40V P-Channel Fast Switching MOSFET

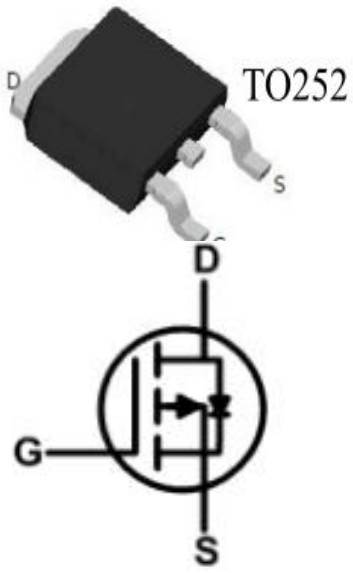
Features

●V_{DSS}=-40V I_D=-52A
$R_{DS(ON)}$=13mΩ(max.)@V_{GS}=-10V
$R_{DS(ON)}$=20mΩ(max.)@V_{GS}=-4.5V
●Excellent CdV/dt effect decline
●Super Low Gate Charge
●100% EAS Guaranteed
●Green Device Available
●Advanced high cell density Trench technology

Applications

●The SI4115D is the high cell density trenched P-ch MOSFETS, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications.
●The SI4115D meet the ROHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

PIN DESCRIPTION



Part Number	Package	Marking	ROHS Status	Packing
SI4115D	TO-252	D4115	Halogen-Free	Tape&Reel

Absolute Maximum Ratings (T_A=25℃ unless otherwise noted)

Symbol	Parameter		Ratings	Unit
V_{DS}	Drain-Source Voltage		-40	V
V_{GS}	Gate-Source Voltage		±20	V
I_D	Continuous Drain Current,V_{GS}=-10V	Tc=25°C	-52	A
		Tc=100°C	-32	A
I_{DM}	Pulsed Drain Current		-105	A
I_{AS}	Avalanche Current		-54	A
E_{AS}	Single Pulse Avalanche Energy		146	mJ
T_J, T_{stg}	Operating Junction and Storage Temperature Range		-55 to 150	°C
P_D	Total Power Dissipation	Tc=25°C	52.1	W
		T_A=25°C	2	W

THERMAL RESISTANCE RATINGS

Symbol	Paramete	Typical	Max	Unit
$R_{\theta JA}$	Maximum Junction-to-Ambient	-	62	℃/W
$R_{\theta JC}$	Maximum Junction-to-Case	-	2.4	

Electrical Characteristics (TJ=25℃ unless otherwise Ratings)

Symbol	Parameter	Test Conditions	Min.	TYP.	Max.	Unit
Static Characteristics						
B_{VDSS}	Drain-source breakdown voltage	V_{GS}=0V,I_{DS}=-250uA	-40	-	-	V
$V_{GS(th)}$	Gate threshold voltage	V_{DS}=V_{GS},I_{DS}=-250uA	-1.0	-	-2.5	V
I_{DSS}	Drain-Source Leakage Current	V_{DS}=-32V,V_{GS}=0V Tj=25℃	-	-	-1	uA
		V_{DS}=-32V,V_{GS}=0V, Tj=55℃	-	-	-5	uA
I_{GSS}	Gate-source leakage current	V_{GS}=±20V,V_{DS}=0V	-	-	±100	nA
$R_{DS(on)}$	Drain-source on-state resistance	V_{GS}=-10V,I_D=-18A	-	-	13	mΩ
		V_{GS}= -4.5V, I_D=-12A	-	-	20	mΩ
Gfs	Forward Transconductance	V_{DS}=-5V , I_D=-18A	-	24	-	S
Rg	Gate Resistance	V_{DS}=0V,V_{GS}=0V , f=1MHz	-	-	14	Ω
Dynamic Characteristic						
Qg	Total Gate Charge	V_{GS}=-4.5V,V_{DS}=-20V I_{DS}=-12A	-	27.9	-	nC
Qgs	Gate-Source Charge		-	7.7	-	nC
Qgd	Gate-Drain Charge		-	7.5	-	nC
$T_{d(on)}$	Turn-on delay time	I_D=-1A,V_{GS}=-10V V_{DD}=-15V,R_G=3.3Ω	-	40	-	nS
T_r	Rise time		-	35.2	-	nS
$T_{d(off)}$	Turn-off delay time		-	100	-	nS
T_f	Fall time		-	9.6	-	nS
C_{iss}	Input Capacitance	V_{GS}=0V,V_{DS}=-15V f=1.0MHz	-	3500	-	pF
C_{oss}	Output Capacitance		-	323	-	pF
C_{rss}	Reverse Transfer Capacitance		-	222	-	pF
Source-Drain Diode						
V_{SD}	Diode Forward Voltage	V_{GS}=0V,I_S=-1A	-	-	-1	V
I_{SM}	Pulsed Source Current	V_G=V_D=0V Force Current	-	-	-105	A
I_S	Continuous Source Current		-	-	-52	A

Notes:

1. The data tested by surface mounted on a 1 inch ^{2} FR-4 board with 2OZ copper.
2. The data tested by pulsed , pulse width ≦300us , duty cycle ≦2%
3. The E_{AS} data shows Max.rating .The test condition is V_{DD}=-25V, V_{GS}=-10V,L=0.1mH,I_{AS}=-54A
4. The power dissipation is limited by 150 ℃ junction temperature
5. The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation.

Typical Performance Characteristics

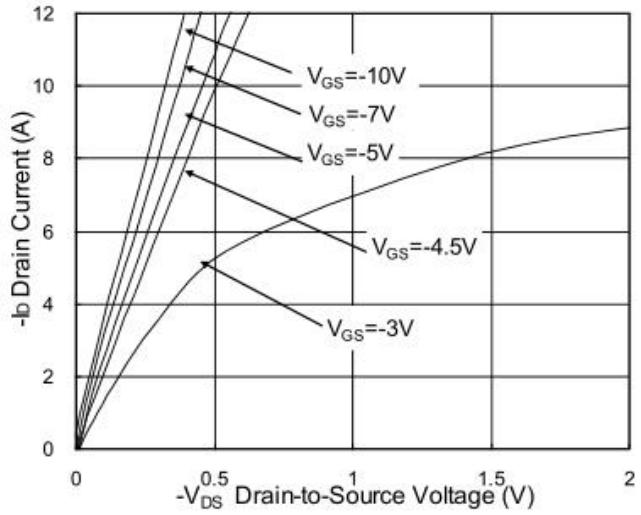


Fig.1 Typical Output Characteristics

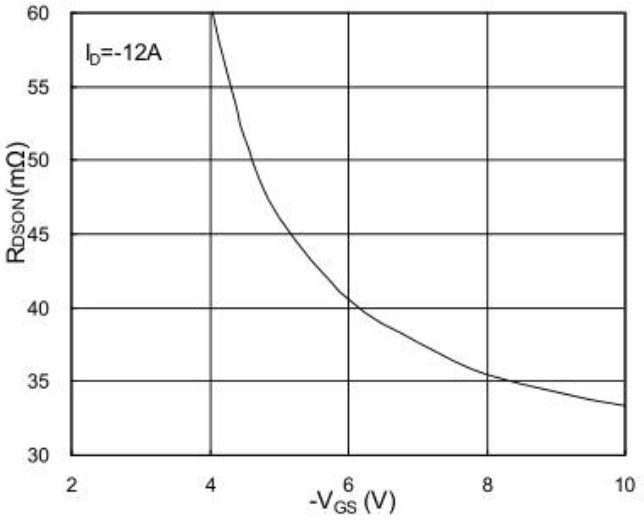


Fig.2 On-Resistance v.s Gate-Source

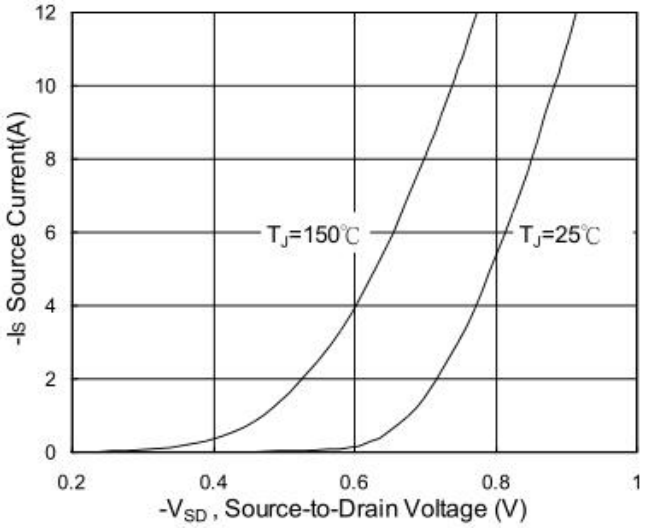


Fig.3 Forward Characteristics of Reverse

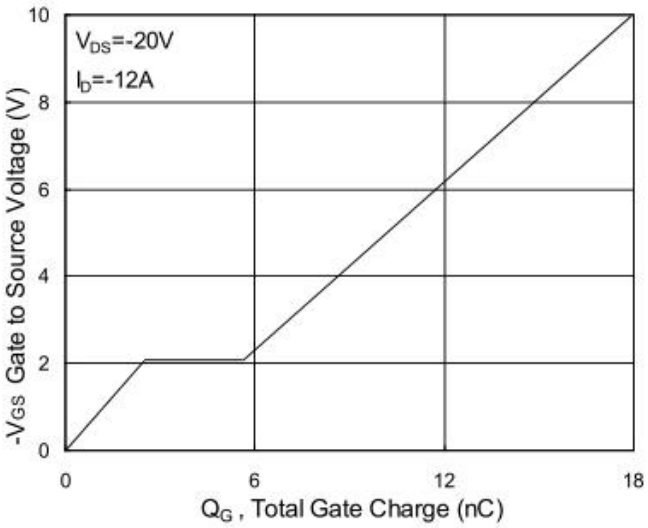


Fig.4 Gate-Charge Characteristics

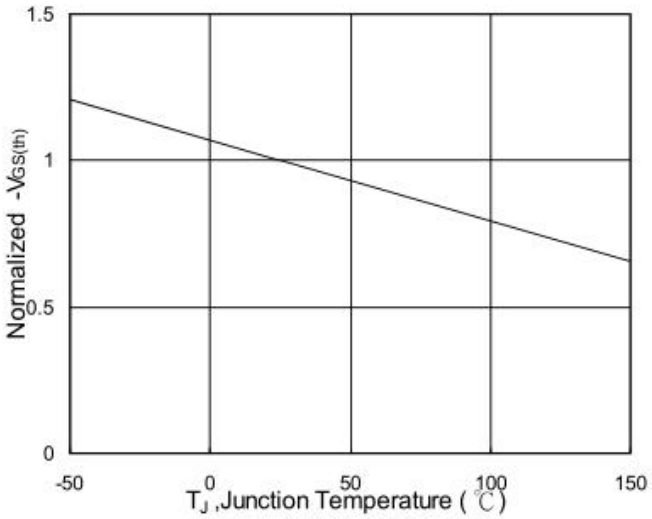


Fig.5 Normalized $V_{GS(th)}$ v.s T_J

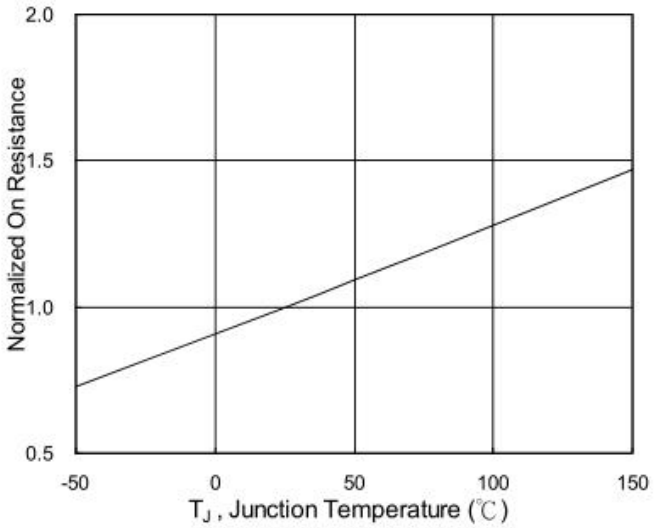


Fig.6 Normalized R_{DSON} v.s T_J

Typical Performance Characteristics (Cont.)

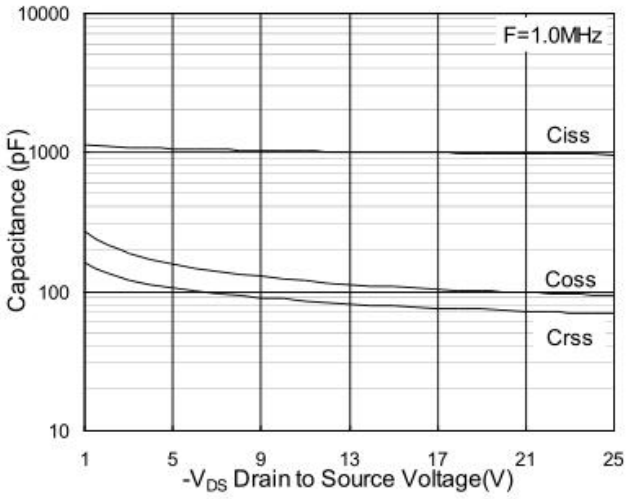


Fig.7 Capacitance

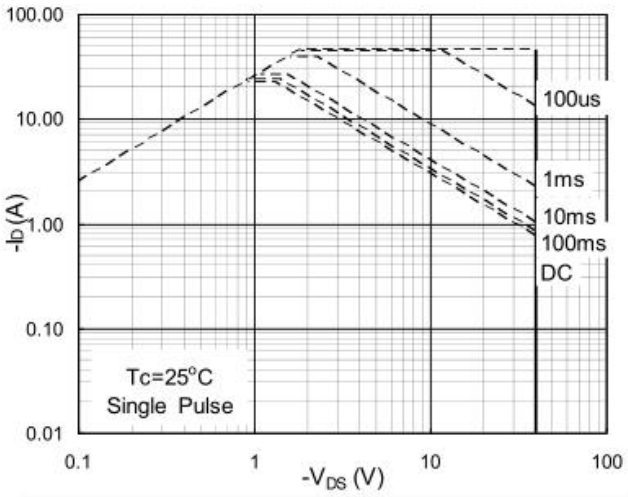


Fig.8 Safe Operating Area

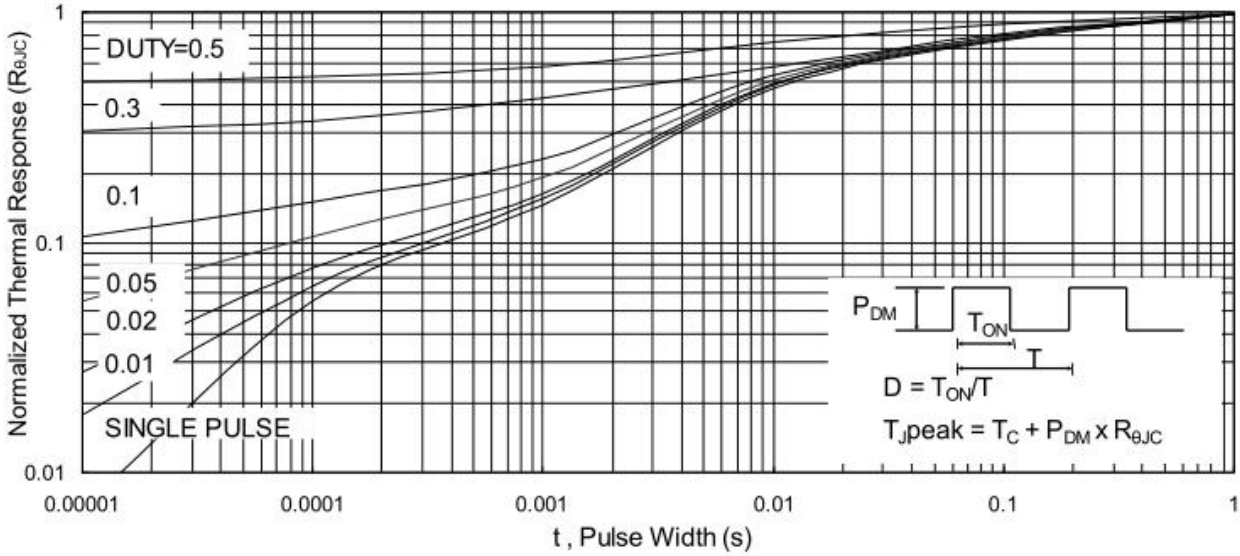


Fig.9 Normalized Maximum Transient Thermal Impedance

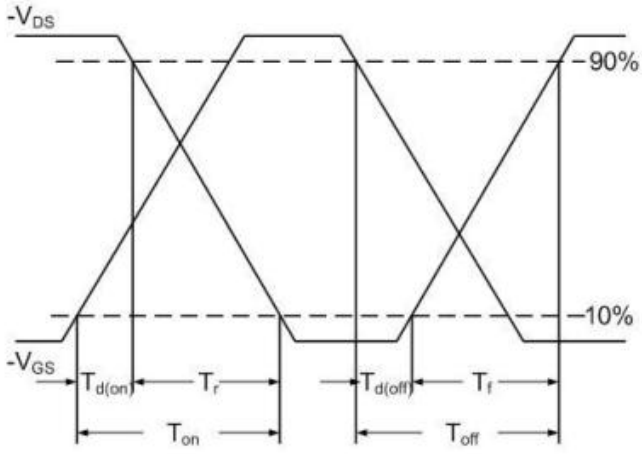


Fig.10 Switching Time Waveform

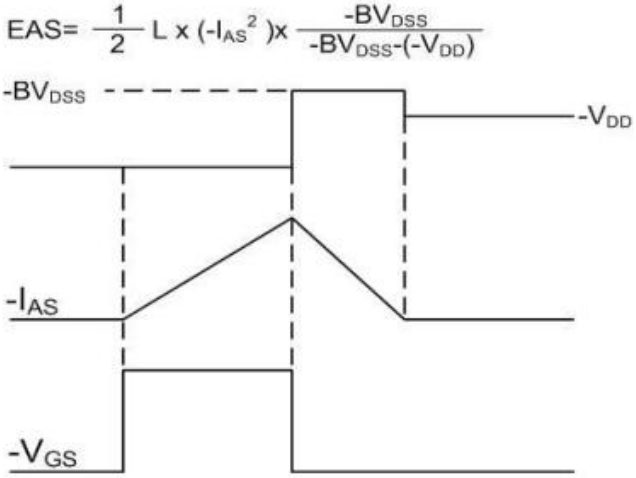
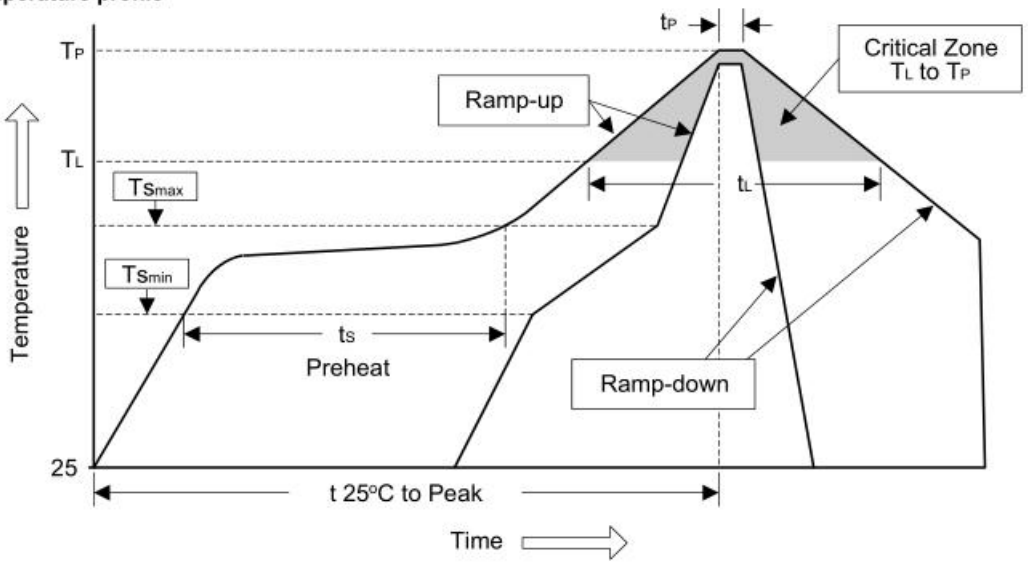


Fig.11 Unclamped Inductive Waveform

Soldering Methods for Products

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average ramp-up rate(TL to TP)	<3℃/sec	<3℃/sec
Preheat -Temperature Min(Ts min) -Temperature Max(Ts max) -Time(min to max)(ts)	- 100℃ 150℃ 60 to 120 sec	- 150℃ 200℃ 60 to 180 sec
Ts max to TL - ramp-up rate	<3℃/sec	<3℃/sec
Time maintained above: -Temperature(TL) -Time(TL)	183℃ 60 to 150 sec	217℃ 60 to 150 sec
Peak Temperature(TP)	240℃+0/-5℃	250℃+0/-5℃
Time within 5℃ of actual Peak Temperature	10 to 30 sec	20 to 40 sec
Ramp-down Rate	<6℃/sec	<6℃/sec
Time 25 ℃ to Peak Temperature	<6 minutes	<8 minutes

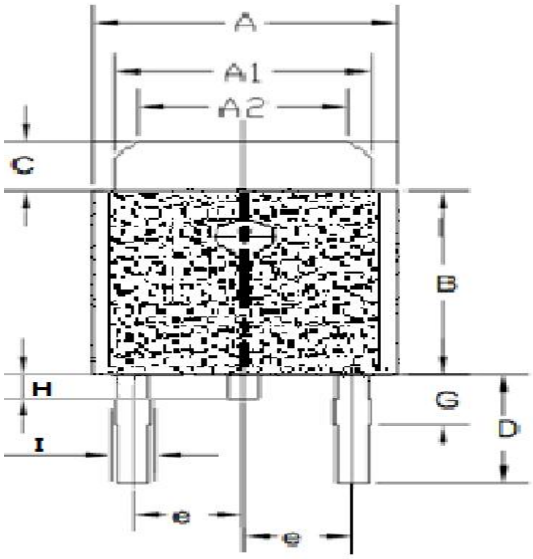
Figure 1: Temperature profile

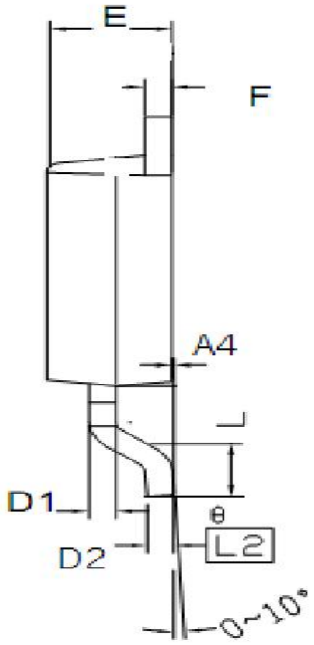


Note : 1.Storage environment: Temperature=10℃ to 35@Humidity=45%±15%
2.Reflow soldering of surface-mount devices
3.Flow(wave) soldering(solder dipping)

Products	Peak Temperature	Dipping Time
Pb devices	245℃±5℃	5sec±1sec
Pb-free devices	250℃+0/-5℃	5sec±1sec

Package Outline





unit：mm					
Symbol	**Min**	**Max**	**Symbol**	**Min**	**Max**
A	6.40	6.60	**D**	2.90	3.10
A1	5.20	5.40	**D1**	0.45	0.55
A2	4.40	4.60	**D2**	0.45	0.55
A3	4.40	4.60	**e**	2.3BSC	
A4	0.00	0.15	**E**	2.20	2.40
A5	4.65	4.95	**F**	0.49	0.59
B	6.00	6.20	**G**	1.7BSC	
B1	1.57	1.77	**L**	1.40	1.60
C	0.90	0.96	**θ(度)**	0.00	10.00
I	0.80	0.85	**H**	0.49	0.52

Important Notice

Si-Trend reserves the right to change all product、product specifications and data without prior notice；Our customer Please confirm to place an order confirmation before make the integrity of information complete and up-to-date。

Any semiconductor under specific conditions are possible to certain failure or malfunction rate；Customers are responsible in the use of Si-Trend products to system design and manufacturing in compliance with safety standards and adopting safety measures，To avoid the potential risk of failure may cause the personal safety and property loss。

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