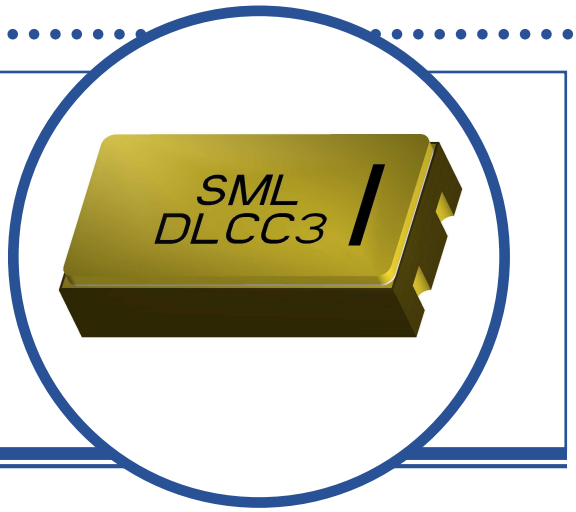
SiC SCHOTTKY DIODE

TT electronics
Semelab Limited

SML05SC06D3A / SML05SC06D3B

- $V_{R(max)}$ = 600V
- $I_{F(avg)}$ = 5A
- $V_{F(typ)}$ = 1.5V
- DLCC3 Hermetic Ceramic Surface Mount Package Designed as a Drop In Replacement for "D-5B"/ "E-MELF" Package †
- No Reverse Recovery
- No Forward Recovery
- High Reliability Screening Options Available



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

V_{RRM}	Peak Repetitive Reverse Voltage	600V
V_{RSM}	Surge Peak Reverse Voltage	600V
$I_{F(AVG)}$	Average Forward Current (1)	5A
I_{FSM}	Non-Repetitive Peak Forward Surge Current (3,4)	60A
P_D	Total Power Dissipation at T_A = 25°C	2.96 (2)
	Derate Above T_A = 25°C	14.8mW/°C (2)
T_J	Junction Temperature Range	-55 to +225°C
T_{stg}	Storage Temperature Range	-55 to +225°C

THERMAL PROPERTIES

Symbols	Parameters	Max.	Units
$R_{\theta JSP(IN)}$	Thermal Resistance, Junction To Solder Pads T_{SP} = 25°C	29	°C/W
$R_{\theta JA(PCB)}$(2)	Thermal Resistance, Junction To Ambient, On PCB	67.5	°C/W
$R_{\theta JA(PCB)}$(3)	Thermal Resistance, Junction To Ambient, On PCB	123	°C/W

Notes

(1) I_{O1} is rated at 1.75A @ 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 $R_{\theta JA(PCB)} \leq$ 68°C/W.

(2) PCB = FR4, 0.0625 Inch (1.59mm) thick, single layer, 1.0-Oz Cu, Pad Size, (1.0" x 1.0"), (25.4mm x 25.4mm) , horizontal in still air.

(3) 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_{O1} is rated at 1.0A @ T_A = 25°C for PC boards where $R_{\theta JA(PCB)} \leq$ 125°C/W. Derate at 7.33mA/°C above T_A = 25°C in this case.

(4) MIL-STD-750 Method 4066.4 Condition A1. I_o = 1A, V_{RWM} = 600V, V_{RSM} = 600V, ten surges of 8.3mS each at 1 minute intervals, T_A = 25°C.

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

Semelab ltd reserves the right to change test conditions, parameter limits and package dimensions without notice. Information furnished by Semelab is believed to be both accurate and reliable at the time of going to press. However Semelab assumes no responsibility for any errors or omissions discovered in its use. Semelab encourages customers to verify that datasheets are current before placing an order.

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

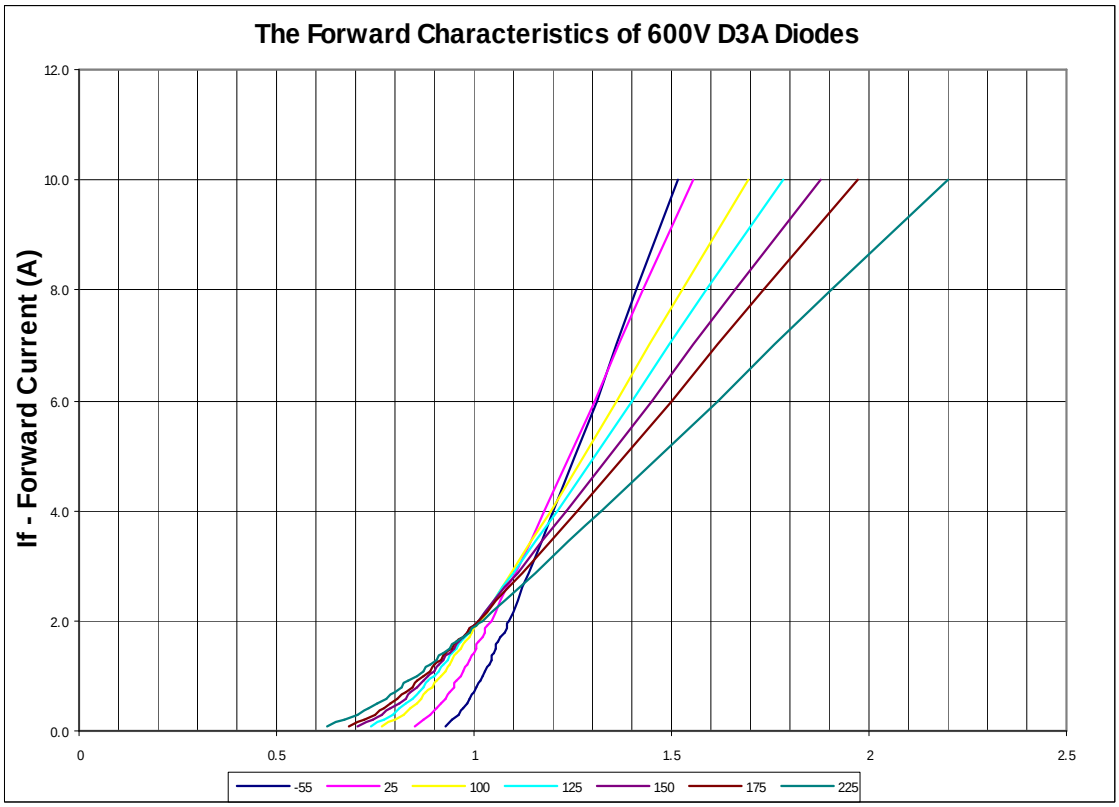
Symbol	Parameters	Test Conditions		Min.	Typ.	Max.	Unit
V_F (1)	Diode Forward Voltage	I_F = 5A	T_J = 25°C		1.5	1.8	V
		I_F = 5A	T_J = 175°C		2.0	2.4	
I_R	Leakage Current	V_R = 600V	T_J = 25°C		50	200	µA
		V_R = 600V	T_J = 175°C		100	1000	

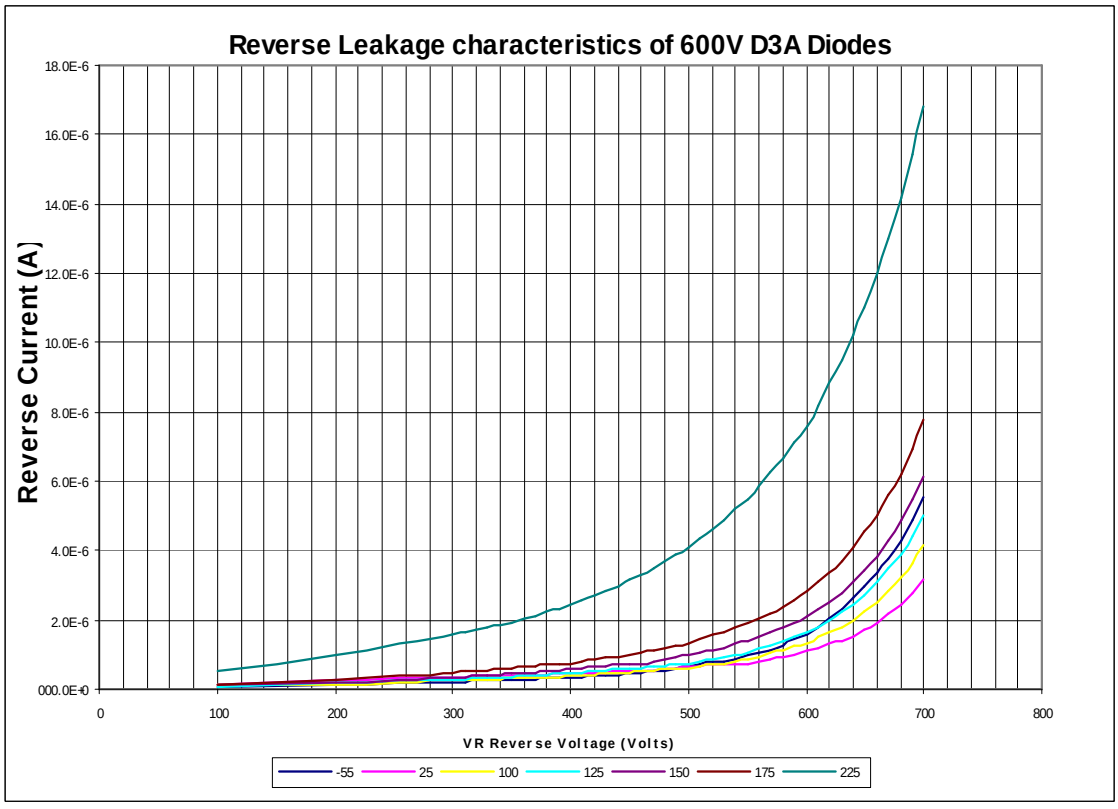
DYNAMIC CHARACTERISTICS

Q_C	Total Capacitive Charge	V_R = 600V d_i/d_t = 500A/µs	I_F = 5A T_J = 25°C		28		nC
C_T	Junction Capacitance (f = 1.0MHz)	V_R = 0V	T_J = 25°C		550		pF
		V_R = 200V	T_J = 25°C		65		
		V_R = 400V	T_J = 25°C		50		

Notes
(1) Pulse Width ≤ 300us, δ ≤ 2%

Typical Performance Over Temperature Range



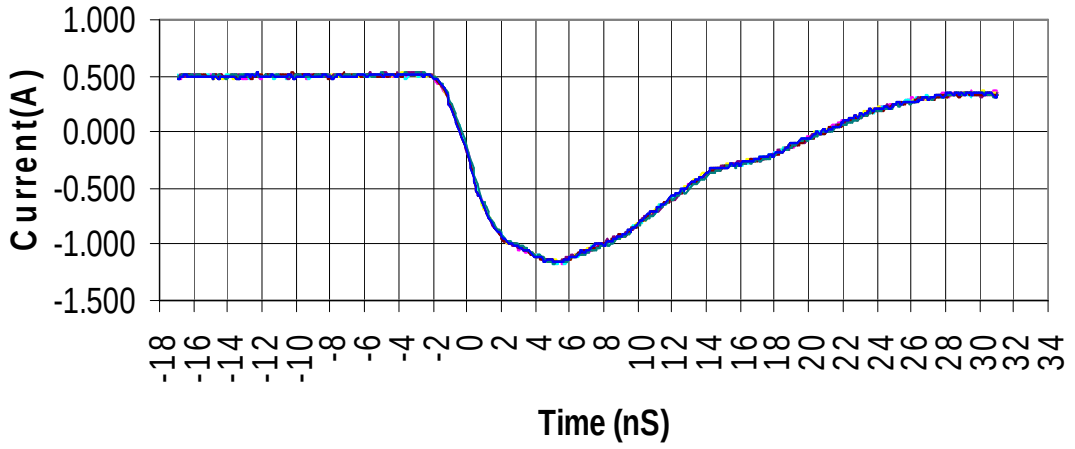


SiC Schottky Diode, no minority carrier recombination thus zero reverse recovery. Recovery time shown is due to a small junction capacitance charge and is independent of junction

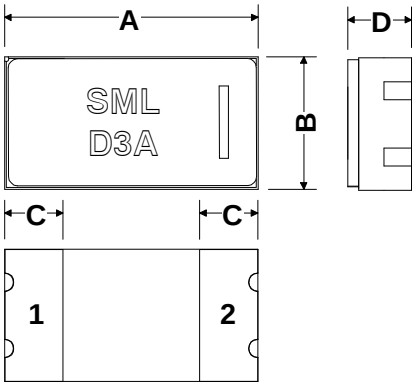
SML05SC06D3

Equivalent Reverse Recovery Time Device

I_F=500mA, I_R = 1A, I_{RR}=250mA

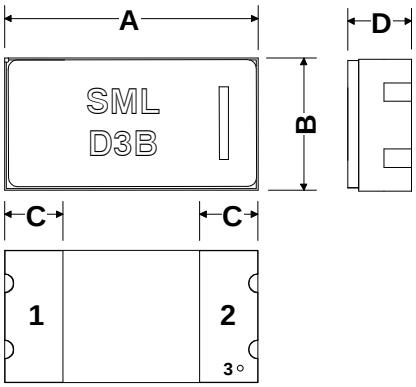


MECHANICAL DATA



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



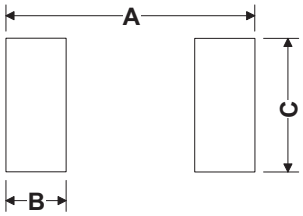
DLCC3 Variant B (D3B)

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.

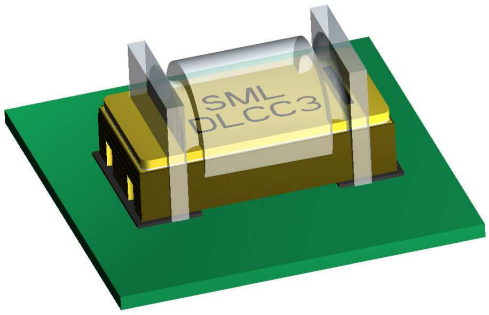
† The DLCC3 package design takes full advantage of the proven high reliability pedigree of the HTCC surface mount packaging technology, which is easily integrated for automated assembly. Semelab has taken the existing standards for ceramic surface mount package manufacture and added additional design 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

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.

Semelab's 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.

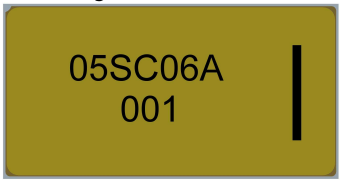
Alternative or additional customer specific conformance or screening requirements would be considered. Contact Semelab sales with enquires.

MARKING DETAILS

Parts can be laser marked with approximately 7 characters on two lines and always includes 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 Stability 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 SML05SC06D3A / SML05SC06D3B part with package variant B, JQRS screening, additional Group C conformance testing and a Data pack.

Part Numbers:
SML05SC06D3B-JQRS (Include quantity for flight parts)
SML05SC06D3B.GRPC (chargeable conformance option)
SML05SC06D3B.GCDE (charge for destructive parts)
SML05SC06D3B.GCDM (charge for destructive parts)
SML05SC06D3B.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.

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