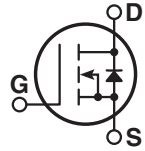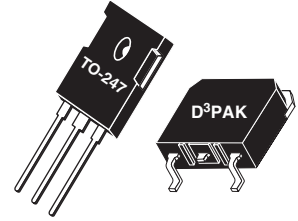**COOLMOS**
Power Semiconductors

Super Junction MOSFET

- **Ultra Low $R_{DS(ON)}$**
- **Low Miller Capacitance**
- **Ultra Low Gate Charge, Q_g**
- **Avalanche Energy Rated**
- **Extreme dv/dt Rated**
- **Popular TO-247 or Surface Mount D^3 package.**

TO-247 D^3PAK

MAXIMUM RATINGS

All Ratings per die: T_C = 25°C unless otherwise specified.

Symbol	Parameter	APT77N60B_SC6	UNIT
V_{DSS}	Drain-Source Voltage	600	Volts
I_D	Continuous Drain Current @ T_C = 25°C	77	Amps
	Continuous Drain Current @ T_C = 100°C	49	
I_{DM}	Pulsed Drain Current [1]	272	
V_{GS}	Gate-Source Voltage Continuous	±20	Volts
P_D	Total Power Dissipation @ T_C = 25°C	481	Watts
T_J, T_{STG}	Operating and Storage Junction Temperature Range	- 55 to 150	°C
T_L	Lead Temperature: 0.063" from Case for 10 Sec.	300	
I_{AR}	Avalanche Current [2]	13.4	Amps
E_{AR}	Repetitive Avalanche Energy [2] (Id =13.4A, Vdd = 50V)	2.96	mJ
E_{AS}	Single Pulse Avalanche Energy (Id = 13.4A, Vdd = 50V)	1954	

STATIC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
$BV_{(DSS)}$	Drain-Source Breakdown Voltage (V_{GS} = 0V, I_D = 250µA)	600			Volts
$R_{DS(on)}$	Drain-Source On-State Resistance [3] (V_{GS} = 10V, I_D = 44.4A)		.037	.041	Ohms
I_{DSS}	Zero Gate Voltage Drain Current (V_{DS} = V_{DSS}, V_{GS} = 0V, T_C = 25°C)			25	µA
	Zero Gate Voltage Drain Current (V_{DS} = V_{DSS}, V_{GS} = 0V, T_C = 150°C)			250	
I_{GSS}	Gate-Source Leakage Current (V_{GS} = ±20V, V_{DS} = 0V)			±100	nA
$V_{GS(th)}$	Gate Threshold Voltage (V_{DS} = V_{GS}, I_D = 2.96mA)	2.5	3	3.6	Volts

CAUTION: These Devices are Sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed.

DYNAMIC CHARACTERISTICS

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{iss}	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ f = 1 MHz		13600		pF
C_{oss}	Output Capacitance			4400		
C_{rss}	Reverse Transfer Capacitance			290		
Q_g	Total Gate Charge [4]	$V_{GS} = 10V$ $V_{DD} = 400V$ I_D = 77A @ 25°C		260		nC
Q_{gs}	Gate-Source Charge			38		
Q_{gd}	Gate-Drain ("Miller") Charge			144		
$t_{d(on)}$	Turn-on Delay Time	**INDUCTIVE SWITCHING** $V_{GS} = 10V$ $V_{DD} = 380V$ I_D = 77A @ 25°C $R_G = 5.0\Omega$		18		ns
t_r	Rise Time			27		
$t_{d(off)}$	Turn-off Delay Time			110	165	
t_f	Fall Time			8	12	
E_{on}	Turn-on Switching Energy [5]	**INDUCTIVE SWITCHING @ 25°C** $V_{DD} = 400V$, $V_{GS} = 15V$ I_D = 77A, $R_G = 5\Omega$		1670		μJ
E_{off}	Turn-off Switching Energy			2880		
E_{on}	Turn-on Switching Energy [5]	**INDUCTIVE SWITCHING @ 125°C** $V_{DD} = 400V$, $V_{GS} = 15V$ I_D = 77A, $R_G = 5\Omega$		2300		
E_{off}	Turn-off Switching Energy			3100		

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic / Test Conditions		MIN	TYP	MAX	UNIT
I_S	Continuous Source Current (Body Diode)				77	Amps
I_{SM}	Pulsed Source Current [1] (Body Diode)				231	
V_{SD}	Diode Forward Voltage [3] ($V_{GS} = 0V$, $I_S = -77A$)			1	1.2	Volts
dv/dt	Peak Diode Recovery dv/dt [6]				15	V/ns
t_{rr}	Reverse Recovery Time ($I_S = -77A$, $di/dt = 100A/\mu s$)	$T_j = 25°C$		950		ns
Q_{rr}	Reverse Recovery Charge ($I_S = -77A$, $di/dt = 100A/\mu s$)	$T_j = 25°C$		32		μC
I_{RRM}	Peak Recovery Current ($I_S = -77A$, $di/dt = 100A/\mu s$)	$T_j = 25°C$		60		Amps

THERMAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case			0.26	°C/W
$R_{\theta JA}$	Junction to Ambient			40	

1 Repetitive Rating: Pulse width limited by maximum junction temperature

2 Repetitive avalanche causes additional power losses that can be calculated as

$P_{AV} = E_{AR} * f$. **Pulse width tp limited by Tj max.**

3 Pulse Test: Pulse width < 380 μs, Duty Cycle < 2%

4 See MIL-STD-750 Method 3471

5 Eon includes diode reverse recovery.

6 Maximum 125°C diode commutation speed = di/dt 600A/μs

Microsemi reserves the right to change, without notice, the specifications and information contained herein.
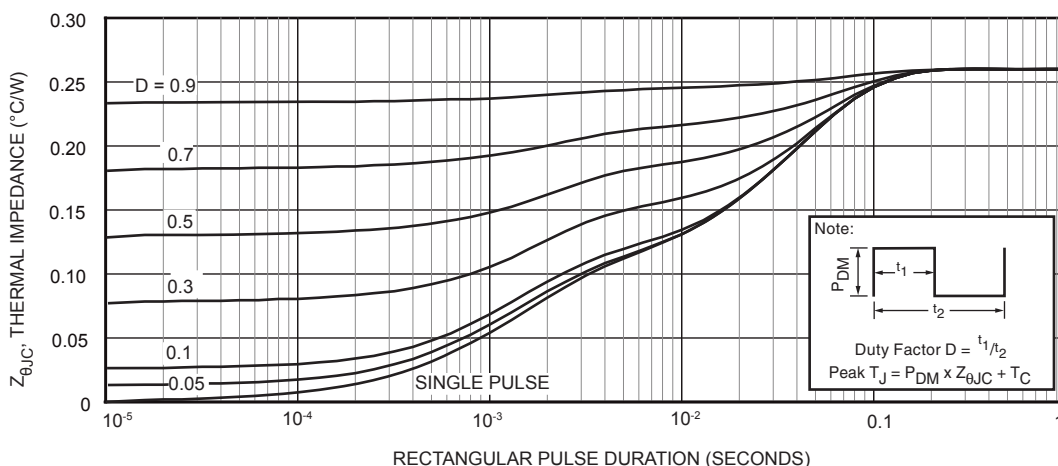
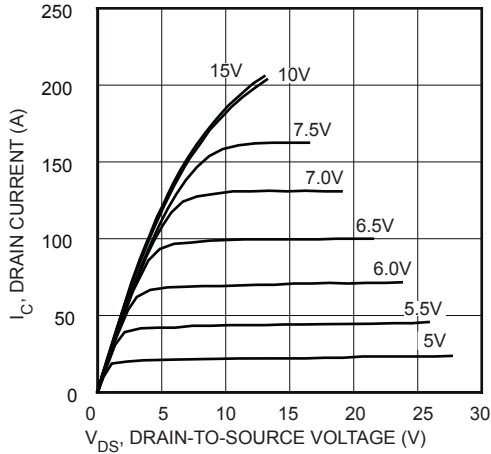**Figure 1, Maximum Effective Transient Thermal Impedance, Junction-To-Case vs Pulse Duration**

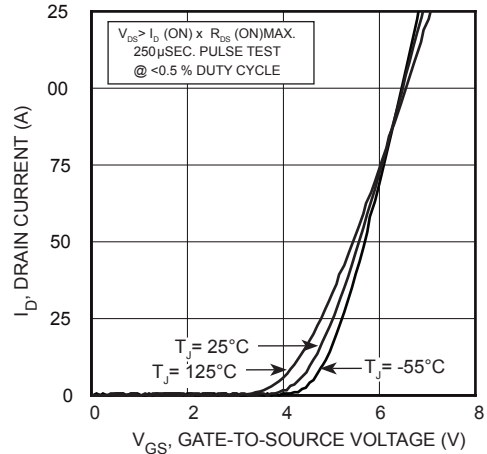**FIGURE 2, Low Voltage Output Characteristics**
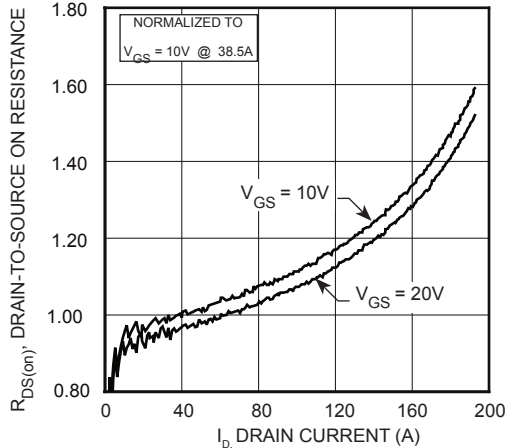
FIGURE 3, Transfer Characteristics

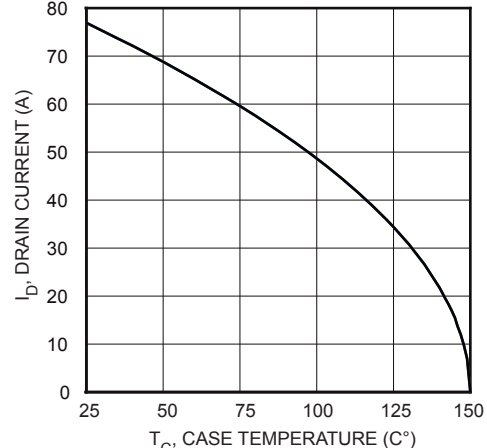**FIGURE 4, R$_{DS}$(ON) vs Drain Current**

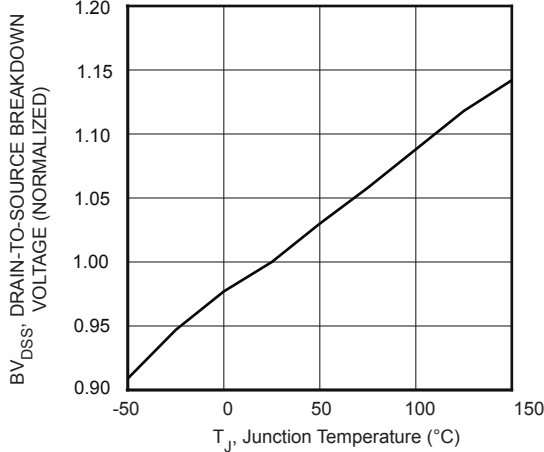**FIGURE 5, Maximum Drain Current vs Case Temperature**
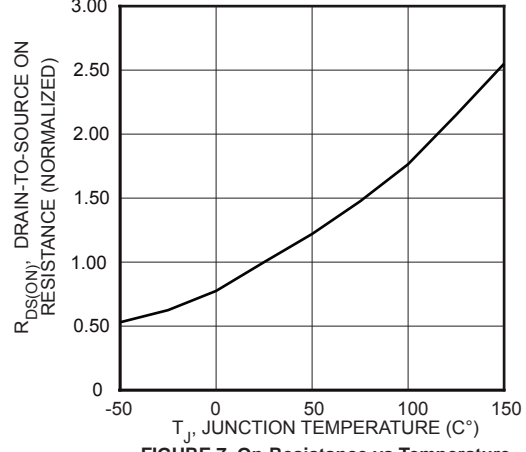
FIGURE 6, Breakdown Voltage vs Temperature
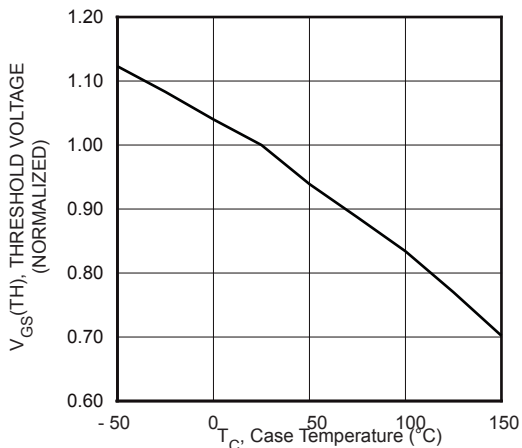
FIGURE 7, On-Resistance vs Temperature

FIGURE 8, Threshold Voltage vs Temperature

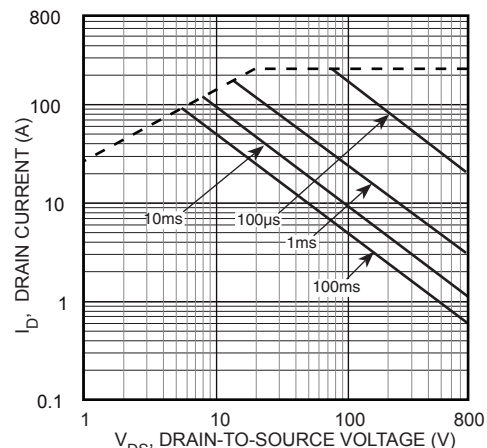**FIGURE 9, Maximum Safe Operating Area**

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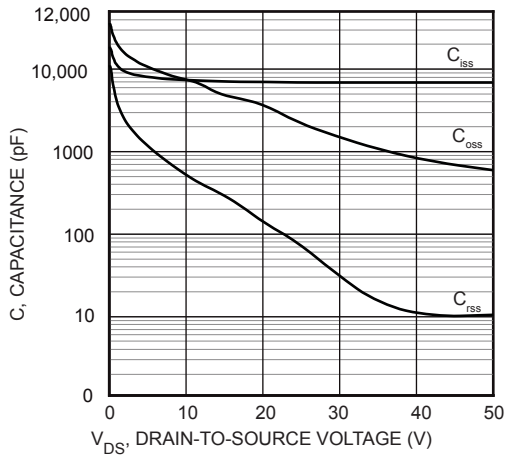
FIGURE 10, Capacitance vs Drain-To-Source Voltage
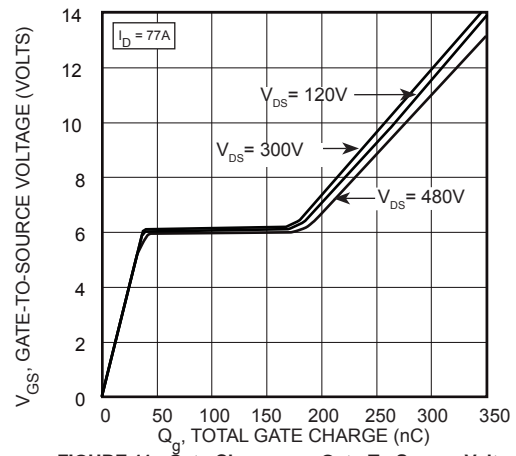
FIGURE 11, Gate Charges vs Gate-To-Source Voltage
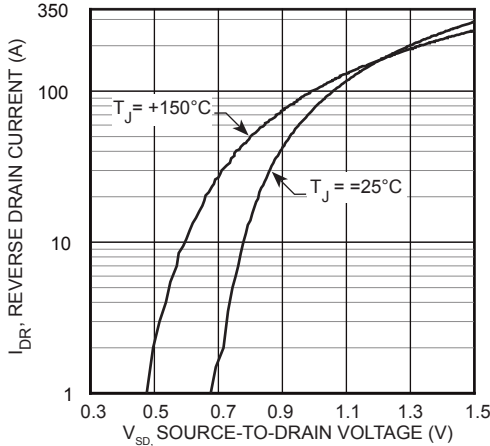
FIGURE 12, Source-Drain Diode Forward Voltage
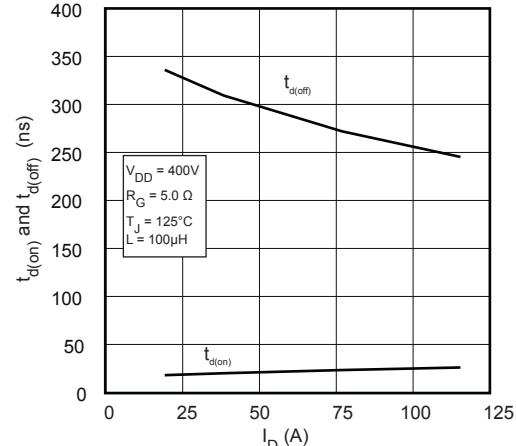
FIGURE 13, Delay Times vs Current
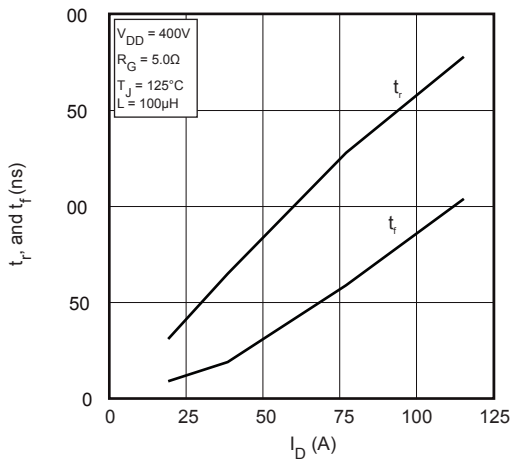

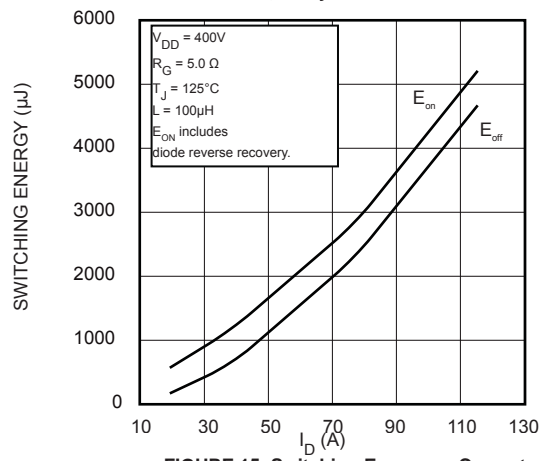**FIGURE 14 , Rise and Fall Times vs Current**
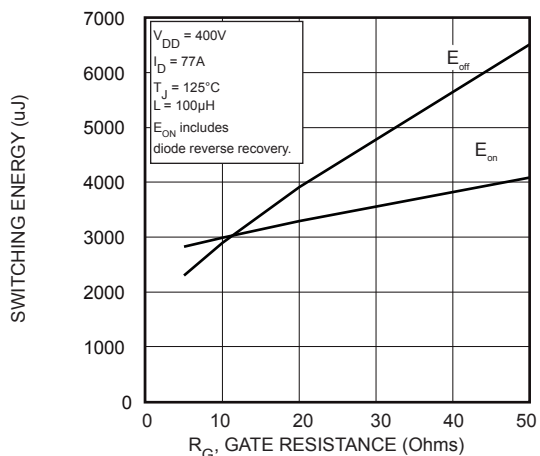

FIGURE 15, Switching Energy vs Current

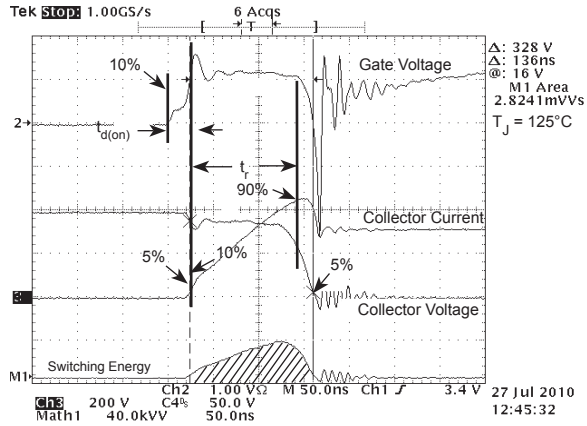**FIGURE 16, Switching Energy vs Gate Resistance**
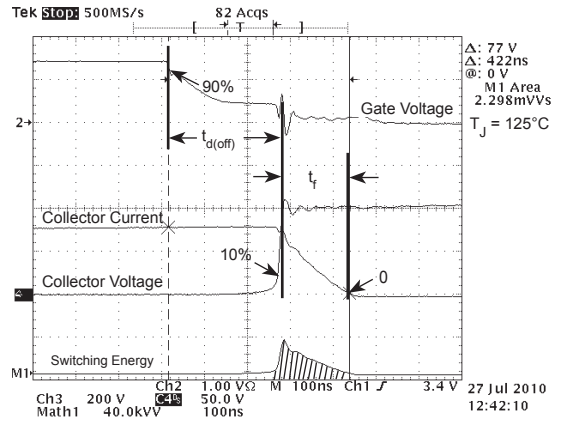
Figure 17, Turn-on Switching Waveforms and Definitions

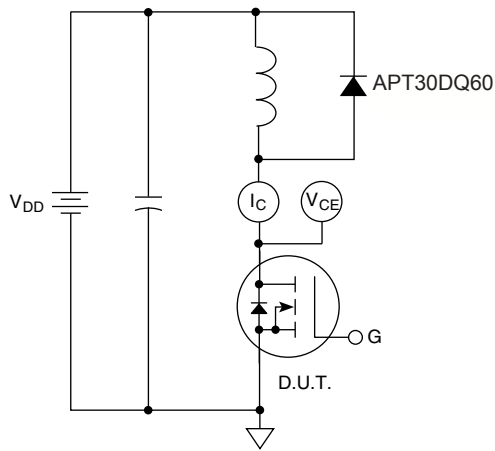**Figure 18, Turn-off Switching Waveforms and Definitions**

Figure 19, Inductive Switching Test Circuit
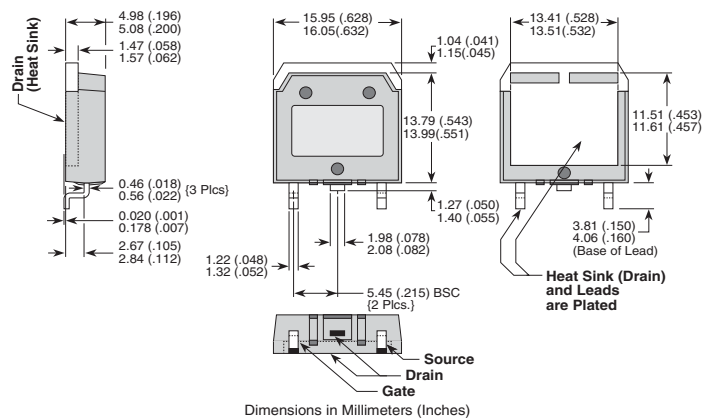
TO-247 Package Outline

Dimensions in Millimeters and (Inches)

D³PAK Package Outline

ⓔ3 100% Sn

Dimensions in Millimeters (Inches)

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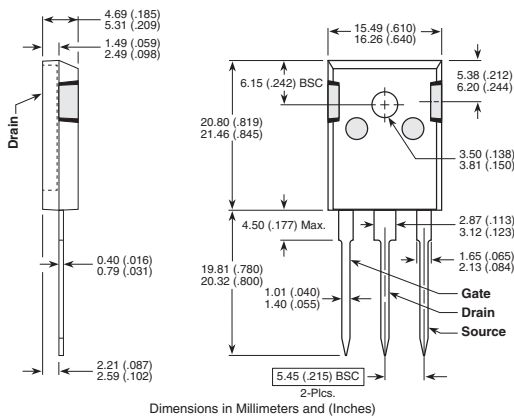
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