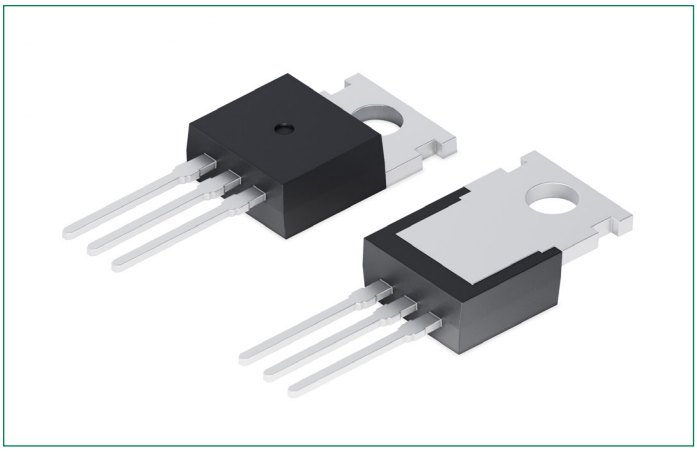
IXTP86N20X4

200 V, 13 mΩ X4-Class Power MOSFET™



Features:

- International Standard Package
- Low $R_{DS(ON)}$ and Q_G
- Avalanche Rated
- Low Package Inductance

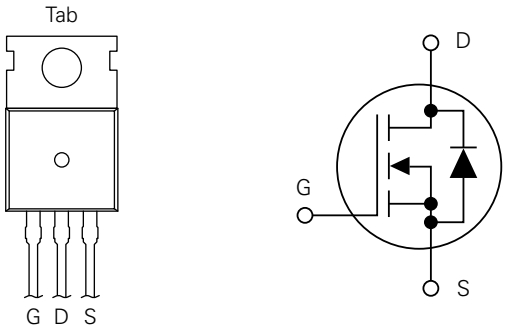
Advantages:

- High Power Density
- Easy to Mount
- Space Savings

Applications:

- Switch-Mode and Resonant-Mode Power Supplies
- DC-DC Converters
- PFC Circuits
- AC and DC Motor Drives
- Robotics and Servo Controls

Pinout Diagram (TO-220-3L)



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

Product Summary

Characteristic	Value	Unit
V_{DSS}	200	V
I_{D25}	86	A
$R_{DS(on)}$	13	mΩ

Revised: XZ 05/16/2023

Maximum Ratings

Symbol	Characteristics	Conditions	Value	Units
V_{DSS}	Drain-Source Voltage	T_J = 25°C to 175°C	200	V
V_{DGR}	Drain-Gate Voltage	T_J = 25°C to 175°C, R_{GS} = 1 MΩ	200	V
V_{GS}	Gate-Source Voltage	Continuous	±20	V
V_{GSM}		Transient	±30	
I_{D25}	Drain Current	T_C = 25°C	86	A
I_{DM}		T_C = 25°C, Pulse width limited by T_{JM}	160	
I_A	Avalanche Current	T_C = 25°C	43	A
E_{AS}	Avalanche Energy	T_C = 25°C	500	mJ
dV/dt	Reverse Diode dV/dt	$I_S \le I_{DM}$, $V_{DD} \le V_{DSS}$, $T_J \le 150°C$	50	V/ns
P_D	Power Dissipation	T_C = 25°C	300	W
T_J	Operating Junction Temperature	–	-55 to +175	°C
T_{JM}	Maximum Junction Temperature	–	175	
T_{stg}	Storage Temperature	–	-55 to +175	
T_L	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	–	–	0.50	°C/W
$R_{th, CS}$	Thermal Resistance, case-to-sink	–	0.50	–	°C/W

Electrical Characteristics – Static (T_J = 25°C unless otherwise specified)

Symbol	Characteristic	Conditions	Value			Unit
			Min.	Typ.	Max.	
BV_{DSS}	Drain-Source Breakdown Voltage	I_D = 250 µA, V_{GS} = 0 V	200	–	–	V
$V_{GS(th)}$	Gate Threshold Voltage	I_D = 250 µA, $V_{DS} = V_{GS}$	2.5	–	4.5	V
I_{GSS}	Gate-Source Leakage Current	V_{DS} = 0 V, V_{GS} = ±20 V	–	–	±100	nA
I_{DSS}	Drain-Source Current	$V_{DS} = V_{DSS}$, V_{GS} = 0 V	–	–	5	µA
		$V_{DS} = V_{DSS}$, V_{GS} = 0 V, T_J = 150°C	–	–	300	µA
$R_{DS(on)}$	Drain-Source On-Resistance[1]	V_{GS} = 10 V, I_D = 0.5 x I_{D25}	–	11	13	mΩ

Note 1: Pulse test, t ≤ 300 µs, duty cycle, d ≤ 2%

Electrical Characteristics – Dynamic (T_J = 25°C unless otherwise specified)

Symbol	Characteristic	Conditions	Value			Unit
			Min.	Typ.	Max.	
g_{fs}	Transconductance [1]	V_{DS} = 10 V, I_D = 0.5 x I_{D25}	50	82	–	S
R_{Gi}	Gate Input Resistance	–	–	4.75	–	Ω
C_{iss}	Input Capacitance	V_{GS} = 0 V, V_{DS} = 25 V, f = 1MHz	–	2250	–	pF
C_{oss}	Output Capacitance		–	660	–	pF
C_{rss}	Reverse Transfer Capacitance		–	185	–	pF
$Q_{g(on)}$	Total Gate Charge	V_{GS} = 10 V, V_{DS} = 0.5 x V_{DSS}, I_D = 0.5 x I_{D25}	–	70	–	nC
Q_{gs}	Gate-Source Charge		–	20	–	
Q_{gd}	Gate-Drain Charge		–	38	–	
$t_{d(on)}$	Turn-on Delay Time	**Resistive Switching** V_{GS} = 10 V, V_{DS} = 0.5 x V_{DSS}, I_D = 0.5 x I_{D25}, $R_{G(ext)}$ = 10 Ω	–	27	–	ns
t_r	Rise Time		–	38	–	
$t_{d(off)}$	Turn-off Delay Time		–	76	–	
t_f	Fall Time		–	35	–	

Source-Drain Diode Characteristics (T_J = 25°C unless otherwise specified)

Symbol	Characteristic	Conditions	Value			Unit
			Min.	Typ.	Max.	
I_S	Continuous Diode Forward Current	V_{GS} = 0 V	–	–	86	A
I_{SM}	Diode Pulse Current	Repetitive, Pusle width limited by T_{JM}	–	–	344	A
V_{SD}	Diode Forward Voltage[1]	I_F = I_S, V_{GS} = 0 V	–	–	1.4	V
t_{rr}	Reverse Recovery Time	I_F = 43 A, –di/dt = 200 A/µs, V_r = 100 V	–	96	–	ns
I_{rm}	Reverse Recovery Charge		–	16.7	–	A
Q_{rm}	Reverse Recovery Current		–	0.8	–	µC

Note 1: Pulse test, t ≤ 300 µs, duty cycle, d ≤ 2%

Characteristic Curves

Fig. 1. Output Characteristics @ T_J = 25ºC

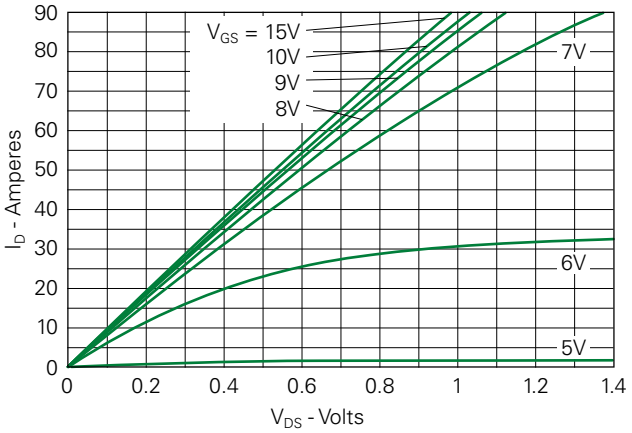


Fig. 2. Extended Output Characteristics @ T_J = 25ºC

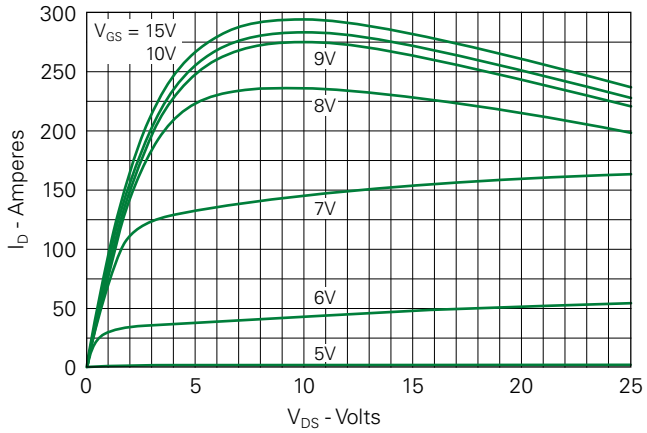


Fig. 3. Output Characteristics @ T_J = 150ºC

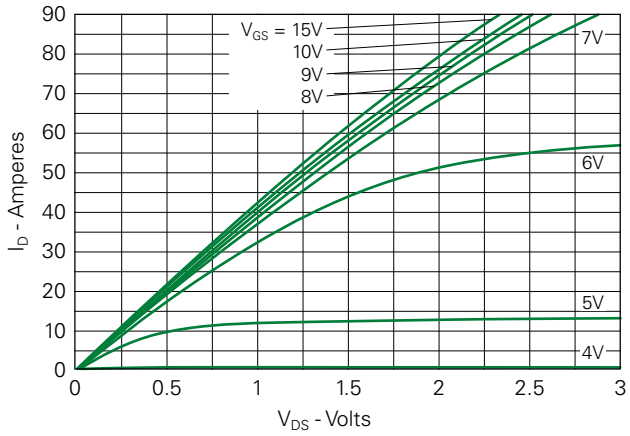


Fig. 4. $R_{DS(on)}$ Normalized to I_D = 43A Value vs. Junction Temperature

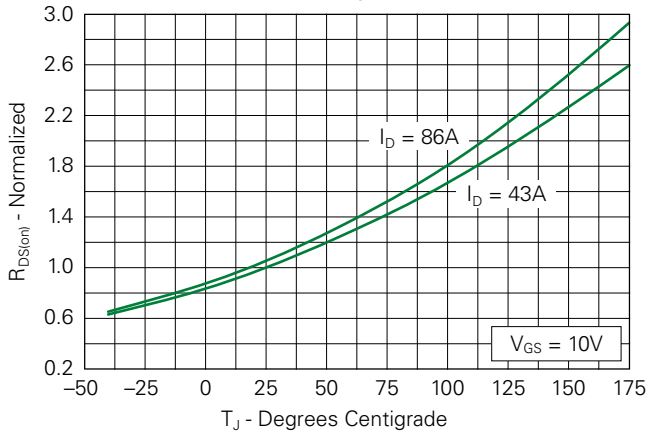


Fig. 5. $R_{DS(on)}$ Normalized to I_D = 43A Value vs. Drain Current

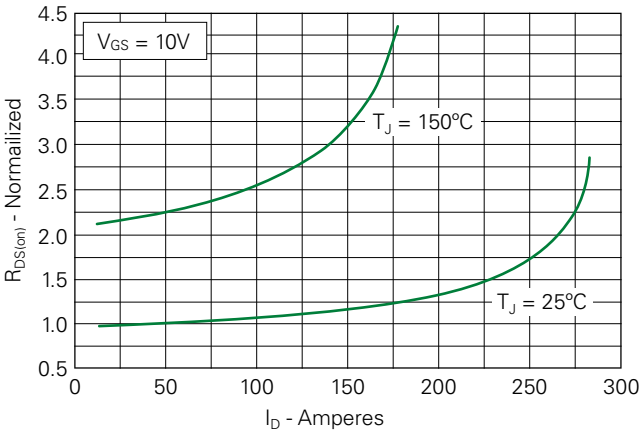


Fig. 6. Normalized Breakdown & Threshold Voltages vs. Junction Temperature

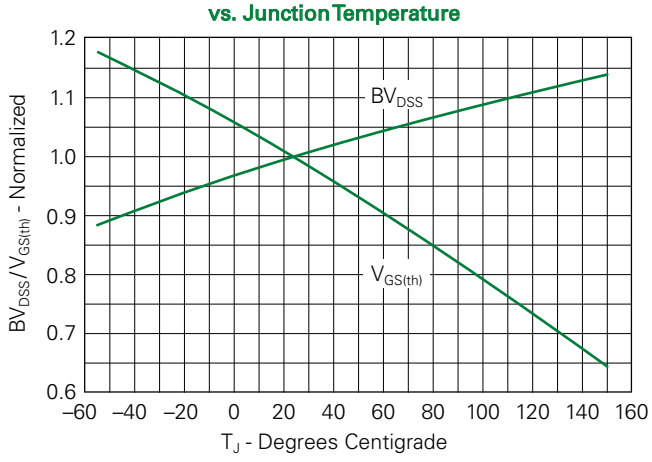


Fig. 7. Maxium Drain Current vs. Case Temperature

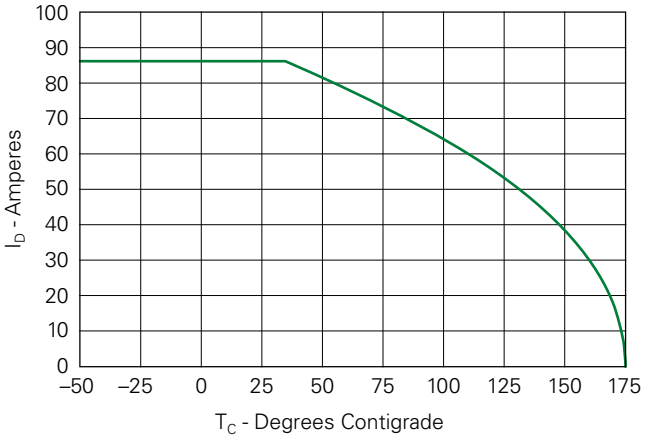


Fig. 8. Input Admittance

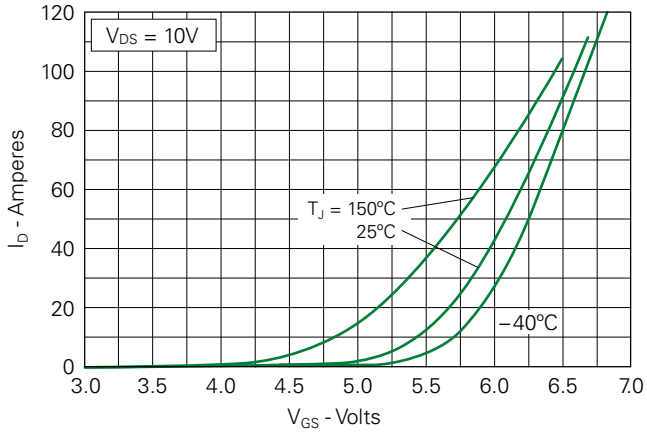


Fig. 9. Transconductance

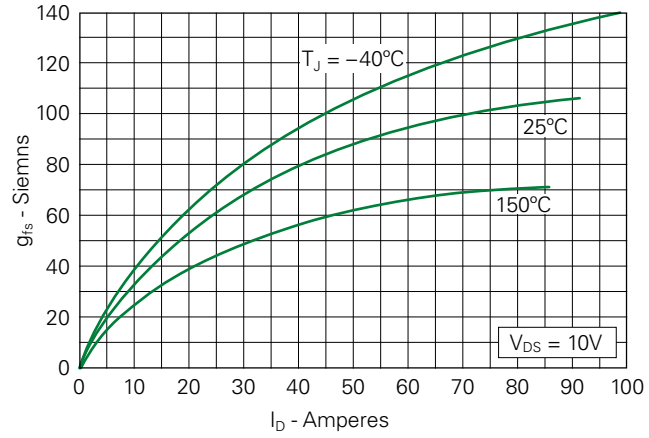


Fig. 10. Forward Voltage Drop of Intrinsic Diode

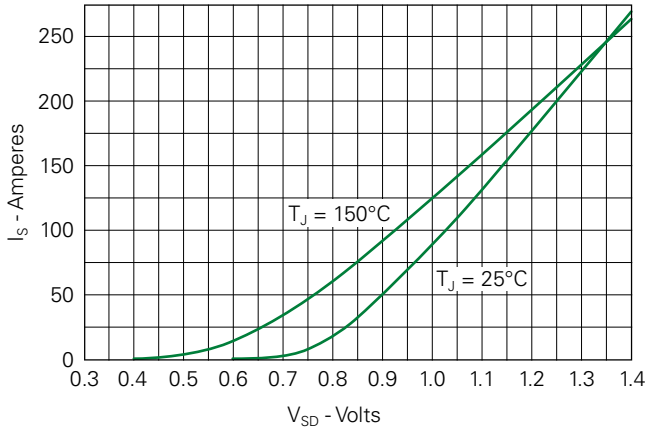


Fig. 11. Gate Charge

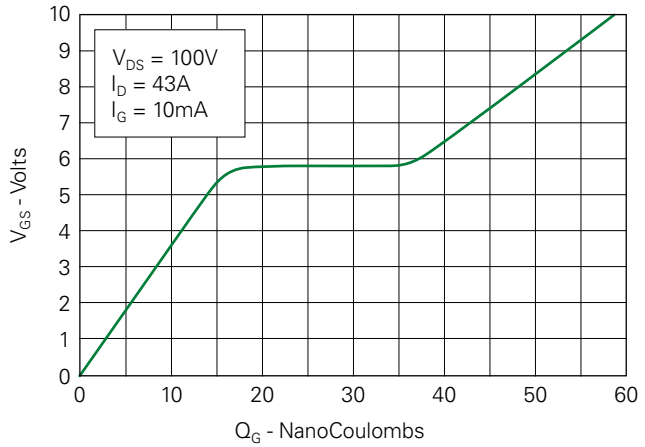


Fig. 12. Capacitance

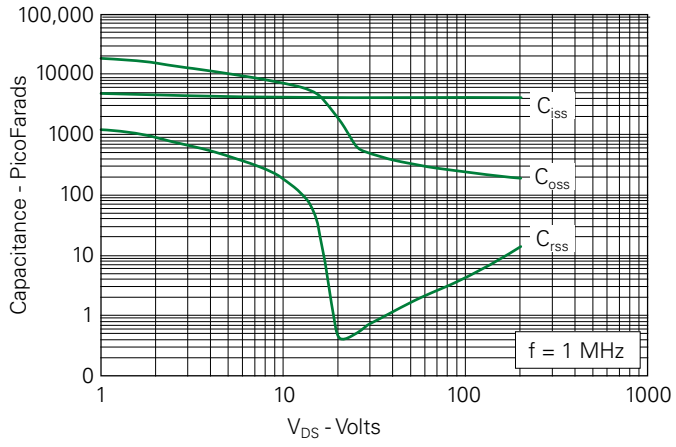


Fig. 13. Output Capacitance Stored Energy

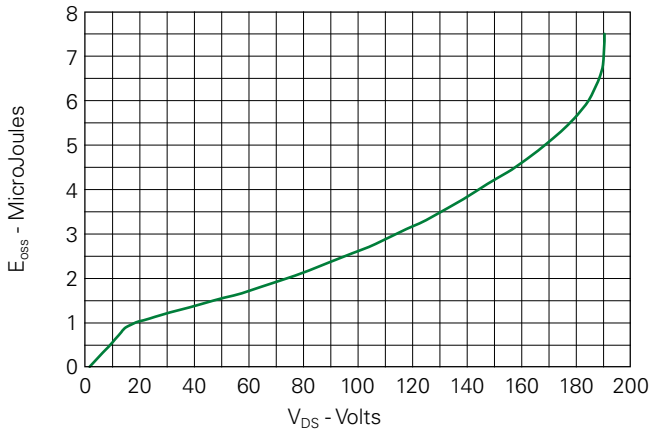


Fig. 14. Forward-Bias Safe Operating Area

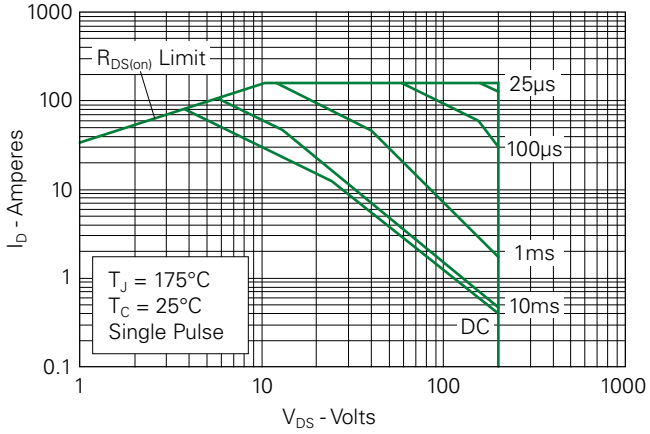
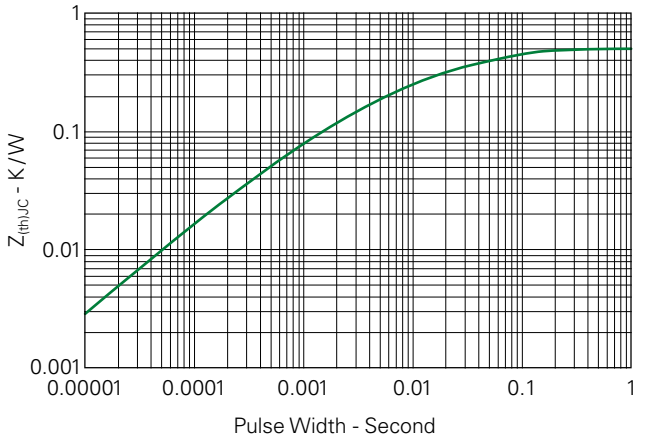
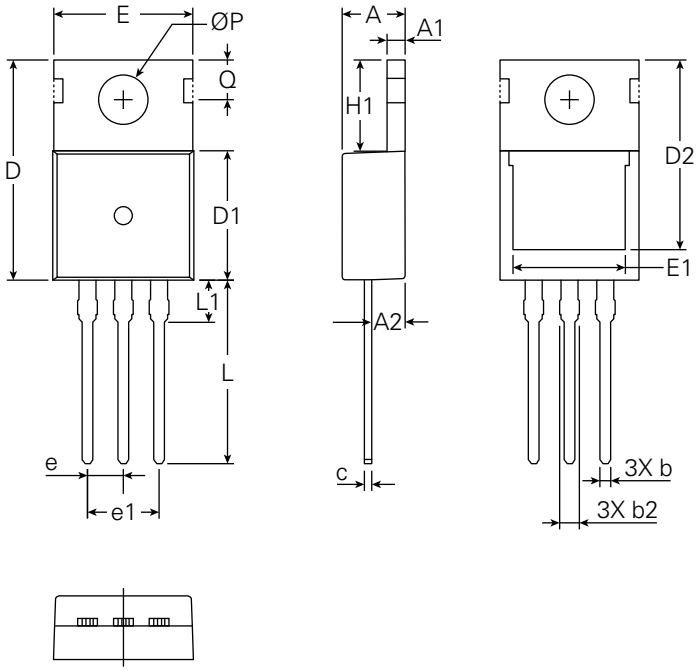


Fig. 15. Maximum Transient Thermal Impedance



Part Outline Drawing (TO-220-3L)



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