

# 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.

- Blocking Voltage to 800 Volts
- 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)
- Device Marking: Logo, Device Type, e.g., MAC15A6, Date Code

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

Rating	Symbol	Value	Unit
Peak Repetitive Off-State Voltage <sup>(1)</sup> ( $T_J = -40$ 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	Volts
Peak Gate Voltage (Pulse Width $\leq 1.0 \mu\text{sec}$ ; $T_C = 90^\circ\text{C}$ )	$V_{\text{GM}}$	10	Volts
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	Watts
Average Gate Power ( $T_C = +80^\circ\text{C}$ , $t = 8.3 \text{ ms}$ )	$P_{\text{G(AV)}}$	0.5	Watts
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 $+150$	$^\circ\text{C}$

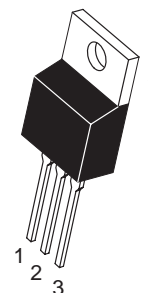
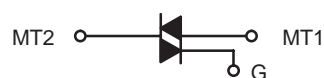
(1)  $V_{\text{DRM}}$  and  $V_{\text{RRM}}$  for all types can be applied on a continuous basis. Blocking voltages shall not be tested with a constant current source such that the voltage ratings of the devices are exceeded.



ON Semiconductor

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



**TO-220AB**  
**CASE 221A**  
**STYLE 4**

#### PIN ASSIGNMENT

1	Main Terminal 1
2	Main Terminal 2
3	Gate
4	Main Terminal 2

#### ORDERING INFORMATION

Device	Package	Shipping
MAC15-8	TO220AB	500/Box
MAC15-10	TO220AB	500/Box
MAC15A6	TO220AB	500/Box
MAC15A8	TO220AB	500/Box
MAC15A10	TO220AB	500/Box

**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 — Junction to Ambient	$R_{\theta JC}$ $R_{\theta JA}$	2.0 62.5	$^{\circ}\text{C}/\text{W}$
Maximum Lead Temperature for Soldering Purposes 1/8" from Case for 10 Seconds	$T_L$	260	$^{\circ}\text{C}$

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

Characteristic	Symbol	Min	Typ	Max	Unit
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## OFF CHARACTERISTICS

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

Peak On-State Voltage <sup>(1)</sup> ( $I_{TM} = \pm 21 \text{ A Peak}$ )	$V_{TM}$	—	1.3	1.6	Volts
Gate Trigger Current (Continuous dc) ( $V_D = 12 \text{ Vdc}, R_L = 100 \text{ Ohms}$ ) MT2(+), G(+) MT2(+), G(–) MT2(–), G(–) MT2(–), G(+) "A" SUFFIX ONLY	$I_{GT}$	— — — —	— — — —	50 50 50 75	$\text{mA}$
Gate Trigger Voltage (Continuous dc) ( $V_D = 12 \text{ Vdc}, R_L = 100 \text{ Ohms}$ ) MT2(+), G(+) MT2(+), G(–) MT2(–), G(–) MT2(–), G(+) "A" SUFFIX ONLY	$V_{GT}$	— — — —	0.9 0.9 1.1 1.4	2 2 2 2.5	Volts
Gate Non-Trigger Voltage ( $V_D = 12 \text{ V}, R_L = 100 \text{ Ohms}, T_J = 110^{\circ}\text{C}$ ) MT2(+), G(+); MT2(–), G(–); MT2(+), G(–) MT2(–), G(+) "A" SUFFIX ONLY	$V_{GD}$	0.2 0.2	— —	— —	Volts
Holding Current ( $V_D = 12 \text{ Vdc}, \text{Gate Open}, \text{Initiating Current} = \pm 200 \text{ mA}$ )	$I_H$	—	6.0	40	$\text{mA}$
Turn-On Time ( $V_D = \text{Rated } V_{DRM}, I_{TM} = 17 \text{ A}$ ) ( $I_{GT} = 120 \text{ mA}, \text{Rise Time} = 0.1 \mu\text{s}, \text{Pulse Width} = 2 \mu\text{s}$ )	$t_{gt}$	—	1.5	—	$\mu\text{s}$

## DYNAMIC CHARACTERISTICS

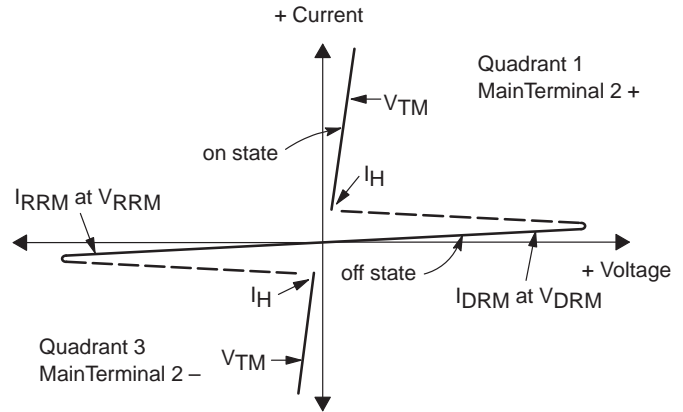
Critical Rate of Rise of Commutation Voltage ( $V_D = \text{Rated } V_{DRM}, I_{TM} = 21 \text{ A}, \text{Commutating } di/dt = 7.6 \text{ A/ms},$ Gate Unenergized, $T_C = 80^{\circ}\text{C}$ )	$dv/dt(c)$	—	5.0	—	$\text{V}/\mu\text{s}$
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(1) Pulse Test: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

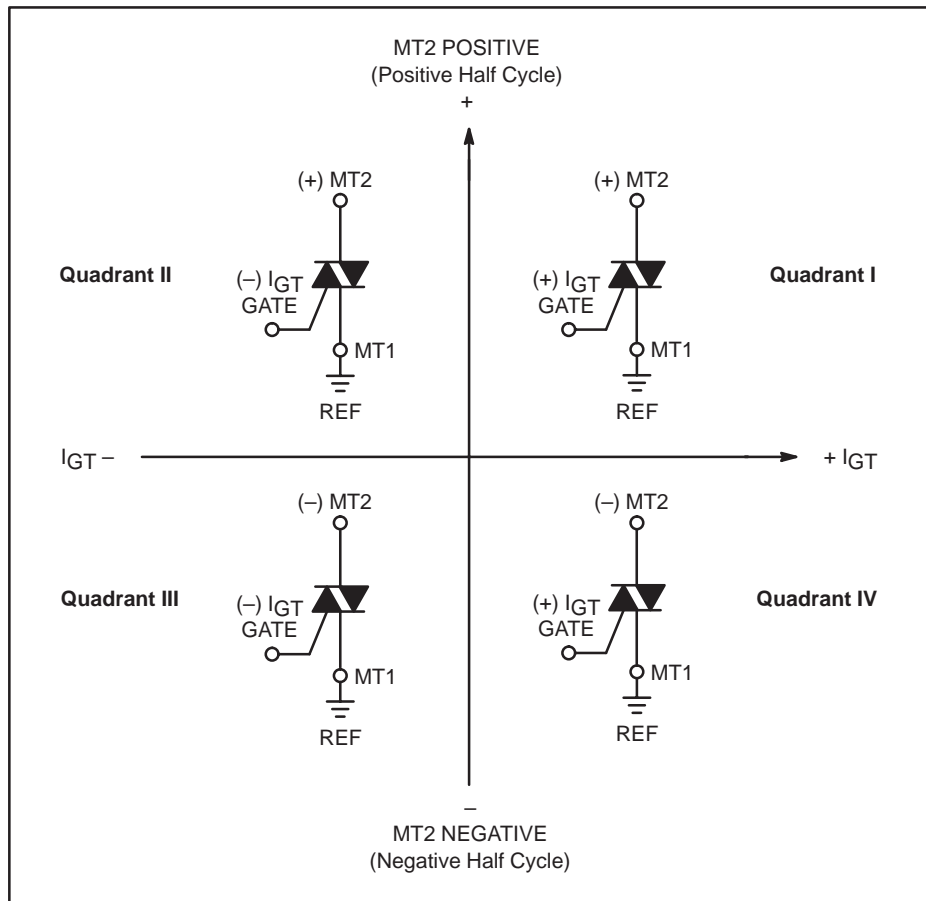
## MAC15 Series

### 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

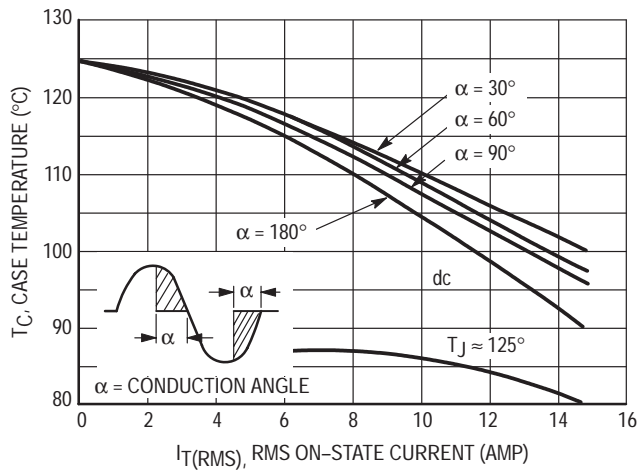


Figure 1. RMS Current Derating

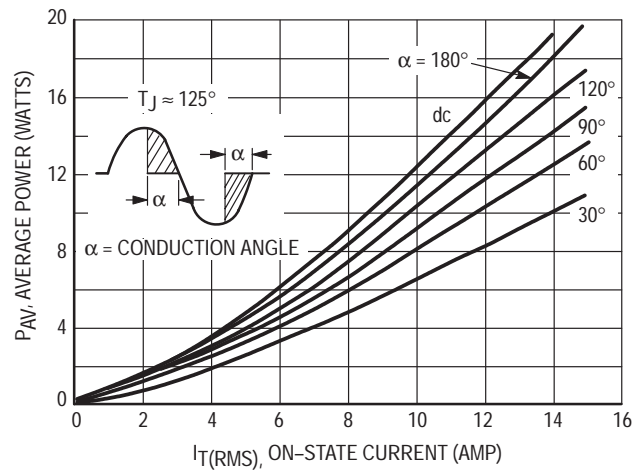


Figure 2. On-State Power Dissipation

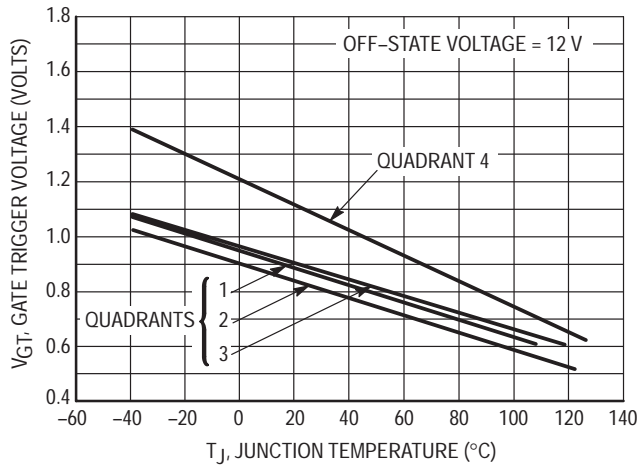


Figure 3. Typical Gate Trigger Voltage

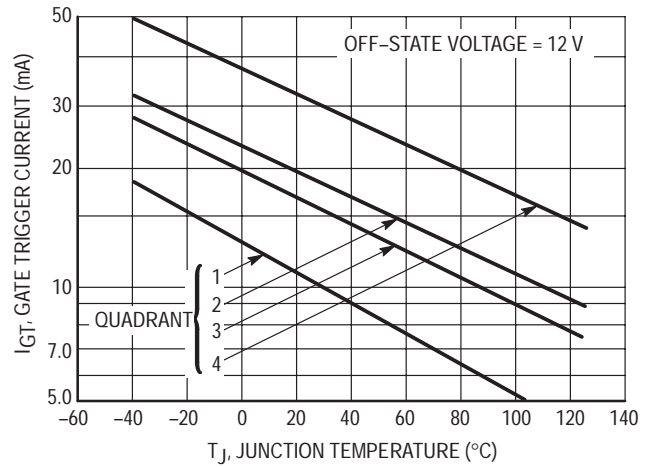


Figure 4. Typical Gate Trigger Current

# MAC15 Series

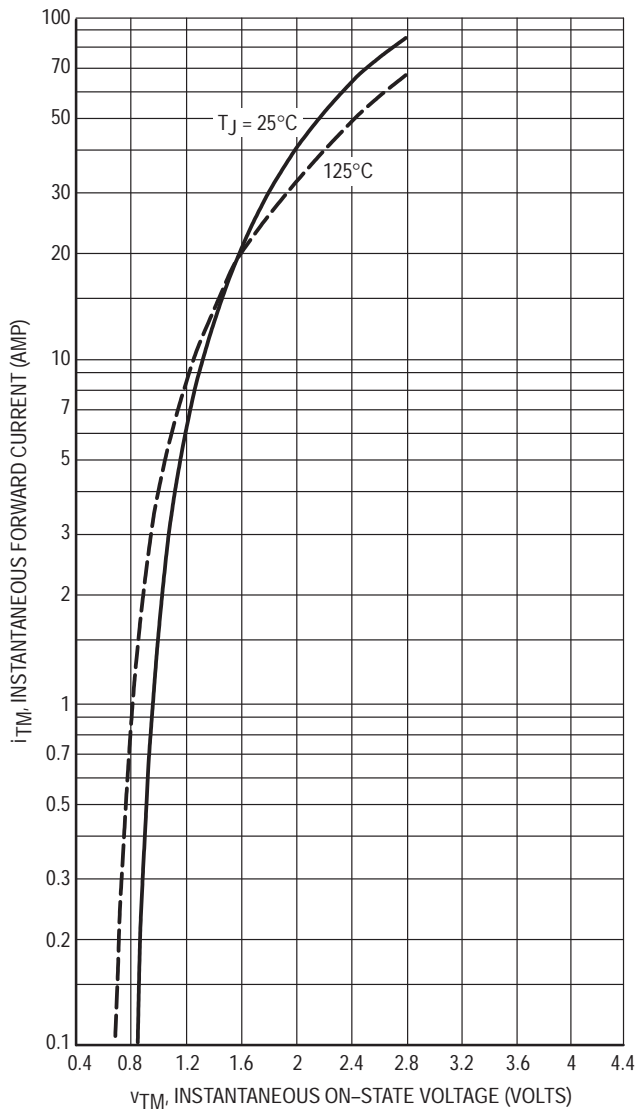


Figure 5. On-State Characteristics

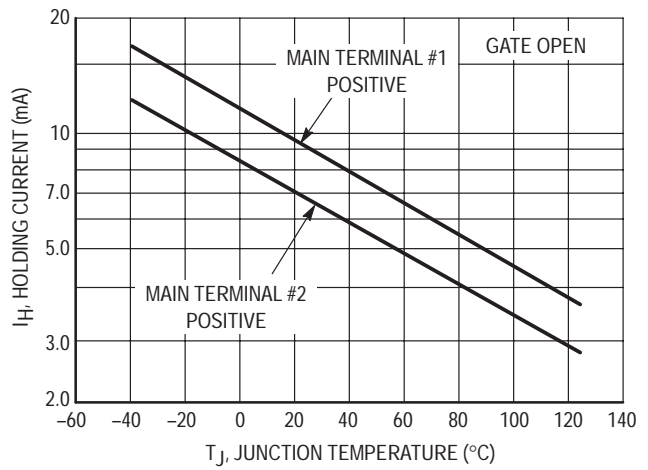


Figure 6. Typical Holding Current

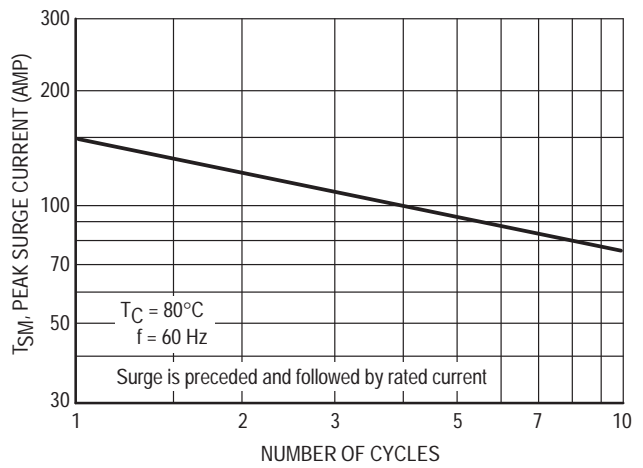


Figure 7. Maximum Non-Repetitive Surge Current

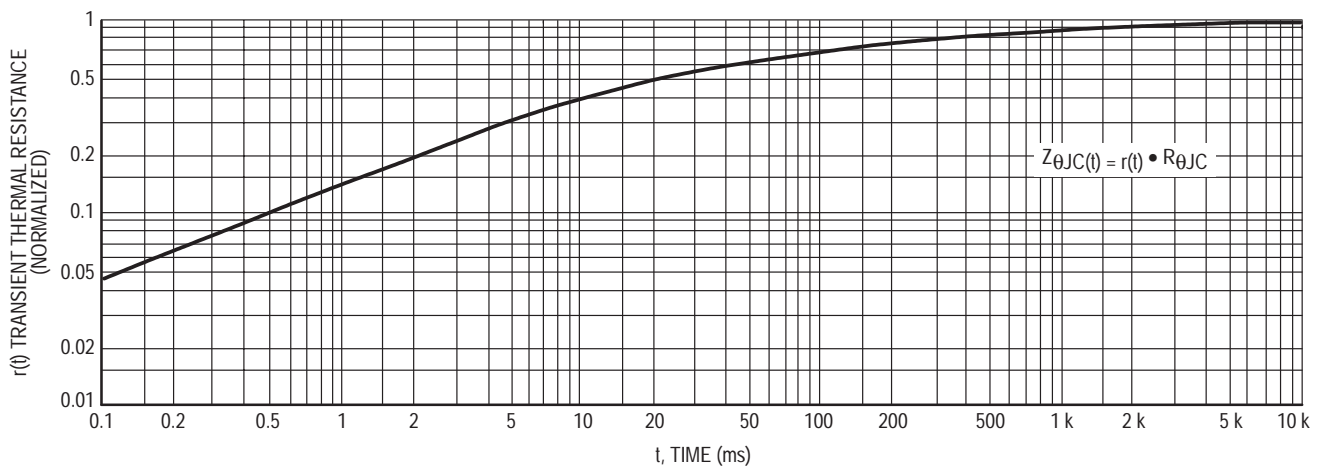
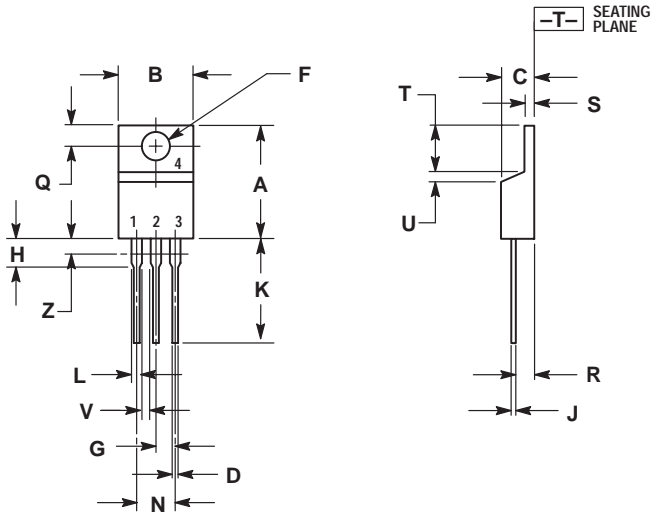


Figure 8. Thermal Response

# MAC15 Series

## PACKAGE DIMENSIONS

### TO-220AB CASE 221A-07 ISSUE Z



#### 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:

- PIN 1. MAIN TERMINAL 1
- MAIN TERMINAL 2
- GATE
- MAIN TERMINAL 2

## **Notes**

# MAC15 Series

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