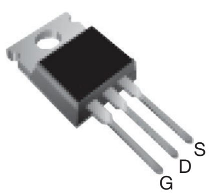
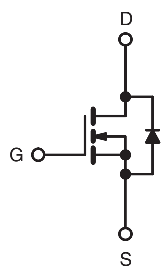
Power MOSFET

PRODUCT SUMMARY		
V_{DS} (V)	100	
$R_{DS(on)}$ (Ω)	V_{GS} = 5.0 V	0.27
Q_g (Max.) (nC)	12	
Q_{gs} (nC)	3.0	
Q_{gd} (nC)	7.1	
Configuration	Single	

TO-220AB





N-Channel MOSFET

FEATURES

- Dynamic dV/dt Rating
- Repetitive Avalanche Rated
- Logic-Level Gate Drive
- $R_{DS(on)}$ Specified at V_{GS} = 4 V and 5 V
- 175 °C Operating Temperature
- Fast Switching
- Ease of Paralleling
- Compliant to RoHS Directive 2002/95/EC

Pb Available

RoHS*
COMPLIANT

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 TO-220AB package is universally preferred for all commercial-industrial applications at power dissipation levels to approximately 50 W. The low thermal resistance and low package cost the TO-220AB contribute to its wide acceptance throughout the industry.

ORDERING INFORMATION	
Package	TO-220AB
Lead (Pb)-free	IRL520PbF
	SiHL520-E3
SnPb	IRL520
	SiHL520

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

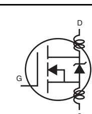
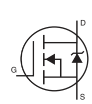
PARAMETER			SYMBOL	LIMIT	UNIT
Drain-Source Voltage			V_{DS}	100	V
Gate-Source Voltage			V_{GS}	± 10	
Continuous Drain Current	V_{GS} at 5.0 V	T_C = 25 °C	I_D	9.2	A
		T_C = 100 °C		6.5	
Pulsed Drain Current[a]			I_{DM}	36	
Linear Derating Factor				0.40	W/°C
Single Pulse Avalanche Energy[b]			E_{AS}	170	mJ
Avalanche Current[a]			I_{AR}	9.2	A
Repetitive Avalanche Energy[a]			E_{AR}	6.0	mJ
Maximum Power Dissipation	T_C = 25 °C		P_D	60	W
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]	
Mounting Torque	6-32 or M3 screw			10	lbf · in
				1.1	N · m

Notes

a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
b. V_{DD} = 25 V, starting T_J = 25 °C, L = 3.0 mH, R_g = 25 Ω, I_{AS} = 9.2 A (see fig. 12).
c. $I_{SD} \leq 9.2$ A, dI/dt ≤ 110 A/μs, $V_{DD} \leq V_{DS}$, $T_J \leq 175$ °C.
d. 1.6 mm from case.

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

THERMAL RESISTANCE RATINGS				
PARAMETER	**SYMBOL**	**TYP.**	**MAX.**	**UNIT**
Maximum Junction-to-Ambient	R_{thJA}	-	62	°C/W
Case-to-Sink, Flat, Greasd Surface	R_{thCS}	0.50	-	
Maximum Junction-to-Case (Drain)	R_{thJC}	-	2.5	

SPECIFICATIONS (T_J = 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		100	-	-	V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to 25 °C, I_D = 1 mA		-	0.12	-	V/°C
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 μA		1.0	-	2.0	V
Gate-Source Leakage	I_{GSS}	V_{GS} = ± 10 V		-	-	± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 100 V, V_{GS} = 0 V		-	-	25	μA
		V_{DS} = 80 V, V_{GS} = 0 V, T_J = 150 °C		-	-	250	
Drain-Source On-State Resistance	$R_{DS(on)}$	V_{GS} = 5.0 V	I_D = 5.5 A[b]	-	-	0.27	Ω
		V_{GS} = 4.0 V	I_D = 4.6 A[b]	-	-	0.38	
Forward Transconductance	g_{fs}	V_{DS} = 50 V, I_D = 5.5 A		3.2	-	-	S
Dynamic							
Input Capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 25 V, f = 1.0 MHz, see fig. 5		-	490	-	pF
Output Capacitance	C_{oss}			-	150	-	
Reverse Transfer Capacitance	C_{rss}			-	30	-	
Total Gate Charge	Q_g	V_{GS} = 5.0 V	I_D = 9.2 A, V_{DS} = 80 V, see fig. 6 and 13[b]	-	-	12	nC
Gate-Source Charge	Q_{gs}			-	-	3.0	
Gate-Drain Charge	Q_{gd}			-	-	7.1	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 50 V, I_D = 9.2 A, R_g = 9.0 Ω, R_D = 5.2 Ω, see fig. 10[b]		-	9.8	-	ns
Rise Time	t_r			-	64	-	
Turn-Off Delay Time	$t_{d(off)}$			-	21	-	
Fall Time	t_f			-	27	-	
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		-	-	9.2	A
Pulsed Diode Forward Current[a]	I_{SM}			-	-	36	
Body Diode Voltage	V_{SD}	T_J = 25 °C, I_S = 9.2 A, V_{GS} = 0 V[b]		-	-	2.5	V
Body Diode Reverse Recovery Time	t_{rr}	T_J = 25 °C, I_F = 9.2 A, dI/dt = 100 A/μs[b]		-	130	190	ns
Body Diode Reverse Recovery Charge	Q_{rr}			-	0.83	1.0	μC
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 ≤ 300 μs; duty cycle ≤ 2 %.

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

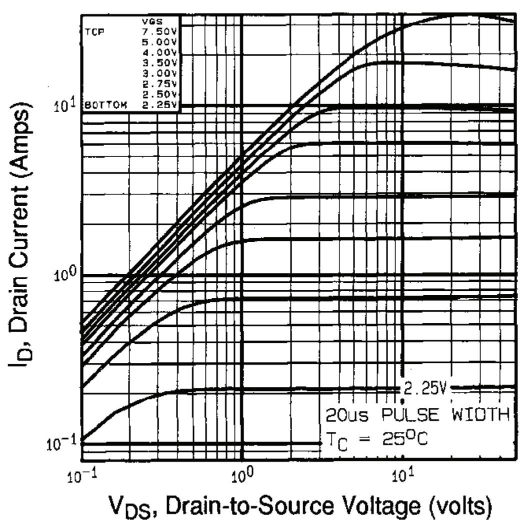


Fig. 1 - Typical Output Characteristics, T_C = 25 °C

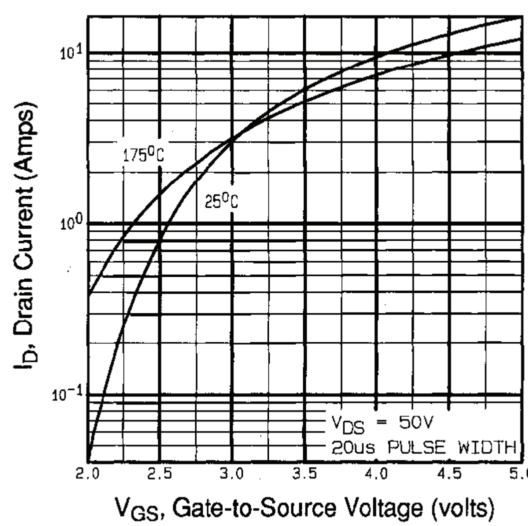


Fig. 3 - Typical Transfer Characteristics

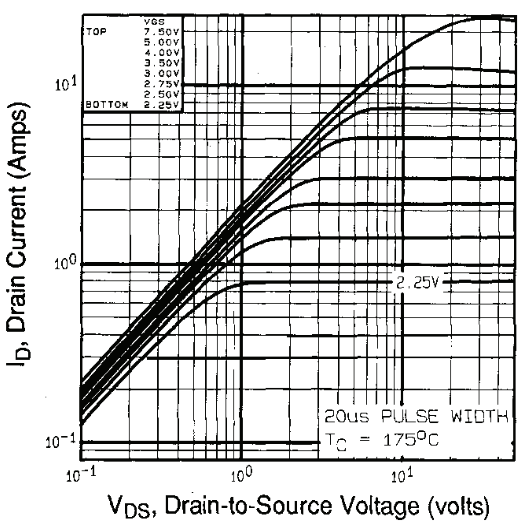


Fig. 2 - Typical Output Characteristics, T_C = 175 °C

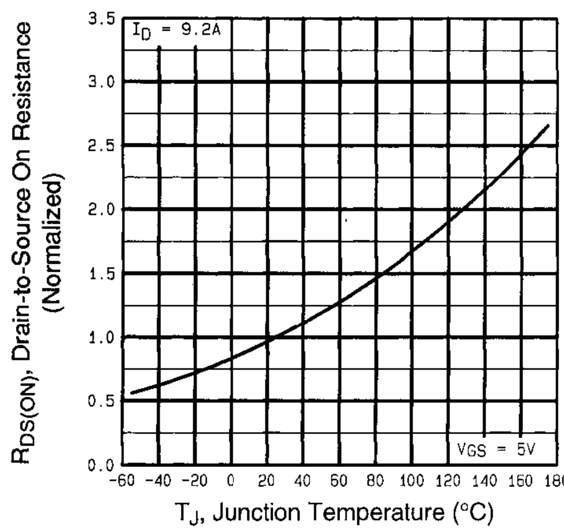


Fig. 4 - Normalized On-Resistance vs. Temperature

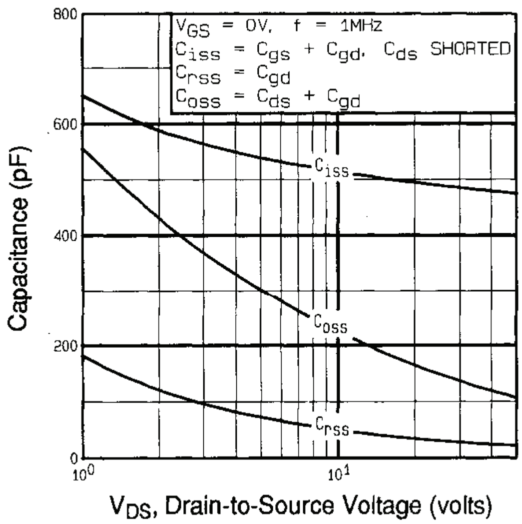


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

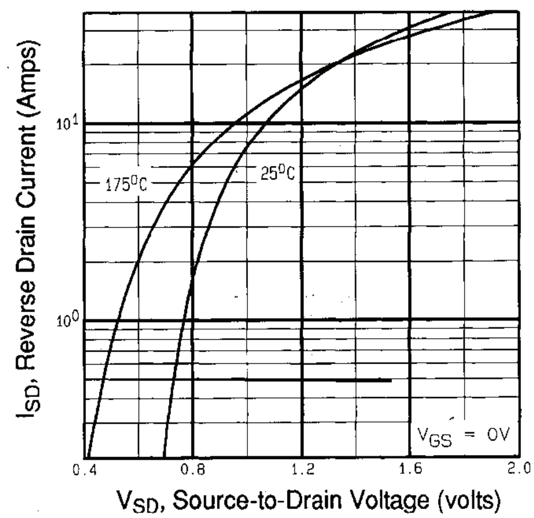


Fig. 7 - Typical Source-Drain Diode Forward Voltage

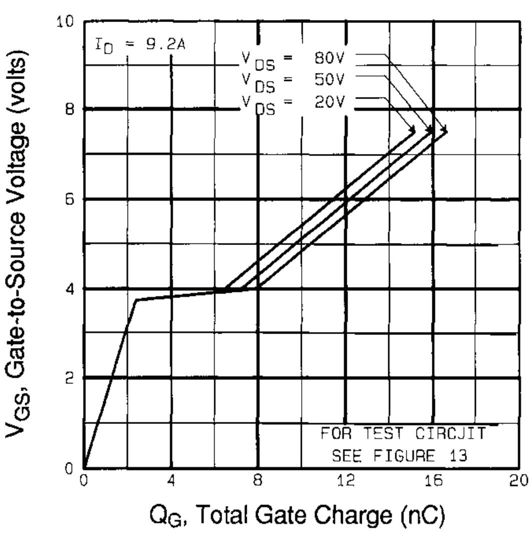


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

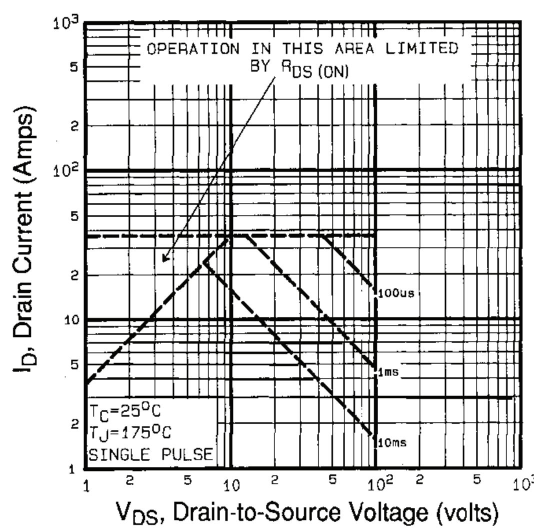


Fig. 8 - Maximum Safe Operating Area

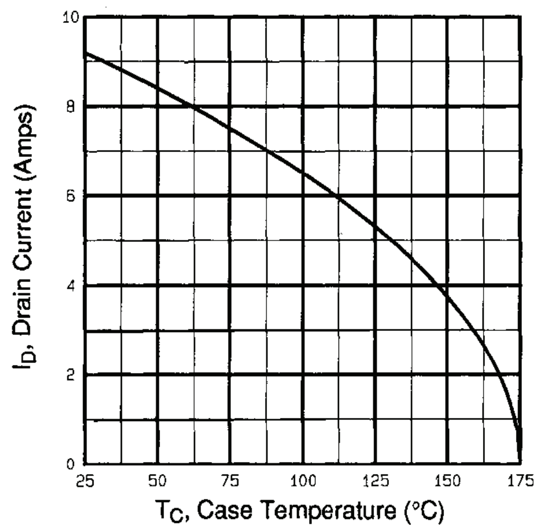


Fig. 9 - Maximum Safe Operating Area

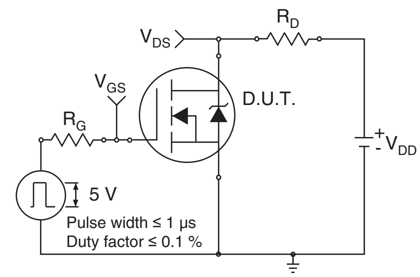


Fig. 10a - Switching Time Test Circuit

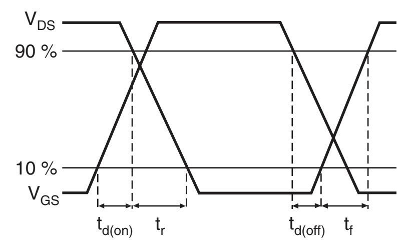


Fig. 10b - Switching Time Waveforms

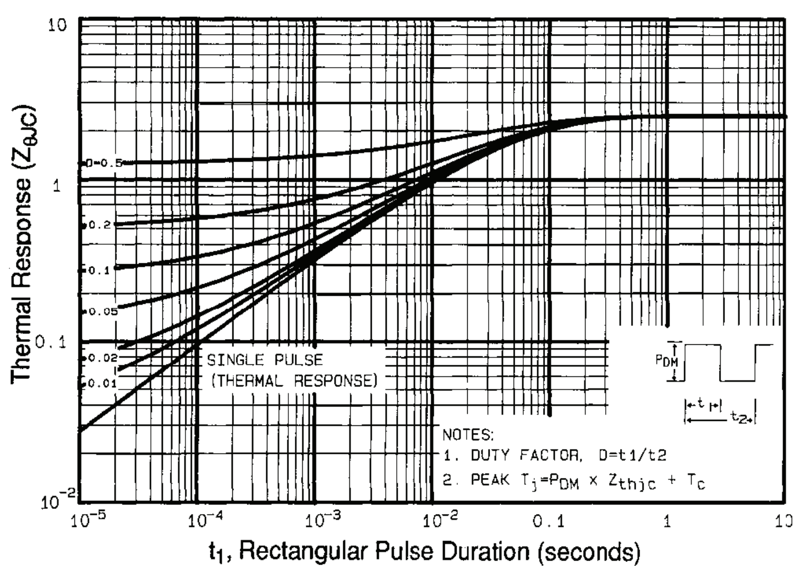


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

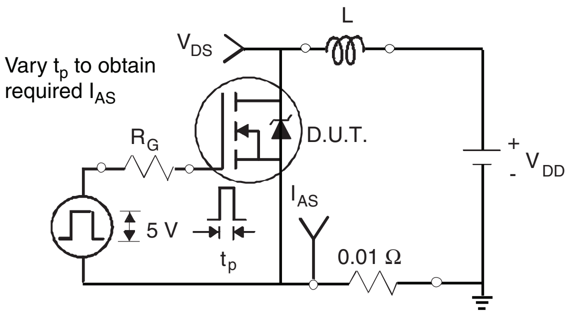


Fig. 12a - Unclamped Inductive Test Circuit

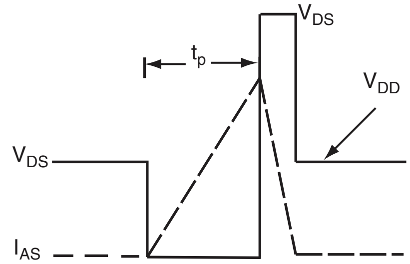


Fig. 12b - Unclamped Inductive Waveforms

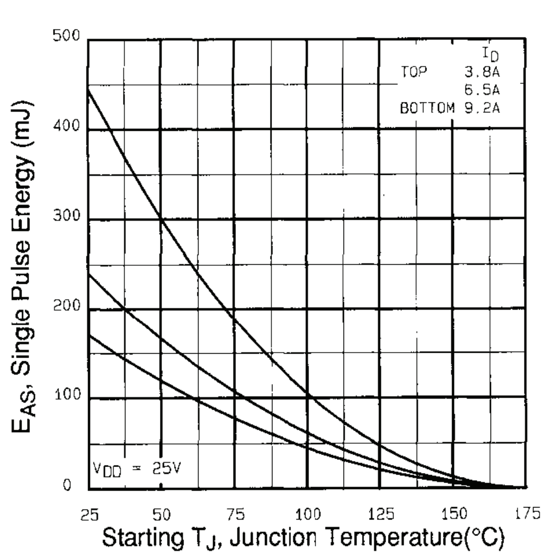


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

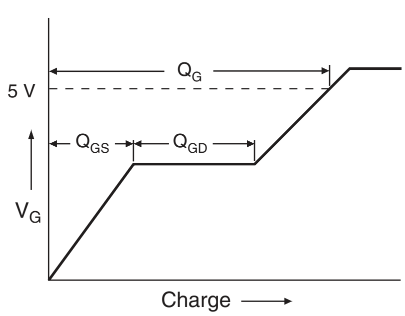


Fig. 13a - Basic Gate Charge Waveform

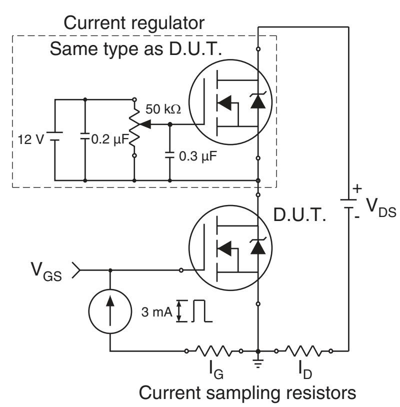
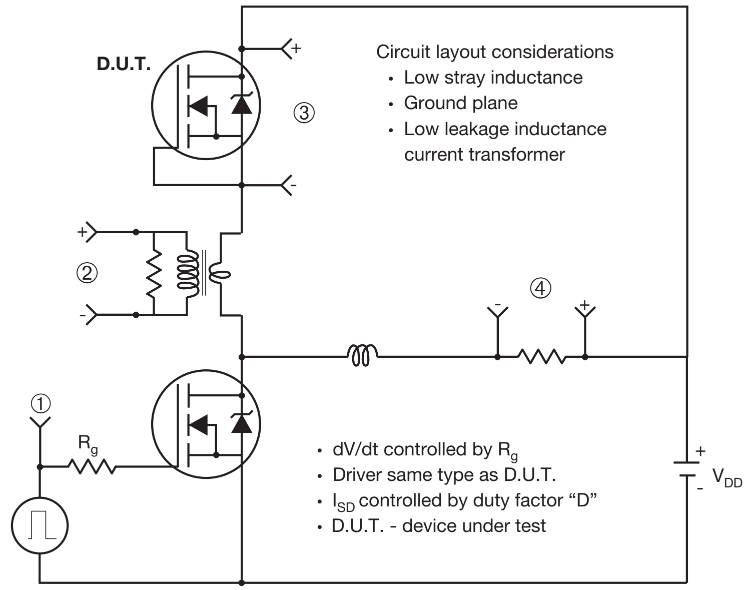
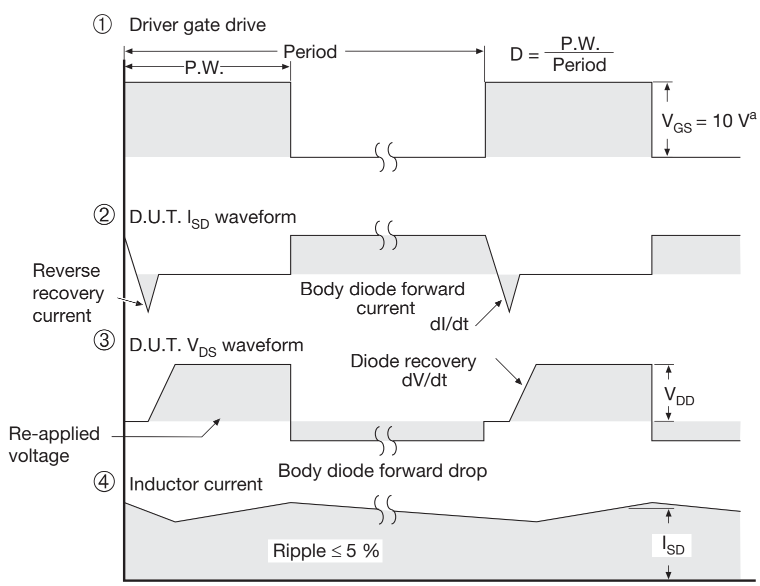


Fig. 13b - Gate Charge Test Circuit

Peak Diode Recovery dV/dt Test Circuit





Note

a. V_{GS} = 5 V for logic level devices

Fig. 14 - For N-Channel

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