P-Channel Enhancement Mode Power MOSFET

Description

The G040P04MA uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge. It can be used in a wide variety of applications.

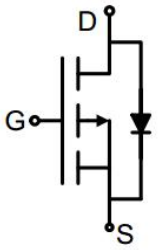
AEC-Q101 Qualified

General Features

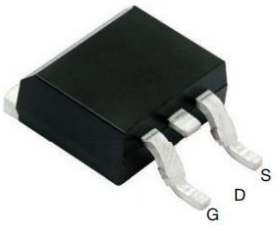
- V_{DS} -40V
- I_D (at V_{GS} = -10V) -180A
- $R_{DS(ON)}$ (at V_{GS} = -10V) < 3.5mΩ
- $R_{DS(ON)}$ (at V_{GS} = -4.5V) < 4.5mΩ
- 100% Avalanche Tested
- RoHS Compliant

Application

- Power switch
- DC/DC converters



Schematic diagram



TO-263

Ordering Information

Device	Package	Marking	Packaging
G040P04MA	TO-263	G040P04	800pcs/Reel

Absolute Maximum Ratings T_C = 25ºC, unless otherwise noted

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	-40	V
Continuous Drain Current	I_D	-180	A
Pulsed Drain Current (note1)	I_{DM}	-720	A
Gate-Source Voltage	V_{GS}	±20	V
Power Dissipation	P_D	178	W
Single pulse avalanche energy （note2）	E_{AS}	625	mJ
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55 To 150	ºC

Thermal Resistance

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Ambient	R_{thJA}	50	ºC/W
Maximum Junction-to-Case	R_{thJC}	0.7	ºC/W

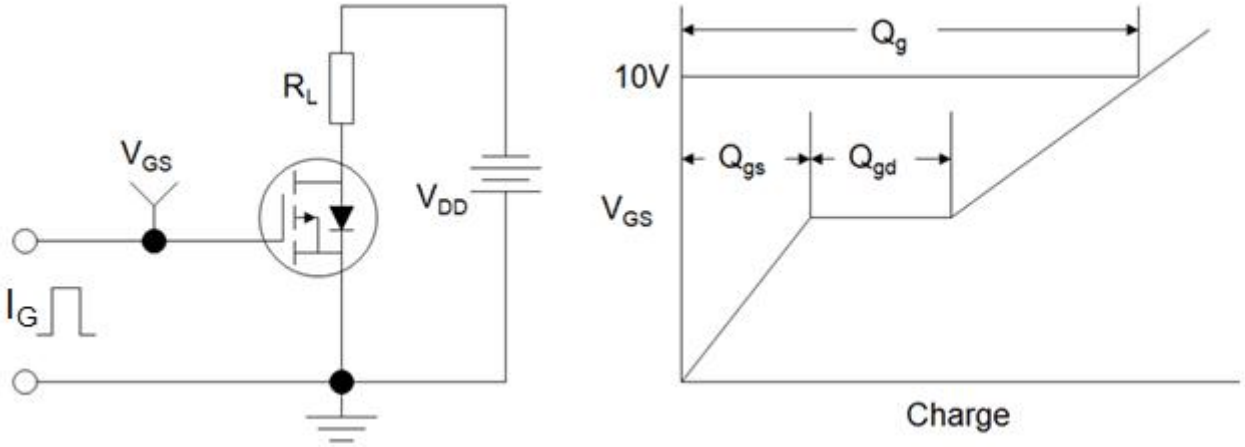
Specifications T_J = 25ºC, unless otherwise noted

Parameter	Symbol	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
Static Parameters						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D = -250μA	-40	--	--	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = -40V, V_{GS} = 0V	--	--	-1	μA
Gate-Source Leakage	I_{GSS}	V_{GS} = ±20V	--	--	±100	nA
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = -250μA	-1.0	-1.6	-2.5	V
Drain-Source On-Resistance	$R_{DS(on)}$	V_{GS} = -10V, I_D = -15A	--	2.9	3.5	mΩ
		V_{GS} = -4.5V, I_D = -15A	--	3.7	4.5	
Forward Transconductance	g_{FS}	V_{DS} = -5V,I_D = -15A	--	44	--	S
Dynamic Parameters						
Input Capacitance	C_{iss}	V_{GS} = 0V, V_{DS} = -20V, f = 1.0MHz	--	14983	--	pF
Output Capacitance	C_{oss}		--	2060	--	
Reverse Transfer Capacitance	C_{rss}		--	1391	--	
Total Gate Charge	Q_g	V_{DD} = -20V, I_D = -15A, V_{GS} = -10V	--	206	--	nC
Gate-Source Charge	Q_{gs}		--	41	--	
Gate-Drain Charge	Q_{gd}		--	26	--	
Turn-on Delay Time	$t_{d(on)}$	V_{DD} = -20V, I_D = -15A, R_G = 1.6Ω	--	44	--	ns
Turn-on Rise Time	t_r		--	49	--	
Turn-off Delay Time	$t_{d(off)}$		--	138	--	
Turn-off Fall Time	t_f		--	44	--	
Drain-Source Body Diode Characteristics						
Continuous Body Diode Current	I_S	T_C = 25ºC	--	--	-180	A
Body Diode Voltage	V_{SD}	T_J = 25ºC, I_{SD} = -15A, V_{GS} = 0V	--	--	-1.2	V
Reverse Recovery Charge	Q_{rr}	I_F = -15A, V_{GS} = 0V di/dt=-100A/us	--	198	--	nC
Reverse Recovery Time	T_{rr}		--	77	--	ns

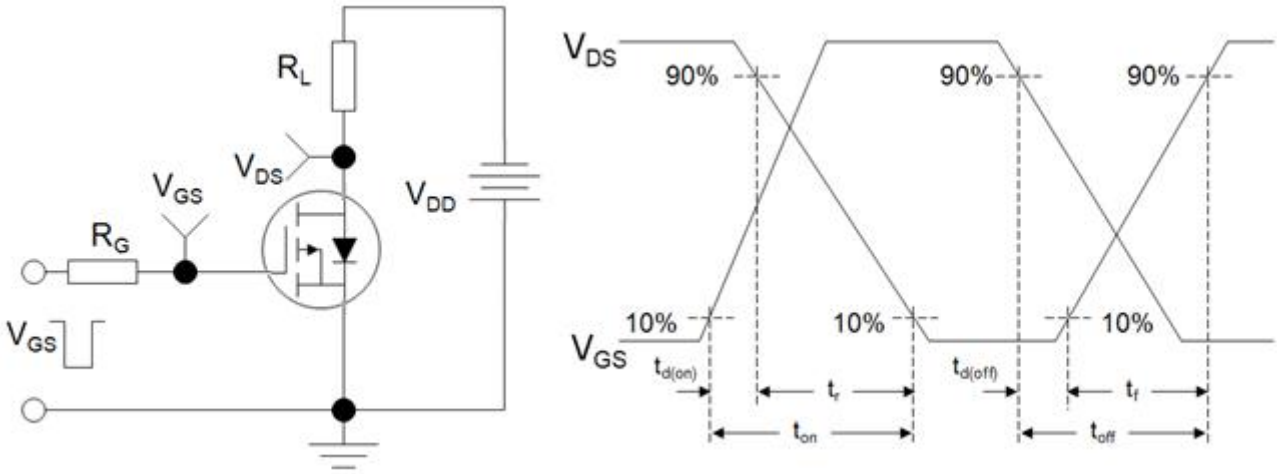
Notes

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. EAS condition : Tj=25℃ ,VDD=-40V,VGS=-10V,L=0.5mH,Rg=25Ω
3. Identical low side and high side switch with identical R_G

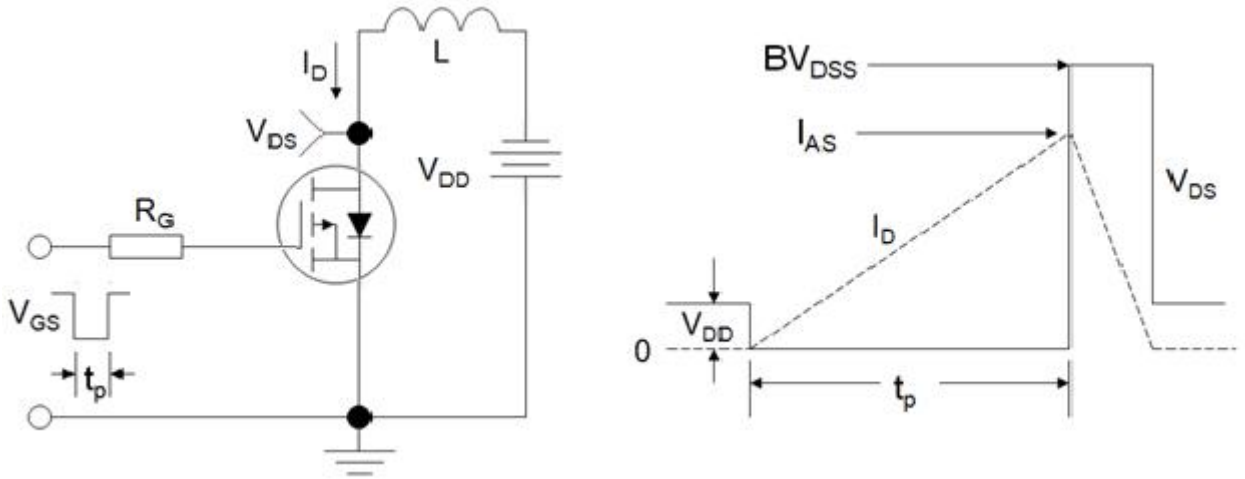
Gate Charge Test Circuit



Switch Time Test Circuit



EAS Test Circuit



Typical Characteristics T_J = 25ºC, unless otherwise noted

Figure 1. Output Characteristics

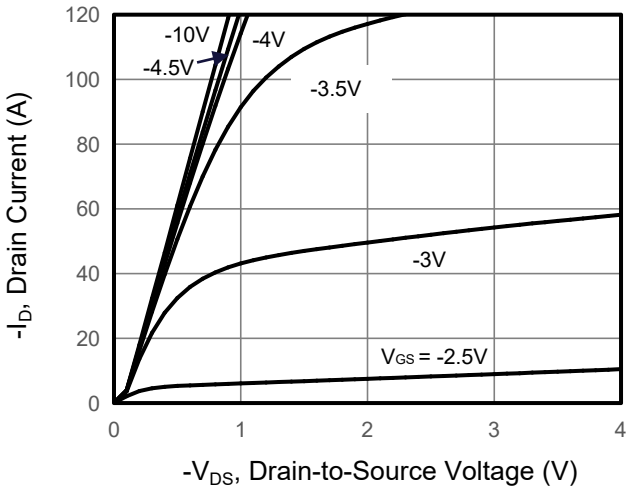


Figure 2. Transfer Characteristics

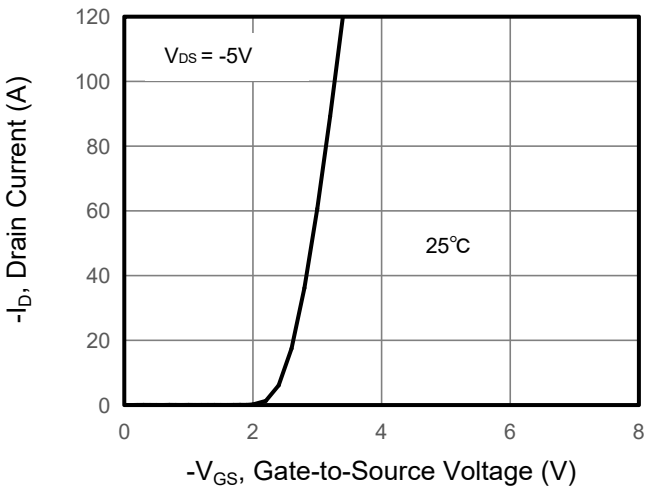


Figure 3.Drain Source On Resistance

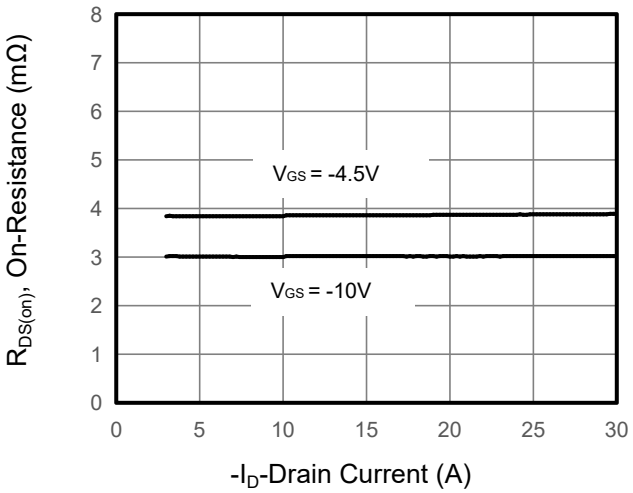


Figure 4. Gate Charge

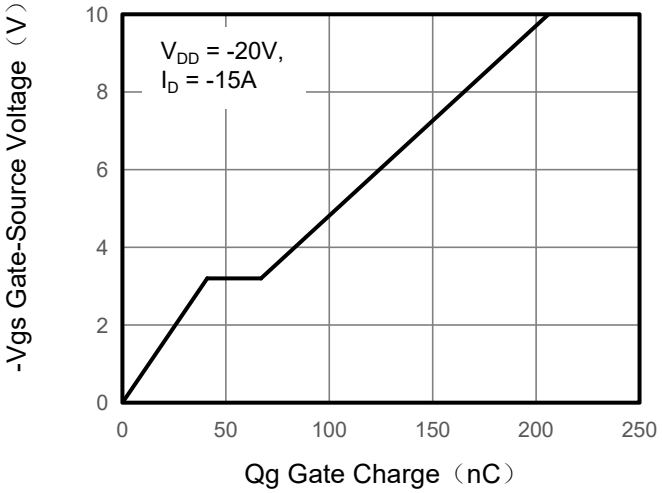


Figure 5. Capacitance

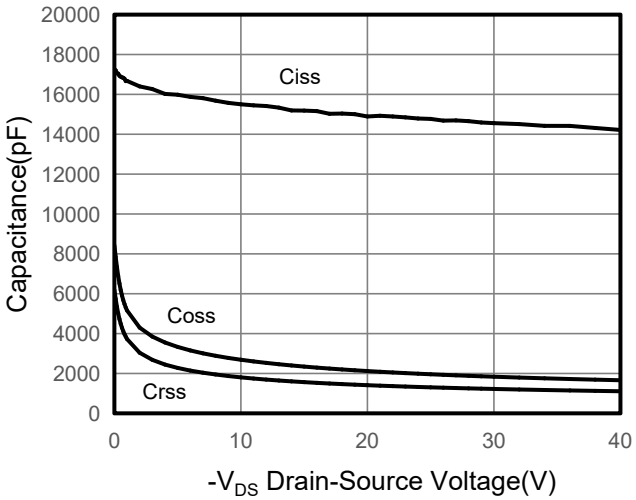
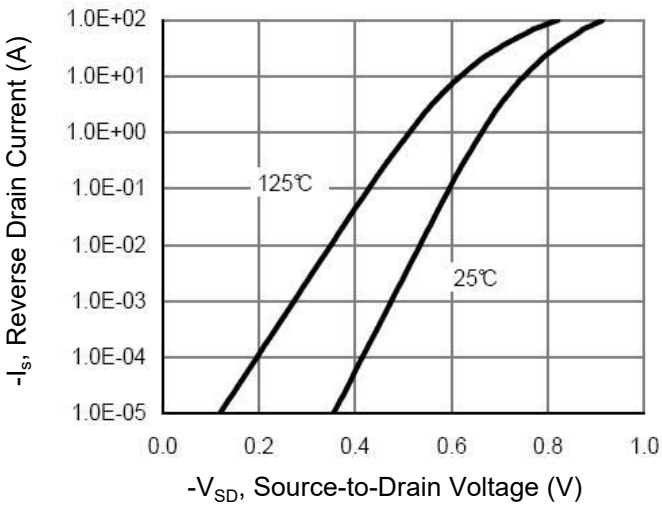


Figure 6. Source-Drain Diode Forward



Typical Characteristics T_J = 25ºC, unless otherwise noted

Figure 7. Drain-Source On-Resistance

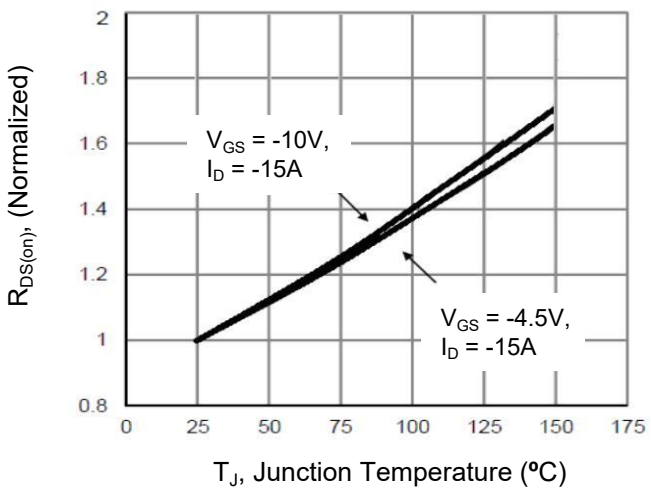


Figure 10. Safe Operation Area

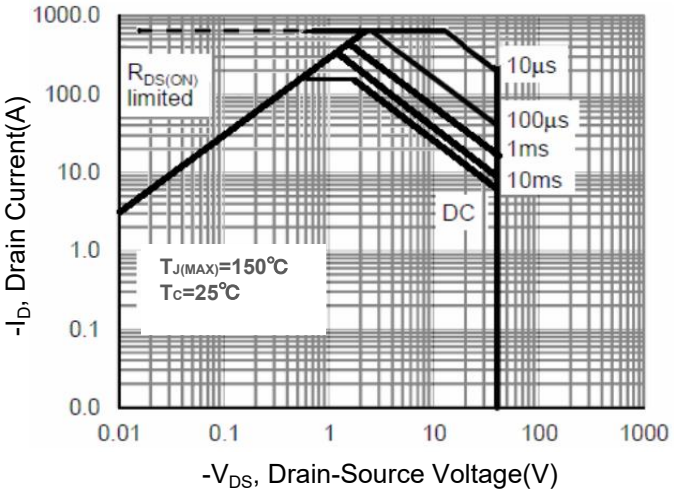
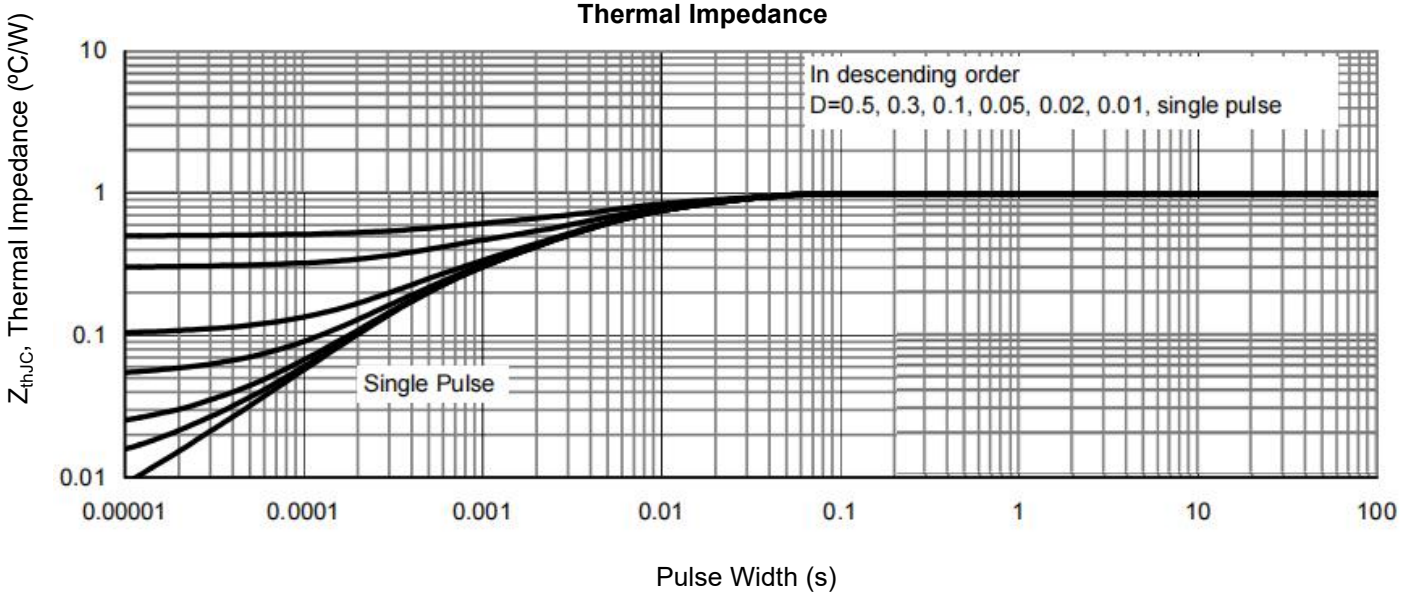
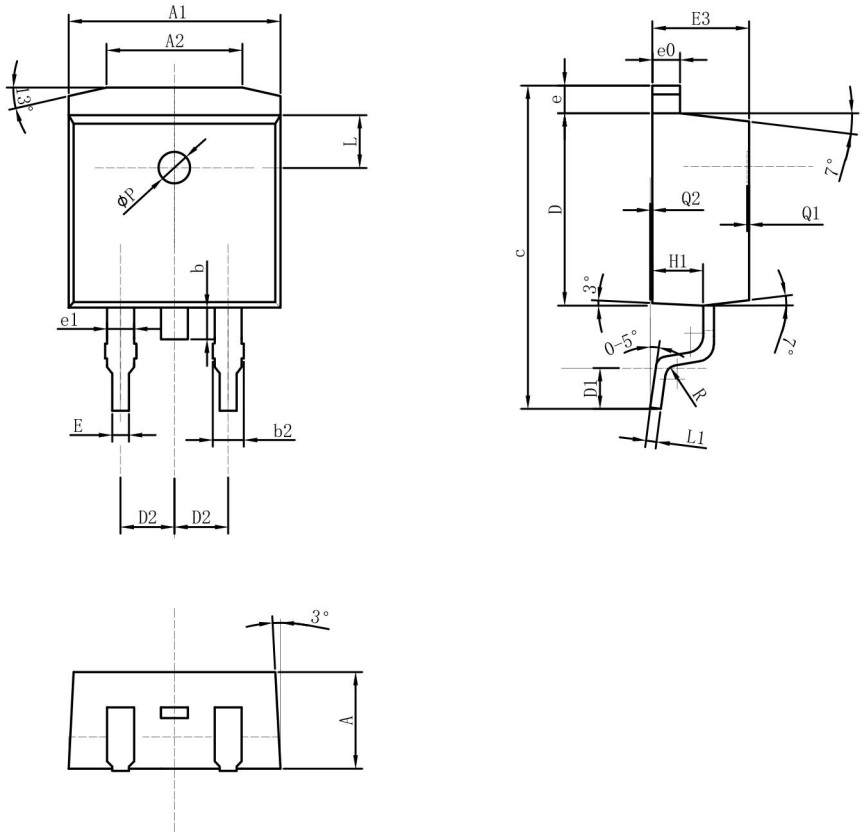


Figure 9. Normalized Maximum Transient Thermal Impedance



TO-263 Package Information



COMMON DIMENSIONS

SYMBO	mm		
	MIN	NOM	MAX
A	4.52	4.57	4.62
A1	9.95	10.00	10.05
A2	6.30	6.40	6.50
b	1.30	1.50	1.70
b2	1.17	1.27	1.37
c	14.80	15.00	15.20
D	9.05	9.10	9.15
D1	1.90	2.10	2.30
D2	-	2.54	-
E	-	0.80	-
E3	-	4.57	-
e	-	1.30	-
e0	-	1.30	-
e1	1.73	3	-
H1	-	2.40	-
L	-	2.50	-
L1	-	0.50	-
ΦP	-	1.50	-
R	-	0.50	-
Q1	0.10	-	0.15
Q2	0	-	0.02