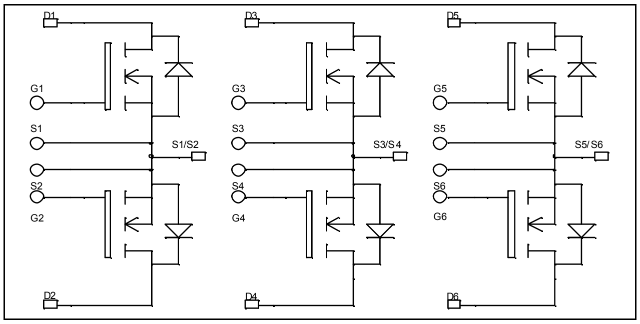
ADVANCED POWER TECHNOLOGY® EUROPE

APTC80TDU15P

Triple dual Common Source Super Junction MOSFET Power Module

V_{DSS} = 800V
R_{DSon} = 150mΩ max @ Tj = 25°C
I_D = 28A @ Tc = 25°C

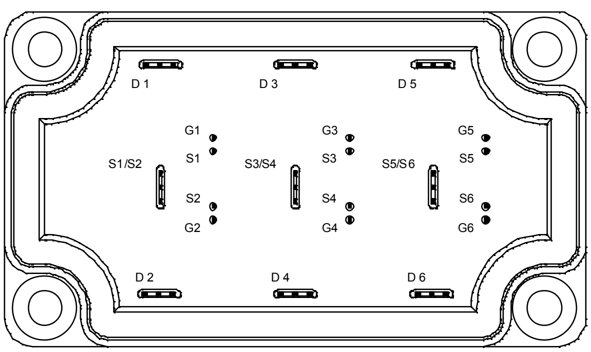


Application

- AC Switches
- Switched Mode Power Supplies
- Uninterruptible Power Supplies

Features

- COOLMOS Power Semiconductors
  - Ultra low R_{DSon}
  - Low Miller capacitance
  - Ultra low gate charge
  - Avalanche energy rated
  - Very rugged
- Kelvin source for easy drive
- Very low stray inductance
  - Symmetrical design
  - Lead frames for power connections
- High level of integration



Benefits

- Outstanding performance at high frequency operation
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Solderable terminals both for power and signal for easy PCB mounting
- Very low (12mm) profile
- Each leg can be easily paralleled to achieve a dual common source configuration of three times the current capability

Absolute maximum ratings

Symbol	Parameter		Max ratings	Unit
V_{DSS}	Drain - Source Breakdown Voltage		800	V
I_D	Continuous Drain Current	$T_c = 25°C$	28	A
		$T_c = 80°C$	21	
I_{DM}	Pulsed Drain current		110	
V_{GS}	Gate - Source Voltage		±30	V
R_{DSon}	Drain - Source ON Resistance		150	mΩ
P_D	Maximum Power Dissipation	$T_c = 25°C$	277	W
I_{AR}	Avalanche current (repetitive and non repetitive)		24	A
E_{AR}	Repetitive Avalanche Energy		0.5	mJ
E_{AS}	Single Pulse Avalanche Energy		670	

CAUTION: These Devices are sensitive to Electrostatic Discharge. Proper Handing Procedures Should Be Followed.

All ratings @ T_j = 25°C unless otherwise specified

Electrical Characteristics

Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
BV_{DSS}	Drain - Source Breakdown Voltage	V_{GS} = 0V, I_D = 375µA		800			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{GS} = 0V, V_{DS} = 800V	T_j = 25°C			50	µA
		V_{GS} = 0V, V_{DS} = 800V	T_j = 125°C			375	
$R_{DS(on)}$	Drain – Source on Resistance	V_{GS} = 10V, I_D = 14A				150	mΩ
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 2mA		2.1	3	3.9	V
I_{GSS}	Gate – Source Leakage Current	V_{GS} = ±20 V, V_{DS} = 0V				±150	nA

Dynamic Characteristics

Symbol	*Characteristic*	*Test Conditions*	*Min*	*Typ*	*Max*	*Unit*
C_{iss}	Input Capacitance	V_{GS} = 0V V_{DS} = 25V f = 1MHz		4507		pF
C_{oss}	Output Capacitance			2092		
C_{rss}	Reverse Transfer Capacitance			108		
Q_g	Total gate Charge	V_{GS} = 10V V_{Bus} = 400V I_D = 28A		180		nC
Q_{gs}	Gate – Source Charge			22		
Q_{gd}	Gate – Drain Charge			90		
$T_{d(on)}$	Turn-on Delay Time	**Inductive switching @125°C** V_{GS} = 15V V_{Bus} = 533V I_D = 28A R_G = 2.5Ω		10		ns
T_r	Rise Time			13		
$T_{d(off)}$	Turn-off Delay Time			83		
T_f	Fall Time			35		
E_{on}	Turn-on Switching Energy ❶	**Inductive switching @ 25°C** V_{GS} = 15V, V_{Bus} = 533V I_D = 28A, R_G = 2.5Ω		486		µJ
E_{off}	Turn-off Switching Energy ❷			278		
E_{on}	Turn-on Switching Energy ❶	**Inductive switching @ 125°C** V_{GS} = 15V, V_{Bus} = 533V I_D = 28A, R_G = 2.5Ω		850		µJ
E_{off}	Turn-off Switching Energy ❷			342		

Source - Drain diode ratings and characteristics

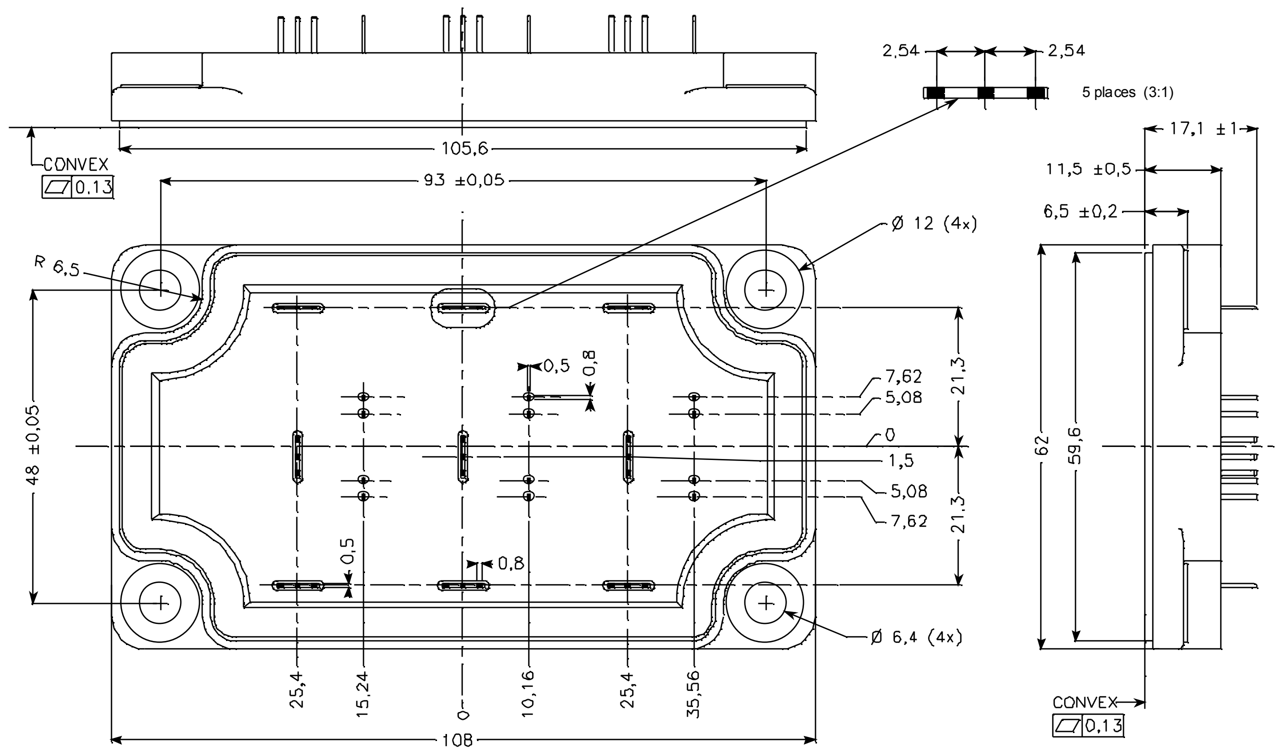
Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
I_S	Continuous Source current (Body diode)		Tc = 25°C		28		A
			Tc = 80°C		21		
V_{SD}	Diode Forward Voltage	V_{GS} = 0V, I_S = - 28A				1.2	V
dv/dt	Peak Diode Recovery ❸					6	V/ns
t_{rr}	Reverse Recovery Time	I_S = - 28A V_R = 400V di_S/dt = 200A/µs	T_j = 25°C		550		ns
Q_{rr}	Reverse Recovery Charge		T_j = 25°C		30		µC

❶ E_{on} includes diode reverse recovery.
❷ In accordance with JEDEC standard JESD24-1.
❸ dv/dt numbers reflect the limitations of the circuit rather than the device itself.
$I_S \leq$ - 28A di/dt ≤ 200A/µs $V_R \leq V_{DSS}$ $T_j \leq$ 150°C

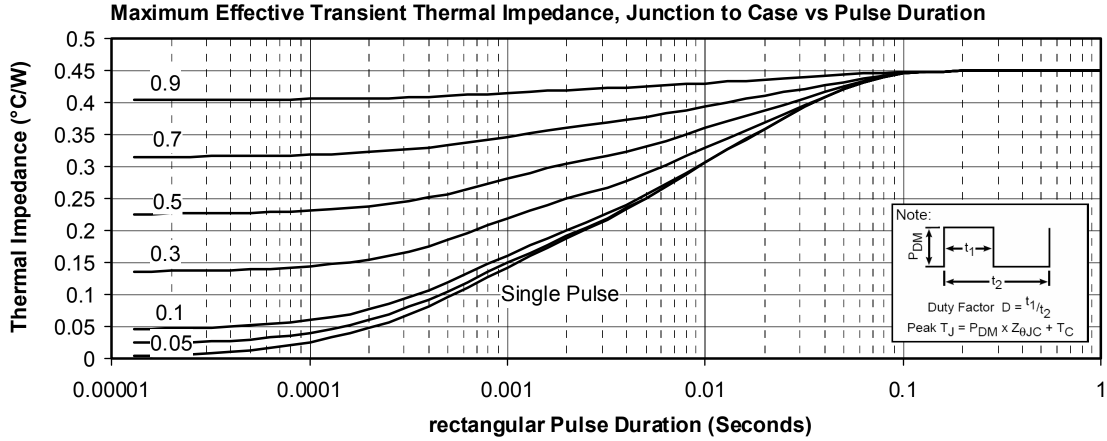
Thermal and package characteristics

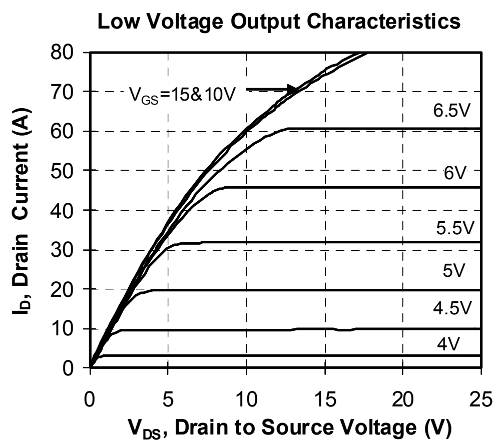
Symbol	*Characteristic*	*Min*	*Typ*	*Max*	*Unit*
R_{thJC}	Junction to Case			0.45	°C/W
V_{ISOL}	RMS Isolation Voltage, any terminal to case t =1 min, I isol<1mA, 50/60Hz	2500			V
T_J	Operating junction temperature range	-40		150	°C
T_{STG}	Storage Temperature Range	-40		125	°C
T_C	Operating Case Temperature	-40		100	°C
Torque	Mounting torque — To heatsink — M6	3		5	N.m
Wt	Package Weight			250	g

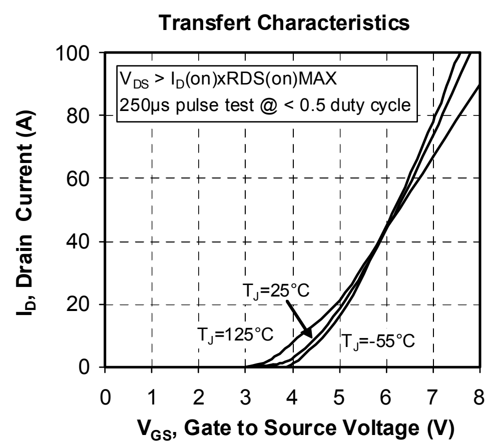
Package outline

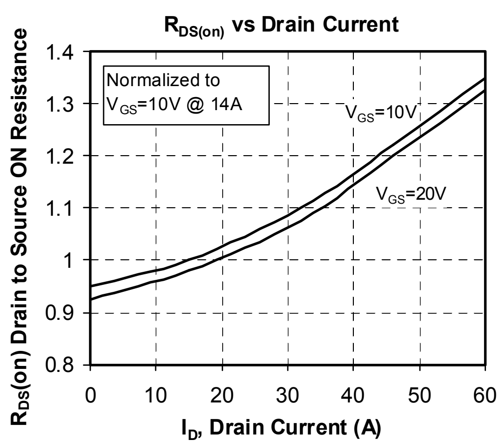


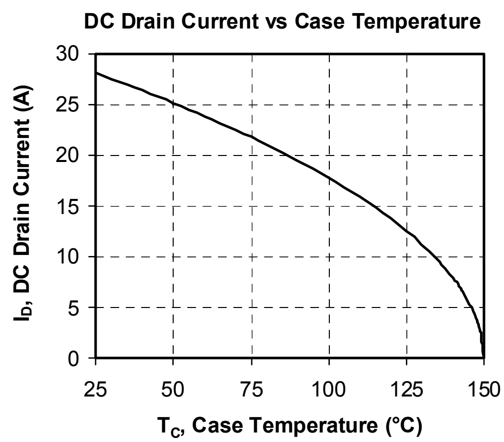
Typical Performance Curve

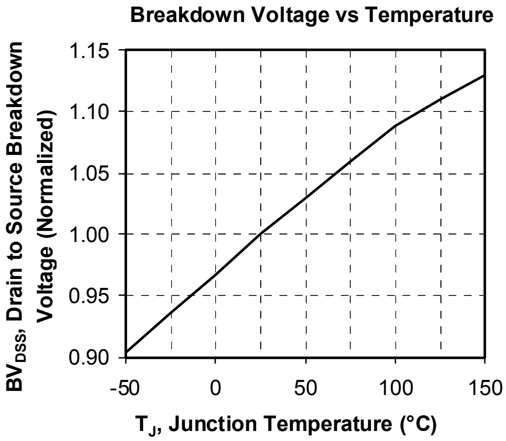


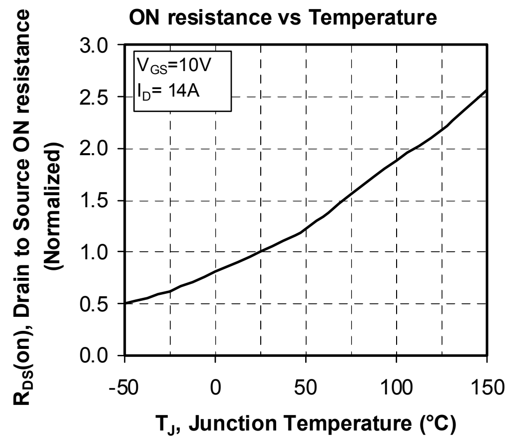


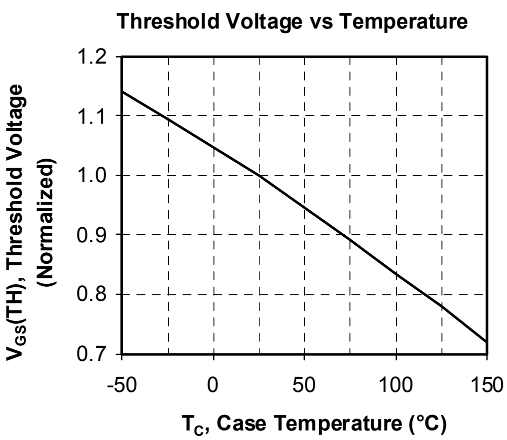


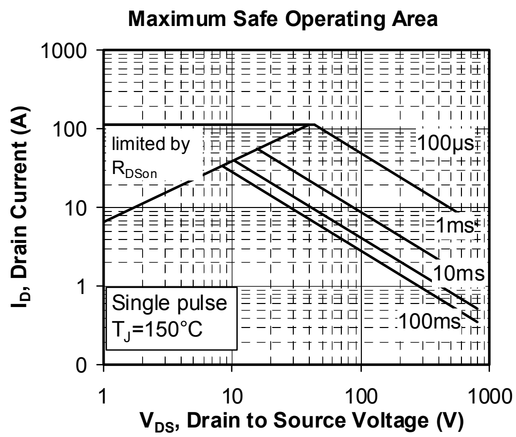


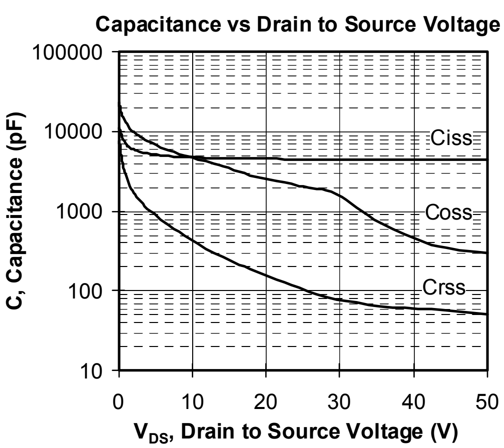


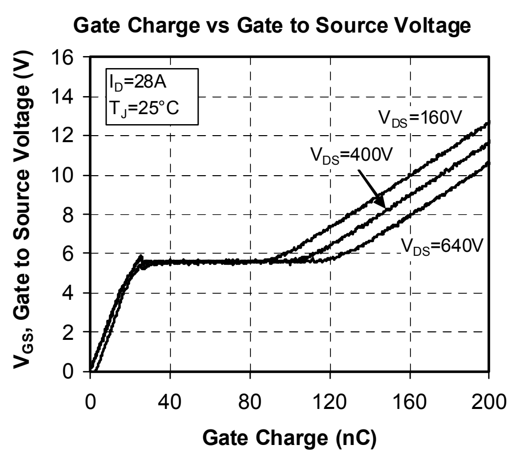

Breakdown Voltage vs Temperature
BVDSS, Drain to Source Breakdown Voltage (Normalized)
1.15
1.10
1.05
1.00
0.95
0.90
-50
0
50
100
150
TJ, Junction Temperature (°C)

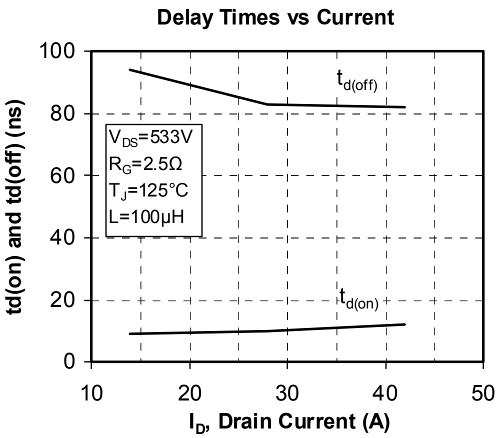

ON resistance vs Temperature
VGS=10V
ID= 14A
RDS(on), Drain to Source ON resistance (Normalized)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-50
0
50
100
150
TJ, Junction Temperature (°C)

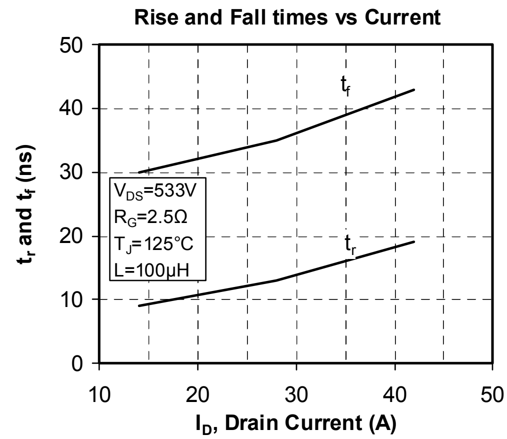

Threshold Voltage vs Temperature
VGS(TH), Threshold Voltage (Normalized)
1.2
1.1
1.0
0.9
0.8
0.7
-50
0
50
100
150
TC, Case Temperature (°C)

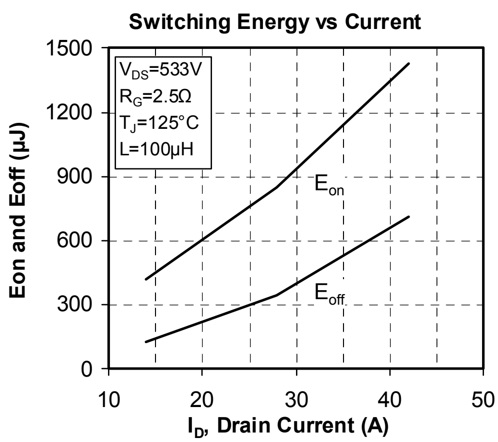

Maximum Safe Operating Area
ID, Drain Current (A)
1000
100
10
1
0
limited by RDSon
100µs
1ms
10ms
100ms
Single pulse
TJ=150°C
1
10
100
1000
VDS, Drain to Source Voltage (V)

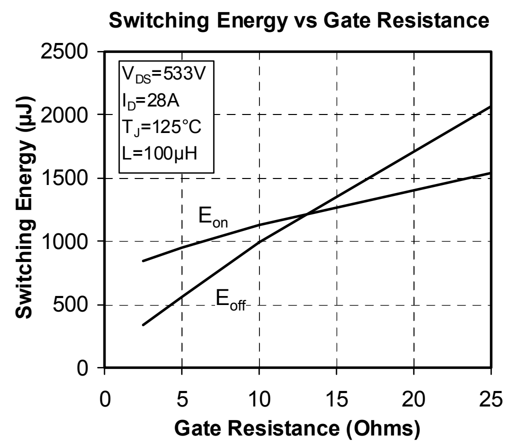

Capacitance vs Drain to Source Voltage
C, Capacitance (pF)
100000
10000
1000
100
10
Ciss
Coss
Crss
0
10
20
30
40
50
VDS, Drain to Source Voltage (V)

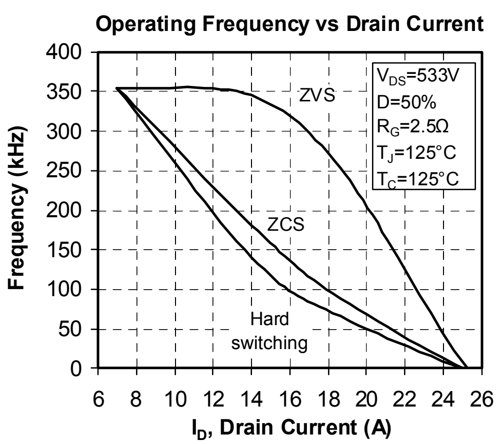

Gate Charge vs Gate to Source Voltage
VGS, Gate to Source Voltage (V)
16
14
12
10
8
6
4
2
0
ID=28A
TJ=25°C
VDS=160V
VDS=400V
VDS=640V
0
40
80
120
160
200
Gate Charge (nC)

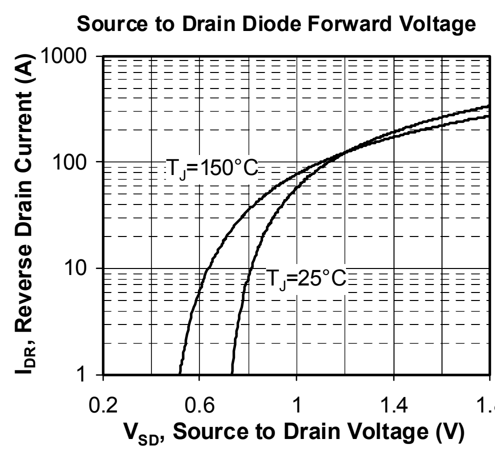












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