SILICON CARBIDE SCHOTTKY RECTIFIER DIODE

TT electronics
Semelab Limited

SML05SC12D3A / SML05SC12D3B

- Hermetic Ceramic Surface Mount Package
- "D-5B" / "E-MELF" Compatible Footprint
- 1200V, 5A, Schottky Rectifier
- Effective Zero Forward and Reverse Recovery
- High Frequency Operation
- Fast Temperature Independent Switching
- Positive Temperature Coefficient on VF
- Space Level and High-Reliability Screening Options Available

Typical applications

Applications requiring high voltages low switching losses and fast switching speeds such as Switching Power Supplies, Converters, Power Factor Conversion and Motor Drive and Free Wheeling Diodes

ABSOLUTE MAXIMUM RATINGS (T_J = 25°C unless otherwise stated)

V_{RRM}	Repetitive Peak Reverse Voltage	1200V
V_R	DC Reverse Voltage	1200V
V_{RWM}	Working Peak Reverse Voltage	1200V
$I_{F(AV)}$	Forward Current	5A
$I_{F(AV)}$	Forward Current (1)	1.5A
	Derate above T_A 25°C	10mA/°C
I_{FSM}	Non-Repetitive Peak Forward Surge Current (2,4)	15A
T_J	Junction Temperature Range	-55 to +175°C
T_{STG}	Storage Temperature Range	-55 to +175°C

THERMAL PROPERTIES

Symbols	Parameters	Max.	Units
$R_{\theta JSP(IN)}$	Thermal Resistance, Junction To Solder Pads T_{SP} = 25°C	26	°C/W
$R_{\theta JA(PCB)}$ (3)	Thermal Resistance, Junction To Ambient, On PCB	70	°C/W
$R_{\theta JA(PCB)}$ (4)	Thermal Resistance, Junction To Ambient, On PCB	125	°C/W

Notes

(1) $I_{F(AV)}$ is rated at 1.5A @ T_A = 25°C for PC boards where thermal resistance from mounting point to ambient is sufficiently controlled where T_J(Max) does not exceed 175°C; This equates to $R_{\theta JA(PCB)} \leq 71$°C/W.

(2) MIL-STD-750 Method 4066 Condition A1. I_O = 1A, V_{RWM} = 1200V, V_{RSM} = 1200V, ten surges of 8.3mS each at 1 minute intervals, T_A = 25°C

(3) PCB = FR4, 0.0625 Inch (1.59mm) thick, single layer, 1.0-Oz Cu, Pad Size, (1.0" x 1.0"), (645mm x 645mm) , horizontal in still air.

(4) PCB = FR4, 0.0625 Inch (1.59mm) thick, single layer, 1.0-Oz Cu, Pad Size, (0.070" x 0.155")‡, (1.78mm x 3.94mm) ‡, horizontal in still air. $I_{F(AV)}$ is rated at 1A @ T_A = 25°C for PC boards where $R_{\theta JA(PCB)} \leq 125$°C/W. Derate at 6.7mA/°C above T_A = 25°C in this case.

‡ Recommended solder pad layout dimensions for this device, as detailed within this datasheet for the D-5A device.

SEMELAB
A subsidiary of TT electronics plc.

Semelab Limited
Telephone +44 (0) 1455 556565
Email: sales@semelab-tt.com

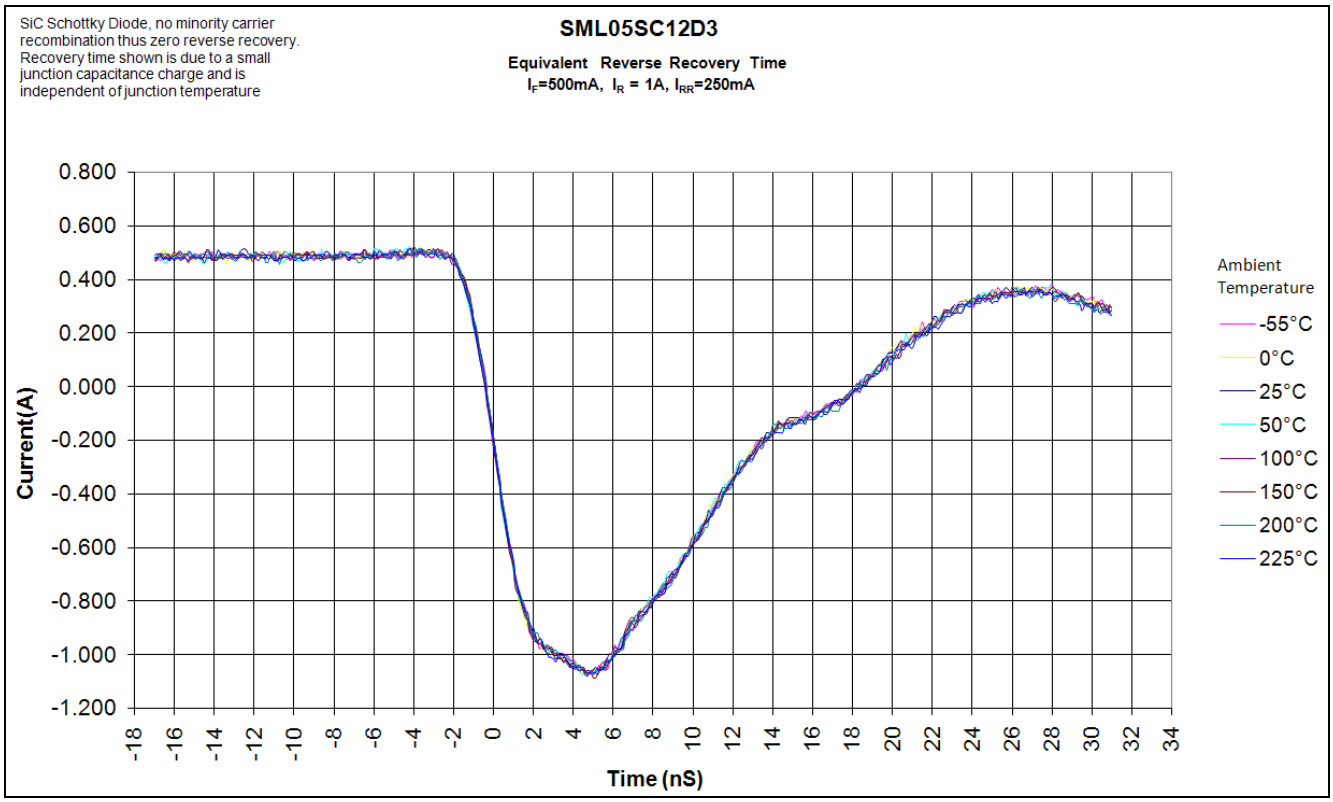
Coventry Road, Lutterworth, Leicestershire, LE17 4JB
Fax +44 (0) 1455 552612
Website: http://www.semelab-tt.com

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise stated)

Symbol	Parameter	Test Conditions		Min	Typ	Max	Units
V_{FM}[5]	Forward Voltage Drop	I_F = 5A				1.8	V
			T_J = 175°C			3.0	
I_R	Reverse Leakage Current	V_R = Rated V_R				200	µA
			T_J = 175°C			1.0	mA
Q_C	Total Capacitive Charge	V_R = 500V di/dt = 500A/µA	I_F = 1.0A		28		nC
C_J	Junction Capacitance	V_R = 0V	f = 1.0MHz		455		pF
		V_R = 200V	f = 1.0MHz		45		
		V_R = 400V	f = 1.0MHz		33		

Notes
(5) Pulse Width < 300µs, Duty Cycle <2%

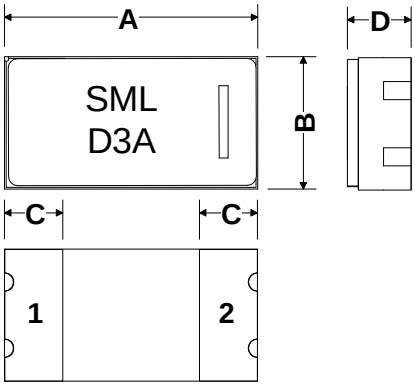
TYPICAL CHARACTERISTICS (T_J = 25°C unless otherwise stated)



SILICON CARBIDE SCHOTTKY RECTIFIER DIODE

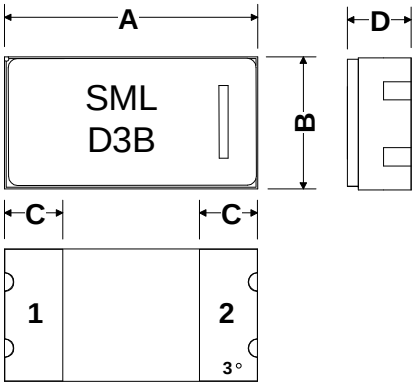
SML05SC12D3A / SML05SC12D3B

MECHANICAL DATA



DLCC3 Variant A (D3A)

PAD 1	ANODE	
PAD 2	CATHODE	
DIMENSION	mm	Inches
A	7.00 ±0.10	0.275 ±0.004
B	3.75 ±0.10	0.143 ±0.004
C	1.60 ±0.10	0.063 ±0.004
D	1.76 ±0.10	0.069 ±0.004



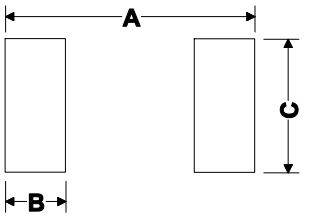
DLCC3 Variant B (D3B)

PAD 1	ANODE	
PAD 2	CATHODE	
PAD 3	LID CONTACT TO CATHODE*	
DIMENSION	mm	Inches
A	7.00 ±0.10	0.275 ±0.004
B	3.75 ±0.10	0.143 ±0.004
C	1.60 ±0.10	0.063 ±0.004
D	1.76 ±0.10	0.069 ±0.004

* The additional contact provides a connection to the lid in the application. Connecting the metal lid to a known electrical potential stops deep dielectric discharge in space applications; see the Space Weather link www.semelab.co.uk/dlcc3.html on the Semelab web site. Package variant to be specified at order.

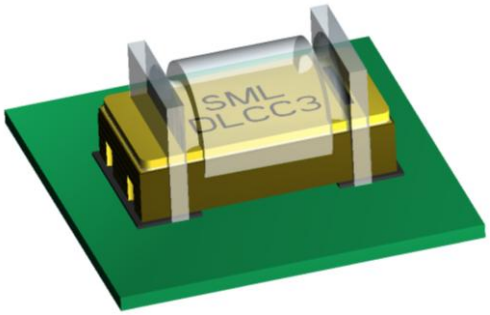
† The DLCC3 package design takes full advantage of the proven high reliability pedigree of the HTCC surface mount packaging technology, which is easily integrated for automated assembly. Semelab has taken the existing standards for ceramic surface mount package manufacture and added additional design features to enhance thermal performance, to present a competitive alternative for high reliability applications.

SOLDER PAD LAYOUT



	mm	Inches
A	7.32	0.288
B	1.78	0.070
C	3.94	0.155

Soldering temperature should be 260°C for a maximum of 10 seconds.



The physical dimensions for the DLCC3 ceramic package are designed to be different from the published dimensions for the "D-5B" and "E-MELF" outlines. The DLCC3 design fully utilises the recommended solder footprint for the "D-5B" / "E-MELF" Package, and as such presents a drop in replacement for existing board designs.

PACKAGE MASS

Gold Plated Solder Pad Finish = 150mg (Typical)

SILICON CARBIDE SCHOTTKY RECTIFIER DIODE

SML05SC12D3A / SML05SC12D3B

SCREENING OPTIONS

Space Level (JQRS/ESA) and High Reliability options are available in accordance with the High Reliability and Screening Options Handbook available for download from the from the TT electronics Semelab web site.

ESA Quality Level Products are based on the testing procedures specified in the generic ESCC 5000 and in the corresponding part detail specifications.

Semelabs QR216 and QR217 processing specifications (JQRS), in conjunction with the companies ISO 9001:2000 approval present a viable alternative to the American MIL-PRF-19500 space level processing.

QR217 (Space Level Quality Conformance) is based on the quality conformance inspection requirements of MIL-PRF-19500 groups A (table V), B (table VIa), C (table VII) and also ESA / ESCC 5000 (chart F4) lot validation tests.

QR216 (Space Level Screening) is based on the screening requirements of MIL-PRF-19500 (table IV) and also ESA /ESCC 5000 (chart F3).

JQRS parts are processed to the device data sheet and screened to QR216 with conformance testing to Q217 groups A and B in accordance with MIL-STD-750 methods and procedures.

Additional conformance options are available, for example Pre-Cap Visual Inspection, Buy-Off Visit or Data Packs. These are chargeable and must be specified at the order stage (See Ordering Information). Minimum order quantities may apply.

Alternative or additional customer specific conformance or screening requirements would be considered. Contact Semelab sales with enquires.

MARKING DETAILS

Parts can be marked with approximately 8 characters on two lines and can include the cathode identification.
Typical marking would include part or specification number, week of seal or serial number subject to available space and legibility.

Customer specific marking requirements can be arranged at the time of order.

Example Marking:

ORDERING INFORMATION

Part numbers are built up from Type, Package Variant, and screening level. The part numbers are extended to include the additional options as shown below.

Type – See Electrical Characteristics Table
Package Variant – See Mechanical Data
Screening Level – See Screening Options (ESA / JQRS)

Additional Options:

Customer Pre-Cap Visual Inspection	.CVP
Customer Buy-Off visit	.CVB
Data Pack	.DA
Solderability Samples	.SS
Scanning Electron Microscopy	.SEM
Radiography (X-ray)	.XRAY
Total Dose Radiation Test	.RAD
MIL-PRF-19500 (QR217)	
Group B charge	.GRPB
Group B destructive mechanical samples	.GBDM (12 pieces)
Group C charge	.GRPC
Group C destructive electrical samples	.GCDE (12 pieces)
Group C destructive mechanical samples	.GCDM (6 pieces)
ESA/ESCC	
Lot Validation Testing (subgroup 1) charge	.LVT1
LVT1 destructive samples (environmental)	.L1DE (15 pieces)
LVT1 destructive samples (mechanical)	.L1DM (15 pieces)
Lot Validation Testing (subgroup 2) charge	.LVT2
LVT2 endurance samples (electrical)	.L2D (15 pieces)
Lot Validation Testing (subgroup 3) charge	.LVT3
LVT3 destructive samples (mechanical)	.L3D (5 pieces)

Additional Option Notes:
1) All 'Additional Options' are chargeable and must be specified at order stage.
2) When Group B,C or LVT is required, additional electrical and mechanical destructive samples must be ordered
3) All destructive samples are marked the same as other production parts unless otherwise requested.

Example ordering information:
The following example is for the SML05SC12D3 part with package variant B, JQRS screening, additional Group C conformance testing and a Data pack.

Part Numbers:
SML05SC12D3B-JQRS (Include quantity for flight parts)
SML05SC12D3B.GRPC (chargeable conformance option)
SML05SC12D3B.GCDE (charge for destructive parts)
SML05SC12D3B.GCDM (charge for destructive parts)
SML05SC12D3B.DA (charge for Data pack)

Customers with any specific requirements (e.g. marking or screening) may be supplied with a similar alternative part number (there is maximum 20 character limit to part numbers). Contact Semelab sales with enquiries.

High Reliability and Screening Options Handbook link: http://www.semelab.co.uk/pdf/misc/documents/hirel_and_screening_options.pdf