

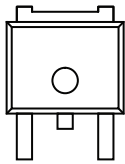
## Automotive P-Channel 60 V (D-S) 175 °C MOSFET



PRODUCT SUMMARY	
$V_{DS}$ (V)	- 60
$R_{DS(on)}$ ( $\Omega$ ) at $V_{GS} = -10$ V	0.0155
$R_{DS(on)}$ ( $\Omega$ ) at $V_{GS} = -4.5$ V	0.0200
$I_D$ (A)	- 50
Configuration	Single

### FEATURES

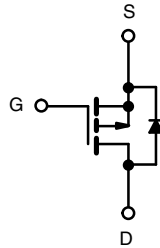
- TrenchFET® Power MOSFET
- Package with Low Thermal Resistance
- 100 %  $R_g$  and UIS Tested
- AEC-Q101 Qualified
- Material categorization:  
For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

**TO-252**


G D S

Top View

Drain Connected to Tab



P-Channel MOSFET

### ORDERING INFORMATION

Package	TO-252
Lead (Pb)-free and Halogen-free	SQD50P06-15L-GE3

### ABSOLUTE MAXIMUM RATINGS ( $T_C = 25$ °C, unless otherwise noted)

PARAMETER	SYMBOL	LIMIT	UNIT	
Drain-Source Voltage	$V_{DS}$	- 60	V	
Gate-Source Voltage	$V_{GS}$	$\pm 20$		
Continuous Drain Current <sup>a</sup>	$I_D$	$T_C = 25$ °C	- 50	
		$T_C = 125$ °C	- 38	
Continuous Source Current (Diode Conduction) <sup>a</sup>	$I_S$	- 50	A	
Pulsed Drain Current <sup>b</sup>	$I_{DM}$	- 200		
Single Pulse Avalanche Current	$I_{AS}$	- 52		
Single Pulse Avalanche Energy	$E_{AS}$	L = 0.1 mH	135	mJ
Maximum Power Dissipation <sup>b</sup>			$P_D$	
		$T_C = 125$ °C		45
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to + 175	°C	

### THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	LIMIT	UNIT
Junction-to-Ambient	$R_{thJA}$	50	°C/W
Junction-to-Case (Drain)			

#### Notes

- Package limited.
- Pulse test; pulse width  $\leq 300$   $\mu$ s, duty cycle  $\leq 2$  %.
- When mounted on 1" square PCB (FR-4 material).



SPECIFICATIONS ( $T_C = 25\text{ }^\circ\text{C}$ , unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT	
<b>Static</b>							
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}$ , $I_D = -250\text{ }\mu\text{A}$	-60	-	-	V	
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = -250\text{ }\mu\text{A}$	-1.5	-	-2.5		
Gate-Source Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 20\text{ V}$	-	-	$\pm 100$	nA	
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS} = 0\text{ V}$	$V_{DS} = -60\text{ V}$	-	-	-1	$\mu\text{A}$
		$V_{GS} = 0\text{ V}$	$V_{DS} = -60\text{ V}$ , $T_J = 125\text{ }^\circ\text{C}$	-	-	-50	
		$V_{GS} = 0\text{ V}$	$V_{DS} = -60\text{ V}$ , $T_J = 175\text{ }^\circ\text{C}$	-	-	-150	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{GS} = -10\text{ V}$	$V_{DS} \geq -5\text{ V}$	-50	-	-	A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = -10\text{ V}$	$I_D = -17\text{ A}$	-	0.0135	0.0155	$\Omega$
		$V_{GS} = -10\text{ V}$	$I_D = -50\text{ A}$ , $T_J = 125\text{ }^\circ\text{C}$	-	-	0.026	
		$V_{GS} = -10\text{ V}$	$I_D = -50\text{ A}$ , $T_J = 175\text{ }^\circ\text{C}$	-	-	0.032	
		$V_{GS} = -4.5\text{ V}$	$I_D = -14\text{ A}$	-	0.017	0.020	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = -15\text{ V}$ , $I_D = -17\text{ A}$		-	50	-	S
<b>Dynamic<sup>b</sup></b>							
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}$	$V_{DS} = -25\text{ V}$ , $f = 1\text{ MHz}$	-	4730	5910	$\mu\text{F}$
Output Capacitance	$C_{oss}$			-	485	606	
Reverse Transfer Capacitance	$C_{rss}$			-	330	410	
Total Gate Charge <sup>c</sup>	$Q_g$	$V_{GS} = -10\text{ V}$	$V_{DS} = -30\text{ V}$ , $I_D = -50\text{ A}$	-	98	150	nC
Gate-Source Charge <sup>c</sup>	$Q_{gs}$			-	15	23	
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$			-	21	32	
Gate Resistance	$R_g$	f = 1 MHz		1.47	2.9	4.42	$\Omega$
Turn-On Delay Time <sup>c</sup>	$t_{d(on)}$	$V_{DD} = -30\text{ V}$ , $R_L = 0.6\text{ }\Omega$ $I_D \cong -50\text{ A}$ , $V_{GEN} = -10\text{ V}$ , $R_g = 6.0\text{ }\Omega$		-	15	18	ns
Rise Time <sup>c</sup>	$t_r$			-	12	16	
Turn-Off Delay Time <sup>c</sup>	$t_{d(off)}$			-	112	125	
Fall Time <sup>c</sup>	$t_f$			-	39	48	
<b>Source-Drain Diode Ratings and Characteristics<sup>b</sup></b>							
Pulsed Current <sup>a</sup>	$I_{SM}$			-	-	-200	A
Forward Voltage	$V_{SD}$	$I_F = -50\text{ A}$ , $V_{GS} = 0\text{ V}$		-	-0.8	-1.5	V

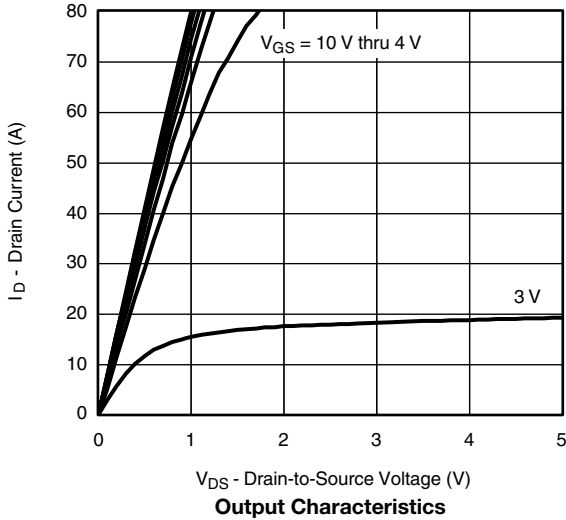
**Notes**

- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .  
b. Guaranteed by design, not subject to production testing.  
c. Independent of operating temperature.

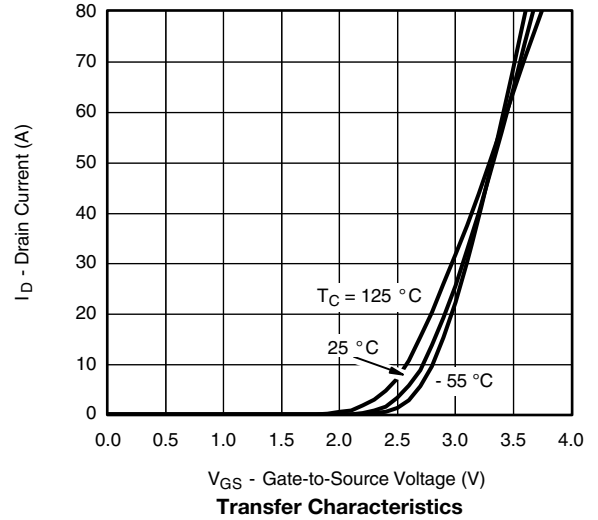
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.



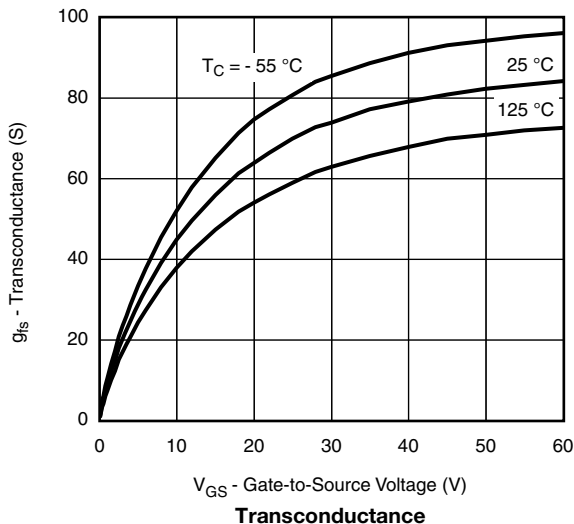
TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C, unless otherwise noted)



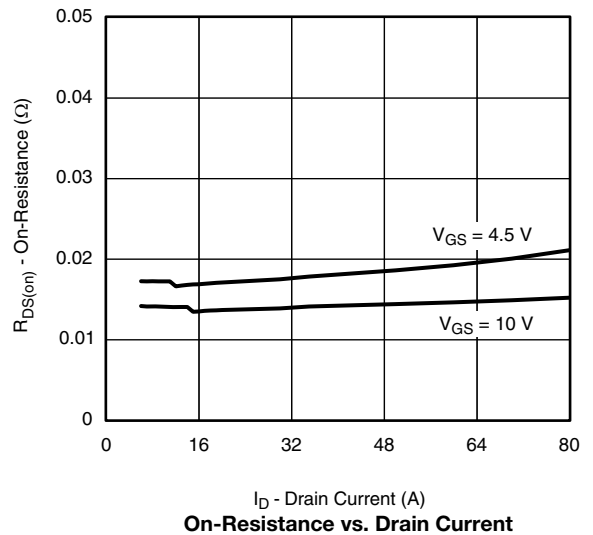
Output Characteristics



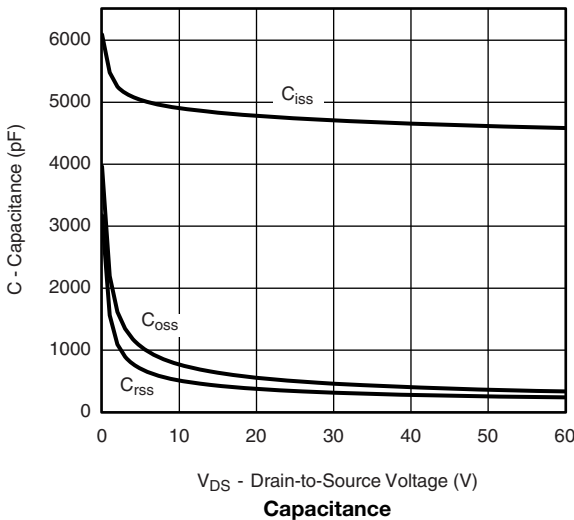
Transfer Characteristics



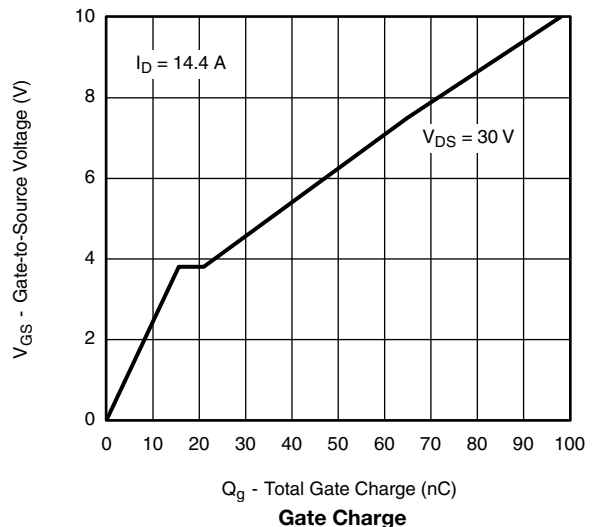
Transconductance



On-Resistance vs. Drain Current



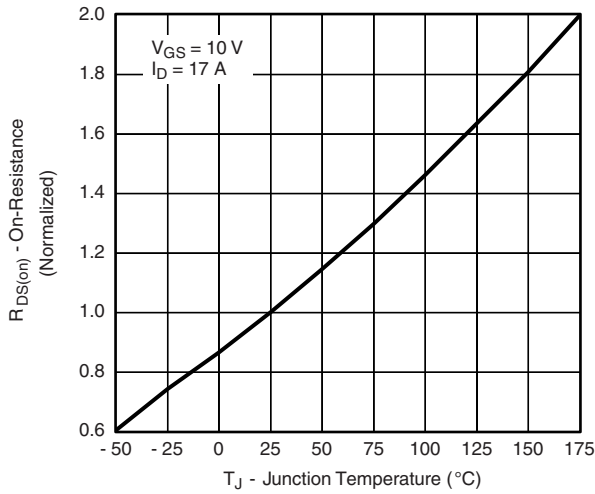
Capacitance



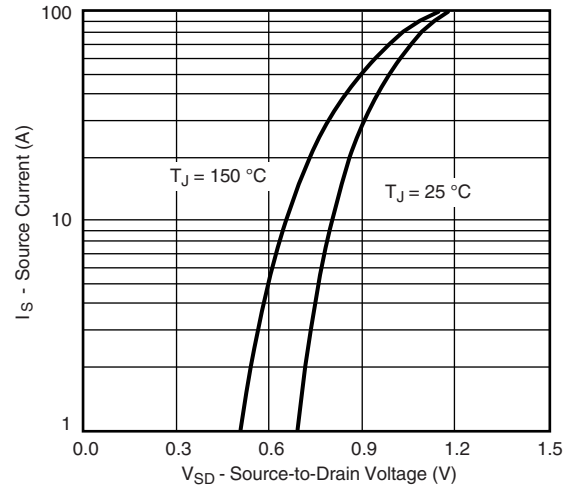
Gate Charge



TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C, unless otherwise noted)

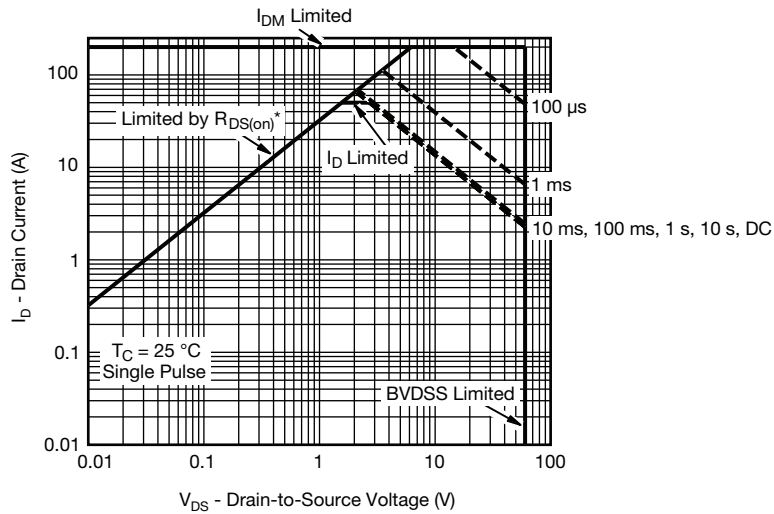


On-Resistance vs. Junction Temperature



Source Drain Diode Forward Voltage

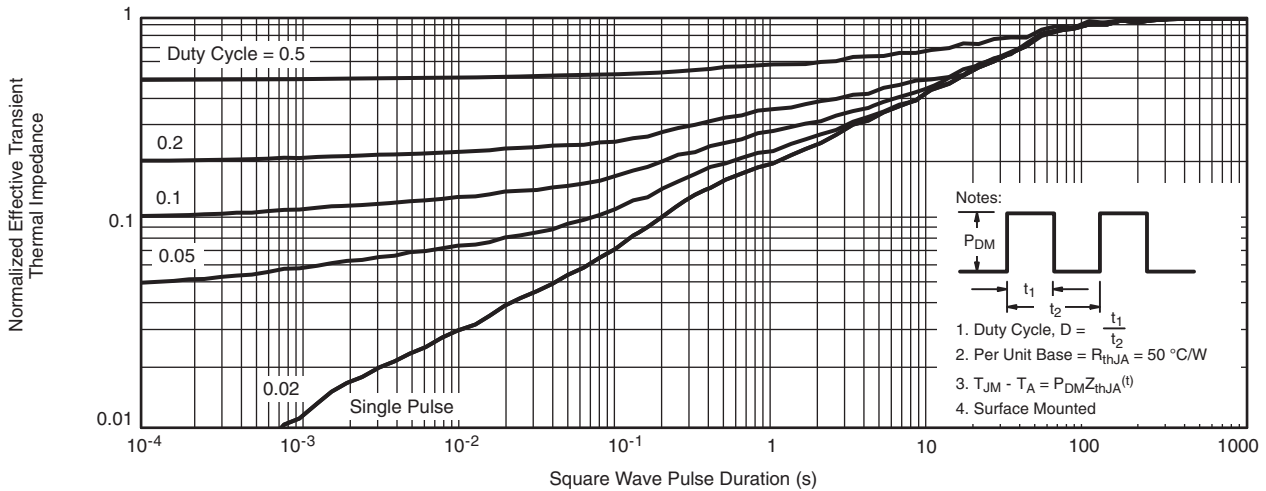
THERMAL RATINGS (T<sub>A</sub> = 25 °C, unless otherwise noted)



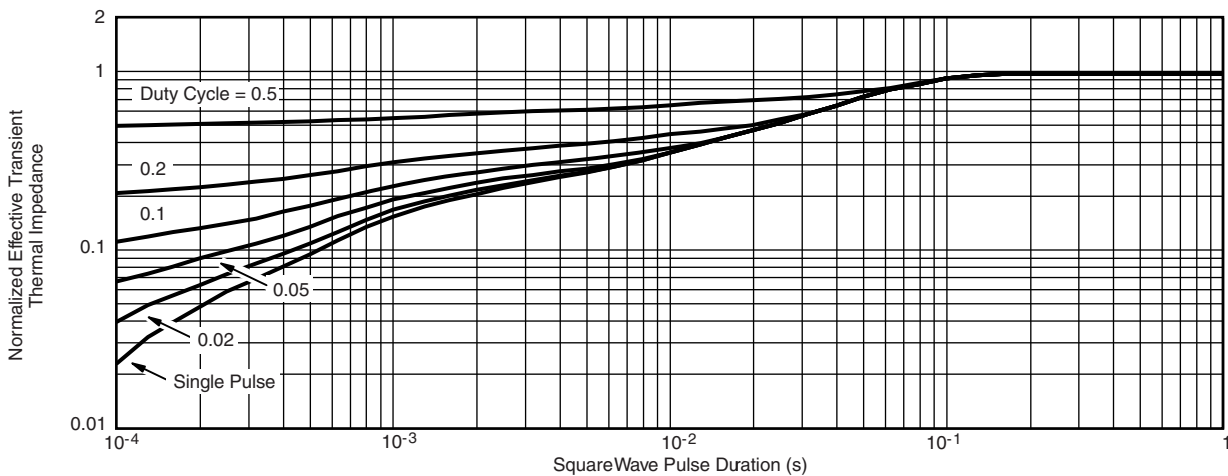
\* V<sub>GS</sub> > minimum V<sub>GS</sub> at which R<sub>DS(on)</sub> is specified

Safe Operating Area

**THERMAL RATINGS** ( $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted)



**Normalized Thermal Transient Impedance, Junction-to-Ambient**



**Normalized Thermal Transient Impedance, Junction-to-Case**

**Note**

- The characteristics shown in the two graphs
  - Normalized Transient Thermal Impedance Junction to Ambient ( $25\text{ }^\circ\text{C}$ )
  - Normalized Transient Thermal Impedance Junction to Case ( $25\text{ }^\circ\text{C}$ )
 are given for general guidelines only to enable the user to get a “ball park” indication of part capabilities. The data are extracted from single pulse transient thermal impedance characteristics which are developed from empirical measurements. The latter is valid for the part mounted on printed circuit board - FR4, size 1" x 1" x 0.062", double sided with 2 oz. copper, 100 % on both sides. The part capabilities can widely vary depending on actual application parameters and operating conditions.

Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see [www.vishay.com/ppg?69098](http://www.vishay.com/ppg?69098).



### TO-252AA Case Outline

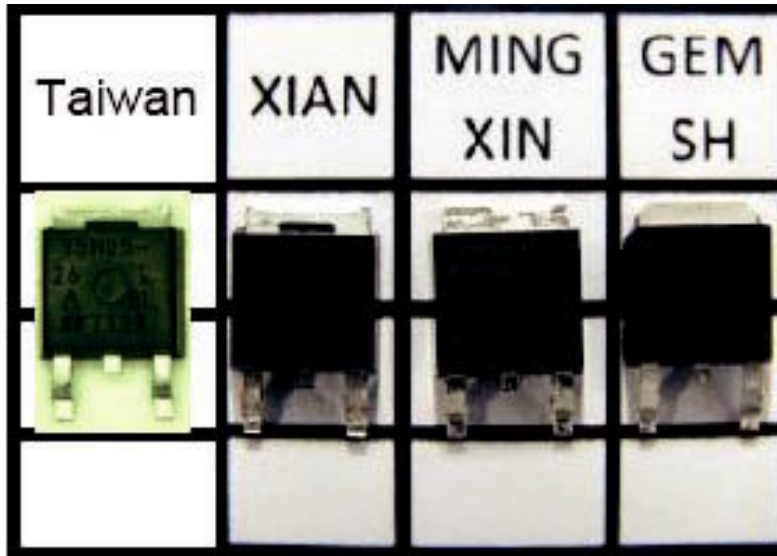


DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	2.18	2.38	0.086	0.094
A1	-	0.127	-	0.005
b	0.64	0.88	0.025	0.035
b2	0.76	1.14	0.030	0.045
b3	4.95	5.46	0.195	0.215
C	0.46	0.61	0.018	0.024
C2	0.46	0.89	0.018	0.035
D	5.97	6.22	0.235	0.245
D1	4.10	-	0.161	-
E	6.35	6.73	0.250	0.265
E1	4.32	-	0.170	-
H	9.40	10.41	0.370	0.410
e	2.28 BSC		0.090 BSC	
e1	4.56 BSC		0.180 BSC	
L	1.40	1.78	0.055	0.070
L3	0.89	1.27	0.035	0.050
L4	-	1.02	-	0.040
L5	1.01	1.52	0.040	0.060

ECN: T13-0359-Rev. O, 03-Jun-13  
DWG: 5347

**Notes**

- Dimension L3 is for reference only.
- Xi'an, Mingxin, and GEM SH actual photo.



## RECOMMENDED MINIMUM PADS FOR DPAK (TO-252)



Recommended Minimum Pads  
Dimensions in Inches/(mm)

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