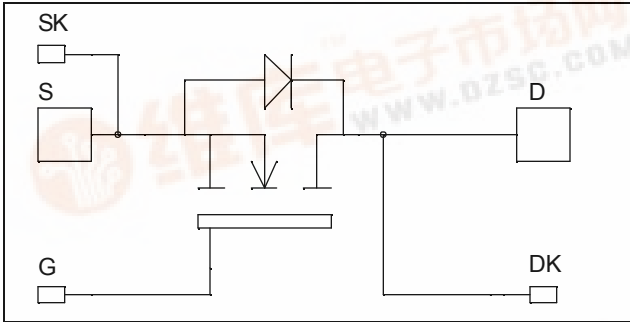




APT0502UM70FAG

Single switch MOSFET Power Module

$V_{DSS} = 1200V$
 $R_{DSon} = 70m\Omega \text{ typ @ } T_j = 25^\circ C$
 $I_D = 171A \text{ @ } T_c = 25^\circ C$

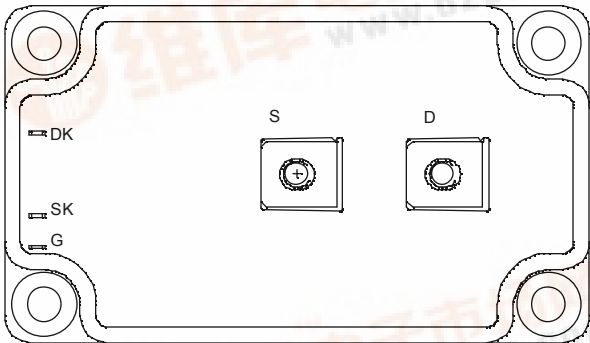


Application

- Welding converters
- Switched Mode Power Supplies
- Uninterruptible Power Supplies
- Motor control

Features

- Power MOS 7[®] FREDFETs
 - Low R_{DSon}
 - Low input and Miller capacitance
 - Low gate charge
 - Fast intrinsic reverse diode
 - Avalanche energy rated
 - Very rugged
- Kelvin source for easy drive
- Very low stray inductance
 - Symmetrical design
 - M5 power connectors
- High level of integration
- AlN substrate for improved thermal performance



Benefits

- Outstanding performance at high frequency operation
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Low profile
- RoHS Compliant

Absolute maximum ratings

Symbol	Parameter	Max ratings	Unit
V_{DSS}	Drain - Source Breakdown Voltage	1200	V
I_D	Continuous Drain Current	$T_c = 25^\circ C$	171
		$T_c = 80^\circ C$	126
I_{DM}	Pulsed Drain current	684	A
V_{GS}	Gate - Source Voltage	± 30	V
R_{DSon}	Drain - Source ON Resistance	80	$m\Omega$
P_D	Maximum Power Dissipation	$T_c = 25^\circ C$	5000
I_{AR}	Avalanche current (repetitive and non repetitive)	24	A
E_{AR}	Repetitive Avalanche Energy	50	mJ
E_{AS}	Single Pulse Avalanche Energy	3200	

CAUTION: These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed. See application note APT0502 on www.microsemi.com



All ratings @ $T_j = 25^\circ\text{C}$ unless otherwise specified

Electrical Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
I_{DSS}	Zero Gate Voltage Drain Current	$V_{GS} = 0V, V_{DS} = 1200V$			1.5	mA
		$T_j = 25^\circ\text{C}$				
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 0V, V_{DS} = 1000V$			6	m Ω
		$T_j = 125^\circ\text{C}$				
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 10V, I_D = 85.5A$		70	80	m Ω
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 30mA$	3		5	V
I_{GSS}	Gate – Source Leakage Current	$V_{GS} = \pm 30V, V_{DS} = 0V$			± 600	nA

Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C_{iss}	Input Capacitance	$V_{GS} = 0V$		43.5		nF
C_{oss}	Output Capacitance	$V_{DS} = 25V$		6.6		
C_{rss}	Reverse Transfer Capacitance	$f = 1MHz$		1.2		
Q_g	Total gate Charge	$V_{GS} = 10V$		1650		nC
Q_{gs}	Gate – Source Charge	$V_{Bus} = 600V$		192		
Q_{gd}	Gate – Drain Charge	$I_D = 171A$		1074		
$T_{d(on)}$	Turn-on Delay Time	Inductive switching @ 125°C $V_{GS} = 15V$ $V_{Bus} = 800V$ $I_D = 171A$ $R_G = 0.8\Omega$		20		ns
T_r	Rise Time			17		
$T_{d(off)}$	Turn-off Delay Time			245		
T_f	Fall Time			62		
E_{on}	Turn-on Switching Energy	Inductive switching @ 25°C $V_{GS} = 15V, V_{Bus} = 800V$ $I_D = 171A, R_G = 0.8\Omega$		7.6		mJ
E_{off}	Turn-off Switching Energy			6.9		
E_{on}	Turn-on Switching Energy	Inductive switching @ 125°C $V_{GS} = 15V, V_{Bus} = 800V$ $I_D = 171A, R_G = 0.8\Omega$		13.8		mJ
E_{off}	Turn-off Switching Energy			8.5		

Source - Drain diode ratings and characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit	
I_S	Continuous Source current (Body diode)		$T_c = 25^\circ\text{C}$			171	A
			$T_c = 80^\circ\text{C}$			126	
V_{SD}	Diode Forward Voltage	$V_{GS} = 0V, I_S = -171A$			1.3	V	
dv/dt	Peak Diode Recovery ①				18	V/ns	
t_{rr}	Reverse Recovery Time	$I_S = -171A$ $V_R = 600V$ $di/dt = 600A/\mu s$	$T_j = 25^\circ\text{C}$			375	ns
			$T_j = 125^\circ\text{C}$			860	
Q_{rr}	Reverse Recovery Charge		$T_j = 25^\circ\text{C}$		12	μC	
			$T_j = 125^\circ\text{C}$		54		

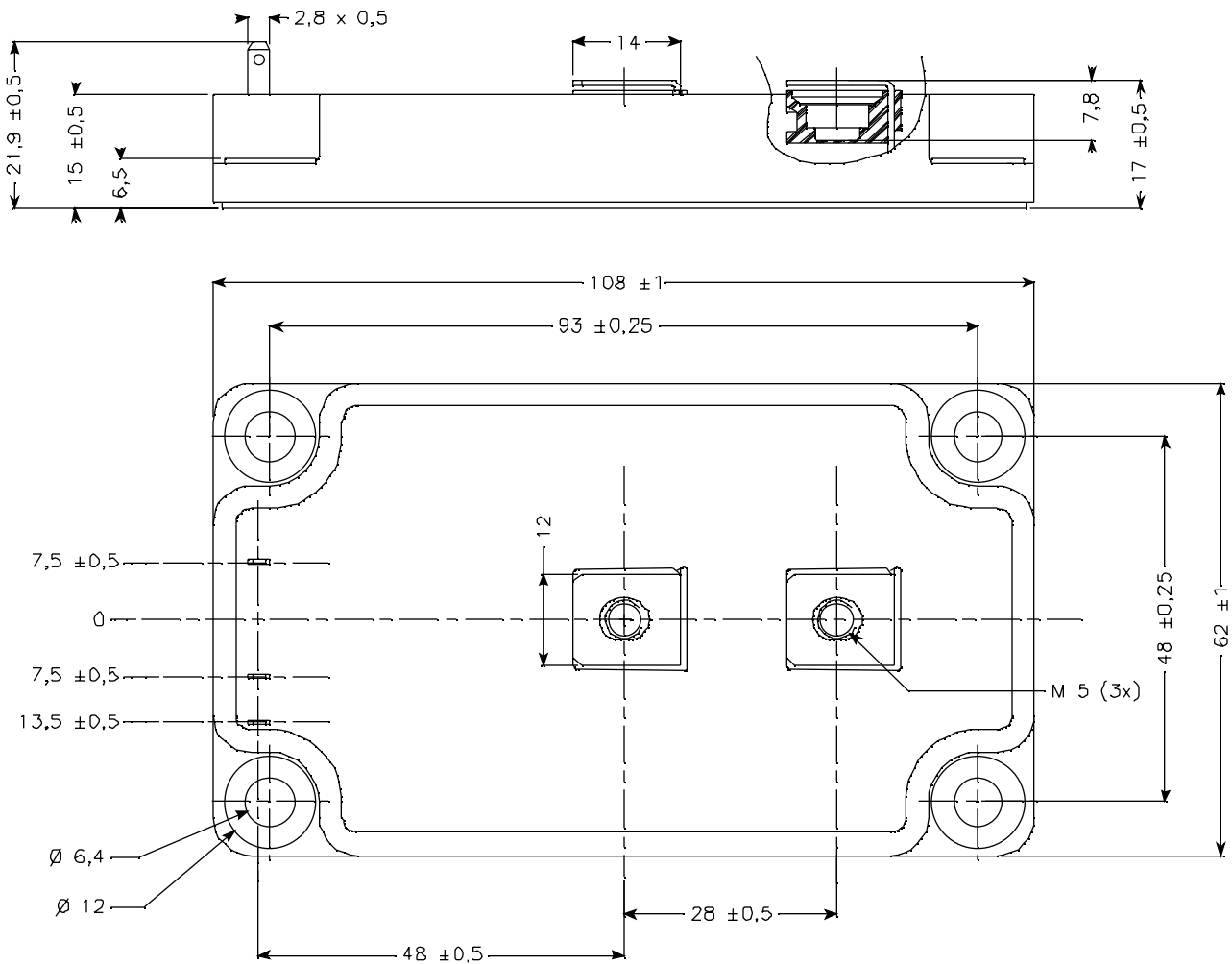
 ① dv/dt numbers reflect the limitations of the circuit rather than the device itself.

$$I_S \leq -171A \quad di/dt \leq 700A/\mu s \quad V_R \leq V_{DSS} \quad T_j \leq 150^\circ\text{C}$$

Thermal and package characteristics

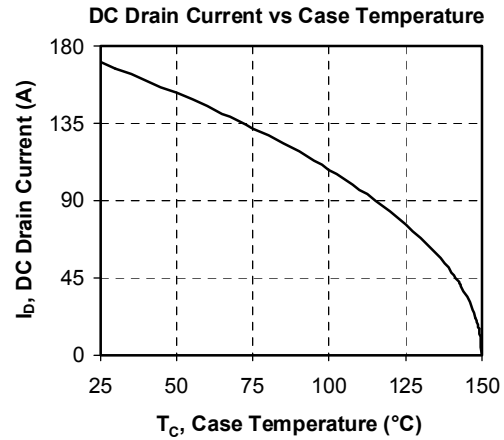
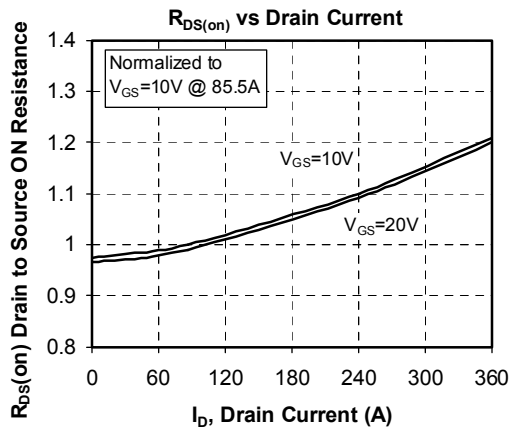
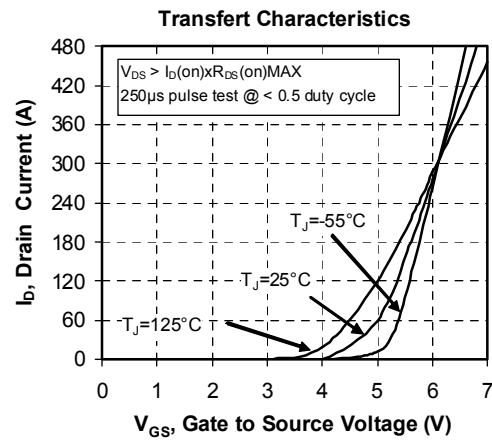
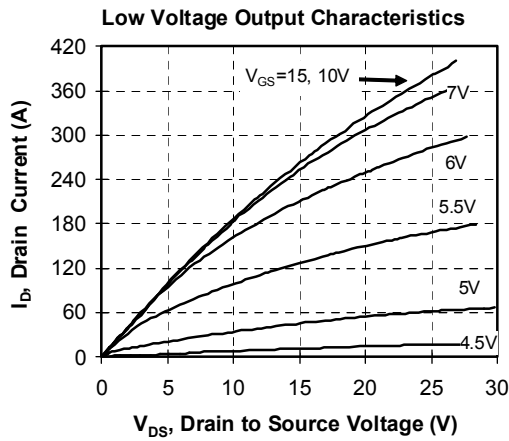
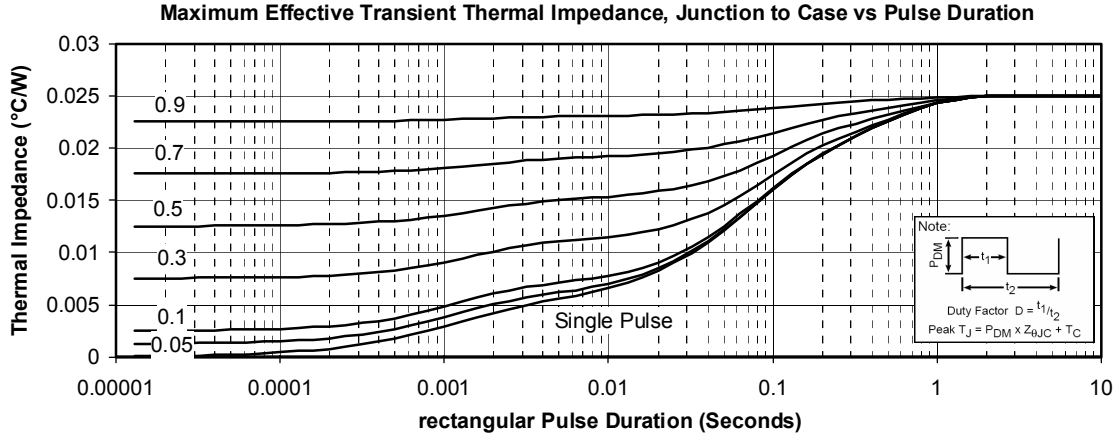
Symbol	Characteristic	Min	Typ	Max	Unit	
R_{thJC}	Junction to Case Thermal Resistance			0.025	°C/W	
V_{ISOL}	RMS Isolation Voltage, any terminal to case $t=1$ min, $I_{isol}<1$ mA, 50/60Hz	2500			V	
T_J	Operating junction temperature range	-40		150	°C	
T_{STG}	Storage Temperature Range	-40		125		
T_C	Operating Case Temperature	-40		100		
Torque	Mounting torque	To heatsink	M6	3	5	N.m
		For terminals	M5	2	3.5	
Wt	Package Weight			280	g	

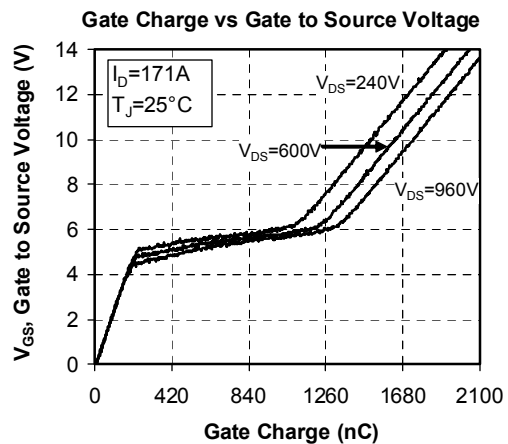
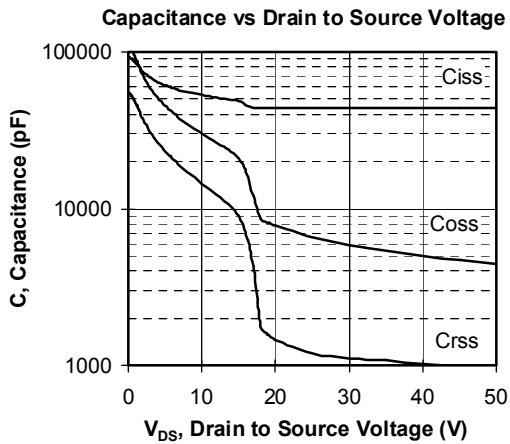
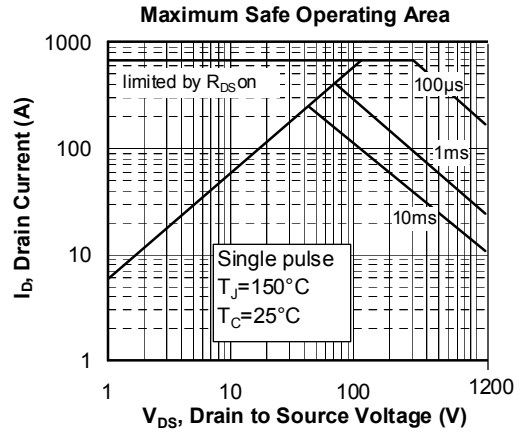
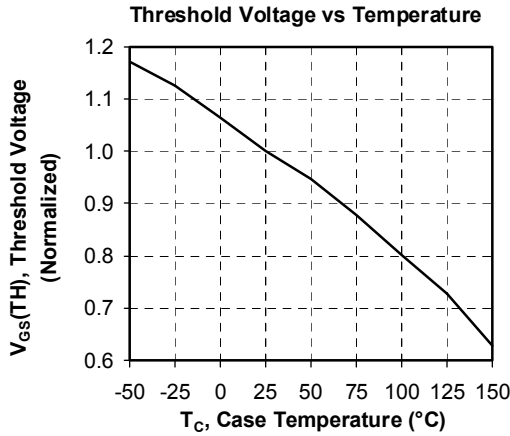
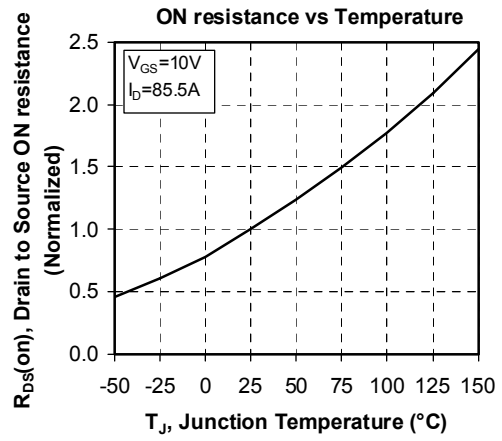
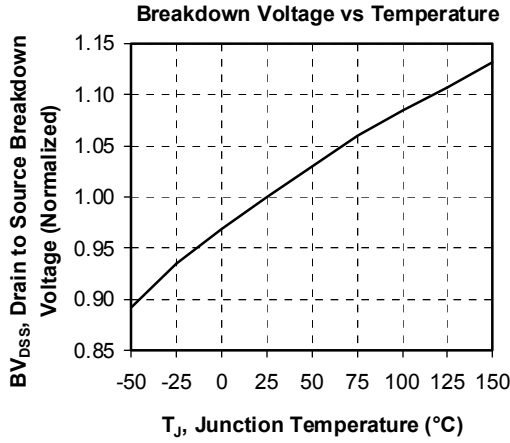
SP6 Package outline (dimensions in mm)

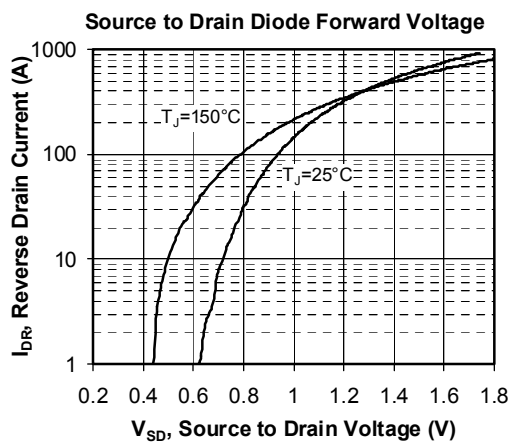
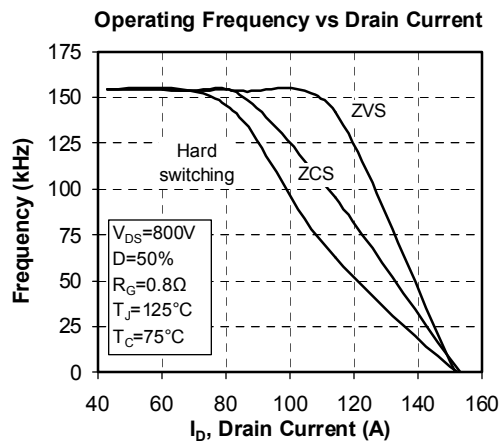
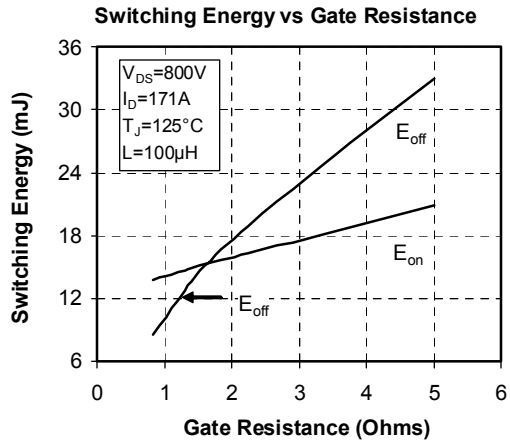
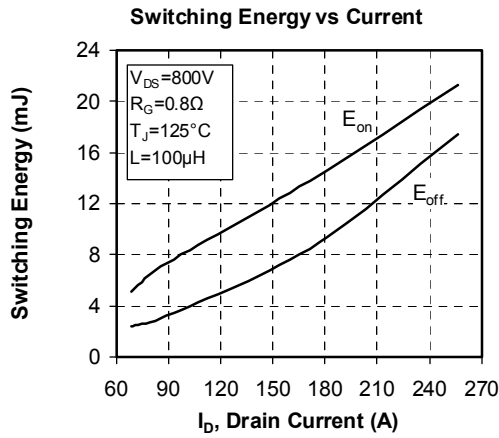
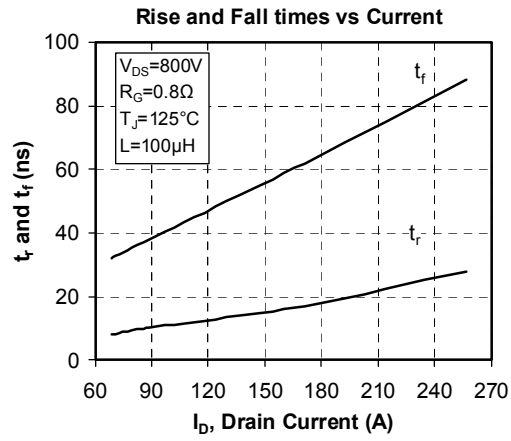
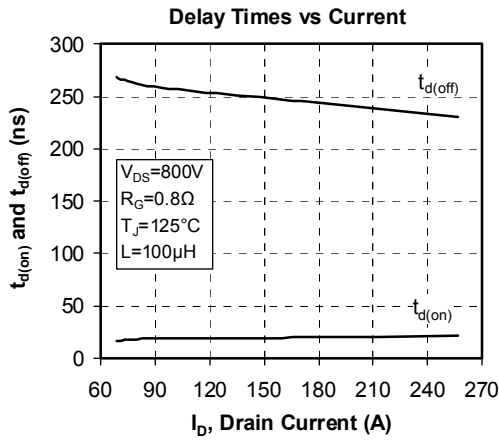


See application note APT0601 - Mounting Instructions for SP6 Power Modules on www.microsemi.com

Typical Performance Curve







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