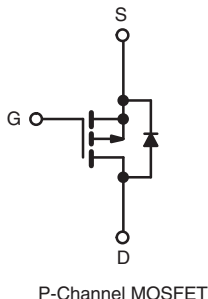
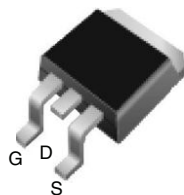


Power MOSFET

PRODUCT SUMMARY

V_{DS} (V)	- 100	
$R_{DS(on)}$ (Ω)	$V_{GS} = - 10$ V	0.20
Q_g (Max.) (nC)	61	
Q_{gs} (nC)	14	
Q_{gd} (nC)	29	
Configuration	Single	

D²PAK (TO-263)



FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- Surface Mount
- Available in Tape and Reel
- Dynamic dV/dt Rating
- Repetitive Avalanche Rated
- P-Channel
- 175 °C Operating Temperature
- Fast Switching
- Compliant to RoHS Directive 2002/95/EC



RoHS*
COMPLIANT
HALOGEN
FREE
Available

DESCRIPTION

Third generation Power MOSFETs from Vishay provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

The D²PAK (TO-263) is a surface mount power package capable of accommodating die sizes up to HEX-4. It provides the highest power capability and the lowest possible on-resistance in any existing surface mount package. The D²PAK (TO-263) is suitable for high current applications because of its low internal connection resistance and can dissipate up to 2.0 W in a typical surface mount application.

ORDERING INFORMATION

Package	D ² PAK (TO-263)	D ² PAK (TO-263)
Lead (Pb)-free and Halogen-free	SiHF9540S-GE3	SiHF9540STRL-GE3 ^a
Lead (Pb)-free	IRF9540SPbF	IRF9540STRLPbF ^a
	SiHF9540S-E3	SiHF9540STL-E3 ^a

Note

a. See device orientation.

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

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	V_{DS}	- 100	V
Gate-Source Voltage	V_{GS}	± 20	
Continuous Drain Current	V_{GS} at - 10 V	$T_C = 25$ °C	A
		$T_C = 100$ °C	
Pulsed Drain Current ^a	I_{DM}	- 72	W/°C
Linear Derating Factor		1.0	
Linear Derating Factor (PCB Mount) ^e		0.025	
Single Pulse Avalanche Energy ^b	E_{AS}	640	mJ
Repetitive Avalanche Current ^a	I_{AR}	- 19	A
Repetitive Avalanche Energy ^a	E_{AR}	15	mJ
Maximum Power Dissipation	$T_C = 25$ °C	150	W
Maximum Power Dissipation (PCB Mount) ^e		3.7	
Peak Diode Recovery dV/dt ^c	dV/dt	- 5.5	V/ns
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to + 175	°C
Soldering Recommendations (Peak Temperature)	for 10 s	300 ^d	

Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- $V_{DD} = - 25$ V, starting $T_J = 25$ °C, $L = 2.7$ mH, $R_g = 25$ Ω , $I_{AS} = - 19$ A (see fig. 12).
- $I_{SD} \leq - 19$ A, $dI/dt \leq 200$ A/ μ s, $V_{DD} \leq V_{DS}$, $T_J \leq 175$ °C.
- 1.6 mm from case.
- When mounted on 1" square PCB (FR-4 or G-10 material)

* Pb containing terminations are not RoHS compliant, exemptions may apply

THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient (PCB Mount) ^a	R_{thJA}	-	-	40	°C/W
Maximum Junction-to-Case (Drain)	R_{thJC}	-	-	1.0	

Note

a. When mounted on 1" square PCB (FR-4 or G-10 material).

SPECIFICATIONS ($T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0$, $I_D = - 250\text{ }\mu\text{A}$		- 100	-	-	V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^{\circ}\text{C}$, $I_D = - 1\text{ mA}$		-	- 0.087	-	V/ $^{\circ}\text{C}$
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = - 250\text{ }\mu\text{A}$		- 2.0	-	- 4.0	V
Gate-Source Leakage	I_{GSS}	$V_{GS} = \pm 20\text{ V}$		-	-	± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = - 100\text{ V}$, $V_{GS} = 0\text{ V}$		-	-	- 100	μA
		$V_{DS} = - 80\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 150\text{ }^{\circ}\text{C}$		-	-	- 500	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = - 10\text{ V}$	$I_D = - 11\text{ A}^b$	-	-	0.20	Ω
Forward Transconductance	g_{fs}	$V_{DS} = - 50\text{ V}$, $I_D = - 11\text{ A}$		6.2	-	-	S
Dynamic							
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}$, $V_{DS} = - 25\text{ V}$, $f = 1.0\text{ MHz}$, see fig. 5		-	1400	-	pF
Output Capacitance	C_{oss}			-	590	-	
Reverse Transfer Capacitance	C_{rss}			-	140	-	
Total Gate Charge	Q_g	$V_{GS} = - 10\text{ V}$	$I_D = - 19\text{ A}$, $V_{DS} = - 80\text{ V}$, see fig. 6 and 13 ^b	-	-	61	nC
Gate-Source Charge	Q_{gs}			-	-	14	
Gate-Drain Charge	Q_{gd}			-	-	29	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = - 50\text{ V}$, $I_D = - 19\text{ A}$, $R_G = 9.1\text{ }\Omega$, $R_D = 2.4\text{ }\Omega$, see fig. 10 ^b		-	16	-	ns
Rise Time	t_r			-	73	-	
Turn-Off Delay Time	$t_{d(off)}$			-	34	-	
Fall Time	t_f			-	57	-	
Internal Drain Inductance	L_D	Between lead, 6 mm (0.25") from package and center of die contact		-	4.5	-	nH
Internal Source Inductance	L_S			-	7.5	-	
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p - n junction diode		-	-	- 19	A
Pulsed Diode Forward Current ^a	I_{SM}			-	-	- 72	
Body Diode Voltage	V_{SD}	$T_J = 25\text{ }^{\circ}\text{C}$, $I_S = - 19\text{ A}$, $V_{GS} = 0\text{ V}^b$		-	-	- 5.0	V
Body Diode Reverse Recovery Time	t_{rr}	$T_J = 25\text{ }^{\circ}\text{C}$, $I_F = - 19\text{ A}$, $dI/dt = 100\text{ A}/\mu\text{s}^b$		-	130	260	ns
Body Diode Reverse Recovery Charge	Q_{rr}			-	0.35	0.70	nC
Forward Turn-On Time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by L_S and L_D)					

Notes

a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).

b. Pulse width $\leq 300\text{ }\mu\text{s}$; duty cycle $\leq 2\%$.

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

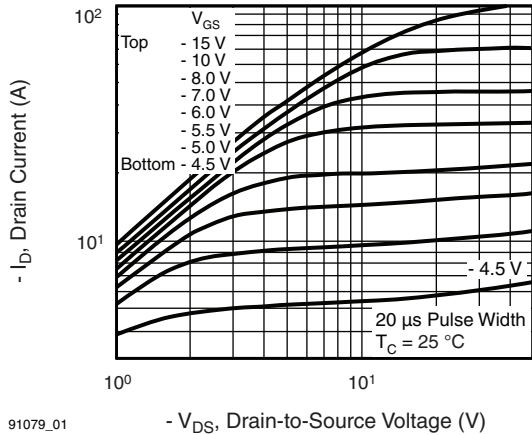


Fig. 1 - Typical Output Characteristics, $T_C = 25^\circ\text{C}$

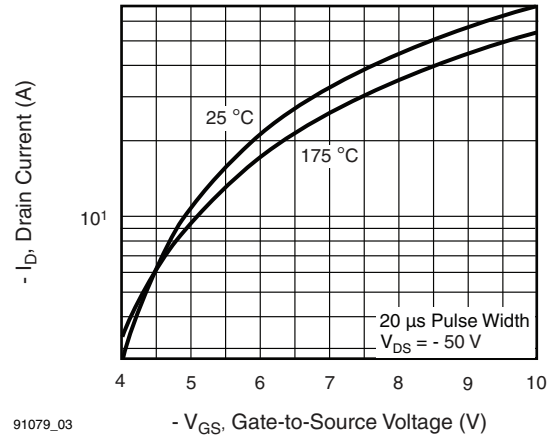


Fig. 3 - Typical Transfer Characteristics

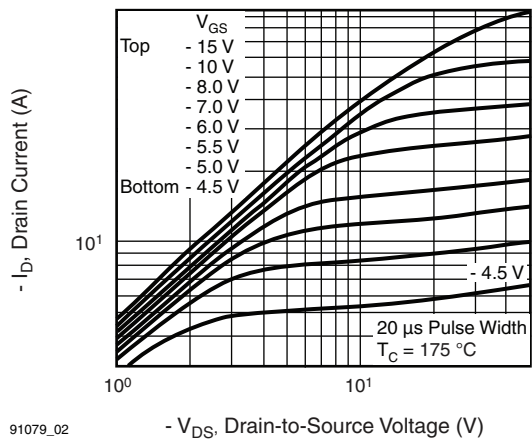


Fig. 2 - Typical Output Characteristics, $T_C = 175^\circ\text{C}$

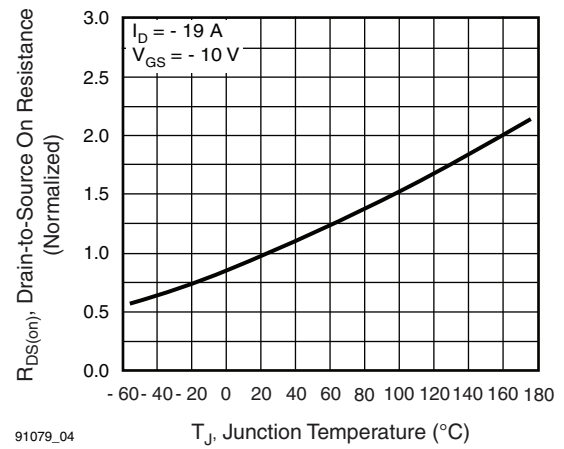


Fig. 4 - Normalized On-Resistance vs. Temperature

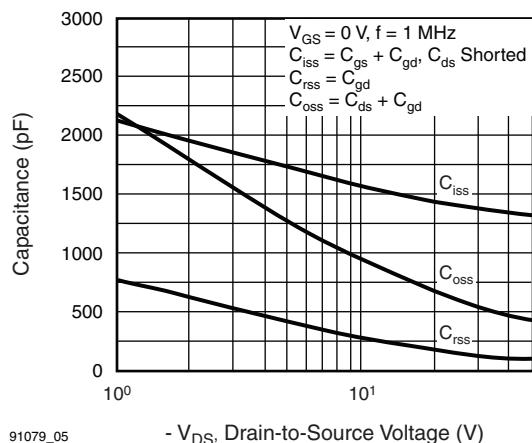


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

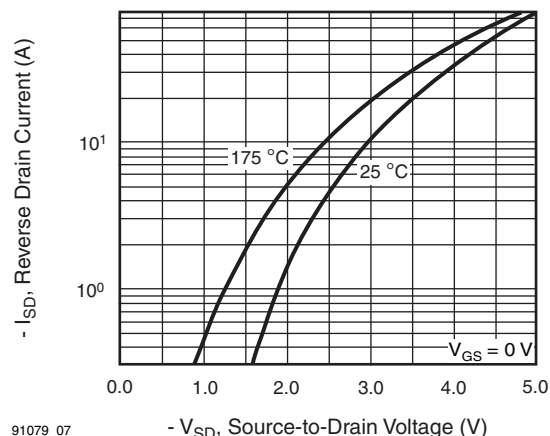


Fig. 7 - Typical Source-Drain Diode Forward Voltage

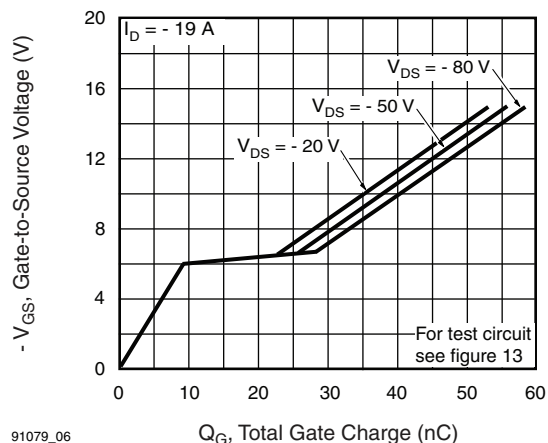


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

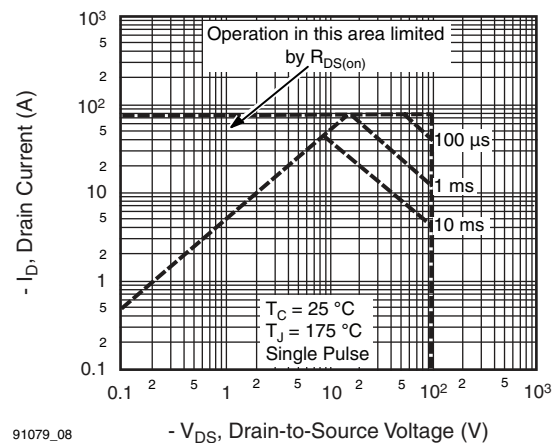


Fig. 8 - Maximum Safe Operating Area

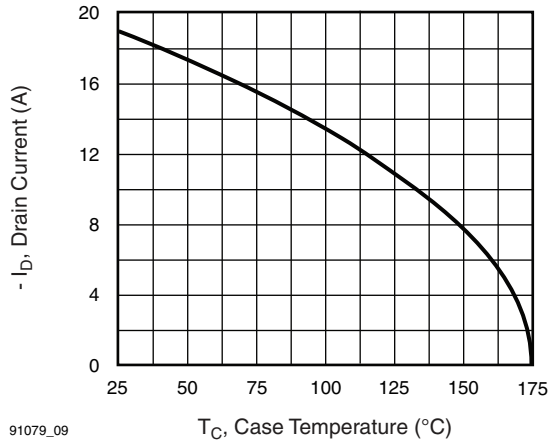


Fig. 9 - Maximum Drain Current vs. Case Temperature

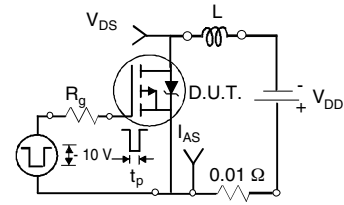


Fig. 10a - Switching Time Test Circuit

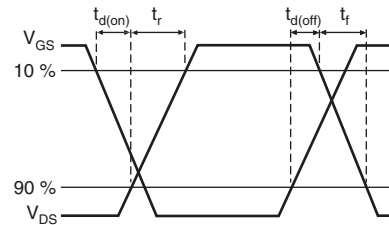


Fig. 10b - Switching Time Waveforms

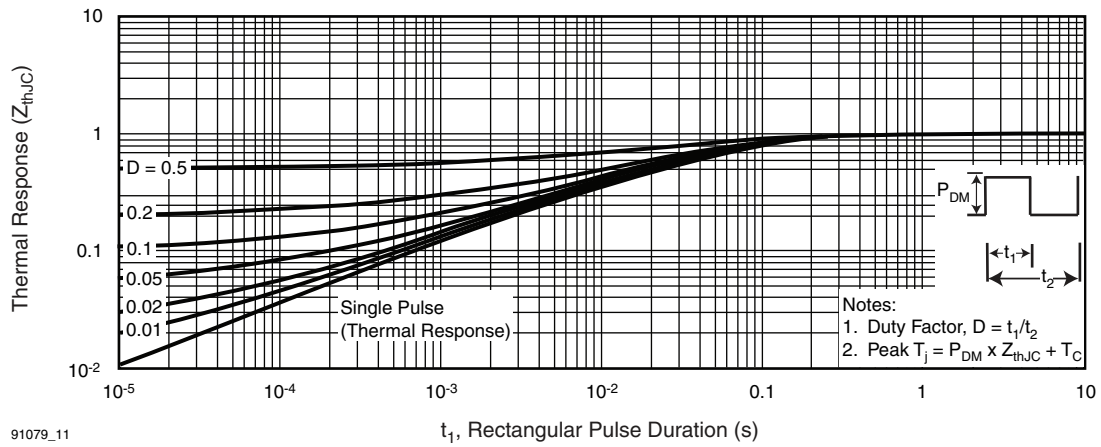


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

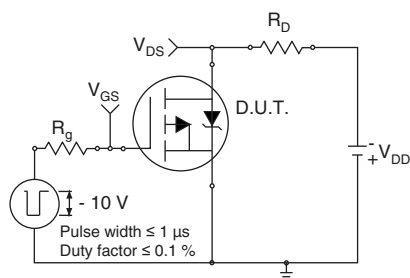


Fig. 12a - Unclamped Inductive Test Circuit

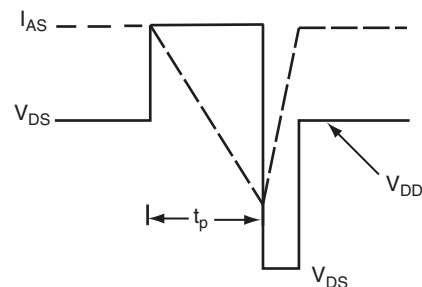


Fig. 12b - Unclamped Inductive Waveforms

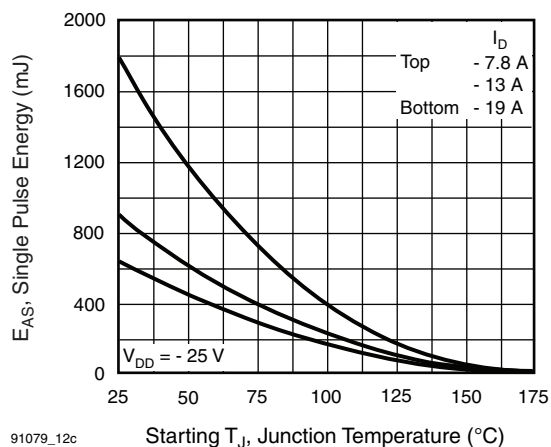


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

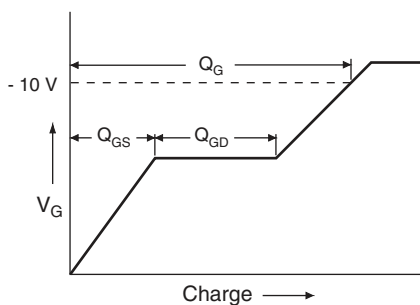


Fig. 13a - Basic Gate Charge Waveform

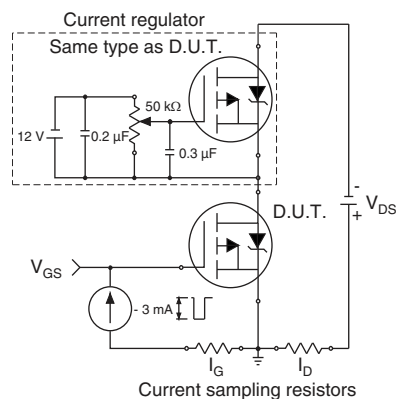


Fig. 13b - Gate Charge Test Circuit

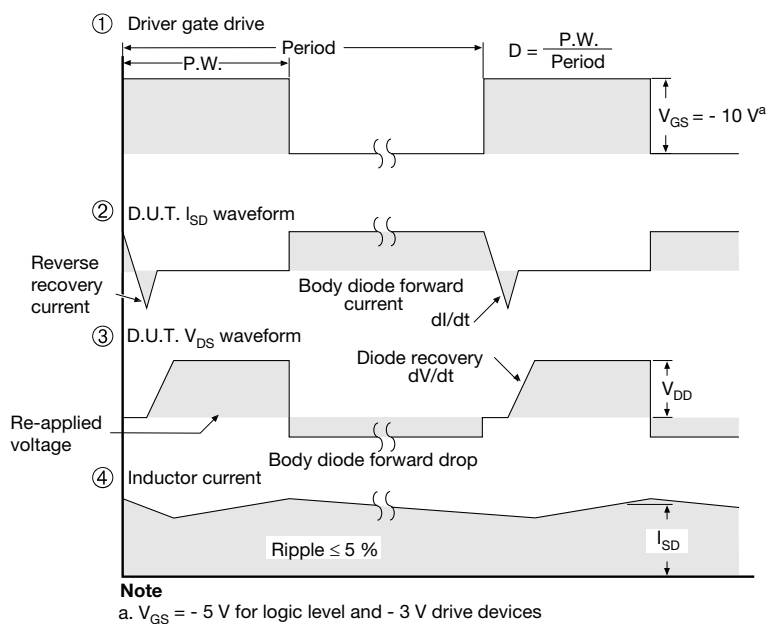
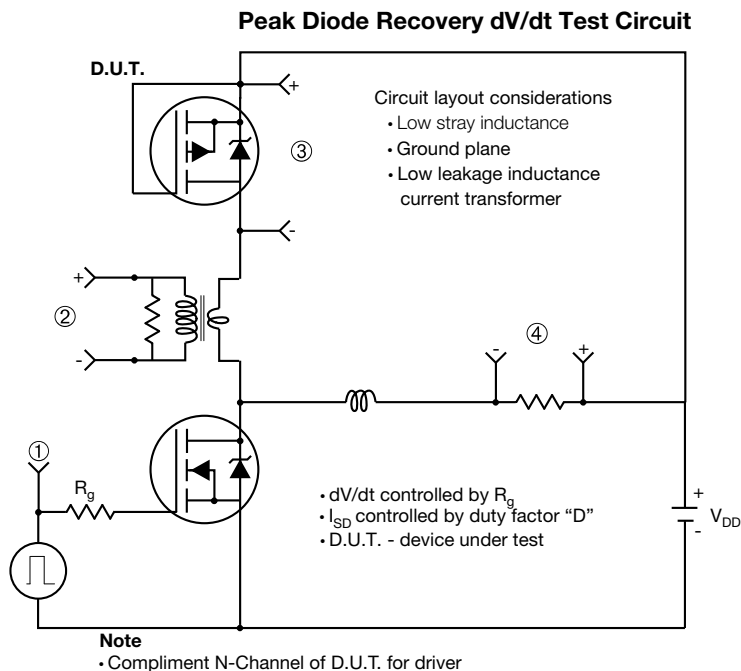


Fig. 14 - For P-Channel

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	MILLIMETERS		INCHES	
DIM.	MIN.	MAX.	MIN.	MAX.
D1	6.86	-	0.270	-
E	9.65	10.67	0.380	0.420
E1	6.22	-	0.245	-
e	2.54 BSC		0.100 BSC	
H	14.61	15.88	0.575	0.625
L	1.78	2.79	0.070	0.110
L1	-	1.65	-	0.066
L2	-	1.78	-	0.070
L3	0.25 BSC		0.010 BSC	
L4	4.78	5.28	0.188	0.208



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