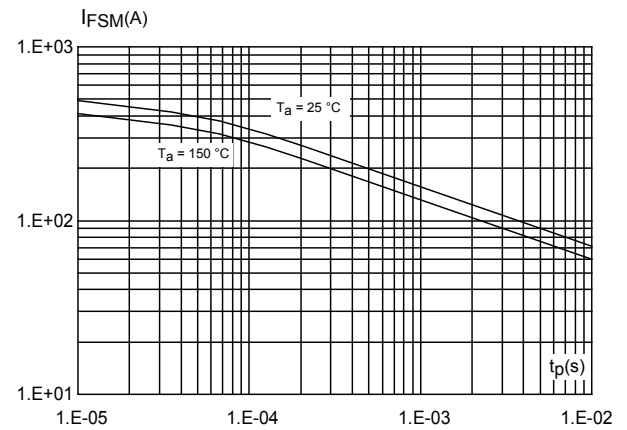
**Figure 6. Relative variation of thermal impedance junction to case versus pulse duration (TO-220AC, DPAK HV 2L, D<sup>2</sup>PAK)**



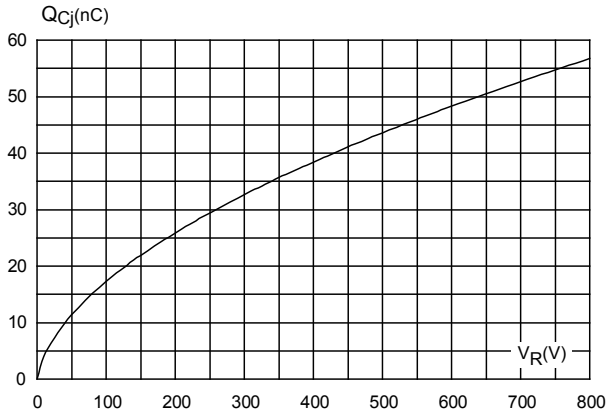
**Figure 7. Relative variation of thermal impedance junction to case versus pulse duration (DO-247LL)**



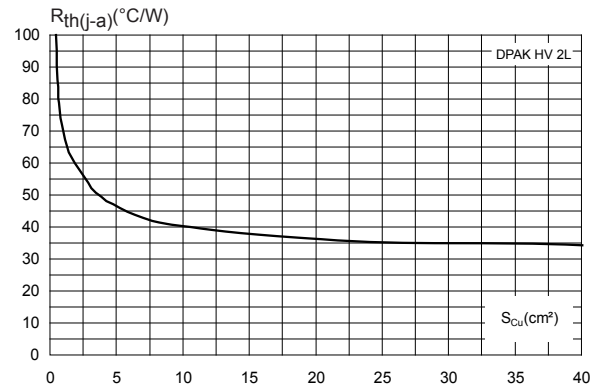
**Figure 8. Non-repetitive peak surge forward current versus pulse duration (sinusoidal waveform)**



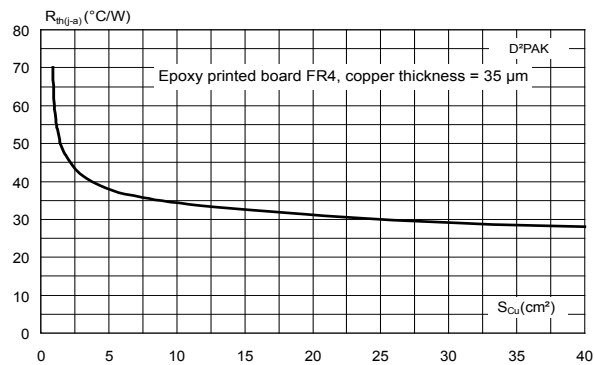
**Figure 9. Total capacitive charges versus reverse voltage applied (typical values)**



**Figure 10. Thermal resistance junction to ambient versus copper surface under tab on epoxy printed board FR4,  $e_{Cu} = 35 \mu\text{m}$  (typical values)**



**Figure 11. Thermal resistance junction to ambient versus copper surface under tab for D<sup>2</sup>PAK package (typical values)**



## 2 Package information

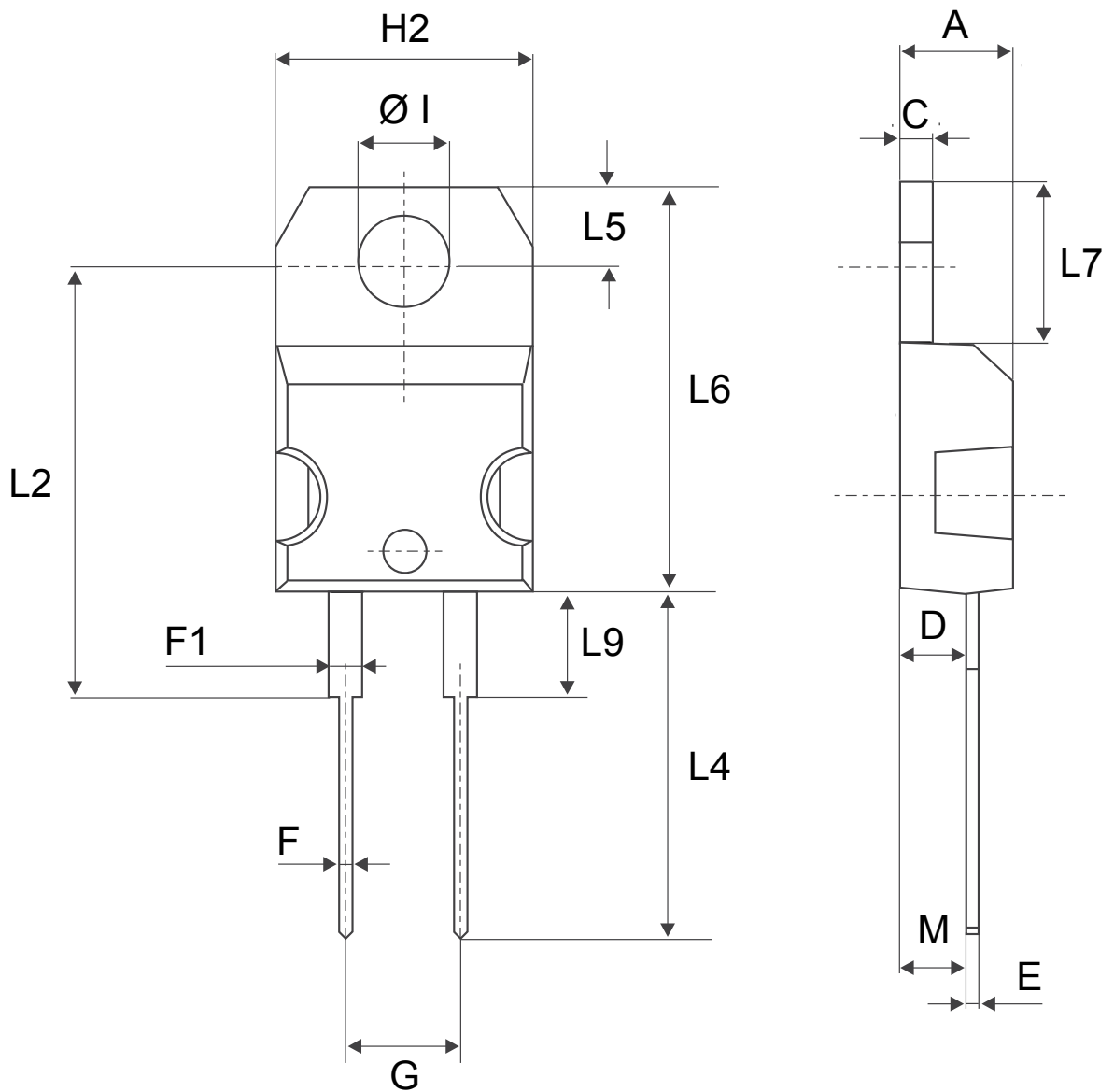
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In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK® is an ST trademark.

## 2.1 TO-220AC package information

- Cooling method: by conduction (C)
- Epoxy meets UL94,V0
- Recommended torque value: 0.55 N·m
- Maximum torque value: 0.7 N·m

Figure 12. TO-220AC package outline





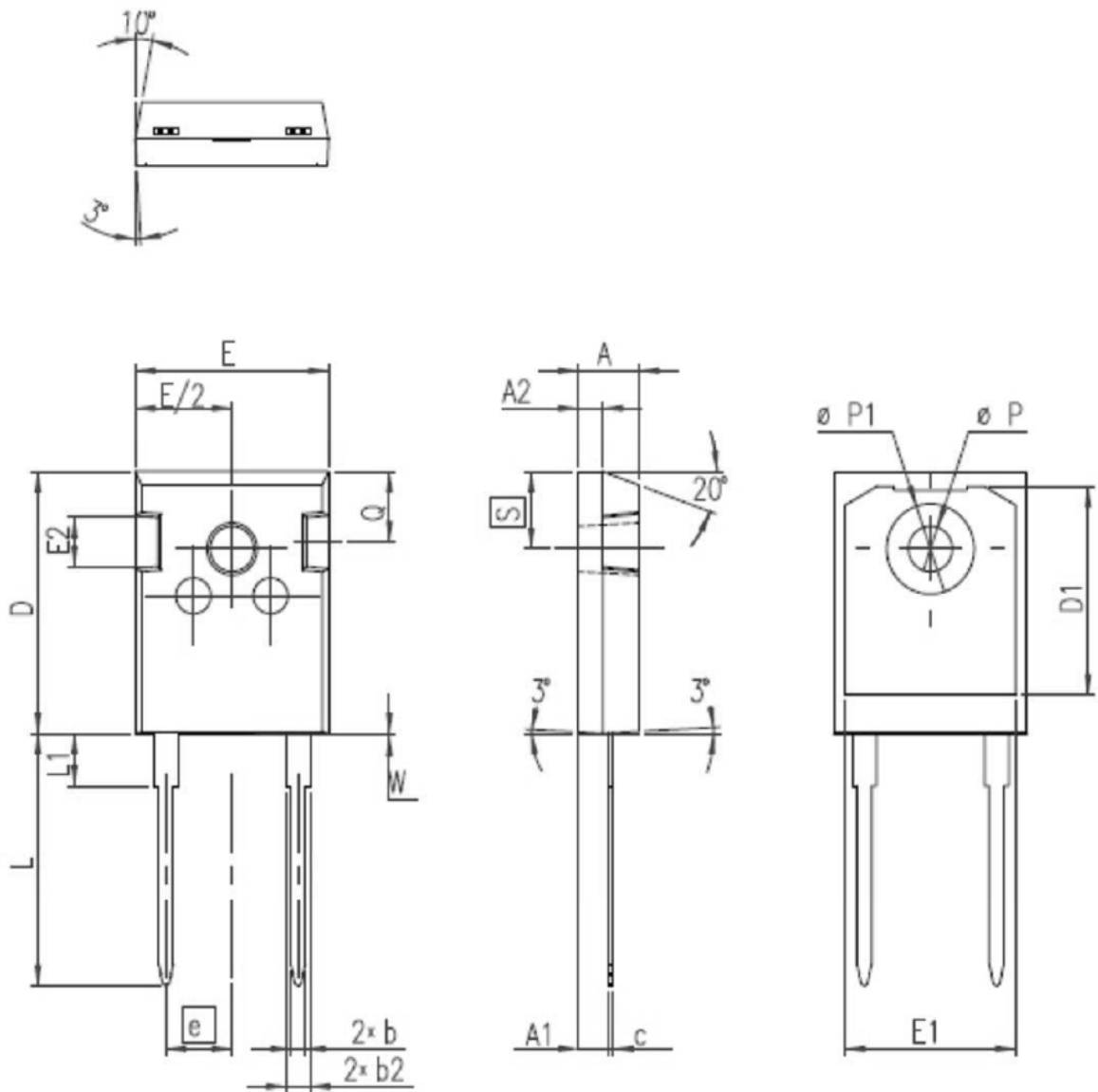
**Table 6. TO-220AC package mechanical data**

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.40	4.60	0.173	0.181
C	1.23	1.32	0.048	0.051
D	2.40	2.72	0.094	0.107
E	0.49	0.70	0.019	0.027
F	0.61	0.88	0.024	0.034
F1	1.14	1.70	0.044	0.066
G	4.95	5.15	0.194	0.202
H2	10.00	10.40	0.393	0.409
L2	16.40 typ.		0.645 typ.	
L4	13.00	14.00	0.511	0.551
L5	2.65	2.95	0.104	0.116
L6	15.25	15.75	0.600	0.620
L7	6.20	6.60	0.244	0.259
L9	3.50	3.93	0.137	0.154
M	2.6 typ.		0.102 typ.	
Diam	3.75	3.85	0.147	0.151

## 2.2 DO-247 LL package information

- Cooling method: by conduction (C)
- Epoxy meets UL94,V0
- Recommended torque value: 0.8 N·m
- Maximum torque value: 1.0 N·m

Figure 13. DO-247 LL package outline



**Table 7. DO-247 LL package mechanical data**

Ref.	Dimensions			
	Millimeters		Inches <sup>(1)</sup>	
	Min.	Max.	Min.	Max.
A	4.70	5.31	0.185	0.209
A1	2.21	2.59	0.087	0.102
A2	1.50	2.49	0.059	0.098
b	0.99	1.40	0.039	0.055
b2	1.65	2.39	0.065	0.094
c	0.38	0.89	0.015	0.035
D	20.80	21.46	0.819	0.845
D1	13.08		0.515	
E	15.49	16.26	0.610	0.640
e	5.44 typ.		0.214	
E1	13.46		0.530	
E2	3.43	3.99	0.135	0.157
L	19.81	20.32	0.780	0.800
L1		4.50		0.177
P	3.56	3.66	0.140	0.144
P1	7.06	7.39	0.278	0.291
Q	5.38	6.20	0.219	0.244
S	6.17 typ.		0.243	
W		0.15		0.006

1. Inches dimensions given for reference only

### 2.3 D<sup>2</sup>PAK package information

- Cooling method: by conduction (C)
- Epoxy meets UL 94,V0

Figure 14. D<sup>2</sup>PAK package outline

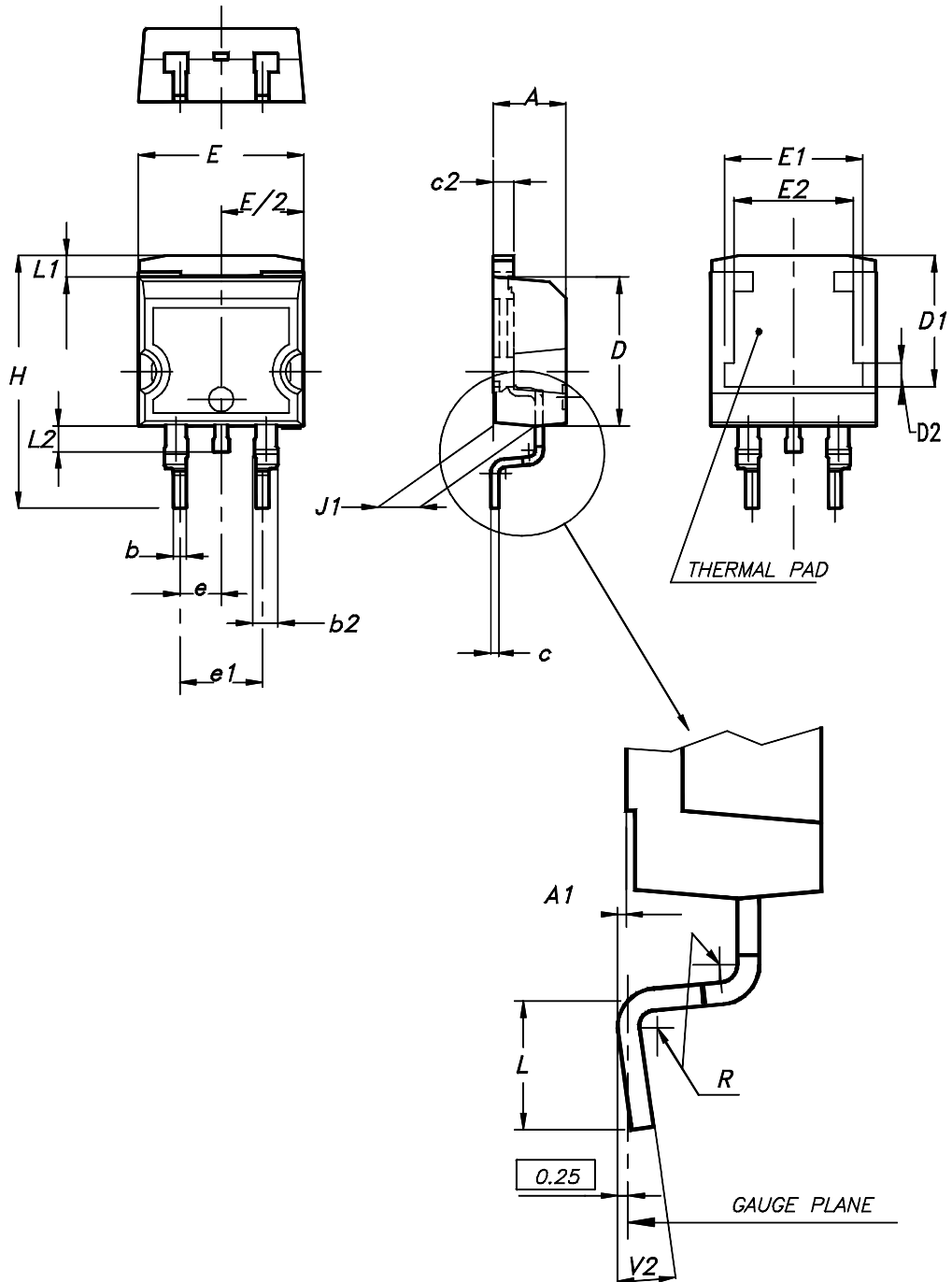
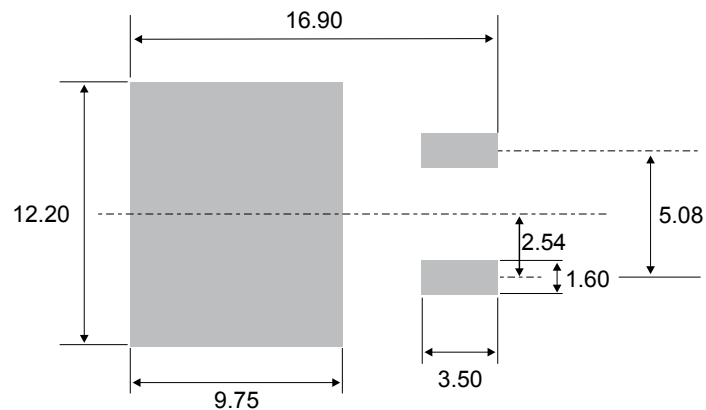


Table 8. D<sup>2</sup>PAK package mechanical data

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.36	4.60	0.172	0.181
A1	0.00	0.25	0.000	0.010
b	0.70	0.93	0.028	0.037
b2	1.14	1.70	0.045	0.067
c	0.38	0.69	0.015	0.027
c2	1.19	1.36	0.047	0.053
D	8.60	9.35	0.339	0.368
D1	6.90	8.00	0.272	0.311
D2	1.10	1.50	0.043	0.060
E	10.00	10.55	0.394	0.415
E1	8.10	8.90	0.319	0.346
E2	6.85	7.25	0.266	0.282
e	2.54 typ.		0.100	
e1	4.88	5.28	0.190	0.205
H	15.00	15.85	0.591	0.624
J1	2.49	2.90	0.097	0.112
L	1.90	2.79	0.075	0.110
L1	1.27	1.65	0.049	0.065
L2	1.30	1.78	0.050	0.070
R	0.4 typ.		0.015	
V2	0°	8°	0°	8°

Figure 15. D<sup>2</sup>PAK Recommended footprint



## 2.4 DPAK HV 2L package information

- Cooling method: by conduction (C)
- Epoxy meets UL 94,V0

Figure 16. DPAK HV 2L package outline

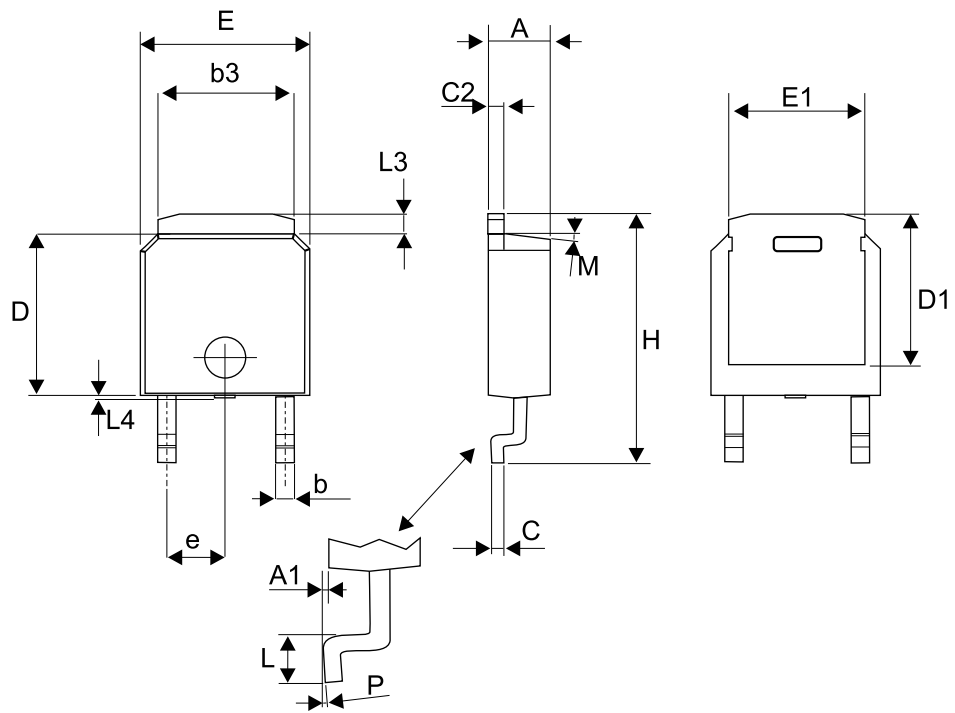
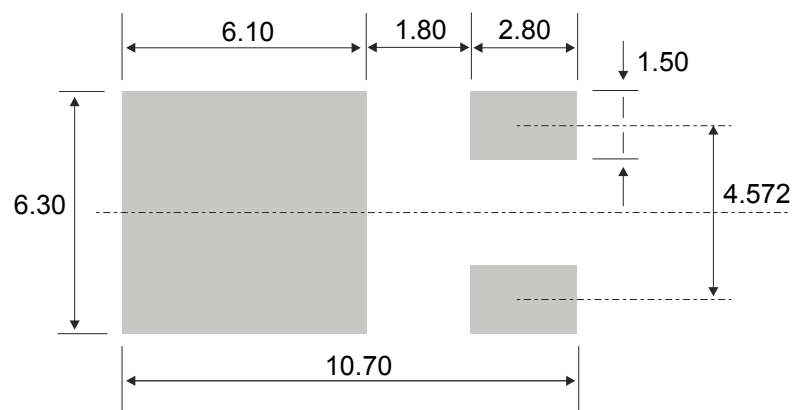


Table 9. DPAK HV 2L package mechanical data

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.16	2.29	2.40	0.085	0.090	0.094
A1	0.06	0.08	0.13	0.002	0.003	0.005
b	0.71	0.76	1.07	0.028	0.029	0.030
b3	5.004	5.10	5.21	0.197	0.201	0.205
c	0.46	0.51	0.56	0.018	0.020	0.025
c2	0.76	0.81	0.86	0.029	0.032	0.034
D	5.97	6.10	6.22	0.235	0.240	0.245
D1	5.84 REF			0.230 REF		
E	6.48	6.60	6.73	0.255	0.260	0.265
E1	4.95	5.08	5.21	0.195	0.200	0.205
e	2.29 REF			0.90 REF		
H	9.70	9.83	10.08	0.382	0.387	0.397
L	1.02	1.14	1.40	0.040	0.045	0.055
L3			1.14			0.045
L4 <sup>(1)</sup>	0.000		0.15	0.000		0.006
M		7°			7°	
P			5°			5°

1. Maximum plastic protrusion

Figure 17. Footprint (dimensions in mm)



### 3 Ordering information

**Table 10. Ordering information**

Order code	Marking	Package	Weight	Base qty.	Delivery mode
STPSC10H12D	STPSC10H12D	TO-220AC	1.86 g	50	Tube
STPSC10H12WL	STPSC10H12WL	DO-247 LL	5.9 g	30	Tube
STPSC10H12B-TR1	STPSC 10H12	DPAK HV 2L	0.368 g	2500	Tape and reel
STPSC10H12G-TR	STPSC10H12G	D <sup>2</sup> PAK	1.48 g	1000	Tape and reel



## Revision history

**Table 11. Document revision history**

Date	Revision	Changes
03-May-2016	1	First issue
06-Feb-2016	2	Added DPAK HV 2L package. Updated Table 5: "Dynamic electrical characteristics".
10-Apr-2017	3	Added D <sup>2</sup> PAK package.
10-Sep-2017	4	Added DO-247 LL package. Updated Section 1: "Characteristics" and Table 10: "Ordering information".
23-Apr-2018	5	Updated <a href="#">Figure 13. DO-247 LL package outline</a> .

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