

# MAC15 Series

Preferred Device

## Triacs

### Silicon Bidirectional Thyristors

Designed primarily for full-wave ac control applications, such as solid-state relays, motor controls, heating controls and power supplies; or wherever full-wave silicon gate controlled solid-state devices are needed. Triac type thyristors switch from a blocking to a conducting state for either polarity of applied main terminal voltage with positive or negative gate triggering.

#### Features

- Blocking Voltage to 800 V
- All Diffused and Glass Passivated Junctions for Greater Parameter Uniformity and Stability
- Small, Rugged, Thermowatt Construction for Low Thermal Resistance, High Heat Dissipation and Durability
- Gate Triggering Guaranteed in Three Modes (MAC15 Series) or Four Modes (MAC15A Series)
- Pb-Free Packages are Available\*

#### MAXIMUM RATINGS ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

Rating	Symbol	Value	Unit
Peak Repetitive Off-State Voltage Note 1 ( $T_J = -40$ to $+125^\circ\text{C}$ , Sine Wave 50 to 60 Hz, Gate Open) MAC15A6 MAC15-8, MAC15A8 MAC15-10, MAC15A10	$V_{\text{DRM}}$ , $V_{\text{RRM}}$	400 600 800	V
Peak Gate Voltage (Pulse Width $\leq 1.0 \mu\text{sec}$ ; $T_C = 90^\circ\text{C}$ )	$V_{\text{GM}}$	10	V
On-State Current RMS; Full Cycle Sine Wave 50 to 60 Hz ( $T_C = +90^\circ\text{C}$ )	$I_{\text{T(RMS)}}$	15	A
Circuit Fusing Consideration ( $t = 8.3 \text{ ms}$ )	$I^2t$	93	$\text{A}^2\text{s}$
Peak Non-Repetitive Surge Current (One Full Cycle Sine Wave, 60 Hz, $T_C = +80^\circ\text{C}$ ) Preceded and Followed by Rated Current	$I_{\text{TSM}}$	150	A
Peak Gate Power ( $T_C = +80^\circ\text{C}$ , Pulse Width = $1.0 \mu\text{s}$ )	$P_{\text{GM}}$	20	W
Average Gate Power ( $T_C = +80^\circ\text{C}$ , $t = 8.3 \text{ ms}$ )	$P_{\text{G(AV)}}$	0.5	W
Peak Gate Current (Pulse Width $\leq 1.0 \mu\text{sec}$ ; $T_C = 90^\circ\text{C}$ )	$I_{\text{GM}}$	2.0	A
Operating Junction Temperature Range	$T_J$	$-40$ to $+125$	$^\circ\text{C}$
Storage Temperature Range	$T_{\text{stg}}$	$-40$ to $+150$	$^\circ\text{C}$

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1.  $V_{\text{DRM}}$  and  $V_{\text{RRM}}$  for all types can be applied on a continuous basis. Blocking voltages shall not be tested with a constant current source such that the voltage ratings of the devices are exceeded.

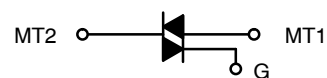
\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



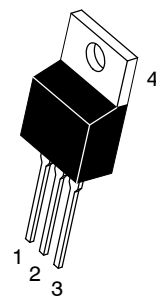
ON Semiconductor®

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**TRIACS**  
**15 AMPERES RMS**  
**400 thru 800 VOLTS**



#### MARKING DIAGRAM



TO-220AB  
CASE 221A  
STYLE 4



MAC15xx = Specific Device Code  
xx = See Table on Page 2  
A = Assembly Location  
Y = Year  
WW = Work Week  
G = Pb-Free Package

#### PIN ASSIGNMENT

Pin	Assignment
1	Main Terminal 1
2	Main Terminal 2
3	Gate
4	Main Terminal 2

#### ORDERING INFORMATION

See detailed ordering, marking, and shipping information in the package dimensions section on page 2 of this data sheet.

Preferred devices are recommended choices for future use and best overall value.

# MAC15 Series

## THERMAL CHARACTERISTICS

Characteristic	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	2.0	$^{\circ}C/W$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	62.5	$^{\circ}C/W$
Maximum Lead Temperature for Soldering Purposes 1/8" from Case for 10 Seconds	$T_L$	260	$^{\circ}C$

## ELECTRICAL CHARACTERISTICS ( $T_C = 25^{\circ}C$ unless otherwise noted; Electricals apply in both directions)

Characteristic	Symbol	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Peak Blocking Current ( $V_D = \text{Rated } V_{DRM}, V_{RRM}; \text{ Gate Open}$ )	$T_J = 25^{\circ}C$	$I_{DRM}$	-	-	10	$\mu A$
	$T_J = 125^{\circ}C$	$I_{RRM}$	-	-	2.0	mA

### ON CHARACTERISTICS

Peak On-State Voltage Note 2 ( $I_{TM} = \pm 21$ A Peak)	$V_{TM}$	-	1.3	1.6	V
Gate Trigger Current (Continuous dc) ( $V_D = 12$ Vdc, $R_L = 100 \Omega$ ) MT2(+), G(+) MT2(+), G(-) MT2(-), G(-) MT2(-), G(+) "A" SUFFIX ONLY	$I_{GT}$	-	-	50	mA
		-	-	50	
		-	-	50	
		-	-	75	
Gate Trigger Voltage (Continuous dc) ( $V_D = 12$ Vdc, $R_L = 100 \Omega$ ) MT2(+), G(+) MT2(+), G(-) MT2(-), G(-) MT2(-), G(+) "A" SUFFIX ONLY	$V_{GT}$	-	0.9	2	V
		-	0.9	2	
		-	1.1	2	
		-	1.4	2.5	
Gate Non-Trigger Voltage ( $V_D = 12$ V, $R_L = 100 \Omega$ ) $T_J = 110^{\circ}C$ ) MT2(+), G(+); MT2(-), G(-); MT2(+), G(-) MT2(-), G(+) "A" SUFFIX ONLY	$V_{GD}$	0.2	-	-	V
		0.2	-	-	
Holding Current ( $V_D = 12$ Vdc, Gate Open, Initiating Current = $\pm 200$ mA)	$I_H$	-	6.0	40	mA
Turn-On Time ( $V_D = \text{Rated } V_{DRM}, I_{TM} = 17$ A) ( $I_{GT} = 120$ mA, Rise Time = $0.1 \mu s$ , Pulse Width = $2 \mu s$ )	$t_{gt}$	-	1.5	-	$\mu s$

### DYNAMIC CHARACTERISTICS

Critical Rate of Rise of Commutation Voltage ( $V_D = \text{Rated } V_{DRM}, I_{TM} = 21$ A, Commutating $di/dt = 7.6$ A/ms, Gate Unenergized, $T_C = 80^{\circ}C$ )	$dv/dt(c)$	-	5.0	-	V/ $\mu s$
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2. Pulse Test: Pulse Width  $\leq 2.0$  ms, Duty Cycle  $\leq 2\%$ .

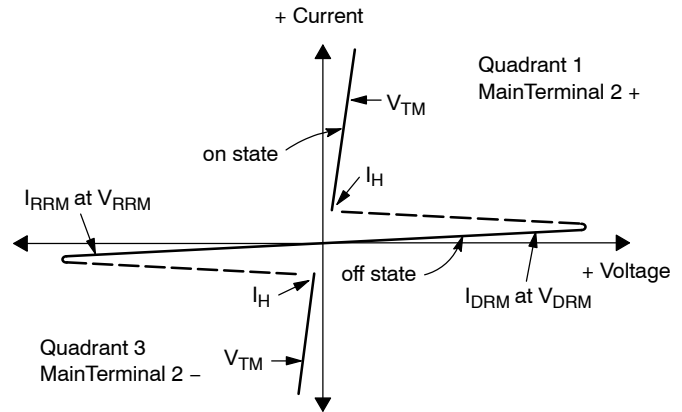
## ORDERING INFORMATION

Device	Device Marking	Package	Shipping
MAC15-008	MAC15-8	TO-220AB	500 Units Bulk
MAC15-8G		TO-220AB (Pb-Free)	
MAC15-10	MAC1510	TO-220AB	
MAC15-10G		TO-220AB (Pb-Free)	
MAC15A6	MAC15A6	TO-220AB	
MAC15A6G		TO-220AB (Pb-Free)	
MAC15A8	MAC15A8	TO-220AB	
MAC15A8G		TO-220AB (Pb-Free)	
MAC15A10	MAC15A10	TO-220AB	
MAC15A10G		TO-220AB (Pb-Free)	
MAC15A10T		TO-220AB	50 Units / Rail

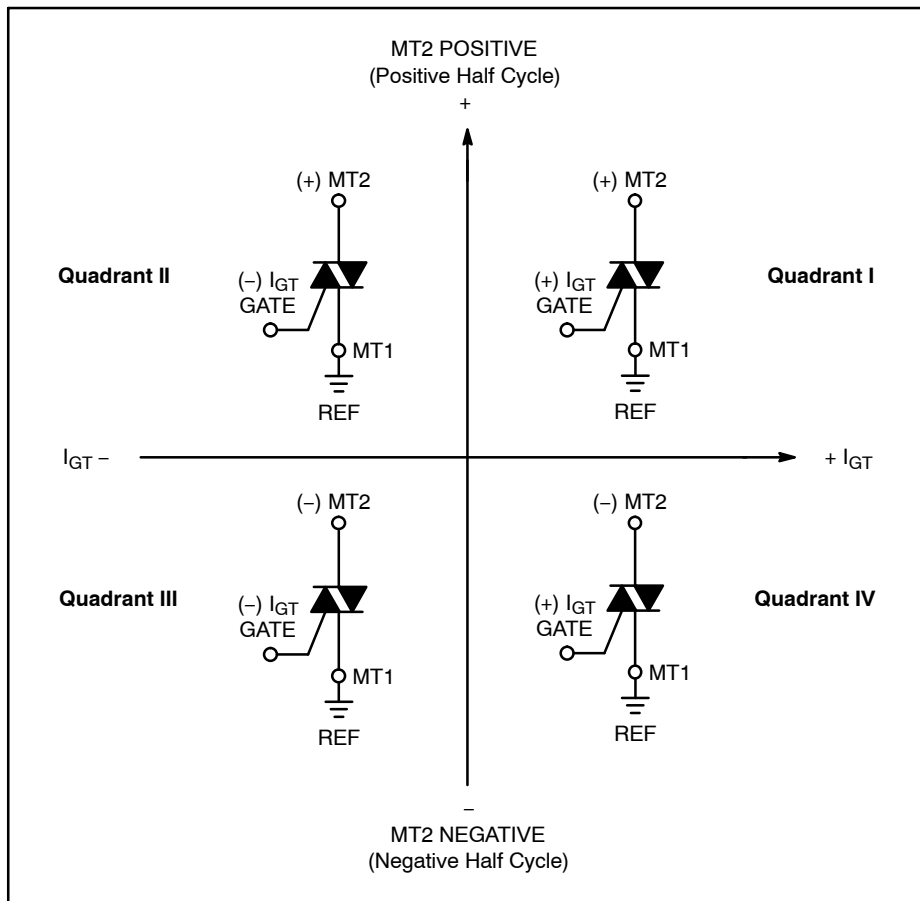
# MAC15 Series

## Voltage Current Characteristic of Triacs (Bidirectional Device)

Symbol	Parameter
$V_{DRM}$	Peak Repetitive Forward Off State Voltage
$I_{DRM}$	Peak Forward Blocking Current
$V_{RRM}$	Peak Repetitive Reverse Off State Voltage
$I_{RRM}$	Peak Reverse Blocking Current
$V_{TM}$	Maximum On State Voltage
$I_H$	Holding Current



### Quadrant Definitions for a Triac



All polarities are referenced to MT1.  
With in-phase signals (using standard AC lines) quadrants I and III are used.

# MAC15 Series

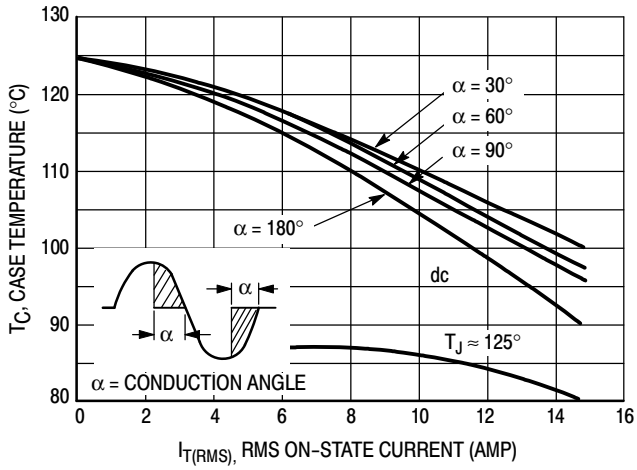


Figure 1. RMS Current Derating

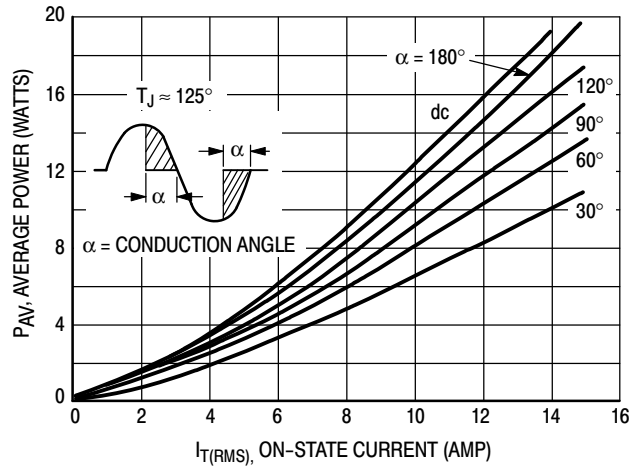


Figure 2. On-State Power Dissipation

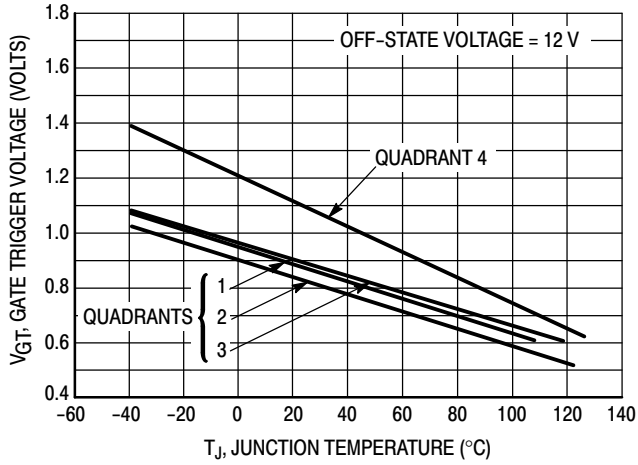


Figure 3. Typical Gate Trigger Voltage

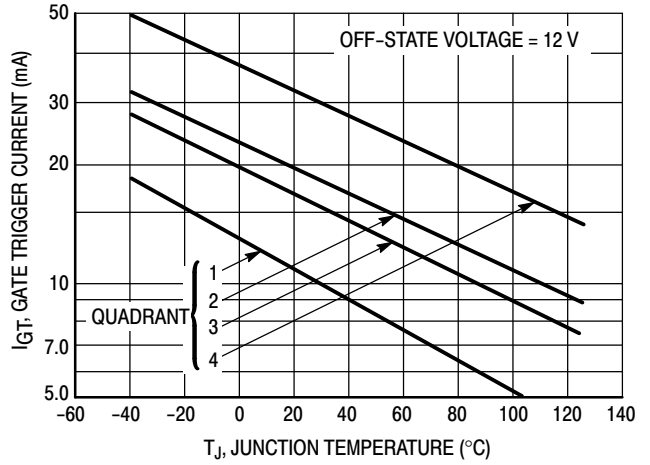


Figure 4. Typical Gate Trigger Current

# MAC15 Series

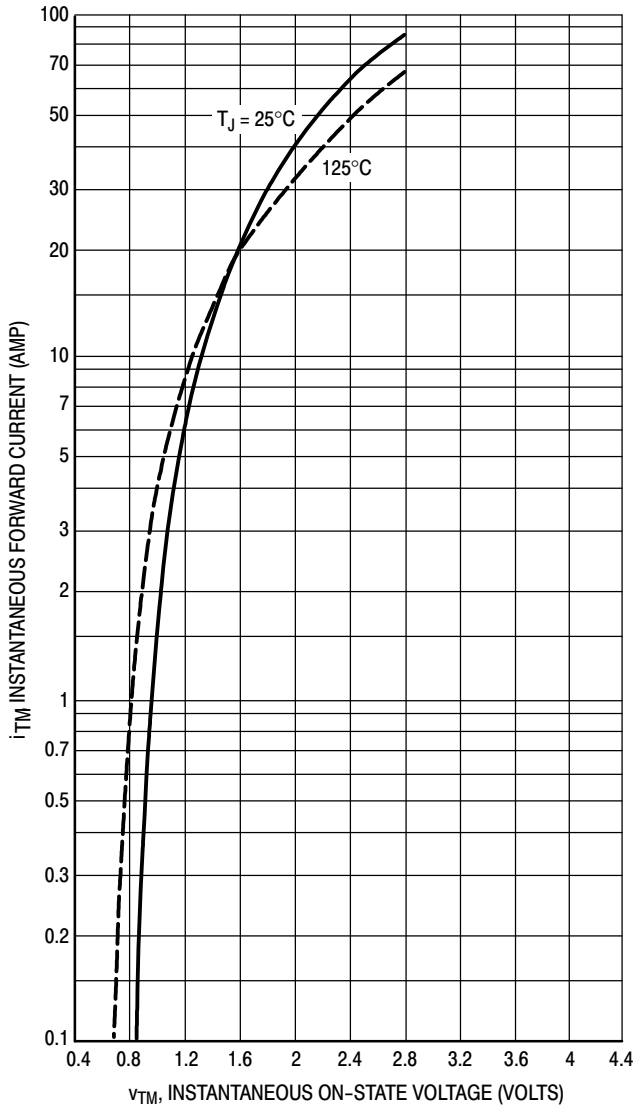


Figure 5. On-State Characteristics

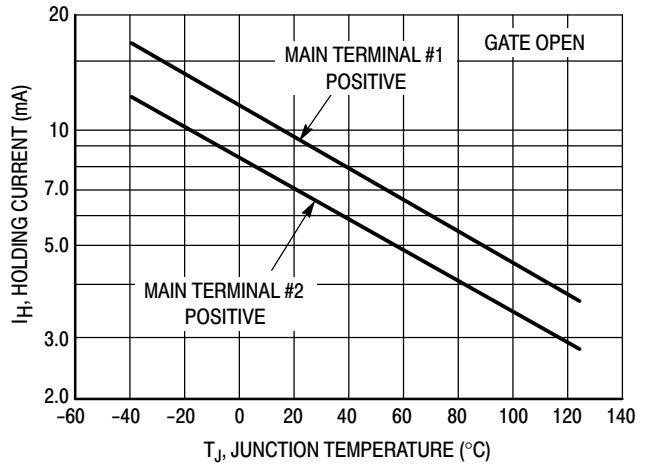


Figure 6. Typical Holding Current

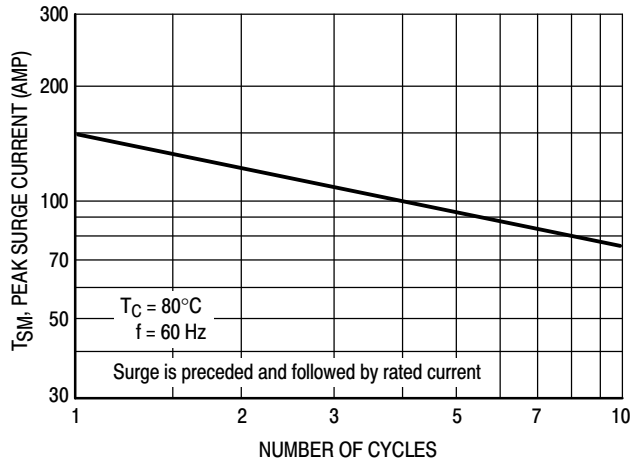


Figure 7. Maximum Non-Repetitive Surge Current

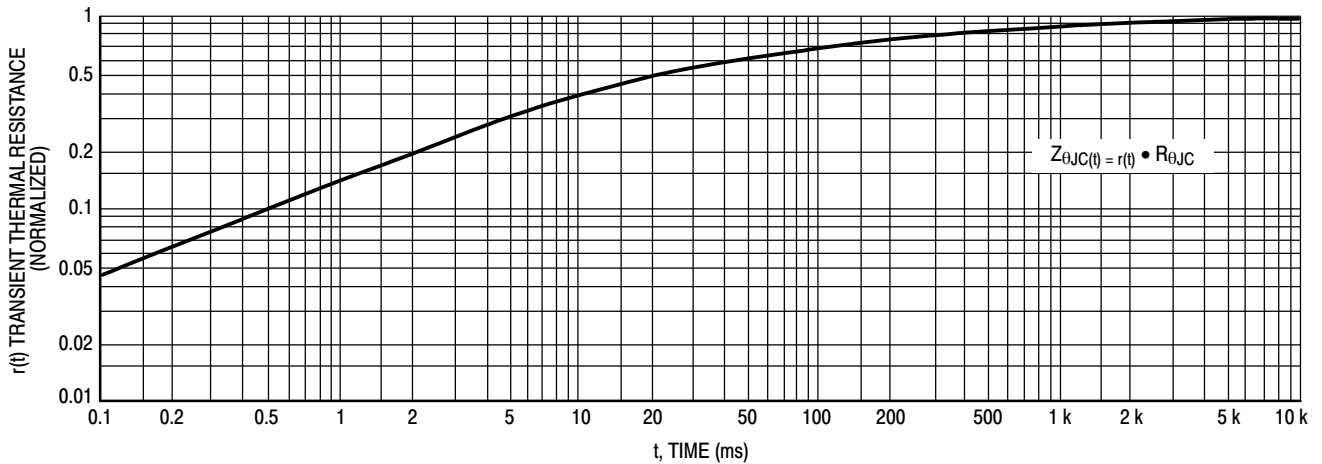
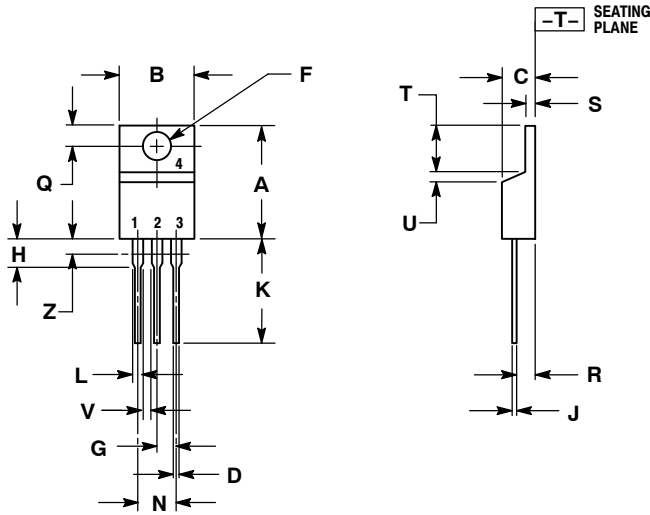


Figure 8. Thermal Response

# MAC15 Series

## PACKAGE DIMENSIONS

TO-220AB  
CASE 221A-07  
ISSUE O



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.570	0.620	14.48	15.75
B	0.380	0.405	9.66	10.28
C	0.160	0.190	4.07	4.82
D	0.025	0.035	0.64	0.88
F	0.142	0.147	3.61	3.73
G	0.095	0.105	2.42	2.66
H	0.110	0.155	2.80	3.93
J	0.014	0.022	0.36	0.55
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.045	0.055	1.15	1.39
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
V	0.045	---	1.15	---
Z	---	0.080	---	2.04

STYLE 4:

1. MAIN TERMINAL 1
2. MAIN TERMINAL 2
3. GATE
4. MAIN TERMINAL 2

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