Automotive N-Channel 60 V (D-S) 175 °C MOSFET
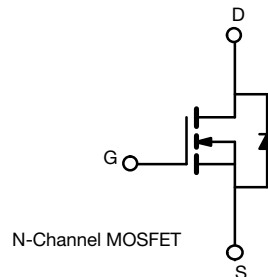
TO-263

Top View
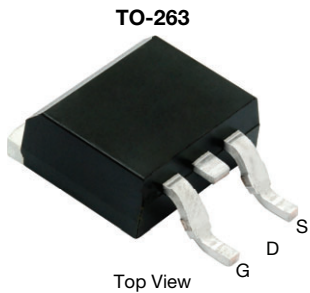
FEATURES

- 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

AUTOMOTIVE GRADE

RoHS COMPLIANT

HALOGEN FREE

N-Channel MOSFET

PRODUCT SUMMARY

V_{DS} (V)	60
$R_{DS(on)}$ (Ω) at V_{GS} = 10 V	0.0039
$R_{DS(on)}$ (Ω) at V_{GS} = 4.5 V	0.0050
I_D (A)	100
Configuration	Single
Package	TO-263

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}	± 20	
Continuous drain current	T_C = 25 °C [a]	I_D	100	A
	T_C = 125 °C		80	
Continuous source current (diode conduction) [a]		I_S	100	
Pulsed drain current [b]		I_{DM}	320	
Single pulse avalanche current	L = 0.1 mH	I_{AS}	48	
Single pulse avalanche energy		E_{AS}	115	mJ
Maximum power dissipation [b]	T_C = 25 °C	P_D	150	W
	T_C = 125 °C		50	
Operating junction and storage temperature range		T_J, T_{stg}	-55 to +175	°C

THERMAL RESISTANCE RATINGS

PARAMETER		SYMBOL	LIMIT	UNIT
Junction-to-ambient	PCB mount [c]	R_{thJA}	40	°C/W
Junction-to-case (drain)		R_{thJC}	1	

Notes

a. Package limited
b. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %
c. When mounted on 1" square PCB (FR4 material)

SPECIFICATIONS (T_C = 25 °C, unless otherwise noted)

| PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-source breakdown voltage	V_{DS}	V_{GS} = 0 V, I_D = 250 µA		60	-	-	V
Gate-source threshold voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA		1.5	2.0	2.5	
Gate-source leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 V		-	-	± 100	nA
Zero gate voltage drain current	I_{DSS}	V_{GS} = 0 V	V_{DS} = 60 V	-	-	1	µA
		V_{GS} = 0 V	V_{DS} = 60 V, T_J = 125 °C	-	-	50	
		V_{GS} = 0 V	V_{DS} = 60 V, T_J = 175 °C	-	-	300	µA
On-state drain current [a]	$I_{D(on)}$	V_{GS} = 10 V	V_{DS} ≥ 5 V	100	-	-	A
Drain-source on-state resistance [a]	$R_{DS(on)}$	V_{GS} = 10 V	I_D = 20 A	-	0.0032	0.0039	Ω
		V_{GS} = 4.5 V	I_D = 15 A	-	0.0041	0.0050	
		V_{GS} = 10 V	I_D = 20 A, T_J = 125 °C	-	-	0.0063	
		V_{GS} = 10 V	I_D = 20 A, T_J = 175 °C	-	-	0.0075	
Forward transconductance [b]	g_{fs}	V_{DS} = 15 V, I_D = 20 A		-	97	-	S
Dynamic [b]							
Input capacitance	C_{iss}	V_{GS} = 0 V	V_{DS} = 25 V, f = 1 MHz	-	4425	6100	pF
Output capacitance	C_{oss}			-	1989	2800	
Reverse transfer capacitance	C_{rss}			-	67	95	
Total gate charge [c]	Q_g	V_{GS} = 10 V	V_{DS} = 30 V, I_D = 50 A	-	60	90	nC
Gate-source charge [c]	Q_{gs}			-	16.3	-	
Gate-drain charge [c]	Q_{gd}			-	4.8	-	
Gate resistance	R_g	f = 1 MHz		0.6	1.24	1.9	Ω
Turn-on delay time [c]	$t_{d(on)}$	V_{DD} = 30 V, R_L = 0.6 Ω I_D ≅ 50 A, V_{GEN} = 10 V, R_g = 1 Ω		-	15	25	ns
Rise time [c]	t_r			-	7	15	
Turn-off delay time [c]	$t_{d(off)}$			-	33	50	
Fall time [c]	t_f			-	7	15	
Source-Drain Diode Ratings and Characteristics [b]							
Pulsed current [a]	I_{SM}			-	-	320	A
Forward voltage	V_{SD}	I_F = 25 A, V_{GS} = 0 V		-	0.81	1.5	V
Body diode reverse recovery time	t_{rr}	I_F = 30 A, di/dt = 100 A/µs		-	42	85	ns
Body diode reverse recovery charge	Q_{rr}			-	34	70	nC
Reverse recovery fall time	t_a			-	15	-	ns
Reverse recovery rise time	t_b			-	27	-	
Body diode peak reverse recovery current	$I_{RM(REC)}$			-	-1.45	-	A

Notes

a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 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.
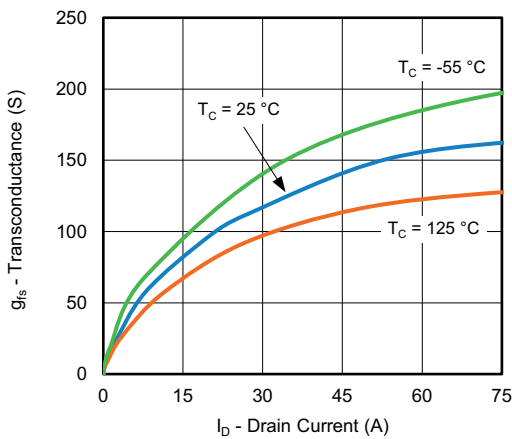
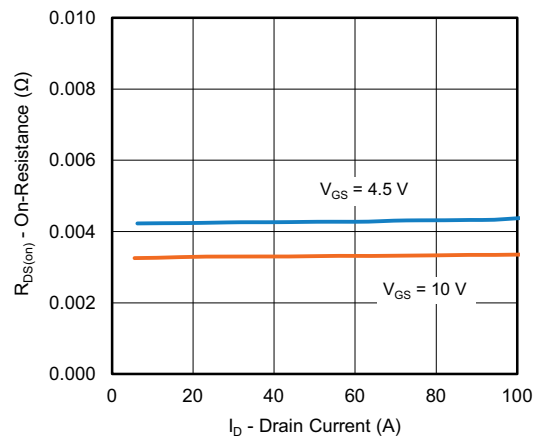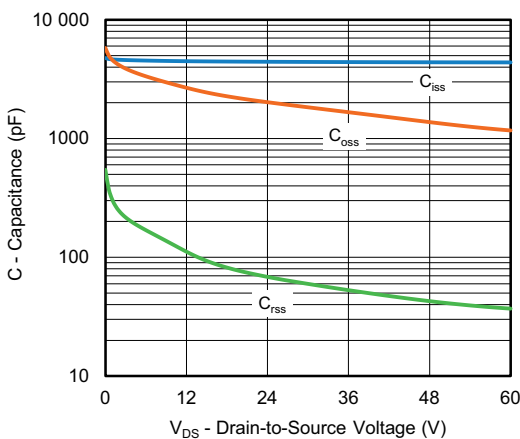## TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)
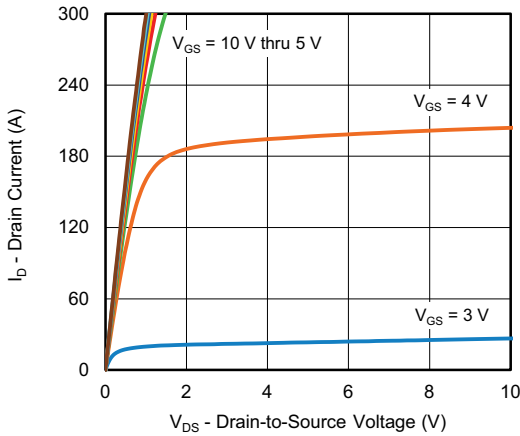
Output Characteristics
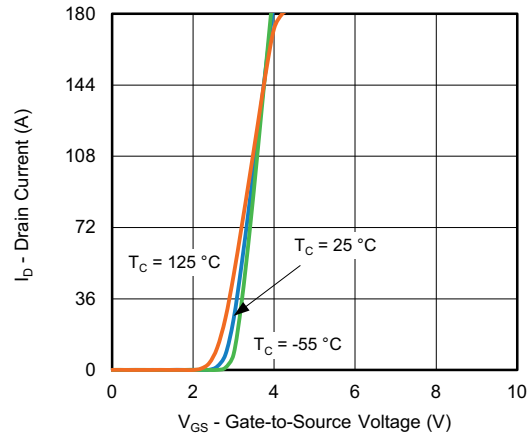
Transfer Characteristics

Transconductance
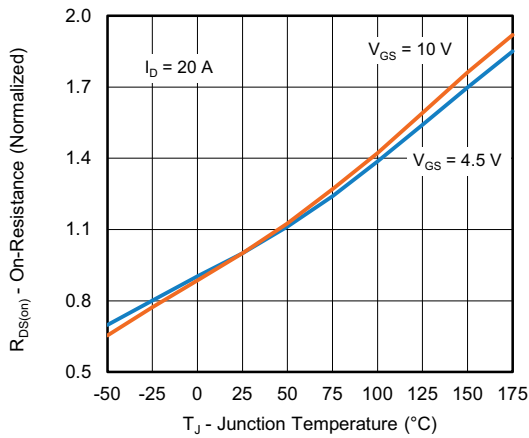

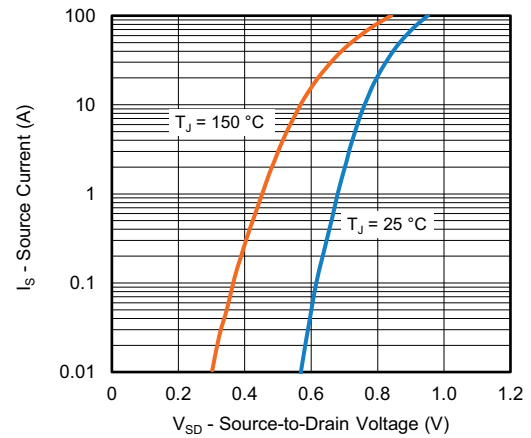**On-Resistance vs. Drain Current**
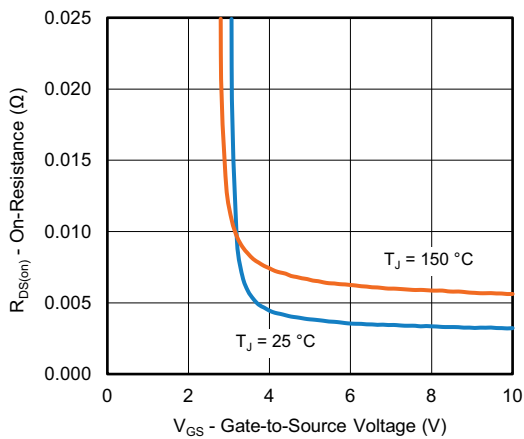

Capacitance
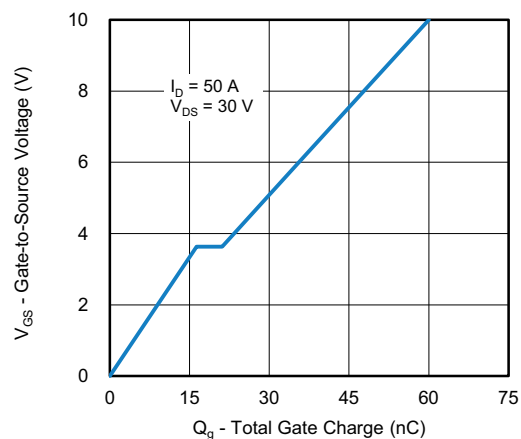
Gate Charge

TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)
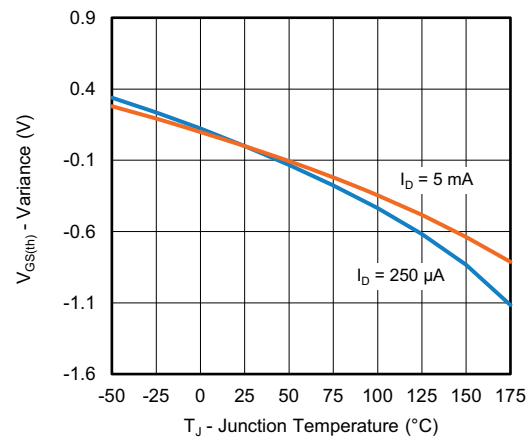

On-Resistance vs. Junction Temperature
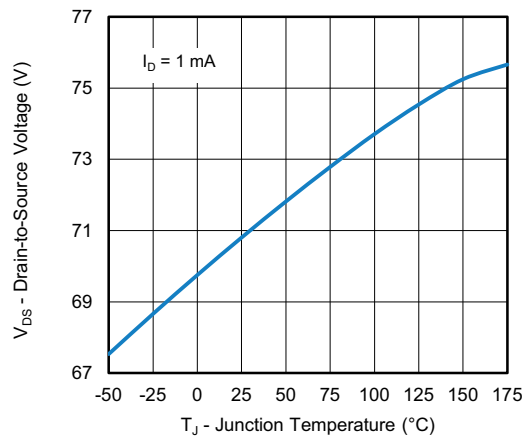

Source Drain Diode Forward Voltage

On-Resistance vs. Gate-to-Source Voltage
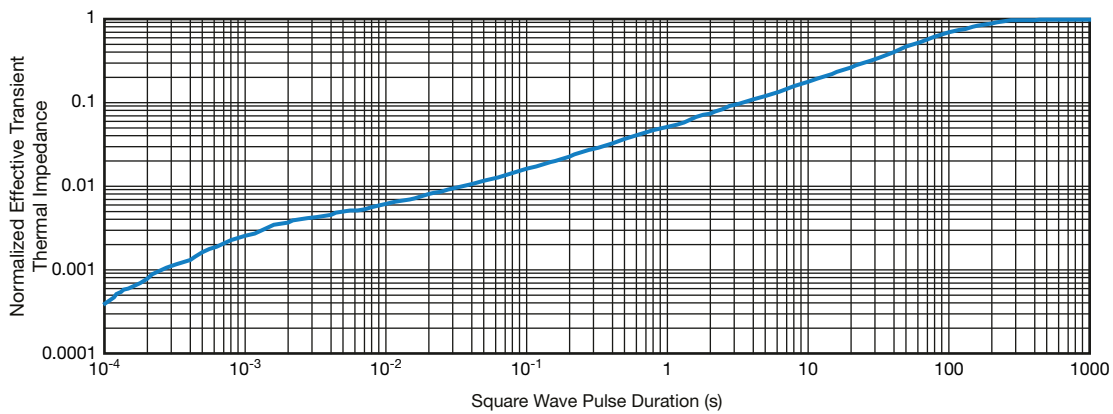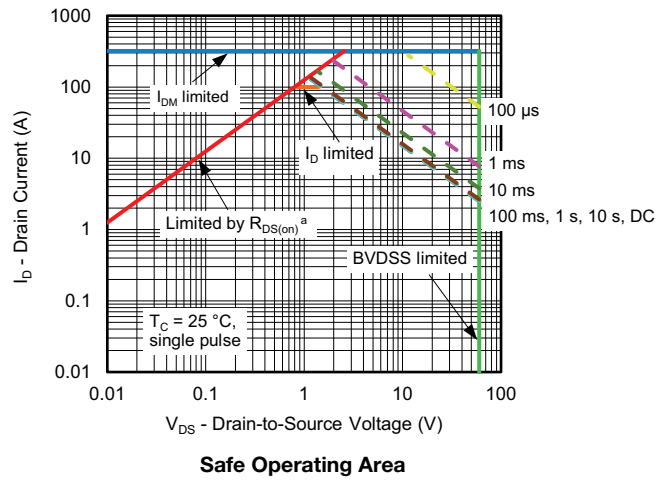

Threshold Voltage

Drain Source Breakdown vs. Junction Temperature

THERMAL RATINGS (T_A = 25 °C, unless otherwise noted)
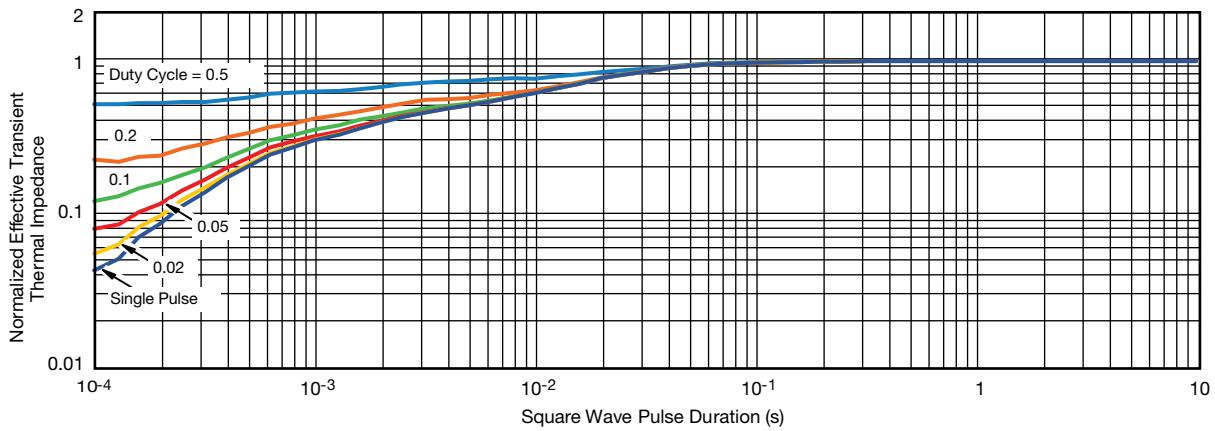

Safe Operating Area

Normalized Thermal Transient Impedance, Junction-to-Ambient

Note

a. V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

THERMAL RATINGS (T_A = 25 °C, unless otherwise noted)

Normalized Thermal Transient Impedance, Junction-to-Case

Note

• The characteristics shown in the two graphs
  - Normalized Transient Thermal Impedance Junction-to-Ambient (25 °C)
  - Normalized Transient Thermal Impedance Junction-to-Case (25 °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

For technical questions, contact: automostechsupport@vishay.com
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TO-263 (D^{2}PAK): 3-LEAD

VERSION 1: FACILITY CODE = T
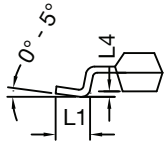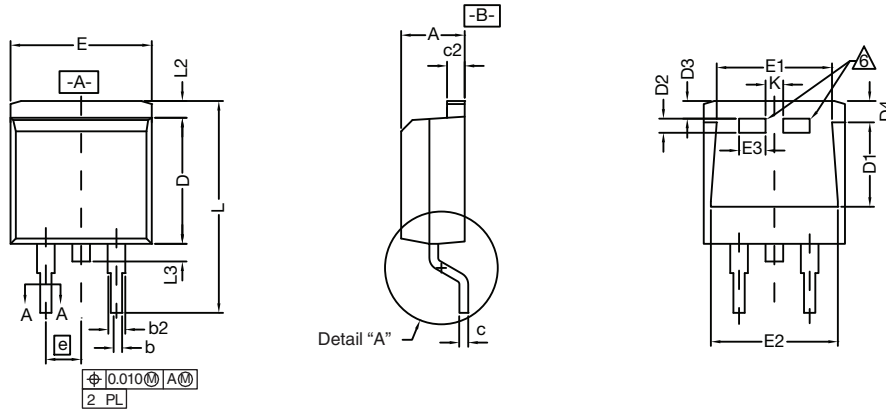
DETAIL A (ROTATED 90°)

SECTION A-A

Detail "A"

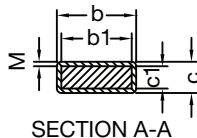|	DIM.	INCHES		MILLIMETERS	
		MIN.	MAX.	MIN.	MAX.
	A	0.160	0.190	4.064	4.826
	b	0.020	0.039	0.508	0.990
	b1	0.020	0.035	0.508	0.889
	b2	0.045	0.055	1.143	1.397
c*	Thin lead	0.013	0.018	0.330	0.457
	Thick lead	0.023	0.028	0.584	0.711
c1	Thin lead	0.013	0.017	0.330	0.431
	Thick lead	0.023	0.027	0.584	0.685
	c2	0.045	0.055	1.143	1.397
	D	0.340	0.380	8.636	9.652
	D1	0.220	0.240	5.588	6.096
	D2	0.038	0.042	0.965	1.067
	D3	0.045	0.055	1.143	1.397
	D4	0.044	0.052	1.118	1.321
	E	0.380	0.410	9.652	10.414
	E1	0.245	-	6.223	-
	E2	0.355	0.375	9.017	9.525
	E3	0.072	0.078	1.829	1.981
	e	0.100 BSC		2.54 BSC	
	K	0.045	0.055	1.143	1.397
	L	0.575	0.625	14.605	15.875
	L1	0.090	0.110	2.286	2.794
	L2	0.040	0.055	1.016	1.397
	L3	0.050	0.070	1.270	1.778
	L4	0.010 BSC		0.254 BSC	
	M	-	0.002	-	0.050

Notes
1. Plane B includes maximum features of heat sink tab and plastic.
2. No more than 25 % of L1 can fall above seating plane by max. 8 mils.
3. Pin-to-pin coplanarity max. 4 mils.
4. *: Thin lead is for SUB, SYB.
   Thick lead is for SUM, SYM, SQM.
5. Use inches as the primary measurement.
6. This feature is for thick lead.

VERSION 2: FACILITY CODE = N

OPTION 1
2 leads

OPTION 2
3 leads

SECTION G - G and T - T

DIM.	MIN.	MAX.
A	4.36	4.56
A1	0	0.25
b	0.70	0.90
b1	0.51	0.89
b2	1.20	1.46
b3	1.17	1.37
c	0.38	0.694
c1	0.38	0.534
c2	1.19	1.34
D	8.60	9.00
D1	6.9	7.5
E	10.15	10.55
E1	8.1	8.7
e	2.54 BSC	
H	15.0	15.6
L	1.9	2.5
L1	-	1.65
L2	-	1.78
L3	0.25 typ.	
L4	4.78	5.28
J1	2.56	2.96

ECN: S24-1080-Rev. L, 28-Oct-2024
DWG: 5843

RECOMMENDED MINIMUM PADS FOR D²PAK: 3-Lead

0.420
(10.668)

0.355
(9.017)

0.635
(16.129)

0.145
(3.683)

0.135
(3.429)

0.200
(5.080)

0.050
(1.257)

Recommended Minimum Pads
Dimensions in Inches/(mm)

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