

N-Channel Super Junction Power MOSFET II

General Description

The series of devices use advanced super junction technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. This super junction MOSFET fits the industry's AC-DC SMPS requirements for PFC, AC/DC power conversion, and industrial power applications.

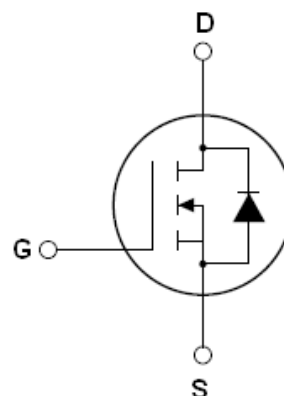
Features

- New technology for high voltage device
- Low on-resistance and low conduction losses
- Small package
- Ultra Low Gate Charge cause lower driving requirements
- 100% Avalanche Tested
- ROHS compliant

Application

- Power factor correction (PFC)
- Switched mode power supplies(SMPS)
- Uninterruptible Power Supply (UPS)

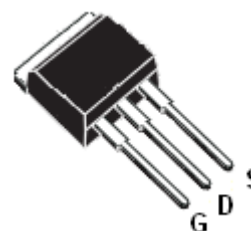
V_{DS}	650	V
$R_{DS(ON) MAX}$	540	m Ω
I_D	8	A



Schematic diagram

Package Marking And Ordering Information

Device	Device Package	Marking
NCE65R540U	TO-262	NCE65R540U



TO-262

Table 1. Absolute Maximum Ratings ($T_c=25^\circ\text{C}$)

Parameter	Symbol	Value	Unit
Drain-Source Voltage ($V_{GS}=0V$)	V_{DS}	650	V
Gate-Source Voltage ($V_{DS}=0V$)	V_{GS}	± 30	V
Continuous Drain Current at $T_c=25^\circ\text{C}$	$I_D (DC)$	8	A
Continuous Drain Current at $T_c=100^\circ\text{C}$	$I_D (DC)$	5.2	A
Pulsed drain current (Note 1)	$I_{DM (pulse)}$	24	A
Maximum Power Dissipation ($T_c=25^\circ\text{C}$)	P_D	80	W
Derate above 25°C		0.64	W/ $^\circ\text{C}$
Single pulse avalanche energy (Note 2)	E_{AS}	185	mJ
Avalanche current (Note 1)	I_{AR}	4	A
Repetitive Avalanche energy, t_{AR} limited by T_{jmax} (Note 1)	E_{AR}	0.4	mJ

Parameter	Symbol	Value	Unit
Drain Source voltage slope, $V_{DS} \leq 480V$,	dv/dt	50	V/ns
Reverse diode dv/dt , $V_{DS} \leq 480V, I_{SD} < I_D$	dv/dt	15	V/ns
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55...+150	°C

* limited by maximum junction temperature

Table 2. Thermal Characteristic

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case (Maximum)	R_{thJC}	1.56	°C/W
Thermal Resistance, Junction-to-Ambient (Maximum)	R_{thJA}	62	°C/W

Table 3. Electrical Characteristics (TA=25°C unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
On/off states						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =250μA	650			V
Zero Gate Voltage Drain Current(Tc=25℃)	I _{DSS}	V _{DS} =650V, V _{GS} =0V			1	μA
Zero Gate Voltage Drain Current(Tc=125℃)	I _{DSS}	V _{DS} =650V, V _{GS} =0V			100	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±30V, V _{DS} =0V			±100	nA
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	2.5	3	3.5	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =4A		480	540	mΩ
Dynamic Characteristics						
Forward Transconductance	g _{FS}	V _{DS} = 20V, I _D = 4A		5.5		S
Input Capacitance	C _{iss}	V _{DS} =50V, V _{GS} =0V, F=1.0MHz		680		pF
Output Capacitance	C _{oss}			58		pF
Reverse Transfer Capacitance	C _{rss}			4		pF
Total Gate Charge	Q _g	V _{DS} =480V, I _D =8A, V _{GS} =10V		14.5	22	nC
Gate-Source Charge	Q _{gs}			2.8		nC
Gate-Drain Charge	Q _{gd}			5.5		nC
Intrinsic gate resistance	R _G	f = 1 MHz open drain		2		Ω
Switching times						
Turn-on Delay Time	t _{d(on)}	V _{DD} =380V, I _D =4A, R _G =12Ω, V _{GS} =10V		5.5		nS
Turn-on Rise Time	t _r			3.5		nS
Turn-Off Delay Time	t _{d(off)}			55	75	nS
Turn-Off Fall Time	t _f			6.5	10	nS
Source- Drain Diode Characteristics						
Source-drain current(Body Diode)	I _{SD}	T _C =25℃			8	A
Pulsed Source-drain current(Body Diode)	I _{SDM}				23.4	A
Forward On Voltage	V _{SD}	T _j =25℃, I _{SD} =8A, V _{GS} =0V		0.9	1.2	V
Reverse Recovery Time	t _{rr}	T _j =25℃, I _F =8A, di/dt=100A/μs		220		nS
Reverse Recovery Charge	Q _{rr}			2.2		uC
Peak Reverse Recovery Current	I _{rrm}			20		A

Notes 1.Repetitive Rating: Pulse width limited by maximum junction temperature

2. $T_J=25^\circ C, V_{DD}=50V, V_G=10V, R_G=25\Omega$

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS (curves)

Figure1. Safe operating area

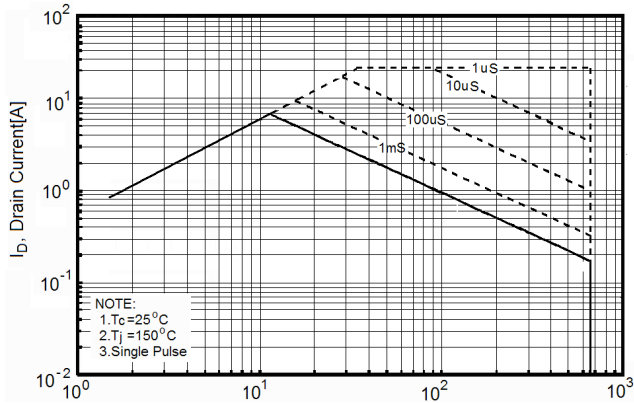


Figure2. Transient Thermal Impedance

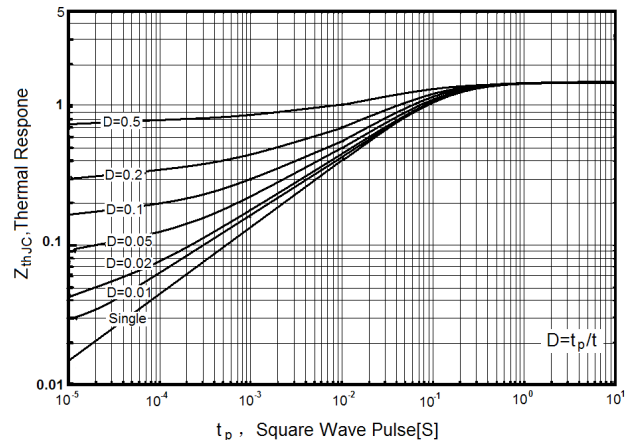


Figure3. Source-Drain Diode Forward Voltage

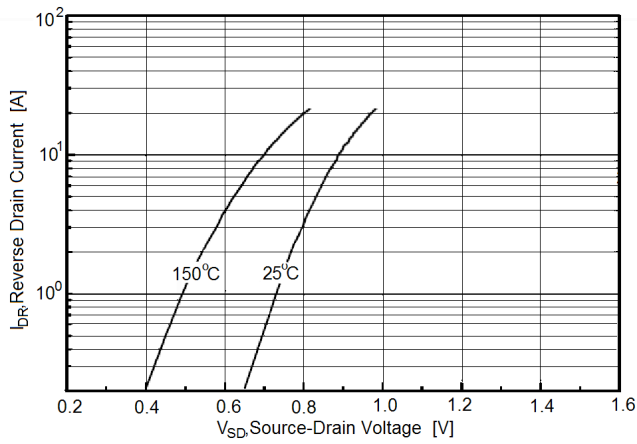


Figure4. Output characteristics

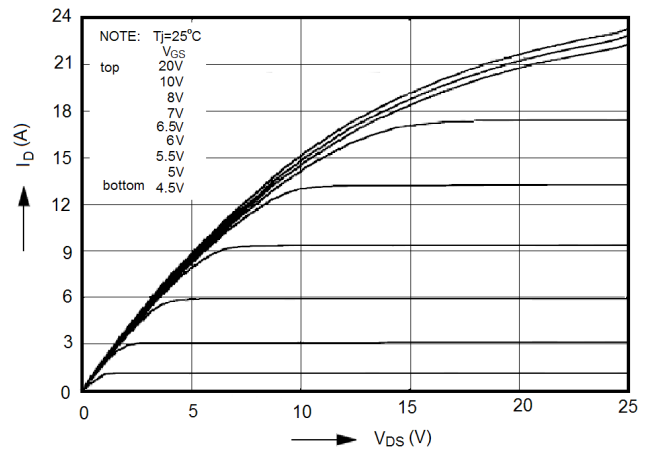


Figure5. Transfer characteristics

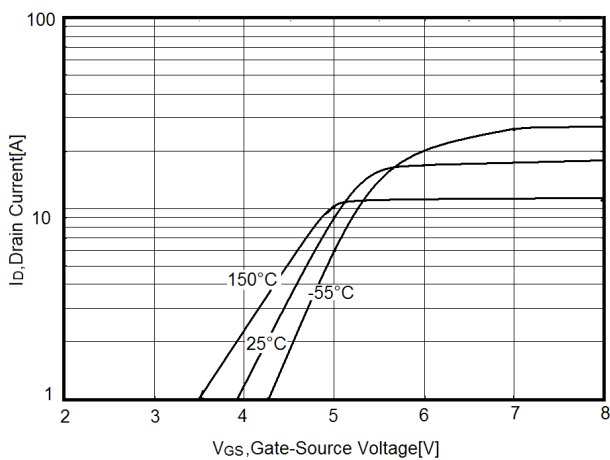


Figure6. Static drain-source on resistance

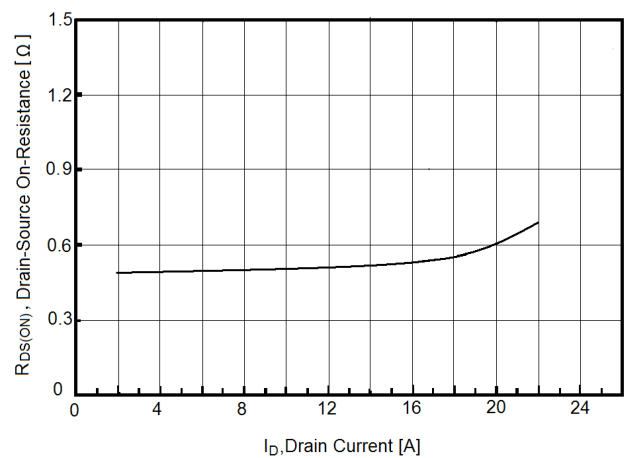


Figure7. $R_{DS(ON)}$ vs Junction Temperature

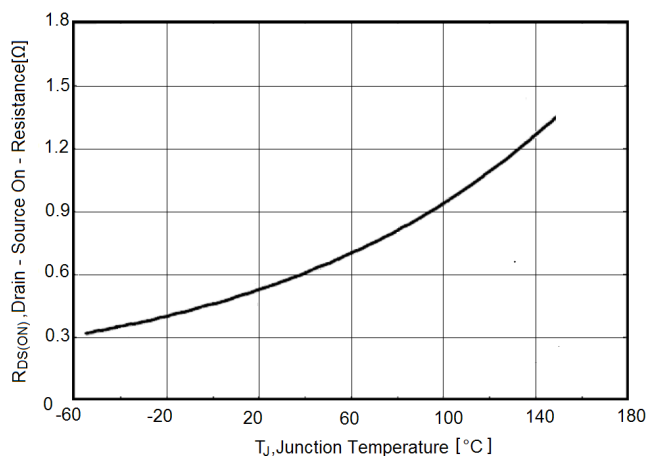


Figure8. BV_{DSS} vs Junction Temperature

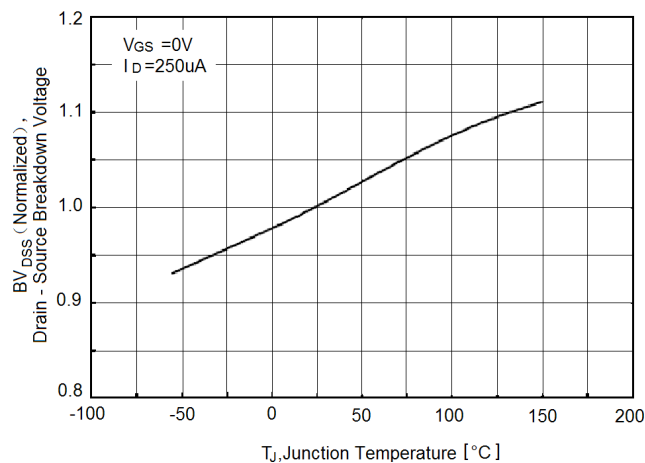


Figure9. Maximum I_D vs Junction Temperature

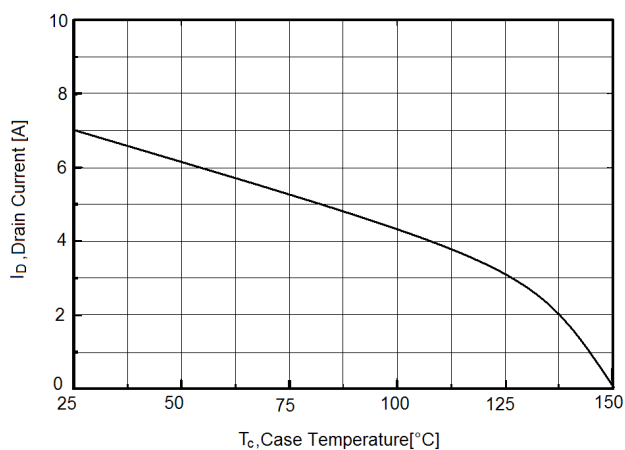


Figure10. Gate charge waveforms

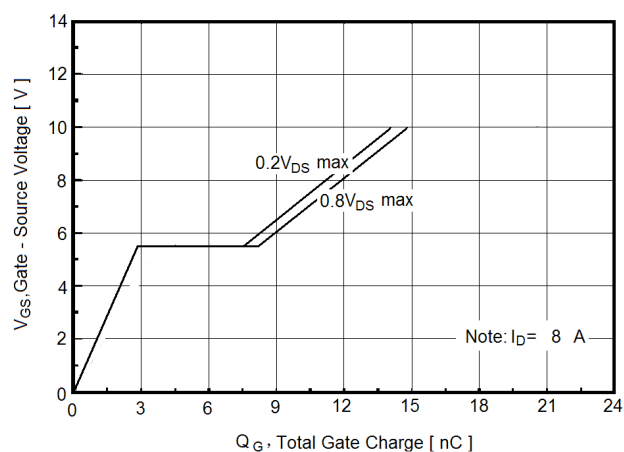
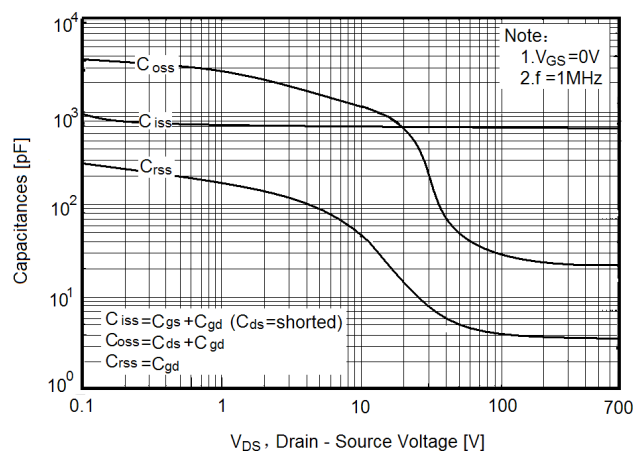
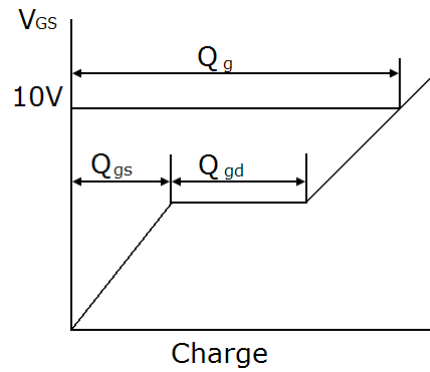
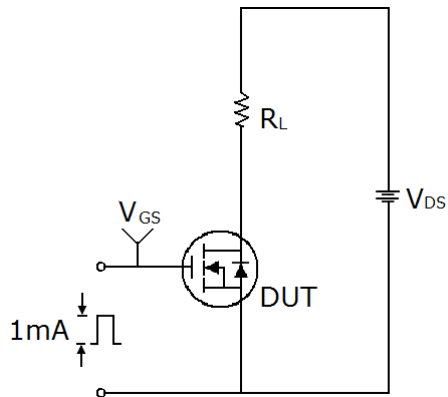


Figure11. Capacitance

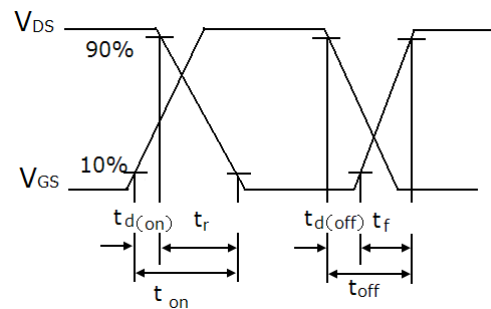
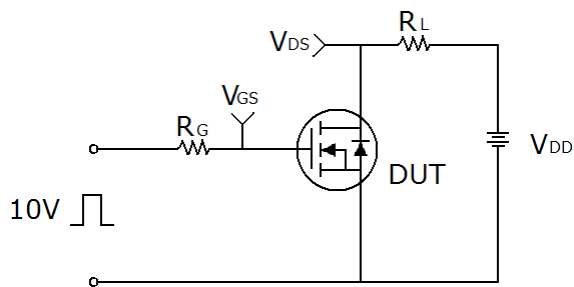


Test circuit

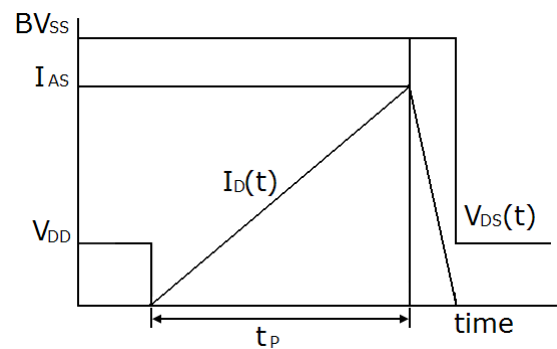
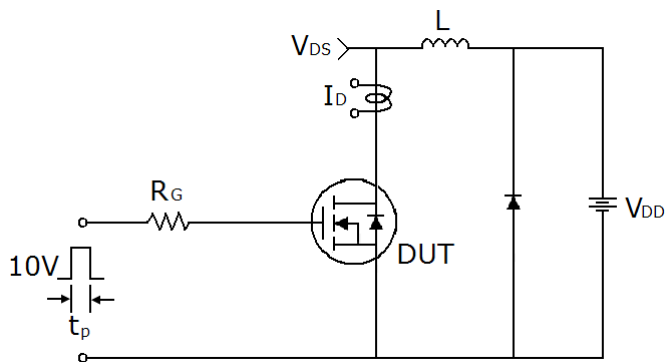
1) Gate charge test circuit & Waveform



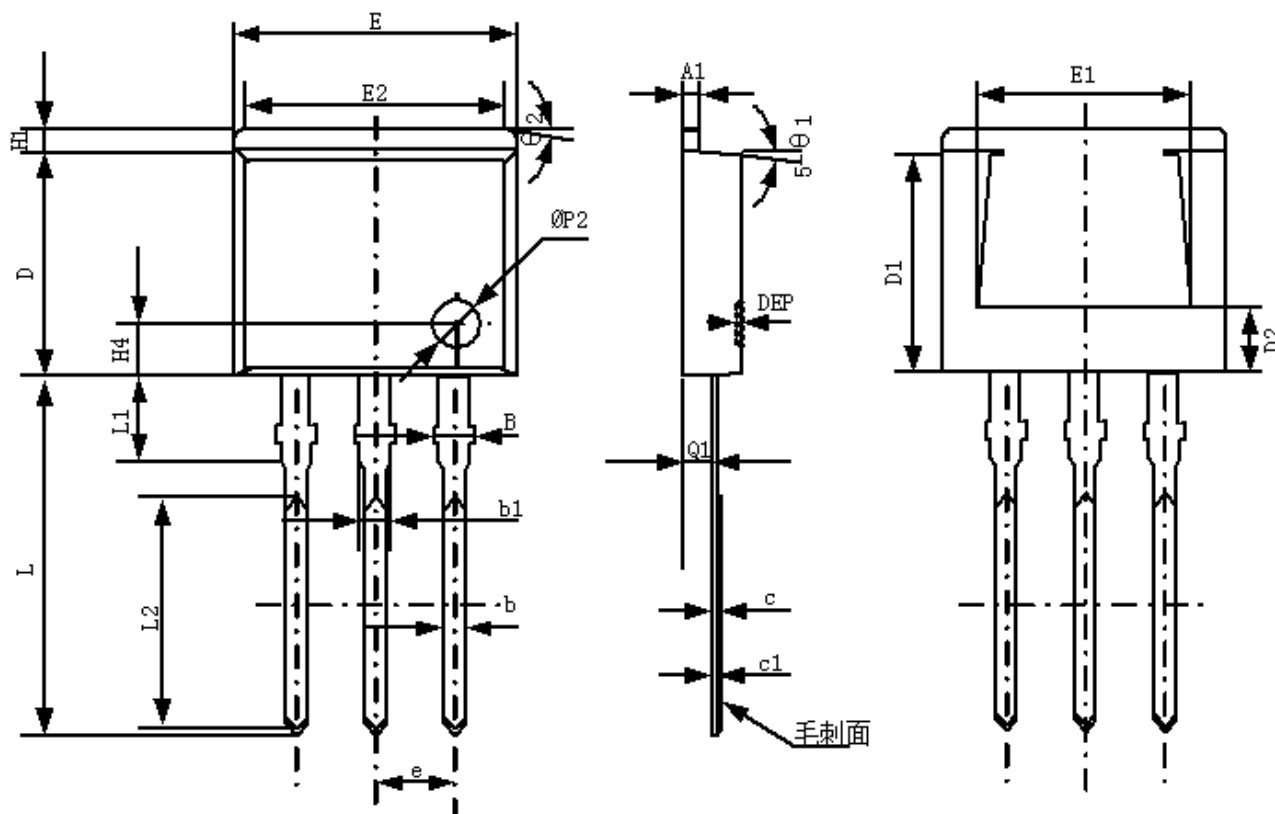
2) Switch Time Test Circuit:



3) Unclamped Inductive Switching Test Circuit & Waveforms



TO-262 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
*A	4.600	4.800	0.182	0.190
A1	1.220	1.320	0.048	0.052
*b	0.763	0.863	0.030	0.034
b1	1.220	1.320	0.048	0.052
B	1.270	1.400	0.050	0.055
*c	0.330	0.430	0.013	0.017
*D	8.540	8.740	0.338	0.346
D1	8.200	8.400	0.324	0.332
D2	2.500	2.700	0.099	0.107
*E	10.10	10.30	0.399	0.407
E1	7.700	7.900	0.305	0.312
E2	8.340	9.340	0.330	0.369
H1	1.170	1.370	0.046	0.054
H4	2.100	2.300	0.083	0.091
*e	2.490	2.590	0.098	0.102
*L	13.66	14.06	0.540	0.556
L1	3.580	3.980	0.142	0.157
L2	8.660	8.860	0.342	0.350
*Q1	2.590	2.790	0.102	0.110

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