JSMICRO
杰 盛 微

Aug 2002

SI3407
P-Channel Enhancement Mode Field Effect Transistor

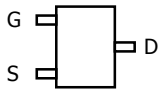
General Description

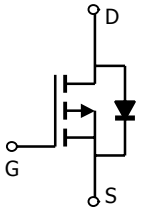
The SI3407 uses advanced trench technology to provide excellent $R_{DS(ON)}$ with low gate charge. This device is suitable for use as a load switch or in PWM applications.

Features

V_{DS} (V) = -30V
I_D = -4.2 A
$R_{DS(ON)}$ < 45mΩ (V_{GS} = -10V)
$R_{DS(ON)}$ < 87mΩ (V_{GS} = -4.5V)

TO-236
(SOT-23)
Top View





Absolute Maximum Ratings T_A=25°C unless otherwise noted

Parameter		Symbol	Maximum	Units
Drain-Source Voltage		V_{DS}	-30	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current [A]	T_A=25°C	I_D	-3.5	A
	T_A=70°C		-3	
Pulsed Drain Current [B]		I_{DM}	-20	
Power Dissipation [A]	T_A=25°C	P_D	1.4	W
	T_A=70°C		1	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150	°C

Thermal Characteristics

Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	65	90	°C/W
Maximum Junction-to-Ambient [A]	Steady-State		85	125	°C/W
Maximum Junction-to-Lead [C]	Steady-State	$R_{\theta JL}$	43	60	°C/W

Electrical Characteristics (T_J=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV_{DSS}	Drain-Source Breakdown Voltage	I_D=-250μA, V_{GS}=0V	-30			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=-24V, V_{GS}=0V			-1	μA
		T_J=55°C			-5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}=±20V			±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=-250μA	-1	-1.8	-3	V
$I_{D(ON)}$	On state drain current	V_{GS}=-4.5V, V_{DS}=-5V	-10			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=-10V, I_D=-4.1A		40.5	52	mΩ
		T_J=125°C		57	73	
		V_{GS}=-4.5V, I_D=-3A		64	87	mΩ
g_{FS}	Forward Transconductance	V_{DS}=-5V, I_D=-4A	5.5	8.2		S
V_{SD}	Diode Forward Voltage	I_S=-1A,V_{GS}=0V		-0.77	-1	V
I_S	Maximum Body-Diode Continuous Current				-2.2	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=-15V, f=1MHz		700		pF
C_{oss}	Output Capacitance			120		pF
C_{rss}	Reverse Transfer Capacitance			75		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		10		Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge (10V)	V_{GS}=-4.5V, V_{DS}=-15V, I_D=-4A		14.3		nC
Q_g	Total Gate Charge (4.5V)			7		nC
Q_{gs}	Gate Source Charge			3.1		nC
Q_{gd}	Gate Drain Charge			3		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=-10V, V_{DS}=-15V, R_L=3.6Ω, R_{GEN}=3Ω		8.6		ns
t_r	Turn-On Rise Time			5		ns
$t_{D(off)}$	Turn-Off DelayTime			28.2		ns
t_f	Turn-Off Fall Time			13.5		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=-4A, dI/dt=100A/μs		27		ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=-4A, dI/dt=100A/μs		15		nC

A: The value of $R_{\theta JA}$ is measured with the device mounted on 1in^2 FR-4 board with 2oz. Copper, in a still air environment with T_A =25°C. The value in any a given application depends on the user's specific board design. The current rating is based on the t≤ 10s thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

C. The $R_{\theta JA}$ is the sum of the thermal impedence from junction to lead $R_{\theta JL}$ and lead to ambient.

D. The static characteristics in Figures 1 to 6,12,14 are obtained using 80μs pulses, duty cycle 0.5% max.

E. These tests are performed with the device mounted on 1 in^2 FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C. The SOA curve provides a single pulse rating.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

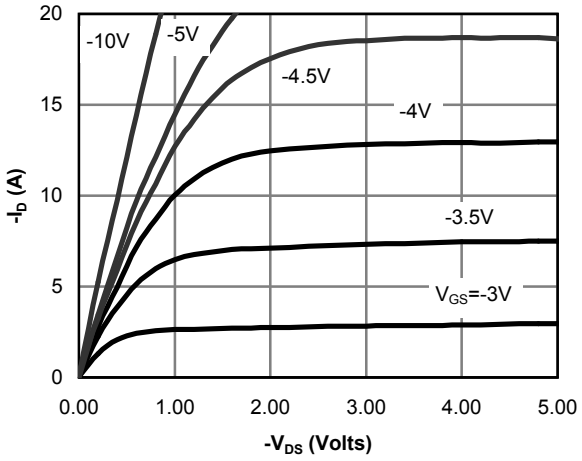


Figure 1: On-Region Characteristics

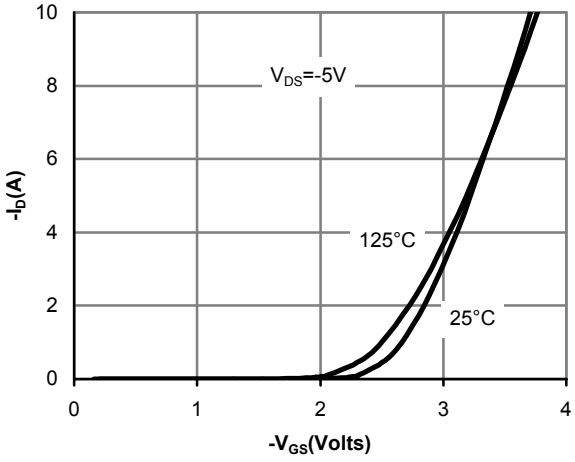


Figure 2: Transfer Characteristics

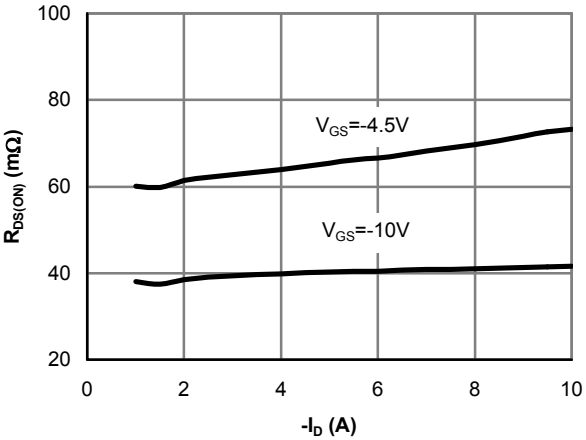


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

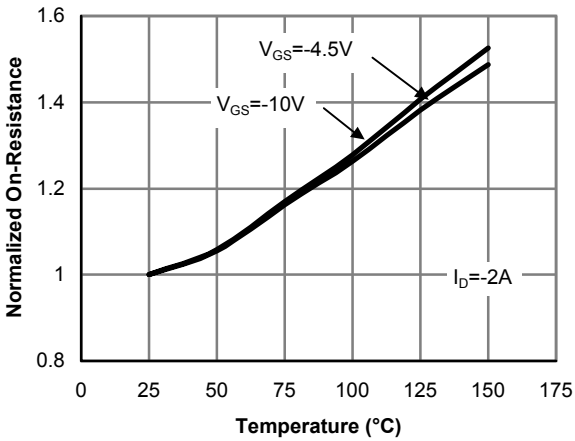


Figure 4: On-Resistance vs. Junction Temperature

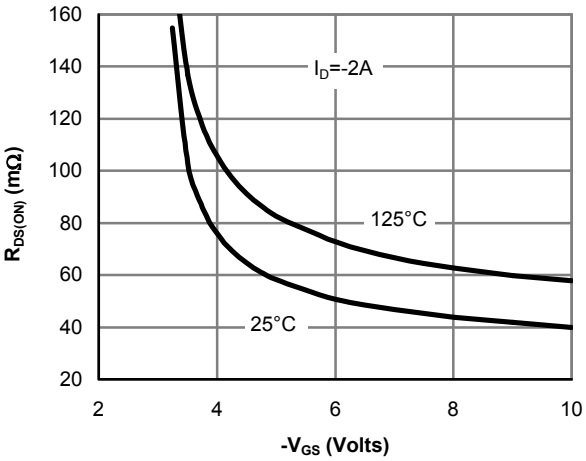


Figure 5: On-Resistance vs. Gate-Source Voltage

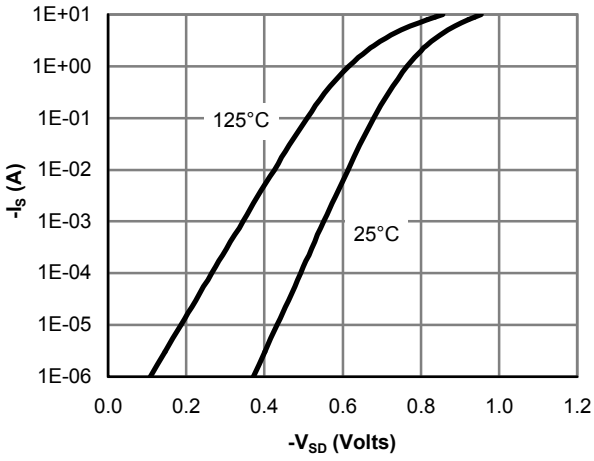


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

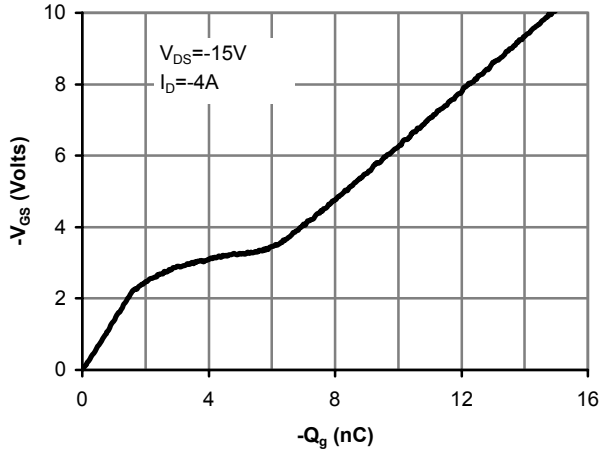


Figure 7: Gate-Charge Characteristics

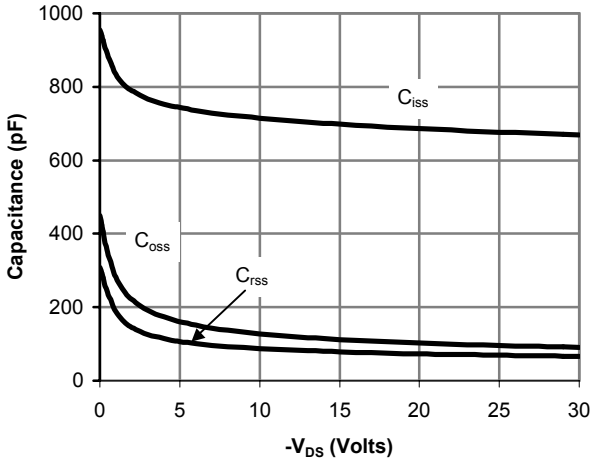


Figure 8: Capacitance Characteristics

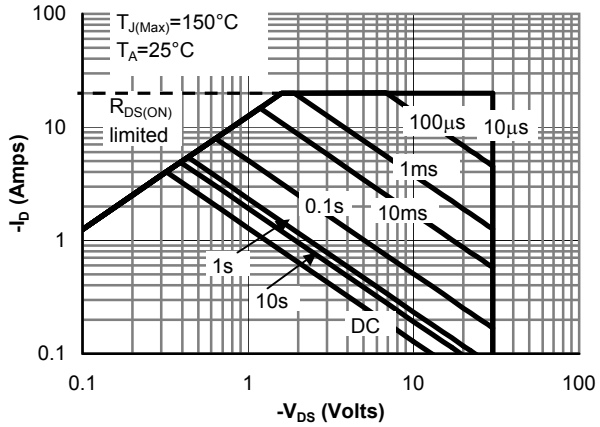


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

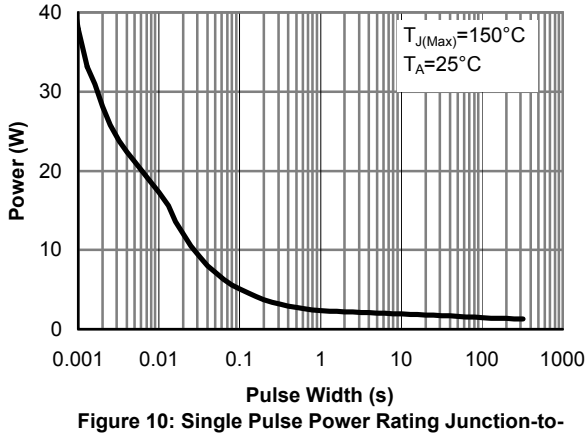


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

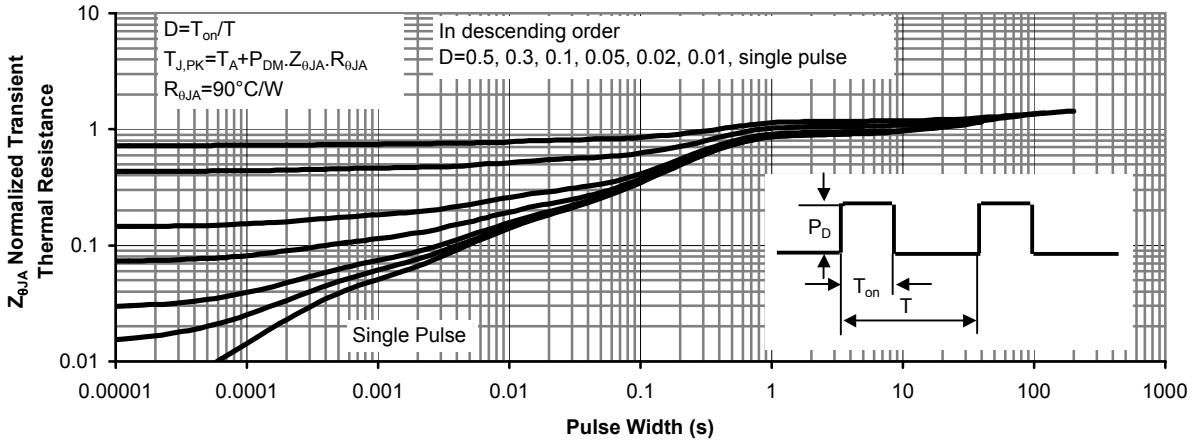
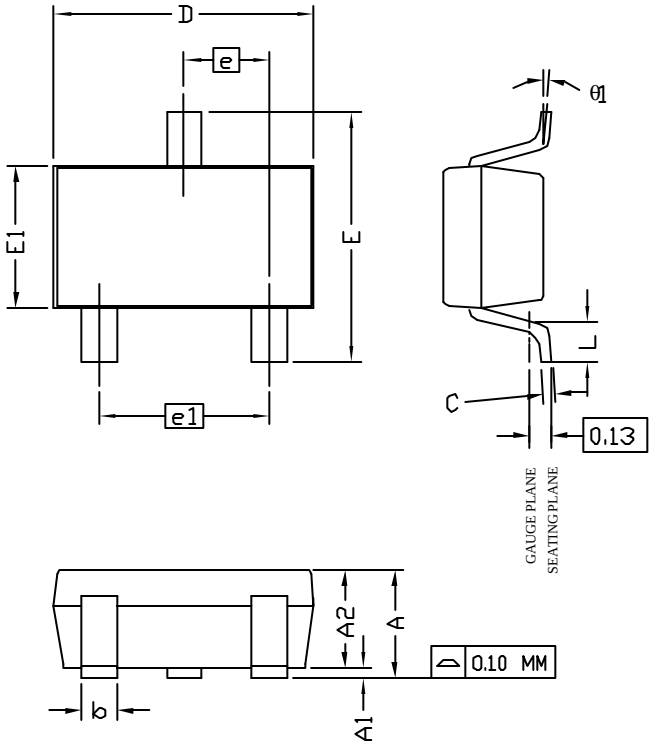


Figure 11: Normalized Maximum Transient Thermal Impedance

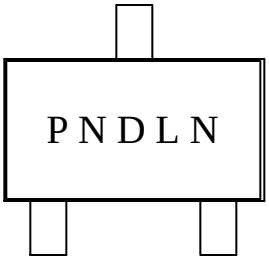
TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS



SYMBOLS	DIMENSIONS IN MILLIMETERS		
	MIN	NOM	MAX
A	1.00	——	1.25
A1	0.00	——	0.10
A2	1.00	1.10	1.15
b	0.35	0.40	0.50
C	0.10	0.15	0.25
D	2.80	2.90	3.04
E	2.60	2.80	2.95
E1	1.40	1.60	1.80
e	——	0.95 BSC	——
e1	——	1.90 BSC	——
L	0.40	——	0.60
θ1	1°	5°	8°

NOTE:
1. LEAD FINISH: 150 MICROINCHES (3.8 um) MIN. THICKNESS OF Tin/Lead (SOLDER) PLATED ON LEAD
2. TOLERANCE ±0.10 mm (4 mil) UNLESS OTHERWISE SPECIFIED
3. COPLANARITY : 0.10 mm
4. DIMENSION L IS MEASURED IN GAGE PLANE

PACKAGE MARKING DESCRIPTION

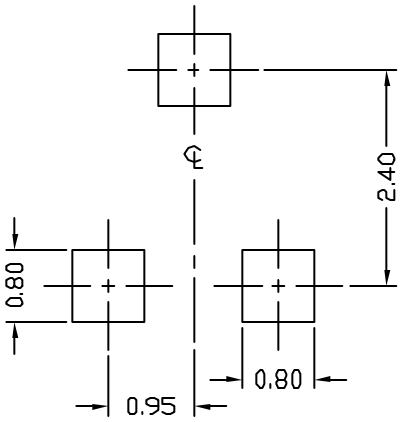


SOT-23 PART NO. CODE

PART NO.	CODE
SI3407	A7

NOTE:
P N - PART NUMBER CODE.
D - YAER AND WEEK CODE.
L N - ASSEMBLY LOT CODE, FAB AND ASSEMBLY LOCATION CODE.

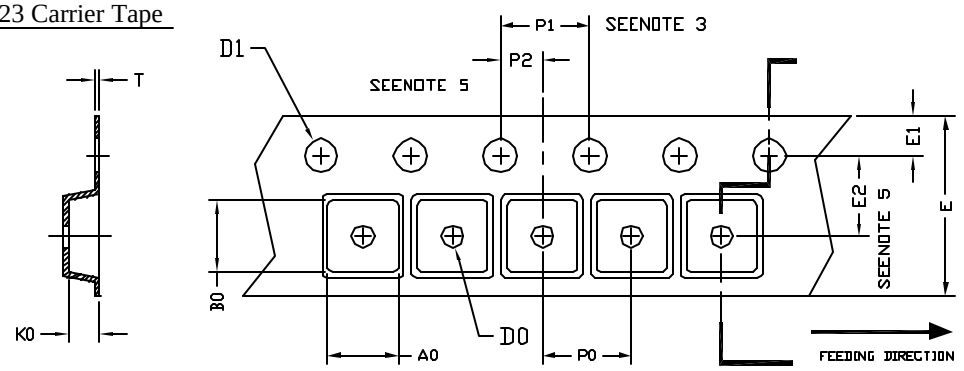
RECOMMENDATION OF LAND PATTERN



Rev. A

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

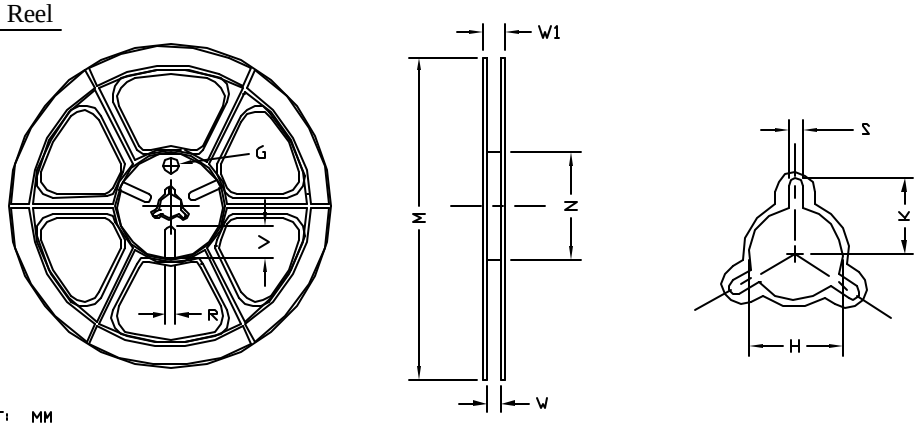
SOT-23 Carrier Tape



UNIT: MM

PACKAGE	A0	B0	K0	D0	D1	E	E1	E2	P0	P1	P2	T
SOT-23 (8 mm)	3.15 ±0.10	3.20 ±0.10	1.40 ±0.10	1.00 MIN	1.50 +0.10	8.00 ±0.30	1.75 ±0.10	3.50 ±0.05	4.00 ±0.10	4.00 ±0.10	2.00 ±0.05	0.25 ±0.05

SOT-23 Reel



UNIT: MM

TAPE SIZE	REEL SIZE	M	N	W	W1	H	K	S	G	R	V
8 mm	Ø180	Ø180.00 ±0.50	Ø60.50	9.00 ±0.30	11.40 ±1.00	Ø13.00 +0.50 -0.20	10.60	2.00 ±0.50	Ø9.00	5.00	18.00

SOT-23 Tape

Leader / Trailer & Orientation

