

10SCT004 ULTRA-FAST TRANSIENT SURGE SUPPRESSOR

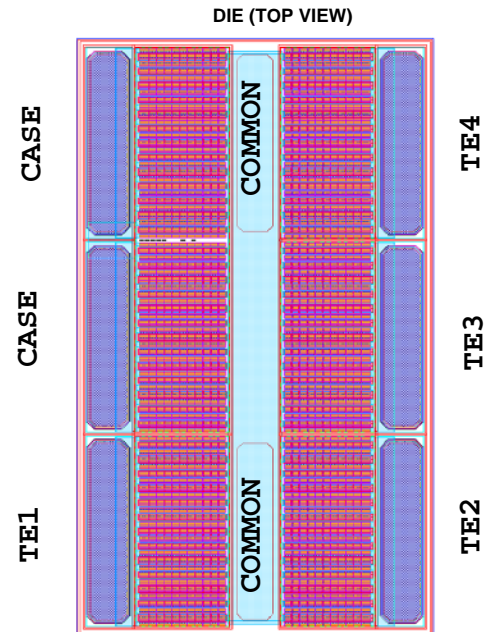
10SCT004 - PRELIMINARY SPECIFICATION - REVISION October 1st, 2019

- 20nSec Clamping Speed
- 9.65V Nominal Breakdown Voltage
- 12.8V Nominal Break-Over Voltage
- Small die size at 965um X 1590um
- Insensitive to MRI frequencies
- Case + 4 electrodes configuration
- Case guaranteed to 10A/10mSec
- Electrodes guaranteed to 5A/10mSec
- Low Cost

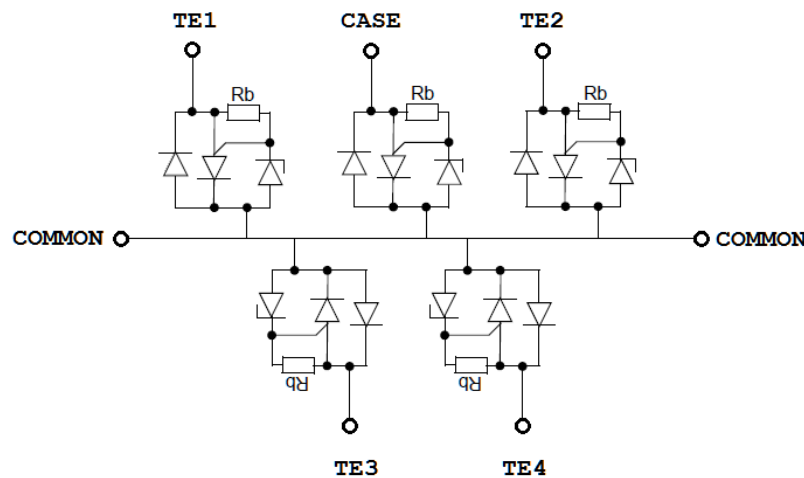
Description

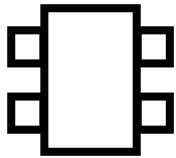
The 10SCT004 is a 12.8V SCR stack with 1 case and 4 electrodes configuration. Common electrode is available for adding additional devices in protection network.

This SCR is ultra fast with typical clamping speed of 20nSec.



Block Diagram:





10SCT004 ULTRA-FAST TRANSIENT SURGE SUPPRESSOR

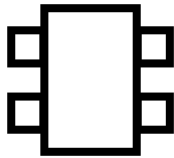
10SCT004 - PRELIMINARY SPECIFICATION - REVISION October 1st, 2019

Absolute maximum rating

CASE current (10mSec)..... 10A
 TERMINAL current (10mSec)..... 5A
 Storage temperature..... -65 C to 150 C

DC characteristics at room temperature (37C +/- 2C) (100% tested)

	PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
I _{LT}	TERMINAL TEx Leakage Current	V(TEx) = 8.0V; Measure Current	0	.03	0.10	uA
I _{LC}	CASE Leakage Current	V(CASE) = 8.0V; Measure Current	0	.06	0.20	uA
V _{tBR}	TERMINAL TEx Breakdown Voltage	I(TEx) = 1mA	9.15	9.65	10.15	V
V _{TBO}	TERMINAL TEx Break-Over Voltage	Current 0-1A in 1uSec, report maximum voltage	11.9	12.8	13.4	V
I _{TBO}	TERMINAL TEx Break-Over Current	Current 0-1A in 1uSec, report current at maximum voltage	15	150	500	mA
V _{CBR}	CASE Breakdown Voltage	I(CASE) = 2mA V(TE1) = V(TE2) = 0V	9.15	9.65	10.15	V
V _{CBO}	CASE Break-Over Voltage	Current 0-2A in 1uSec, report maximum voltage, V(TE1) = V(TE2) = 0V	11.9	12.8	13.4	V
I _{CBO}	CASE Break-Over Current	Current 0-2A in 1uSec, report current at maximum voltage, V(TE1) = V(TE2) = 0V	30	300	1000	mA
V _{TE02}	Terminal 0.2A Voltage	I(TE1) = 0.2A for 10uSec V(TE4) = 0V	1.5	2.5	4.0	V
V _{TE1}	Terminal 1A Voltage	I(TE1) = 1A for 10uSec V(TE4) = 0V	2.0	3.2	4.0	V
V _{TE5}	Terminal 5A Voltage	I(TE1) = 5A for 10mSec V(TE4) = 0V	3.0	4.2	5.0	V
V _{CA02}	Case 0.2A Voltage	I(CASE) = 0.2A for 10uSec V(TE1) = V(TE2) = V(TE3) = V(TE4)= 0V	1.5	2.5	4.0	V
V _{CA2}	Case 1A Voltage	I(CASE) = 2A for 10uSec V(TE1) = V(TE2) = V(TE3) = V(TE4)= 0V	2.0	3.2	4.0	V
V _{CA10}	Case 10A Voltage	I(CASE) = 10A for 10mSec V(TE1) = V(TE2) = V(TE3) = V(TE4)= 0V	3.0	4.2	5.0	V



10SCT004 ULTRA-FAST TRANSIENT SURGE SUPPRESSOR

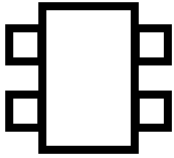
10SCT004 - PRELIMINARY SPECIFICATION - REVISION October 1st, 2019

Transient characteristics at body temperature (37C +/- 2C) (100% tested)

	PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t _{TBO}	Terminal Break-Over time	Current 0-1A in 1uSec, measure time between V(V _{TBR})+1V and V(V _{TBO})+1V V(CASE) = 0V	0	20	50	nSec
t _{CB0}	Case Break-Over time	Current 0-1A in 1uSec, measure time between V(V _{CBR})+1V and V(V _{CBO})+1V V(TE1) = V(TE2) = 0V	0	20	50	nSec

Transient characteristics at room temperature (25C +/- 5C) (22 samples/batch tested)

	PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
C _{TT}	TE1-TE2 Capacitance	10kHz 100mVp V(TE1) = V(TE2) = 0V	0	10	20	pF
C _{CT}	Case-TE _x Capacitance	10kHz 100mVp V(CASE) = V(TE1) = 0V;	0	20	40	pF
dV/dt	Transient Voltage response	V(TE2) 0 to 10V in 4nSec (10%-90%) V(TE1) = 0V; Measure V(TE2) at 1uSec	9.0	10.0	10.5	Vp
RF64	Sensitivity to 64MHz	Apply 32Vpp 64MHz from 50Ohm, measure Vp(TE1)	9.0	13.0	14.5	Vp
RF128	Sensitivity to 128MHz	Apply 32Vpp 128MHz from 50Ohm, measure Vp(TE1)	9.0	13.0	14.5	Vp
DC64	Sensitivity to DC + 64MHz	Apply 10Vpp 64MHz from 50Ohm, add 4.2Vdc measure rectified current	0	1	30	uA
DC128	Sensitivity to DC + 128MHz	Apply 10Vpp 128MHz from 50Ohm, add 4.2Vdc measure rectified current	0	1	30	uA



10SCT004 ULTRA-FAST TRANSIENT SURGE SUPPRESSOR

10SCT004 - PRELIMINARY SPECIFICATION - REVISION October 1st, 2019

Typical Charts

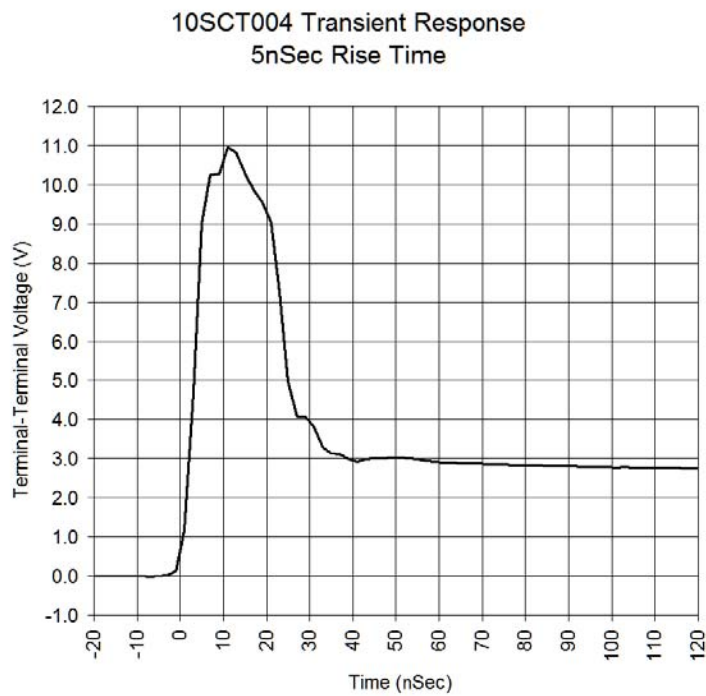
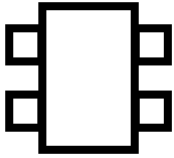


Fig. 1: SCR switching characteristics. Current is switched from 0 to 0.5A in <10nSec and SCR responds from 10V to 4V in about 17nSec.



10SCT004 ULTRA-FAST TRANSIENT SURGE SUPPRESSOR

10SCT004 - PRELIMINARY SPECIFICATION - REVISION October 1st, 2019

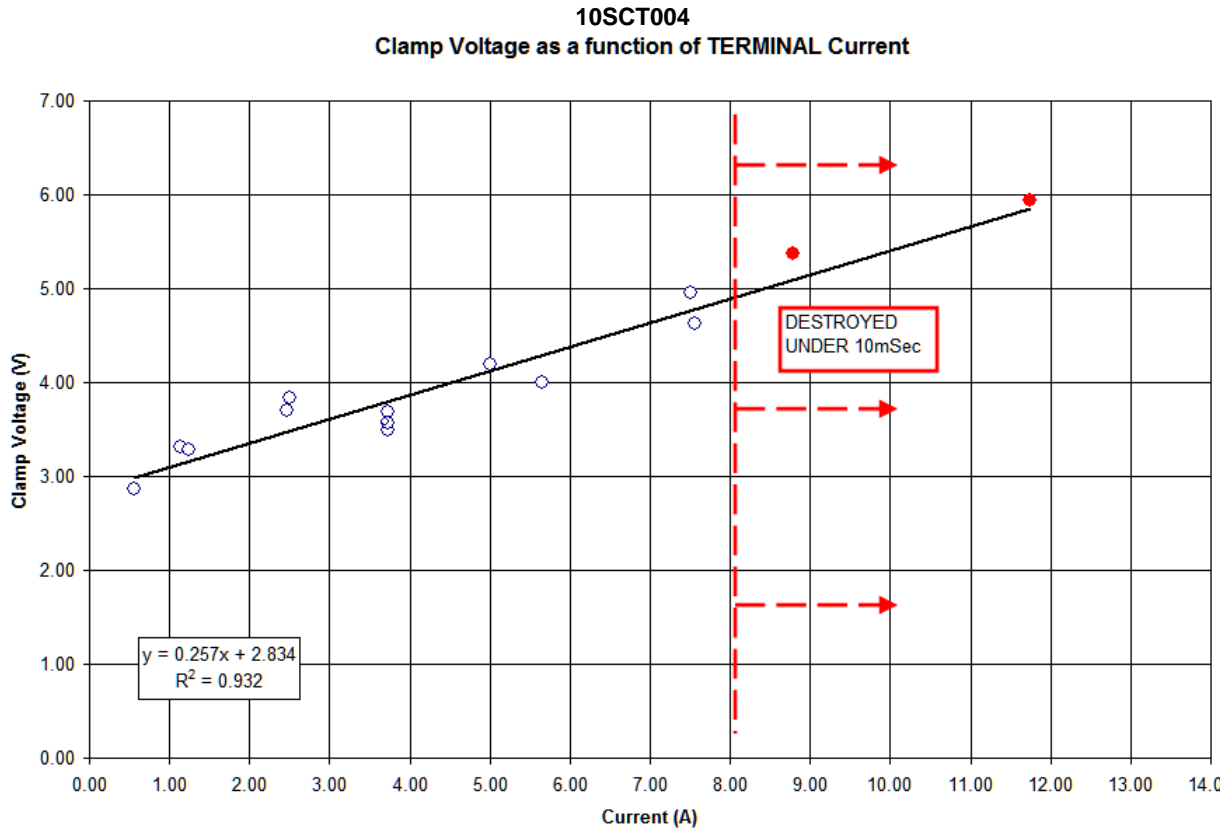
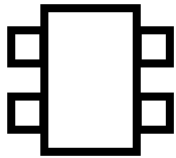


Fig. 2: SCR clamping characteristics. Current is increased up to 8A without terminal destruction. Upper current specification is 5A with clamp voltage < 5V for the 10SCT004.



10SCT004 ULTRA-FAST TRANSIENT SURGE SUPPRESSOR

10SCT004 - PRELIMINARY SPECIFICATION - REVISION October 1st, 2019

Die dimensions

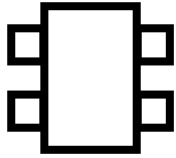
	PARAMETER	MIN	TYP	MAX	UNIT
Y _{SIZE}	Short Side Dimensions	940	965	990	μm
X _{SIZE}	Long Side Dimensions	1565	1590	1615	μm
Z _{SIZE}	Die Thickness	260	285	310	μm

Product qualification tests

PARAMETER	Lot Sampled	Sample Size	Fails Allowed	UNIT
Static burn-in 1000hrs @ V _{BIAS} =8V; MIL STD 883 method 1015	3	22	0	n/a
Physical dimensions	3	11	0	n/a
Wire Bond Evaluation (Gold Ball Bond) per MIL STD 883 method 2011	3	20	1	n/a
64MHz Peak Voltage to trigger SCR (TE1-TE2)	3	22	0	
128MHz Peak Voltage to trigger SCR (TE1-TE2)	3	22	0	

Visual inspection

PARAMETER	Lot Sampled	Sample Size	Fails Allowed	UNIT
100% Visual Inspection per MIL STD 883H Method 2010 Condition S.	ALL	100%	n/a	n/a



10SCT004 ULTRA-FAST TRANSIENT SURGE SUPPRESSOR

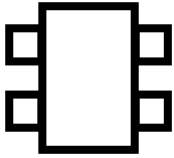
10SCT004 - PRELIMINARY SPECIFICATION - REVISION October 1st, 2019

Lot acceptance tests

PARAMETER	Lot Sampled	Sample Size	Fails Allowed	UNIT
Static burn-in 125C; 168hrs; $V_{BIAS}=32V$; $V_r=2.25V$; $R=2000\ \Omega$ MIL STD 883 method 1015	each	22	0	n/a
Physical dimensions	each	11	0	n/a
Wire Bond Evaluation (Gold Ball Bond) per MIL STD 883 method 2011	each	20	1	n/a
64MHz Peak Voltage to trigger SCR (TE1-TE2)	each	22	0	
128MHz Peak Voltage to trigger SCR (TE1-TE2)	each	22	0	

Product qualification tests are done on 3 batches only while lot acceptance test are performed on each "diffusion lot". Lot acceptance tests (LAT) are considered done if the lot in question was used for product qualification.

All samples used for qualification and LAT burn-in test are assembled in a open cavity ceramic DIL.



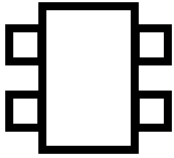
10SCT004 ULTRA-FAST TRANSIENT SURGE SUPPRESSOR

10SCT004 - PRELIMINARY SPECIFICATION - REVISION October 1st, 2019

Spice Model (Nominal)

```
.subckt 10SCT004 CASE T1 T2 T3 T4
XX1 N001 T1 scrcellvlp2
XX2 N001 T2 scrcellvlp2
XX3 N001 T3 scrcellvlp2
XX4 N001 T4 scrcellvlp2
XX5 N001 CASE scrcellvlp2 params: UNIT={57.5*2}
.ends 10SCT004

.subckt scrcellvlp2 Anode Cathode
.PARAM NUNIT=57.5
Q2 NPNbase ESD03 N001 0 PNPA {NUNIT} OFF
RshuntPNP N001 PNPbase {250/NUNIT}
D1 Anode ESD01 DZ {NUNIT}
RshuntNPN NPNbase Anode {200/NUNIT}
Q3 ESD03 P001 Anode 0 NPNESD {NUNIT}
R2NDCAP ESD03 PNPbase {30/NUNIT}
R1NDCAP PNPbase ESD01 {300/NUNIT}
D2 Anode N002 DZ2 {NUNIT}
R1 Cathode N001 {6.08/NUNIT}
R2 NPNbase P001 {1/NUNIT}
D3 N002 N001 DZ2 {NUNIT}
.model DZ D(Is={89*5*.001f} N=1.0500 Rs=.24711 Ikf=1.0080 Cjo=80f
+ M=.35891 Vj=.77639 Isr=1.6251E-14 Nr=3.4 Bv=9.10 Ibv=1.0e-6
+ tt=18.2n Nbv=0.1 Tbv1=0.00081 Ibv1=2.5e-9 nbv1=14)
.model PNPA PNP(IBC={1E-14} IBE=1e-14 ISC=1e-15 VAF=500 BF=200 IKF=0.4 XTB=1.5 BR=4
+ CJC={0} CJE={0} RB=0.2 RC=0.1 RE=0.1
+ TR=10.0E-9 TF=10.90E-9 ITF=1 VTF=2 XTF=3 XTI=3 eg=0.9)
.model NPNESD NPN(IS=1E-14 VAF=100 Bf=300 IKF=0.4 XTB=1.5 BR=20
+ CJC={0} CJE={0} RB=0.2 RC=0.1 ISC=1e-15
+ RE=0.1 TR=5.0E-9 TF=2.4E-9 ITF=1 VTF=2 XTF=3 )
.model DZ2 D(Is={5*.001f} N=1.1500 Rs=.24711 Ikf=1.0080 Cjo=100f
+ M=.35891 Vj=.77639 Isr=1.6251E-14 Nr=3.4 Bv=26.0 Ibv=1e-9
+ tt=18.2n Nbv=0.4 Tbv1=0.00081 )
.ends scrcellvlp2
```

10SCT004 ULTRA-FAST TRANSIENT SURGE SUPPRESSOR

10SCT004 - PRELIMINARY SPECIFICATION - REVISION October 1st, 2019

Die dimensions: 965um (+/-25um) X 1590um (+/-25um).

Thickness 285um +/-25um. Dimensions below in um (+/-1um unless noted).

