

## SICR12650 / SICRB12650 / SICRD12650 / SICRF12650 650V SiC POWER SCHOTTKY RECTIFIER

### Description

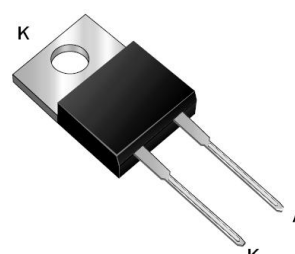
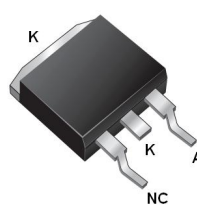



SICR12650/ SICRB12650/ SICRD12650/ SICRF12650 are all single SiC Schottky rectifiers packaged in TO-220AC, D2PAK, DPAK and ITO-220AC case. The device is a high voltage Schottky rectifier that has very low total conduction losses and very stable switching characteristics over temperature extremes. The SICR12650/ SICRB12650/ SICRD12650/ SICRF12650 are ideal for energy sensitive, high frequency applications in challenging environments.

### Applications

- Alternative energy inverters
- Power Factor Correction (PFC)
- Free-Wheeling diodes
- Switching supply output rectification
- Reverse polarity protection

### Features

- 175°C T<sub>J</sub> operation
- Ultra-low switching loss
- Switching speeds independent of operating temperature
- Low total conduction losses
- High forward surge current capability
- High package isolation voltage
- Guard ring for enhanced ruggedness and long term reliability
- Pb - Free Device
- All SMC parts are traceable to the wafer lot
- Additional electrical and life testing can be performed upon request

SICR12650	SICRB12650	SICRD12650	SICRF12650
			
TO-220AC	D <sup>2</sup> PAK	DPAK	ITO-220AC
			

### Maximum Ratings:

Characteristics	Symbol	Condition	Max.	Units
Peak Repetitive Reverse Voltage Working Peak Reverse Voltage DC Blocking Voltage	V <sub>RRM</sub> V <sub>RWM</sub> V <sub>R</sub>	-	650	V
Average Rectified Forward Current	I <sub>F(AV)</sub>	50% duty cycle @T <sub>c</sub> =110°C, rectangular wave form	12	A
Peak One Cycle Non-Repetitive Surge Current	I <sub>FSM</sub>	10ms, Half Sine pulse, T <sub>c</sub> =25°C	50	A

### Electrical Characteristics:

Characteristics	Symbol	Condition	Typ.	Max.	Units
Forward Voltage Drop*	$V_{F1}$	@ 12A, Pulse, $T_J = 25\text{ }^\circ\text{C}$	1.5	1.7	V
	$V_{F2}$	@ 12A, Pulse, $T_J = 150\text{ }^\circ\text{C}$	1.6	2.1	V
Reverse Current at DC condition*	$I_{R1}$	@ $V_R = \text{rated } V_R$ $T_J = 25\text{ }^\circ\text{C}$	30	150	$\mu\text{A}$
	$I_{R2}$	@ $V_R = \text{rated } V_R$ $T_J = 125\text{ }^\circ\text{C}$	200	1500	$\mu\text{A}$
Total Capacitive charge	$Q_C$	$V_r = 400\text{ V}$ , $I_F = 12\text{ A}$ $dI_F/dt = -200\text{ A}/\mu\text{s}$ , $T_J = 150\text{ }^\circ\text{C}$	12	-	nC
Junction Capacitance	$C_T$	@ $V_R = 0\text{ V}$ , $T_C = 25\text{ }^\circ\text{C}$ , $f_{SIG} = 1\text{ MHz}$ @ $V_R = 400\text{ V}$ , $T_C = 25\text{ }^\circ\text{C}$ , $f_{SIG} = 1\text{ MHz}$	750 75	-	pF
Voltage Rate of Change	$dv/dt$	-	-	10,000	$\text{V}/\mu\text{s}$
RSM Isolation Voltage ( $t = 1.0\text{ second}$ , R. H. $\leq 30\%$ , $T_A = 25\text{ }^\circ\text{C}$ )	$V_{ISO}$	Clip mounting, the epoxy body away from the heatsink edge by more than 0.110" along the lead direction.	-	4500	V
		Clip mounting, the epoxy body is inside the heatsink.	-	3500	
		Screw mounting, the epoxy body is inside the heatsink.	-	1500	

\* Pulse width  $< 300\text{ }\mu\text{s}$ , duty cycle  $< 2\%$

### Thermal-Mechanical Specifications:

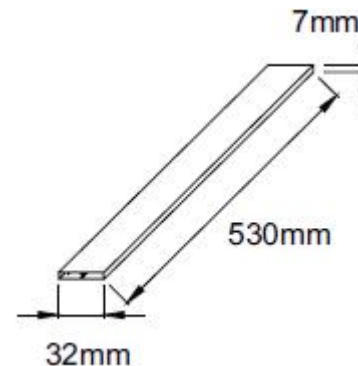
Characteristics	Symbol	SICR12650	SICRB12650	SICRD12650	SICRF12650	Units
Junction Temperature	$T_J$	-55 to +175				$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-55 to +175				$^\circ\text{C}$
Maximum Thermal Resistance Junction to Case	$R_{\theta JC}$	2.4	2.4	2.4	4.2	$^\circ\text{C}/\text{W}$

### Ordering Information

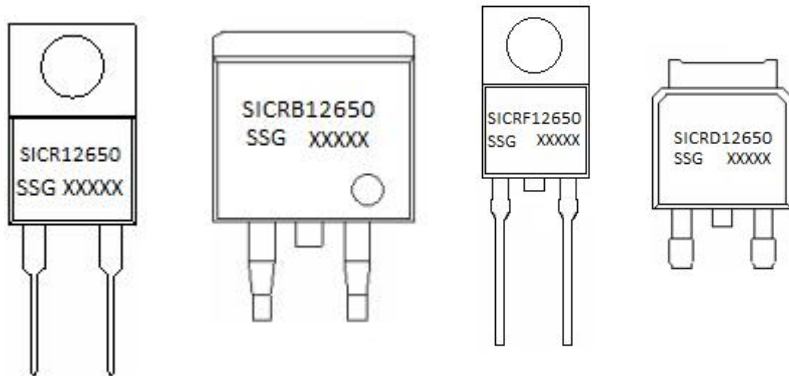
Device	Package	Weight	Shipping
SICR12650	TO-220AC	1.8g	50pcs / tube
SICRB12650	D <sup>2</sup> PAK	1.85g	800pcs / reel
SICRD12650	DPAK	0.39g	2500pcs / reel
SICRF12650	ITO-220AC	1.8g	50pcs / tube

For information on tape and reel specifications, including part orientation and tape sizes, please refer to our tape and reel packaging specification.

### Tube Specification(TO-220AC/ITO-220AC)



## Marking Diagram

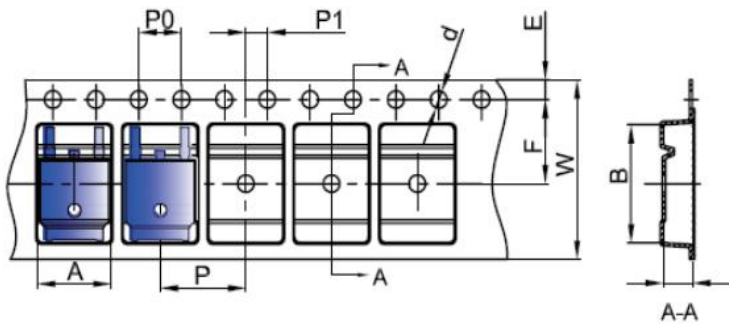


Where XXXXX is YYWWL

SICR = Device Type  
B/D/F = Package type  
12 = Forward Current (12A)  
650 = Reverse Voltage (650V)  
SSG = SSG  
YY = Year  
WW = Week  
L = Lot Number

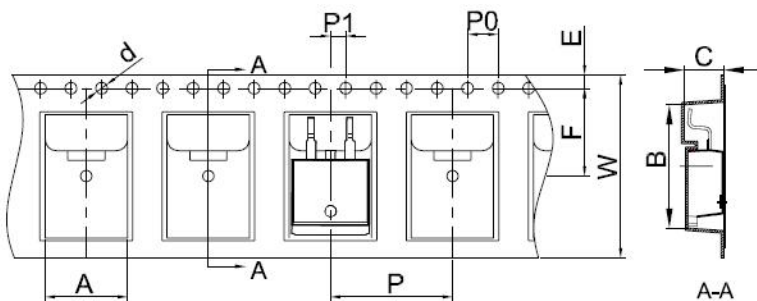
**Cautions:** Molding resin  
Epoxy resin UL:94V-0

## Carrier Tape & Reel Specification DPAK



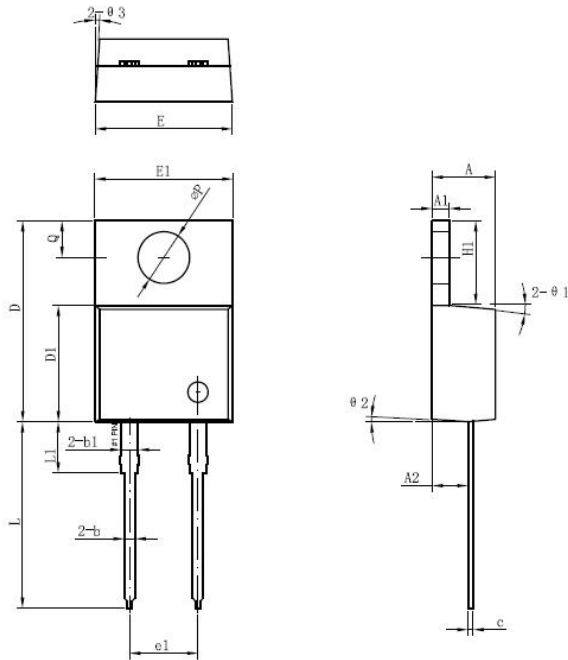
SYMBOL	Millimeters	
	Min.	Max.
A	6.80	7.00
B	10.40	10.60
C	2.60	2.80
d	Φ1.45	Φ1.65
E	1.65	1.85
F	7.40	7.60
P0	3.90	4.10
P	7.90	8.10
P1	1.90	2.10
W	15.90	16.30

## Carrier Tape & Reel Specification D2PAK



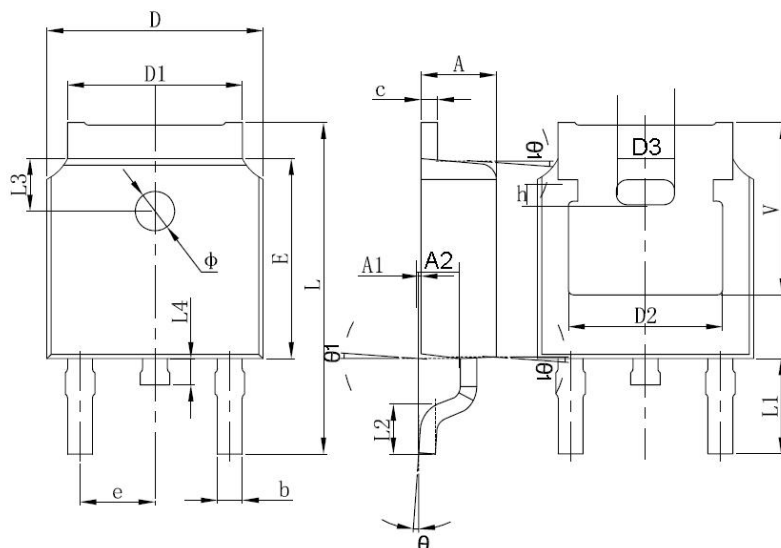
SYMBOL	Millimeters	
	Min.	Max.
A	10.70	10.90
B	16.03	16.23
C	5.11	5.31
d	1.45	1.65
E	1.65	1.85
F	11.40	11.60
P0	3.90	4.10
P	15.90	16.10
P1	1.90	2.10
W	23.90	24.30

### Mechanical Dimensions TO-220AC



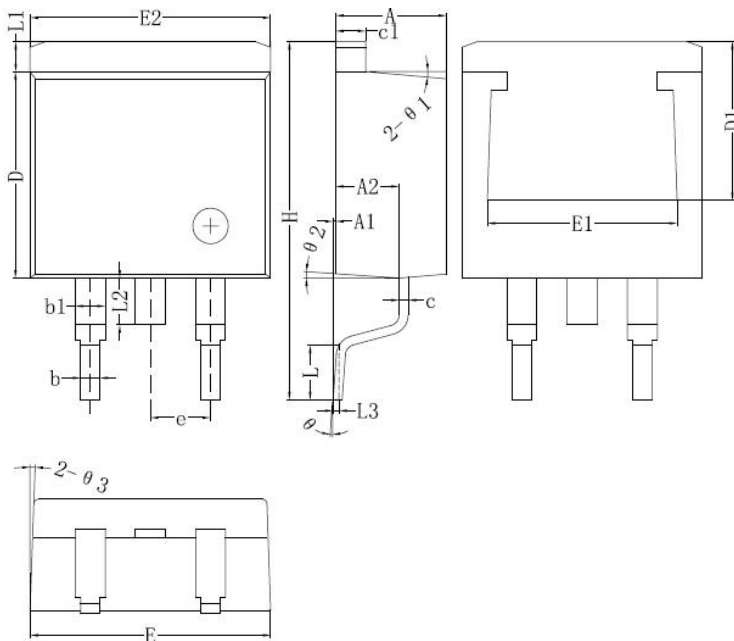
Symbol	Dimensions in millimeters		
	Min.	Typical	Max.
A	4.47	4.70	4.85
A1	1.17	1.27	1.37
A2	2.52	2.69	2.89
b	0.71	0.81	0.96
b1	1.17	1.27	1.37
c	0.31	0.38	0.61
D	14.64	14.94	15.24
D1	8.50	8.07	8.90
E	10.01	10.16	10.31
E1	9.98	10.18	10.38
e1	4.98	5.08	5.18
H1	6.04	6.24	6.44
L	13.00	13.86	14.08
L1	3.56	3.80	3.96
$\Phi P$	3.74	3.84	4.04
Q	2.54	2.74	2.94
$\Theta 1$		5°	
$\Theta 2$		4°	
$\Theta 3$		4°	

### Mechanical Dimensions DPAK



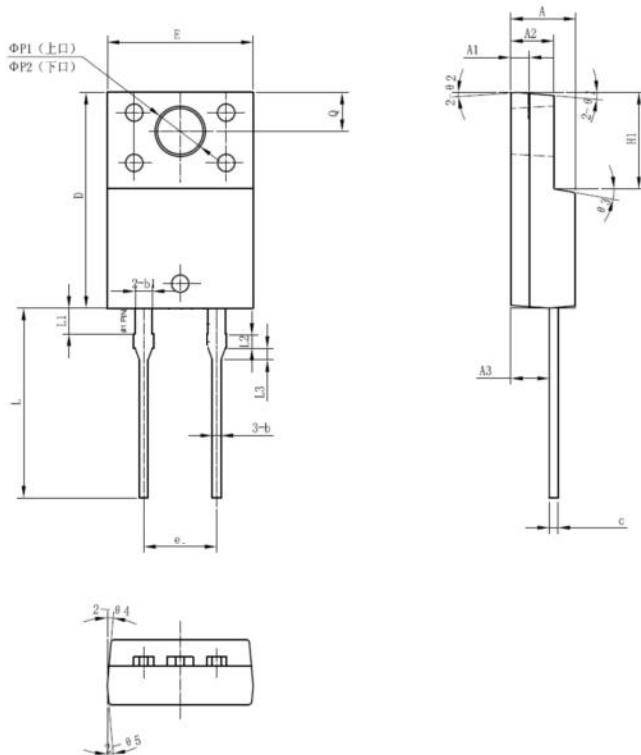
SYMBOL	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	2.20	2.40	0.087	0.094
A1	0.00	0.127	0.000	0.005
b	0.66	0.86	0.026	0.034
c	0.46	0.60	0.018	0.024
D	6.50	6.70	0.256	0.264
D1	5.13	5.46	0.202	0.215
D2	4.83 REF.		0.190 REF.	
E	6.00	6.20	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.70	10.40	0.381	0.409
L1	2.90 REF.		0.144 REF.	
L2	1.40	1.70	0.055	0.067
L3	1.60 REF.		0.063 REF.	
L4	0.60	1.00	0.024	0.039
$\Phi$	1.10	1.30	0.043	0.051
$\theta$	0°	8°	0°	8°
h	0.00	0.30	0.000	0.012
V	5.35 REF.		0.211 REF.	

**Mechanical Dimensions D<sup>2</sup>PAK**



Symbol	Dimensions in millimeters		
	Min.	Typical	Max.
A	4.55	4.70	4.85
A1	0	0.10	0.25
A2	2.59	2.69	2.89
b	0.71	0.81	0.96
b1		1.27	
c	0.36	0.38	0.61
c1	1.17	1.27	1.37
D	8.55	8.70	8.85
D1	6.40		
E	10.01	10.16	10.31
E1	7.6		
E2	9.98	10.08	10.18
e		2.54	
H	14.6	15.1	15.6
L	2.00	2.30	2.70
L1	1.17	1.27	1.40
L2			2.20
L3		0.25BSC	
e	0	-	8°
e1		5°	
e2		4°	
e3		4°	

**Mechanical Dimensions ITO-220AC**



SYMBOL	Millimeters		
	MIN.	TYP.	MAX.
A	4.30	4.50	4.70
A1	1.10	1.30	1.50
A2	2.50	3.00	3.20
A3	2.50	2.70	2.90
b	0.50	0.60	0.85
b1	1.10	1.20	1.35
c	0.50	0.60	0.85
D	14.80	15.00	15.20
E	9.96	10.16	10.36
e	-	5.10	-
H1	6.50	6.70	6.90
L	12.70	13.20	13.70
L1	1.60	1.80	2.00
L2	0.80	1.00	1.20
L3	0.60	0.80	1.00
ΦP1(上口)	3.30	3.50	3.70
ΦP2(下口)	2.99	3.19	3.39
Q	2.50	2.70	2.90
θ1		5°	
θ2		4°	
θ3		10°	
θ4		5°	
θ5		5°	

**Technical Data**  
**Data Sheet N1995, Rev.-**



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