Absolute Maximum Ratings – Alternistor Triac (3 Quadrants)

Symbol	Parameter			Value	Unit
$I_{T(RMS)}$	RMS on-state current (full sine wave)	Qxx40x7 Qxx40xH6	T_C = 75 °C	40	A
I_{TSM}	Non repetitive surge peak on-state current (full cycle, TJ initial = 25°C)	f = 50 Hz	t = 20 ms	335	A
		f = 60 Hz	t = 16.7 ms	400	
I^2t	I2t Value for fusing		t_p = 8.3 ms	664	A^2s
di/dt	Critical rate of rise of on-state current (IG = 2 x IGT, tr ≤ 100 ns)	f = 120 Hz	T_J = 125 °C	150	A/µs
I_{GTM}	Peak gate trigger current	t_p=20µs	T_J = 125 °C	4	A
$P_{G(AV)}$	Average gate power dissipation		T_J = 125 °C	0.5	W
T_{stg}	Storage temperature range			-40 to 150	°C
T_J	Operating junction temperature range			-40 to 125	°C

Absolute Maximum Ratings – Standard Triac (4 Quadrants)

Symbol	Parameter	Test Conditions		Value	Unit
$I_{T(RMS)}$	RMS on-state current	Qxx40x3/Qxx40x4	T_C = 75 °C	40	A
I_{TSM}	Peak non-repetitive surge current	f = 50 Hz	t = 20 ms	335	A
		f = 60 Hz	t = 16 ms	400	
I^2t	I^2t Value for fusing		t_p = 8.3 ms	664	A^2s
di/dt	Critical rate-of-rise of on-state current	f = 120 Hz; T_J =125 °C		150	A/µs
I_{GTM}	Peak gate current	t_p=20µs	T_J = 125 °C	4	A
$P_{G(AV)}$	Average gate power dissipation	T_J = 125°C		0.5	W
T_{stg}	Storage temperature range			-40 to 150	°C
T_J	Operating junction temperature range			-40 to 125	°C

Electrical Characteristics (T_J = 25°C, unless otherwise specified) — Alternistor Triac (3 Quadrants)

Symbol	Test Conditions	Quadrant		Value			Unit
				Qxx40xH6	Qxx40K5	Qxx40x7	
I_{GT}	V_D = 12V R_L = 60 Ω	I – II – III	MAX.	80	50	100	mA
V_{GT}	V_D = 12V R_L = 60 Ω	I – II – III	MAX.	1.3	1.3	2.0	V
V_{GD}	V_D = V_{DRM} R_L = 3.3 kΩ T_J = 125°C	I – II – III	MIN.	0.2			V
I_H	I_T = 400mA		MAX.	80	75	100	mA
dv/dt	V_D = V_{DRM} Gate Open T_J = 125°C	400V	MIN.	600	500	700	V/µs
		600V		500	475	625	
		800V		475	400	575	
		1000V		1000	800	1200	
(dv/dt)c	(di/dt)c = 21.6 A/ms T_J = 125°C		MIN.	30	20	50	V/µs
t_{gt}	I_G = 2 x I_{GT} PW = 15µs I_T = 56.6A(pk)		TYP.	5			µs

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Electrical Characteristics (T_J = 25°C, unless otherwise specified) — Standard Triac (4 Quadrants)

Symbol	Test Conditions	Quadrant		Qxx40x3	Value Qxx40x4	Unit
I_{GT}	V_D = 12 V; R_L = 60 Ω	I – II – III	MAX.	35	50	mA
		IV	MAX.	70	100	
V_{GT}	V_D = 12 V; R_L = 60 Ω	ALL	MAX.	1.3	1.3	V
V_{GD}	$V_D = V_{DRM}$; R_L = 3.3 kΩ ; T_J = 125 °C	ALL	MIN.	0.2	0.2	V
I_H	I_T = 400mA (initial)		MAX.	80	80	mA
dv/dt	$V_D = V_{DRM}$; Gate Open; T_J = 125 °C	400V	MIN.	400	400	V/µs
		600V		400	400	
		800V		400	400	
(dv/dt)c	(di/dt)c = 4.3 A/ms; T_J = 125 °C		MIN.	10	10	V/µs
t_{gt}	I_G = 2 x I_{GT}; PW = 15µs; I_T = 35.4 A		TYP.	5	5	µs
dv/dt	VD=VDRM,Gate Open, TJ=100˚C 1000V		-	-	300	V/µs

Static Characteristics

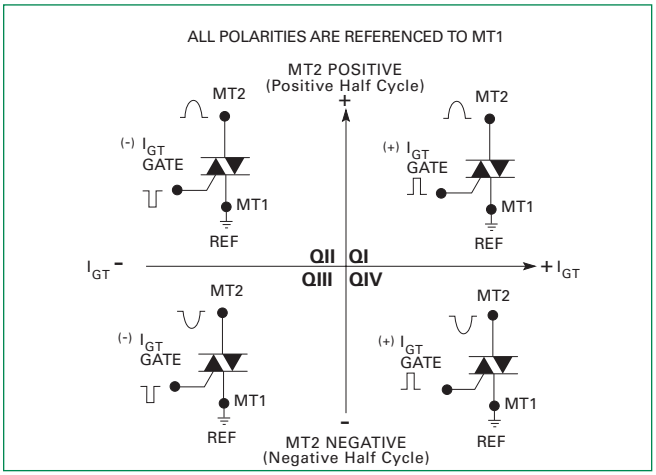
Symbol	Test Conditions				Value	Unit
V_{TM}	I_{TM} = 56.6A t_p = 380 µs	T_J = 25°C	MAX.		1.8	V
I_{DRM} I_{RRM}	$V_D = V_{DRM} / V_{RRM}$	T_J = 25°C	400 –1000V	MAX.	20	µA
		T_J = 125°C	400 – 800V	MAX.	5	mA
		T_J = 100°C	1000V	MAX.	5	mA

Thermal Resistances

Symbol	Parameter			Value	Unit
$R_{\Theta(J-C)}$	Junction to case (AC)		Qxx40KH6 Qxx40K5/7 Qxx40K4/J4 Qxx40K3	0.97	°C/W
			Qxx40JH6 Qxx40J7	0.95	

Note: xx = voltage

Figure 1: Definition of Quadrants



Note: Alternistors will not operate in QIV

Figure 2: Normalized DC Gate Trigger Current for All Quadrants vs. Junction Temperature

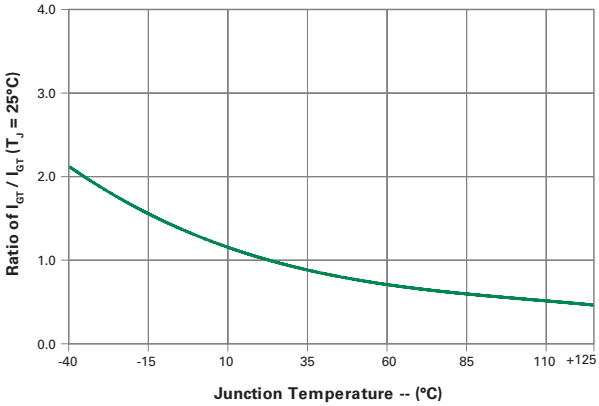


Figure 3: Normalized DC Holding Current vs. Junction Temperature

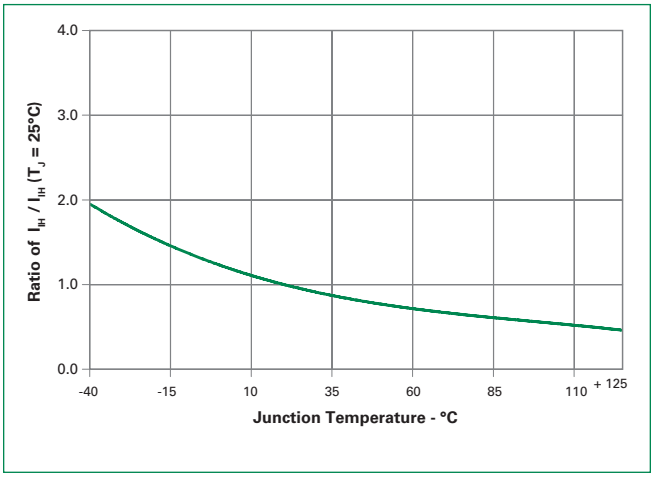


Figure 4: Normalized DC Gate Trigger Voltage for All Quadrants vs. Junction Temperature

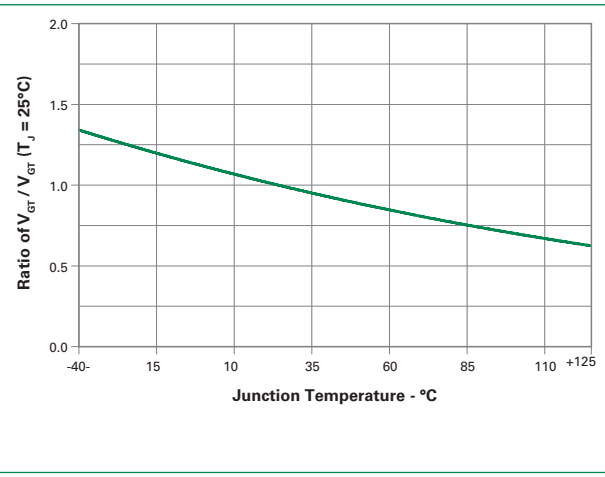


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Figure 5: Power Dissipation (Typical) vs. RMS On-State Current

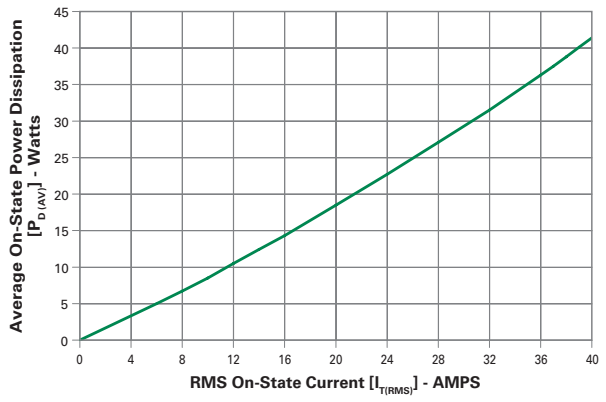


Figure 6: Maximum Allowable Case Temperature vs. On-State Current

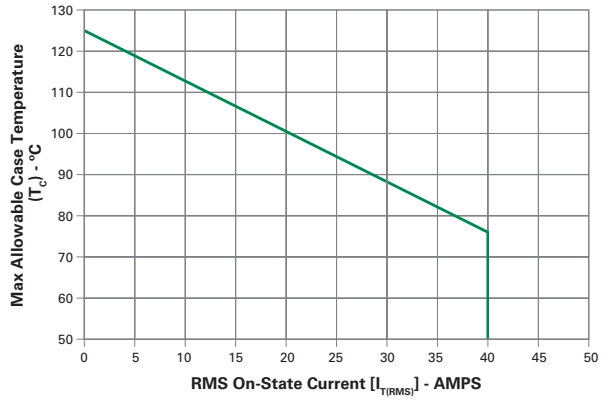


Figure 7: On-State Current vs. On-State Voltage (Typical)

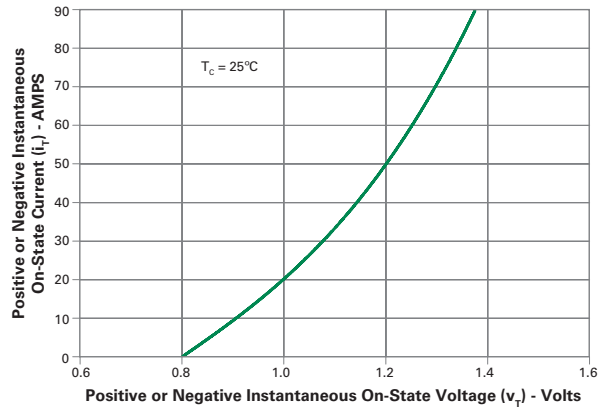
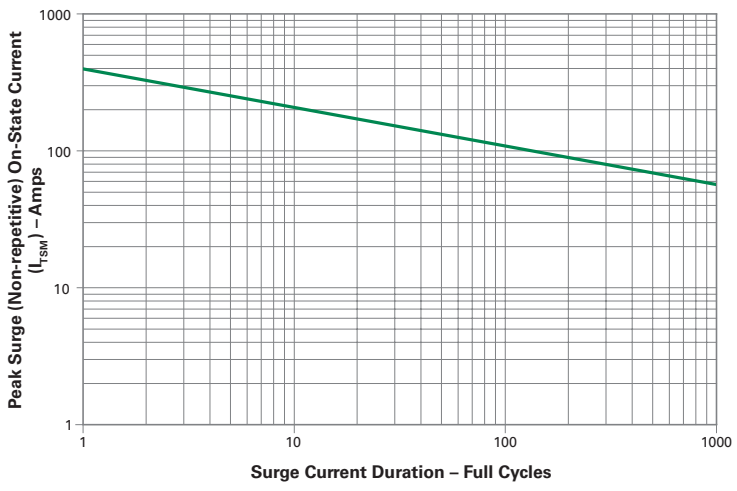


Figure 8: Surge Peak On-State Current vs. Number of Cycles



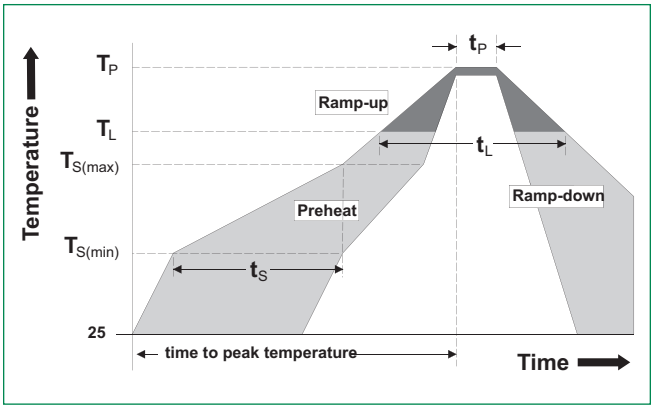
Supply Frequency: 60Hz Sinusoidal
Load: Resistive
RMS On-State [$I_{T(RMS)}$]: Max Rated Value at Specific Case Temperature

Notes:
1) Gate control may be lost during and immediately following surge current interval.
2) Overload may not be repeated until junction temperature has returned to steady-state rated value.

Revised: GD. 12/17/20

Soldering Parameters

Reflow Condition		Pb – Free assembly
Pre Heat	**- Temperature Min ($T_{s(min)}$)**	150°C
	- Temperature Max ($T_{s(max)}$)	200°C
	- Time (min to max) (t_s)	60 – 180 secs
Average ramp up rate (Liquidus Temp) (T_L) to peak		5°C/second max
$T_{S(max)}$ to T_L - Ramp-up Rate		5°C/second max
Reflow	**- Temperature (T_L) (Liquidus)**	217°C
	- Time (min to max) (t_s)	60 – 150 seconds
Peak Temperature (T_P)		$260^{+0/-5}$ °C
Time within 5°C of actual peak Temperature (t_p)		20 – 40 seconds
Ramp-down Rate		5°C/second max
Time 25°C to peak Temperature (T_P)		8 minutes Max.
Do not exceed		280°C



Physical Specifications

Terminal Finish	100% Matte Tin-plated.
Body Material	UL Recognized compound meeting flammability rating V-0
Lead Material	Copper Alloy

Environmental Specifications

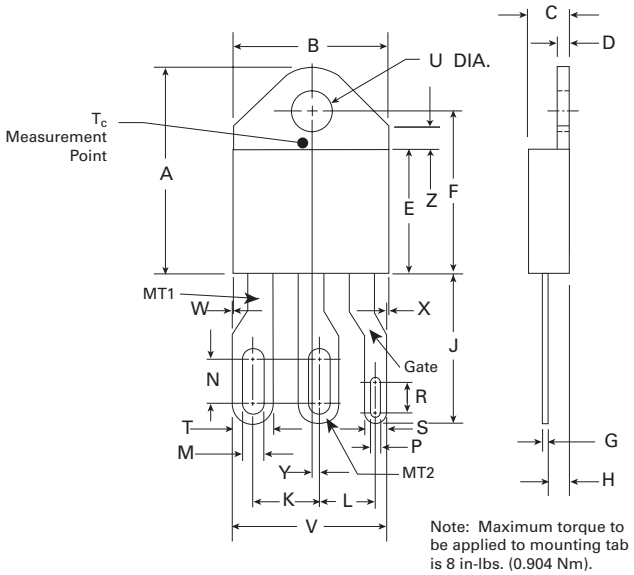
AC Blocking	MIL-STD-750, M-1040, Cond A Applied Peak AC voltage @ 125°C for 1008 hours
Temperature Cycling	MIL-STD-750, M-1051, 100 cycles; -40°C to +150°C; 15-min dwell-time
Temperature/Humidity	EIA / JEDEC, JESD22-A101 1008 hours; 320V - DC: 85°C; 85% rel humidity
High Temp Storage	MIL-STD-750, M-1031, 1008 hours; 150°C
Low-Temp Storage	1008 hours; -40°C
Resistance to Solder Heat	MIL-STD-750 Method 2031
Solderability	ANSI/J-STD-002, category 3, Test A
Lead Bend	MIL-STD-750, M-2036 Cond E

Design Considerations

Careful selection of the correct component for the application's operating parameters and environment will go a long way toward extending the operating life of the Thyristor. Good design practice should limit the maximum continuous current through the main terminals to 75% of the component rating. Other ways to ensure long life for a power discrete semiconductor are proper heat sinking and selection of voltage ratings for worst case conditions. Overheating, overvoltage (including dv/dt), and surge currents are the main killers of semiconductors. Correct mounting, soldering, and forming of the leads also help protect against component damage.

Revised: GD. 12/17/20

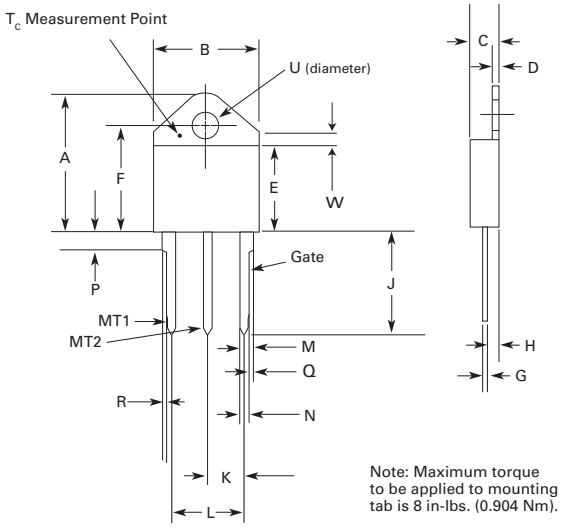
Dimensions — TO-218X (J Package) — Isolated Mounting Tab



Note: Maximum torque to be applied to mounting tab is 8 in-lbs. (0.904 Nm).

Dimension	Inches		Millimeters	
	Min	Max	Min	Max
A	0.810	0.835	20.57	21.21
B	0.610	0.630	15.49	16.00
C	0.178	0.188	4.52	4.78
D	0.055	0.070	1.40	1.78
E	0.487	0.497	12.37	12.62
F	0.635	0.655	16.13	16.64
G	0.022	0.029	0.56	0.74
H	0.075	0.095	1.91	2.41
J	0.575	0.625	14.61	15.88
K	0.256	0.264	6.50	6.71
L	0.220	0.228	5.58	5.79
M	0.080	0.088	2.03	2.24
N	0.169	0.177	4.29	4.49
P	0.034	0.042	0.86	1.07
R	0.113	0.121	2.87	3.07
S	0.086	0.096	2.18	2.44
T	0.156	0.166	3.96	4.22
U	0.161	0.165	4.10	4.20
V	0.603	0.618	15.31	15.70
W	0.000	0.005	0.00	0.13
X	0.003	0.012	0.07	0.30
Y	0.028	0.032	0.71	0.81
Z	0.085	0.095	2.17	2.42

Dimensions — TO-218AC (K Package) — Isolated Mounting Tab



Note: Maximum torque to be applied to mounting tab is 8 in-lbs. (0.904 Nm).

Dimension	Inches		Millimeters	
	Min	Max	Min	Max
A	0.810	0.835	20.57	21.21
B	0.610	0.630	15.49	16.00
C	0.178	0.188	4.52	4.78
D	0.055	0.070	1.40	1.78
E	0.487	0.497	12.37	12.62
F	0.635	0.655	16.13	16.64
G	0.022	0.029	0.56	0.74
H	0.075	0.095	1.91	2.41
J	0.575	0.625	14.61	15.88
K	0.211	0.219	5.36	5.56
L	0.422	0.437	10.72	11.10
M	0.058	0.068	1.47	1.73
N	0.045	0.055	1.14	1.40
P	0.095	0.115	2.41	2.92
Q	0.008	0.016	0.20	0.41
R	0.008	0.016	0.20	0.41
U	0.161	0.165	4.10	4.20
W	0.085	0.095	2.17	2.42

Revised: GD. 12/17/20

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Thyristors
40 Amp Alternistor (High Commutation) and Standard Triacs

Product Selector

Part Number	Voltage				Gate Sensitivity Quadrants		$I_{T(RMS)}$	Type	Package
	400V	600V	800V	1000V	I – II – III	IV			
Qxx40KH6	X	X	X	X	80 mA	-	40 A	Alternistor Triac	TO-218AC
Qxx40JH6	X	X	X	-	80 mA	-	40 A	Alternistor Triac	TO-218X
Qxx40K5	X	X	X	X	50 mA	-	40 A	Alternistor Triac	TO-218AC
Qxx40K7	X	X	X	X	100 mA	-	40 A	Alternistor Triac	TO-218AC
Qxx40J7	X	X	X	-	100 mA	-	40 A	Alternistor Triac	TO-218X
Qxx40K4	X	X	X	X	50 mA	100 mA	40 A	Standard Triac	TO-218AC
Qxx40K3	-	-	X	-	35 mA	70 mA	40 A	Standard Triac	TO-218AC
Qxx40J4	-	-	-	X	50mA	100mA	40 A	Standard Triac	TO-218X

Note: xx = Voltage

Packing Options

Part Number	Marking	Weight	Packing Mode	Base Quantity
Qxx40KH6TP	Qxx40KH6	4.40 g	Tube Pack	250 (25 per tube)
Qxx40JH6TP	Qxx40JH6	5.23 g	Tube Pack	250 (25 per tube)
Qxx40K5TP	Qxx40K5	4.40 g	Tube Pack	250 (25 per tube)
Qxx40K7TP	Qxx40K7	4.40 g	Tube Pack	250 (25 per tube)
Qxx40J7TP	Qxx40J7	5.23 g	Tube Pack	250 (25 per tube)
Qxx40K4TP	Qxx40K4	4.40 g	Tube Pack	250 (25 per tube)
Qxx40K3TP	Qxx40K3	4.40g	Tube Pack	250(25 per tube)
Qxx40J4TP	Qxx40J4	5.23g	Tube Pack	250(25 per tube)

Note: xx = Voltage

Part Numbering System

Q 60 40 K 7

DEVICE TYPE
Q : Triac or Alternistor

VOLTAGE
40 : 400V
60 : 600V
80 : 800V
K0 : 1000V

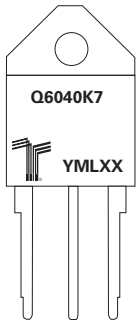
CURRENT
40 : 40A

SENSITIVITY & TYPE
Standard Triac:
3: 35mA (QI,QII,QIII)
70mA(QIV)
4: 50mA(QI,QII,QIII)
100mA(QIV)
Alternistor Triac:
H6: 80mA (QI, QII, QIII)
7 : 100mA (QI, II, III)
5: 50mA (QI, QII, QIII)

PACKAGE TYPE
K : TO-218AC Isolated
J : TO-218X Isolated

Part Marking System

TO-218 AC - (K Package)
TO-218 X - (J Package)



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Littelfuse:

Q4040K7 Q6040K7 Q6040J7 Q4040J7 Q8040J7 Q2040J7 Q2040K7 Q8040K7 QK040K7 Q6040J781 Q8040K5 Q6040J7TP Q8040K7TP Q2040J7TP Q2040K7TP Q4040J7TP Q4040K7TP Q8040J7TP Q8040K5TP QK040K7TP Q6040J781TP Q6040K7TP Q6040K5TP Q6040PH5-E Q6040PH5-C Q6040PH5-W Q4040K5TP Q6040K4TP Q8040K4TP QK040J4TP QK040K4TP Q8040K3TP Q6040JH6TP QK040KH6TP Q6040KH6TP