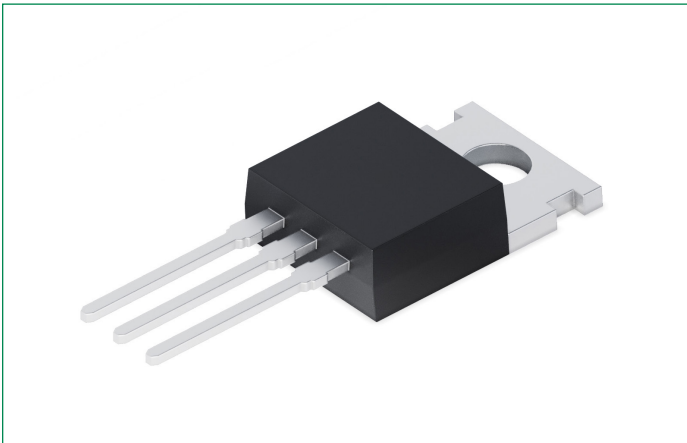


# IOTP64N10L2

## 100 V, 32 mΩ, 64 A Linear L2™ Power MOSFET w/Extended FBSOA

### N-Channel Enhancement Mode



### Features & Benefits:

- Designed for Linear Operation
- International Standard Package
- Avalanche Rated
- Guaranteed FBSOA at  $T_C = 75\text{ }^\circ\text{C}$
- Easy to Mount
- Space Savings
- High Power Density

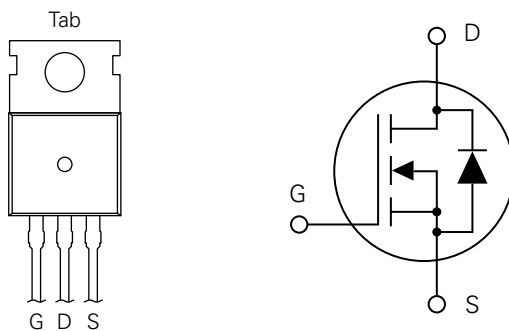
### Applications:

- Solid State Circuit Breakers
- Soft Start Controls
- Linear Amplifiers
- Programmable Loads
- Current Regulators

### Product Summary

Characteristic	Value	Unit
$V_{DSS}$	100	V
$I_{D25}$	64	A
$R_{DS(on)}$	$\leq 32$	mΩ

### Pinout Diagram TO-220 (IOTP)



**G:** Gate; **D:** Drain; **S:** Source; **Tab:** Drain

## Maximum Ratings

Symbol	Characteristic	Conditions	Value	Unit
$V_{DSS}$	Drain-Source Voltage	$T_J = 25\text{ °C to }150\text{ °C}$	100	V
$V_{DGR}$	Drain-Gate Voltage	$T_J = 25\text{ °C to }150\text{ °C}, R_{GS} = 1\text{ M}\Omega$	100	V
$V_{GSS}$	Gate-Source Voltage	Continuous	$\pm 20$	V
$V_{GSM}$		Transient	$\pm 30$	
$I_{D25}$	Drain Current	$T_C = 25\text{ °C}$	64	A
$I_{DM}$		$T_C = 25\text{ °C}, \text{Pulse Width Limited by } T_{JM}$	140	
$I_A$	Avalanche Current	$T_C = 25\text{ °C}$	32	A
$E_{AS}$	Avalanche Energy	$T_C = 25\text{ °C}$	2	J
$P_D$	Power Dissipation	$T_C = 25\text{ °C}$	357	W
$T_J$	Operating Junction Temperature	–	–55 to +150	°C
$T_{JM}$	Maximum Junction Temperature	–	150	
$T_{stg}$	Storage Temperature	–	–55 to +150	
$T_L$	Maximum Lead Temperature for Soldering	1.6 mm (0.062 in.) from Case for 10 s	300	°C
$M_d$	Mounting Torque	–	1.13 / 10	Nm/lb.in
W	Weight	–	3	g

## Thermal Characteristics

Symbol	Characteristic	Value			Unit
		Min.	Typ.	Max.	
$R_{th, JC}$	Thermal Resistance, Junction-to-Case	–	–	0.35	°C/W
$R_{th, CS}$	Thermal Resistance, Case-to-Heatsink	–	0.50	–	°C/W

## Electrical Characteristics – Static ( $T_J = 25\text{ °C}$ unless otherwise specified)

Symbol	Characteristic	Conditions	Value			Unit
			Min.	Typ.	Max.	
$BV_{DSS}$	Drain-Source Breakdown Voltage	$I_D = 250\text{ }\mu\text{A}, V_{GS} = 0\text{ V}$	100	–	–	V
$V_{GS(th)}$	Gate Threshold Voltage	$I_D = 250\text{ }\mu\text{A}, V_{GS} = V_{DS}$	2.5	–	4.5	V
$I_{GSS}$	Gate-Source Leakage Current	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$	–	–	$\pm 100$	nA
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS} = V_{DSS}, V_{GS} = 0\text{ V}$	–	–	5	$\mu\text{A}$
		$V_{DS} = V_{DSS}, V_{GS} = 0\text{ V}, T_J = 125\text{ °C}$	–	–	25	$\mu\text{A}$
$R_{DS(on)}$	Drain-Source On-Resistance <sup>1</sup>	$V_{GS} = 10\text{ V}, I_D = 0.5 \times I_{D25}$	–	–	32	m $\Omega$

**Note 1:** Pulse test,  $t \leq 300\text{ }\mu\text{s}$ , duty cycle,  $d \leq 2\%$

## Electrical Characteristics – Dynamic ( $T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified)

Symbol	Characteristic	Conditions	Value			Unit
			Min.	Typ.	Max.	
$g_{fs}$	Transconductance <sup>1</sup>	$V_{DS} = 10\text{ V}, I_D = 0.5 \times I_{D25}$	21	27	33	S
$R_{Gi}$	Gate Input Resistance	–	–	1.2	–	$\Omega$
$C_{iss}$	Input Capacitance	$V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$	–	3620	–	pF
$C_{oss}$	Output Capacitance		–	720	–	
$C_{rss}$	Reverse Transfer Capacitance		–	235	–	
$Q_{g(on)}$	Total Gate Charge	$V_{GS} = 10\text{ V}, V_{DS} = 0.5 \times V_{DSS},$ $I_D = 0.5 \times I_{D25}$	–	100	–	nC
$Q_{gs}$	Gate-Source Charge		–	16	–	
$Q_{gd}$	Gate-Drain Charge		–	45	–	
$t_{d(on)}$	Turn-on Delay Time	<b>Resistive Switching</b> $V_{GS} = 10\text{ V}, V_{DS} = 0.5 \times V_{DSS},$ $I_D = 0.5 \times I_{D25}, R_{G(ext)} = 0\ \Omega$	–	14	–	ns
$t_r$	Rise Time		–	27	–	
$t_{d(off)}$	Turn-off Delay Time		–	38	–	
$t_f$	Fall Time		–	11	–	

**Note 1:** Pulse test,  $t \leq 300\ \mu\text{s}$ , duty cycle,  $d \leq 2\%$

## Safe Operating Area Specification

Symbol	Test Conditions	Value			Unit
		Min.	Typ.	Max.	
SOA	$V_{DS} = 100\text{ V}, I_D = 2.15\text{ A}, T_C = 75\text{ }^\circ\text{C}, T_p = 5\text{ s}$	215	–	–	W

## Source-Drain Diode Characteristics ( $T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified)

Symbol	Characteristic	Conditions	Value			Unit
			Min.	Typ.	Max.	
$I_S$	Continuous Diode Forward Current	$V_{GS} = 0\text{ V}$	–	–	64	A
$I_{SM}$	Diode Pulse Current	Repetitive, Pulse Width Limited by $T_{JM}$	–	–	256	A
$V_{SD}$	Diode Forward Voltage <sup>1</sup>	$I_F = I_S, V_{GS} = 0\text{ V}$	–	–	1.4	V
$t_{rr}$	Reverse Recovery Time	$I_F = 32\text{ A}, -di/dt = 100\text{ A}/\mu\text{s},$ $V_R = 50\text{ V}, V_{GS} = 0\text{ V}$	–	180	–	ns
$I_{RM}$	Reverse Recovery Current		–	16.2	–	A
$Q_{RM}$	Reverse Recovery Charge		–	1.46	–	$\mu\text{C}$

**Note 1:** Pulse test,  $t \leq 300\ \mu\text{s}$ , duty cycle,  $d \leq 2\%$

## Characteristic Curves

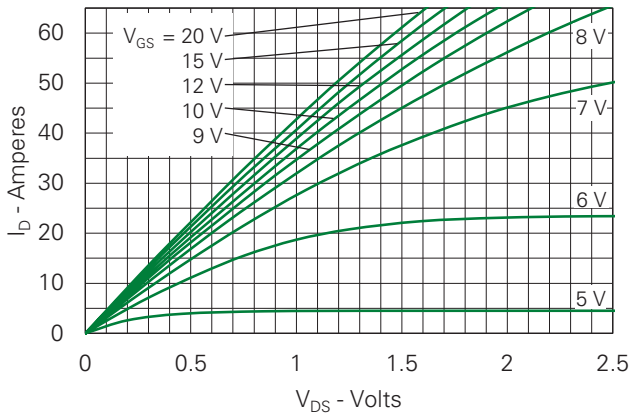
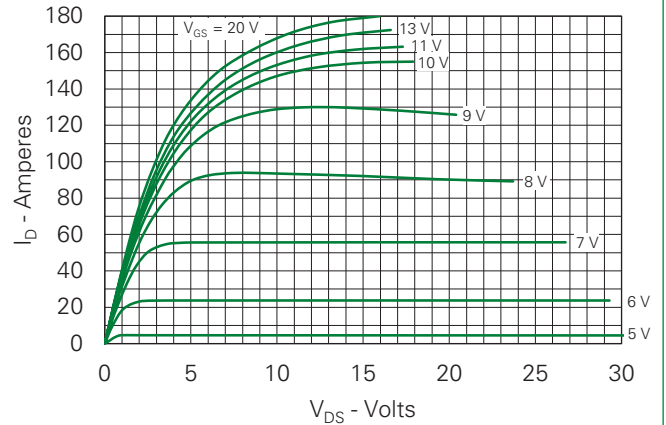
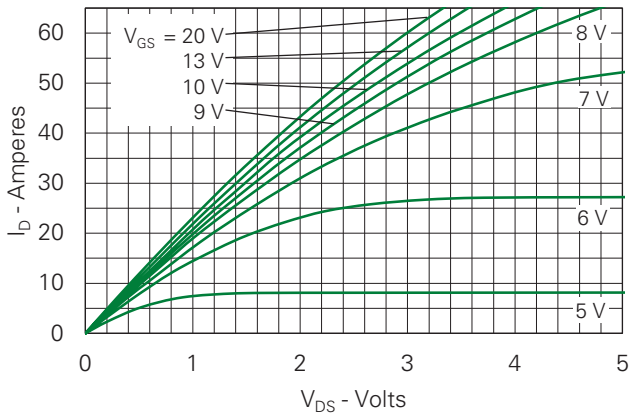
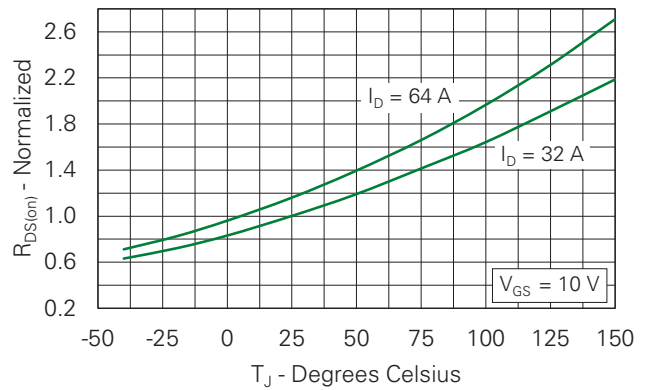
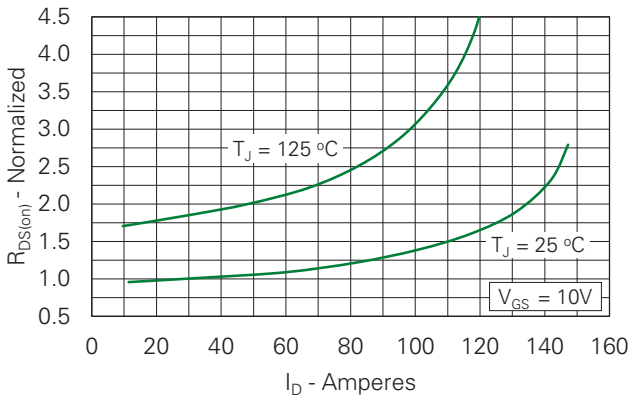
Fig. 1. Output Characteristics @  $T_J = 25\text{ }^\circ\text{C}$ Fig. 2. Extended Output Characteristics @  $T_J = 25\text{ }^\circ\text{C}$ Fig. 3. Output Characteristics @  $T_J = 125\text{ }^\circ\text{C}$ Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 32\text{ A}$  Value vs. Junction TemperatureFig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 32\text{ A}$  Value vs. Drain Current

Fig. 6. Maximum Drain Current vs. Case Temperature

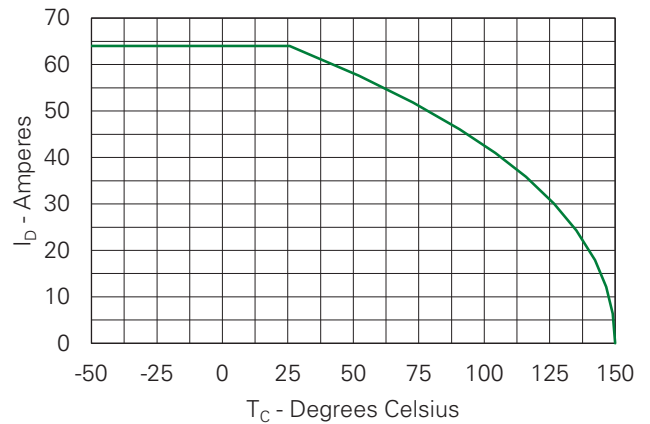


Fig. 7. Input Admittance

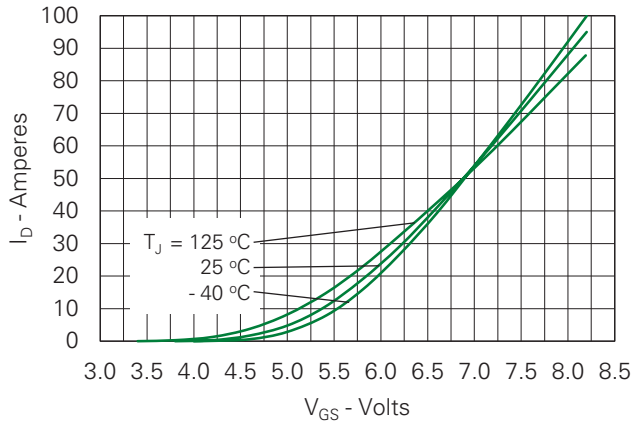


Fig. 8. Transconductance

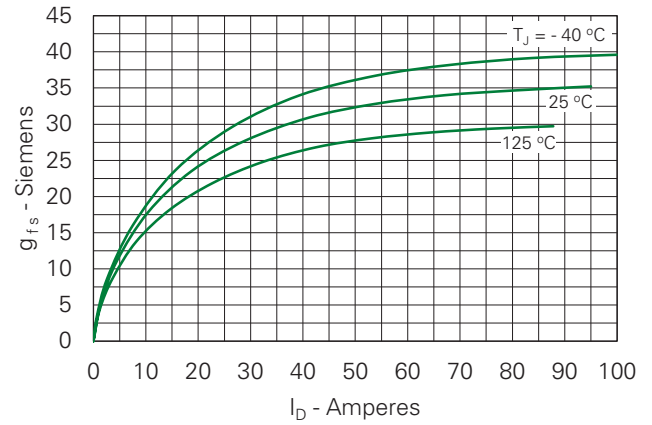


Fig. 9. Forward Voltage Drop of Intrinsic Diode

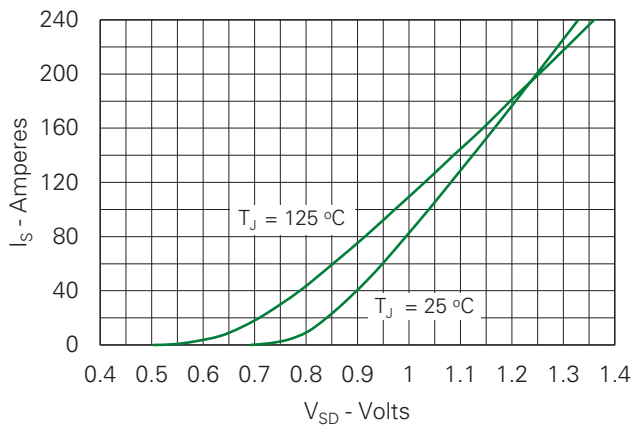


Fig. 10. Gate Charge

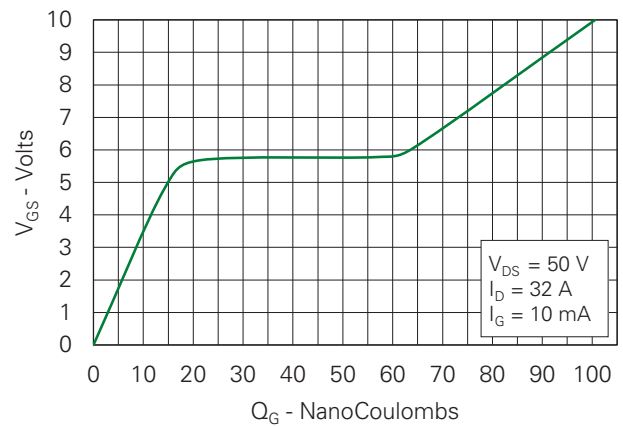


Fig. 11. Capacitance

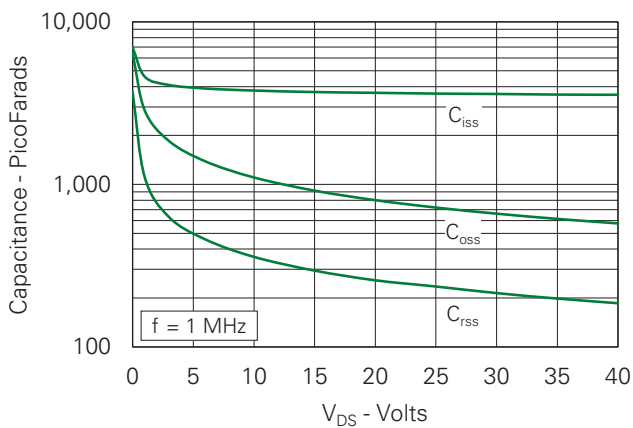
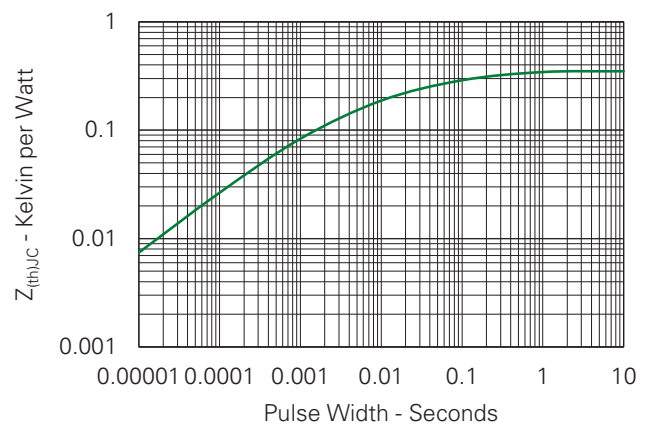
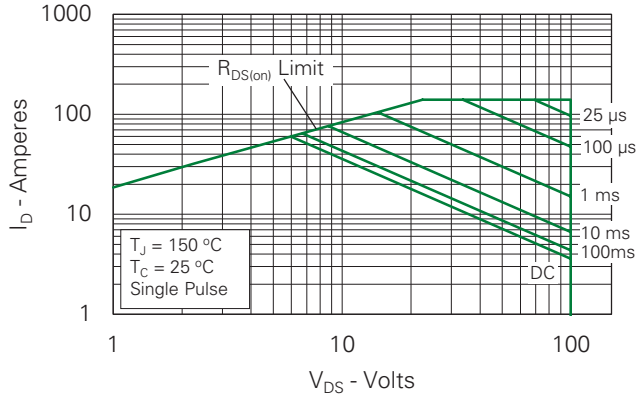


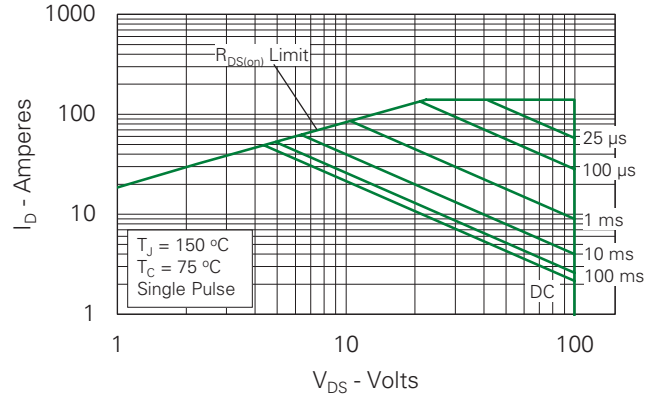
Fig. 12. Maximum Transient Thermal Impedance



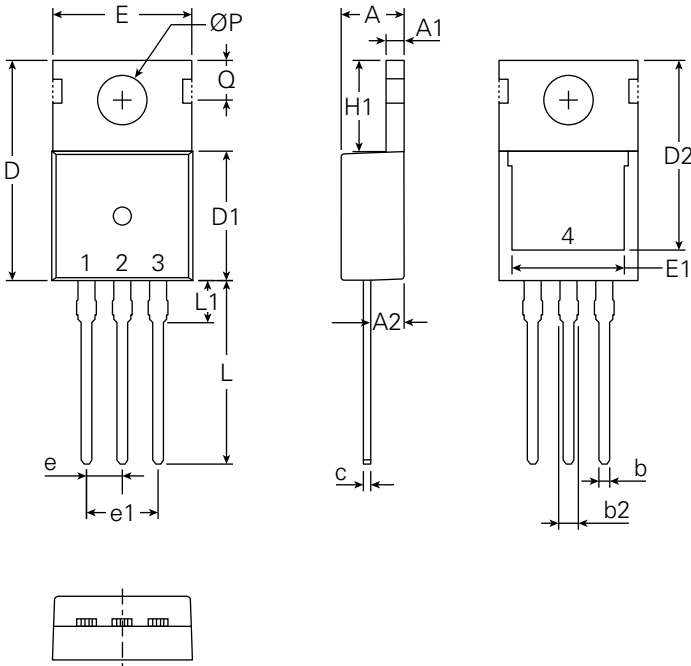
**Fig. 13. Forward-Bias Safe Operating Area**  
@  $T_C = 25\text{ }^\circ\text{C}$



**Fig. 14. Forward-Bias Safe Operating Area**  
@  $T_C = 75\text{ }^\circ\text{C}$



### Part Outline Drawing TO-220 (IXTP)



- 1 - Gate  
2,4 - Drain  
3 - Source

Symbol	Inches			Millimeters		
	Min.	Typical	Max.	Min.	Typical	Max.
A	0.169	-	0.185	4.30	-	4.70
A1	0.047	-	0.055	1.20	-	1.40
A2	0.079	-	0.106	2.00	-	2.70
b	0.024	-	0.039	0.60	-	1.00
b2	0.045	-	0.057	1.15	-	1.45
c	0.014	-	0.026	0.35	-	0.65
D	0.587	-	0.626	14.90	-	15.90
D1	0.335	-	0.370	8.50	-	9.40
(D2)	0.500	-	0.531	12.70	-	13.50
E	0.382	-	0.406	9.70	-	10.30
(E1)	0.283	-	0.323	7.20	-	8.20
e	0.100 BSC			2.45 BSC		
e1	0.200 BSC			5.08 BSC		
H1	0.244	-	0.268	6.20	-	6.80
L	0.492	-	0.547	12.50	-	13.90
L1	0.110	-	0.154	2.80	-	3.90
ØP	0.134	-	0.150	3.40	-	3.80
Q	0.106	-	0.126	2.70	-	3.20

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