

Description

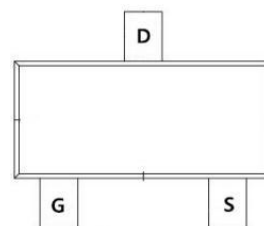
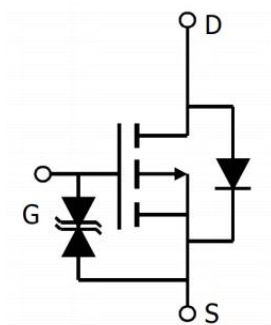
The SX3415AI uses advanced trench
It utilizes the latest processing techniques
to achieve the high cell density and reduces the
on-resistance with high repetitive avalanche rating.
These features combine to make this design
an extremely efficient and reliable device for use
in power switching application and a wide variety
of other applications

General Features

$V_{DS} = -20V, I_D = -4.2A$
 $R_{DS(ON)} < 43m\Omega @ V_{GS} = -4.5V$
ESD=3000V HBM

Application

Advanced MOSFET process technology
Special designed for PWM, load switching and
general purpose applications
Ultra low on-resistance with low gate charge
Fast switching and reverse body recovery
150°C operating temperature



Absolute max Rating: @ $T_A=25^\circ C$ unless otherwise specified

Symbol	Parameter	Max.	Units
$I_D @ TC = 25^\circ C$	Continuous Drain Current, $V_{GS} @ -4.5V$	-4.2 ^①	A
$I_D @ TC = 70^\circ C$	Continuous Drain Current, $V_{GS} @ -4.5V$	-2.4 ^①	
I_{DM}	Pulsed Drain Current ^②	-30	
$P_D @ TC = 25^\circ C$	Power Dissipation ^③	1.4	W
V_{DS}	Drain-Source Voltage	-20	V
V_{GS}	Gate-to-Source Voltage	± 12	V
T_J, T_{STG}	Operating Junction and Storage Temperature Range	-55 to +150	$^\circ C$
$R_{\theta JA}$	Junction-to-ambient ($t \leq 10s$) ^④	90	$^\circ C/W$

Electrical Characterizes @T_A=25°C unless otherwise specified

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
V(BR)DSS	Drain-to-Source breakdown voltage	V _{GS} = 0V, I _D = -250μA	-20	—	—	V
R _{DS(on)}	Static Drain-to-Source on-resistance	V _{GS} =-4.5V, I _D = -4A	—	37	43	mΩ
		V _{GS} =-2.5V, I _D = -4A	—	45	54	
		V _{GS} =-1.8V, I _D = -2A	—	56	73	
		V _{GS} =-1.8V, I _D = -2A	—	56	73	
V _{GS(th)}	Gate threshold voltage	V _{DS} = V _{GS} , I _D = -250μA	-0.3	—	-1.0	V
		T _J = 125°C	—	-0.44	—	
I _{DSS}	Drain-to-Source leakage current	V _{DS} = -16V, V _{GS} = 0V	—	—	-1	μA
		T _J = 125°C	—	—	-50	
I _{GSS}	Gate-to-Source forward leakage	V _{GS} =8V	—	—	10	μA
		V _{GS} = -8V	—	—	-10	
Q _g	Total gate charge	I _D = -4A, V _{DS} =-10V, V _{GS} = -4.5V	—	10	—	nC
Q _{gs}	Gate-to-Source charge		—	0.77	—	
Q _{gd}	Gate-to-Drain("Miller") charge		—	3.5	—	
t _{d(on)}	Turn-on delay time	V _{GS} =-4.5V, V _{DS} =-10V, R _{GEN} =3Ω,	—	10	—	ns
t _r	Rise time		—	8.6	—	
t _{d(off)}	Turn-Off delay time		—	29	—	
t _f	Fall time		—	13	—	
C _{iss}	Input capacitance	V _{GS} = 0V, V _{DS} =-10V, f = 1MHz	—	939	—	pF
C _{oss}	Output capacitance		—	130	—	
C _{rss}	Reverse transfer capacitance		—	111	—	

Source-Drain Ratings and Characteristics

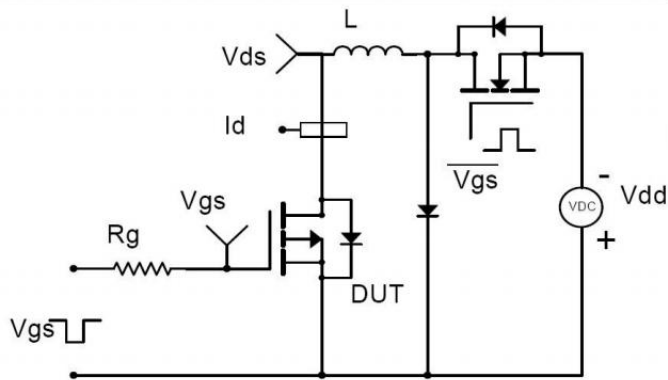
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
I _S	Continuous Source Current (Body Diode)	MOSFET symbol showing the integral reverse p-n junction diode.	—	—	-4.2A ①	A
I _{SM}	Pulsed Source Current (Body Diode)		—	—	-30	A
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V	—	-0.76	-1.0	V
t _{rr}	Reverse Recovery Time	T _J = 25°C, I _F =-4A, di/dt = 100A/μs	—	8.7	—	ns
Q _{rr}	Reverse Recovery Charge		—	2.3	—	nC

Notes:

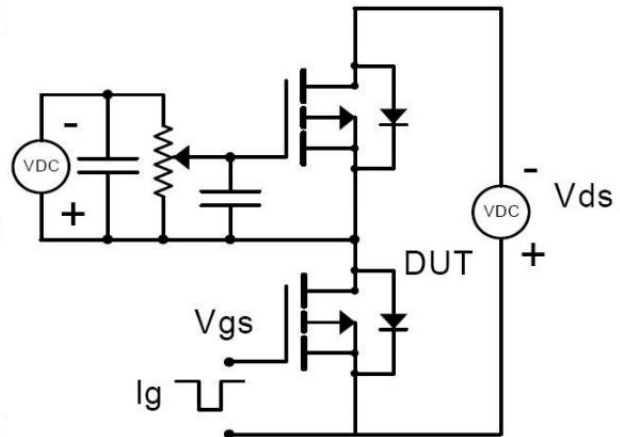
- ① Calculated continuous current based on maximum allowable junction temperature.
- ② Repetitive rating; pulse width limited by max. junction temperature.
- ③ The power dissipation P_D is based on max. junction temperature, using junction-to-case thermal resistance.
- ④ The value of R_{θJA} is measured with the device mounted on 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with T_A =25°C

Test circuits and Waveforms

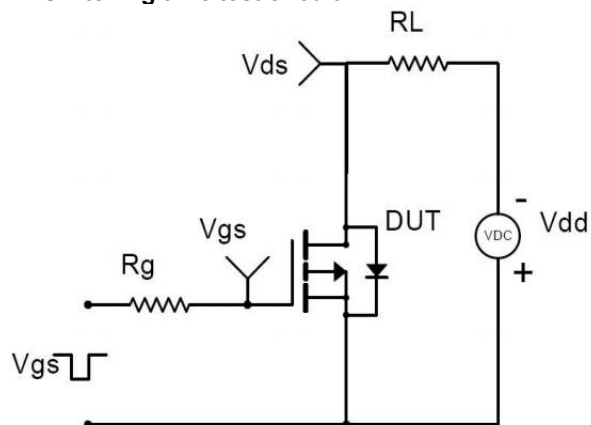
EAS test circuit:



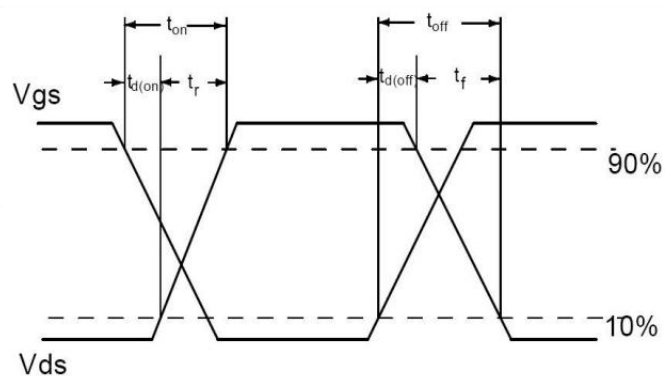
Gate charge test circuit:



Switching time test circuit:



Switch Waveforms:



Typical electrical and thermal characteristics

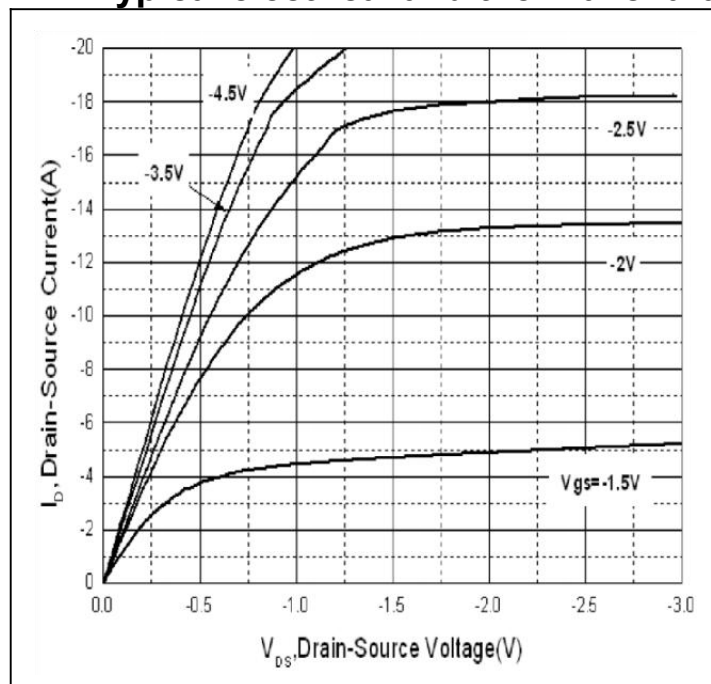


Figure 1: Typical Output Characteristics

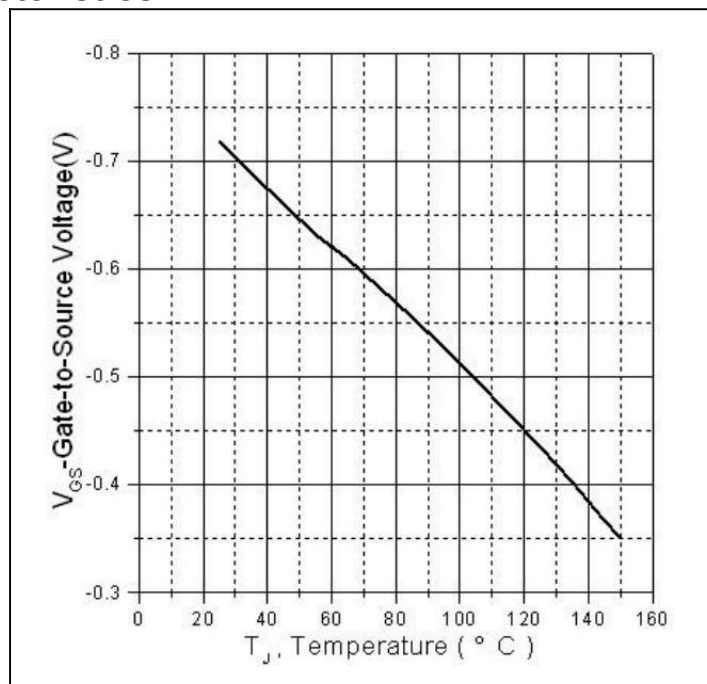


Figure 2. Gate to source cut-off voltage

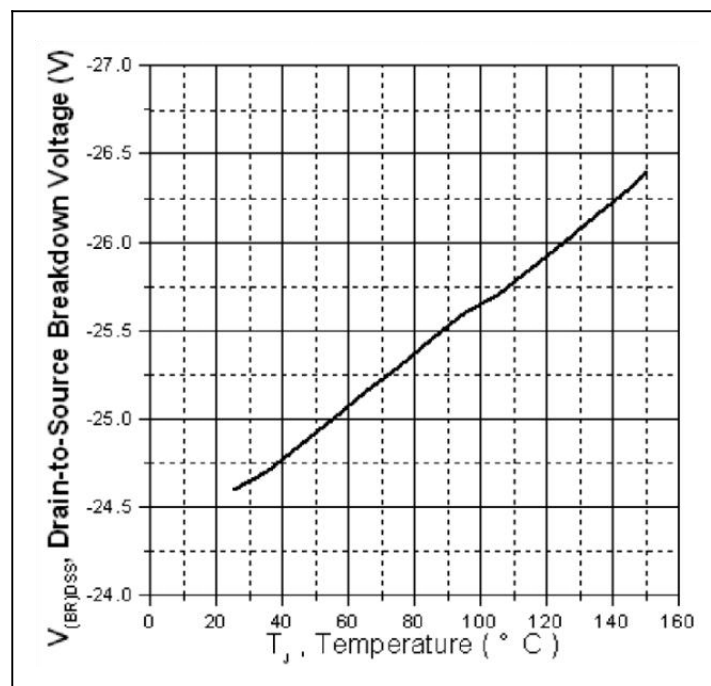


Figure 3. Drain-to-Source Breakdown Voltage Vs.

Case Temperature

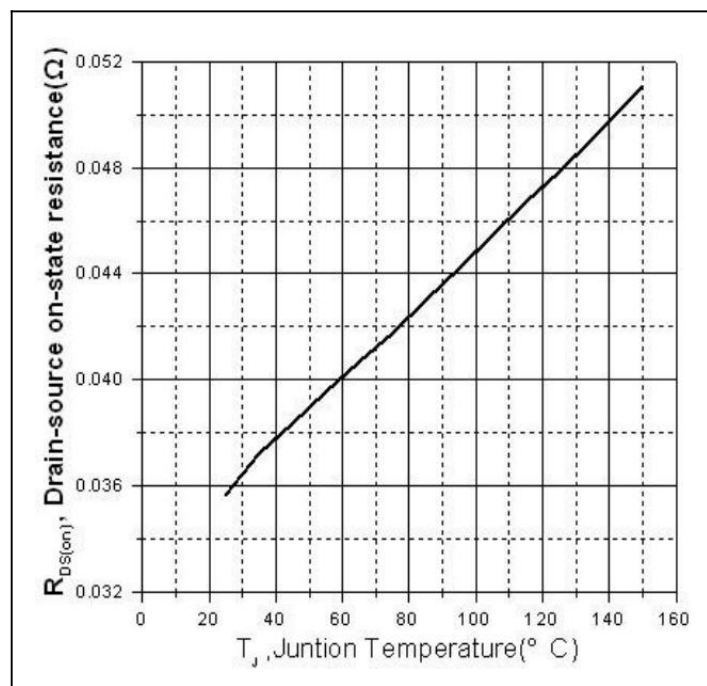


Figure 4: Normalized On-Resistance Vs. Case

Temperature

Typical electrical and thermal characteristics

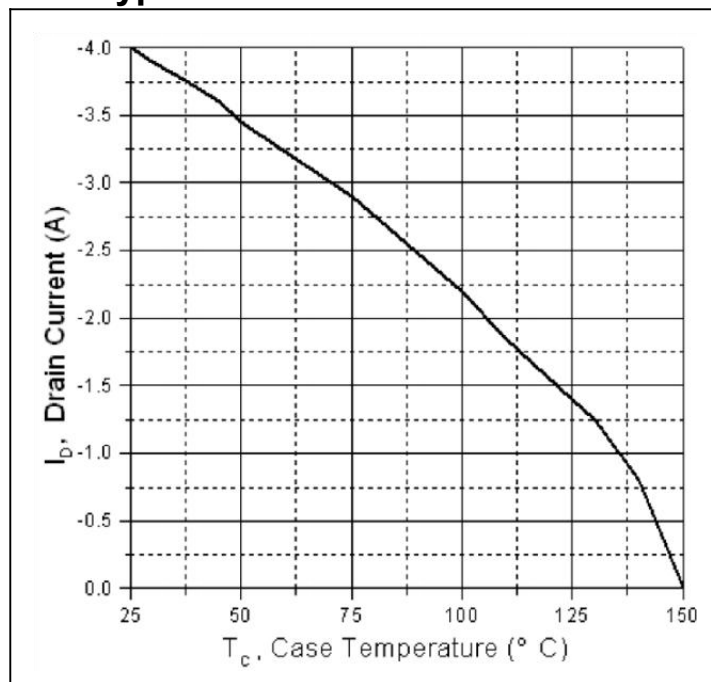


Figure 5. Maximum Drain Current Vs. Case Temperature

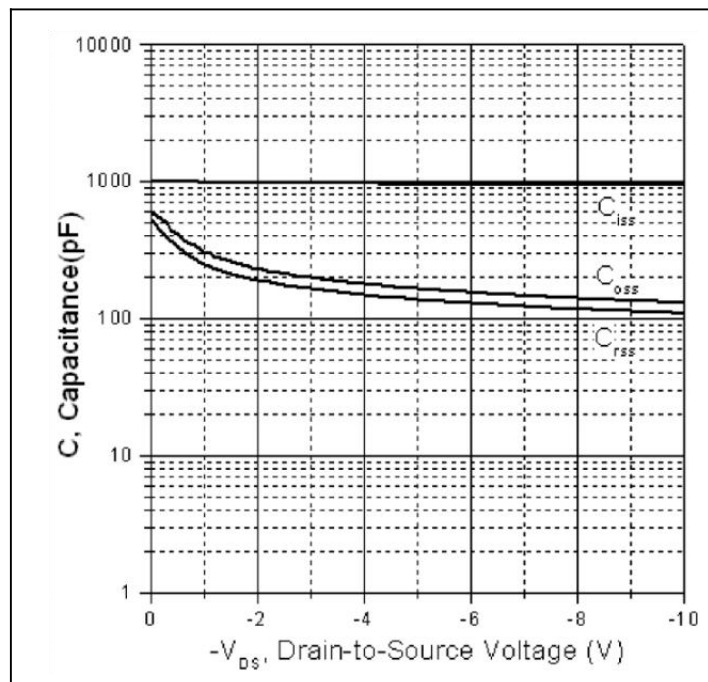


Figure 6. Typical Capacitance Vs. Drain-to-Source Voltage

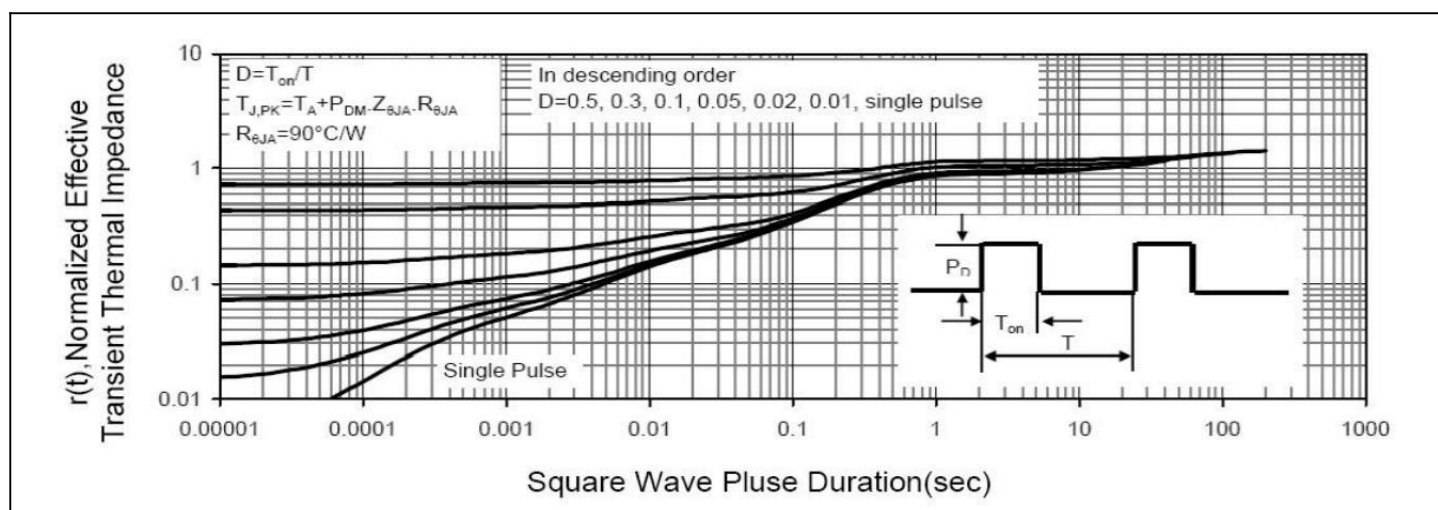
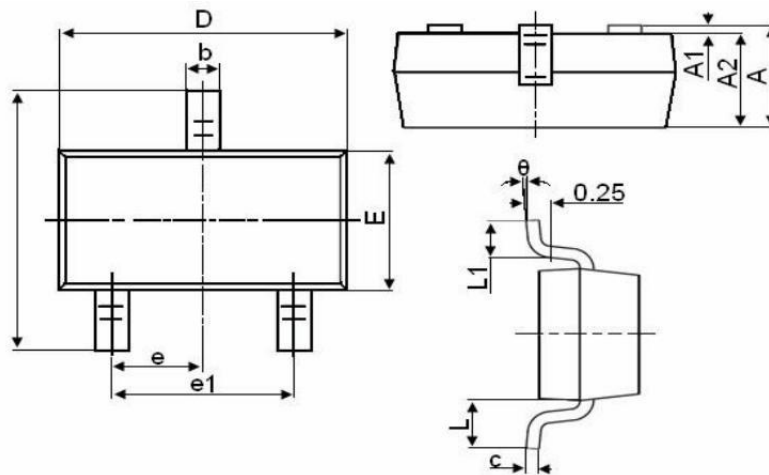


Figure7. Maximum Effective Transient Thermal Impedance Junction-to-Case

Package Mechanical Data-SOT23-XC-Single


Symbol	Dimensions in Millimeters	
	MIN.	MAX.
A	0.900	1.150
A1	0.000	0.100
A2	0.900	1.050
b	0.300	0.500
c	0.080	0.150
D	2.800	3.000
E	1.200	1.400
E1	2.250	2.550
e	0.950TYP	
e1	1.800	2.000
L	0.550REF	
L1	0.300	0.500
θ	0°	8°

Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
TAPING	SOT-23		3000