

DESCRIPTION

The PT5671 is a three-phase controller for use with N-channel external power MOSFETs and. One logic level input is provided for each of the six power MOSFETs in the 3-phase bridge, allowing motors to be driven with any commutation scheme defined by an external controller. The power MOSFETs are protected from cross-conduction by integrated crossover control.

PT5671 uses a multi-power BCD technology, only requiring a single power supply of $V_M = 4.5 - 32V$ and a few external components.

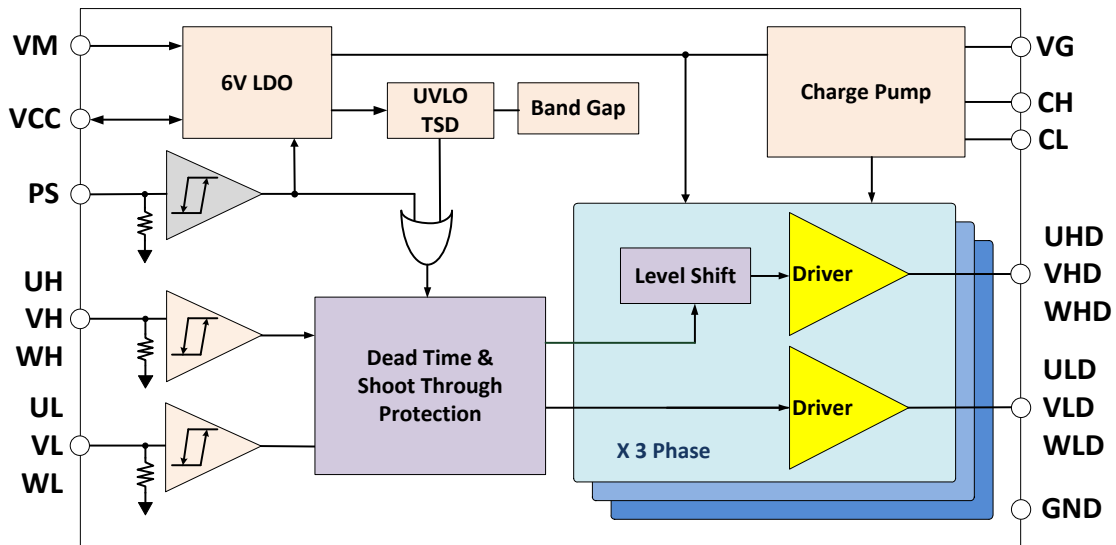
FEATURES

- Driver up to 3-phase half-bridge gates
- Wide supply voltage, $V_M = 4.5V - 32V$
- 5V gate output voltage
- Operating temperature range: -40 to $+85^\circ C$
- Charge-pump
- Built-in protection circuits
 - Shoot-through protection
 - Under Voltage Lock Out (UVLO)
 - Thermal Shut Down (TSD)

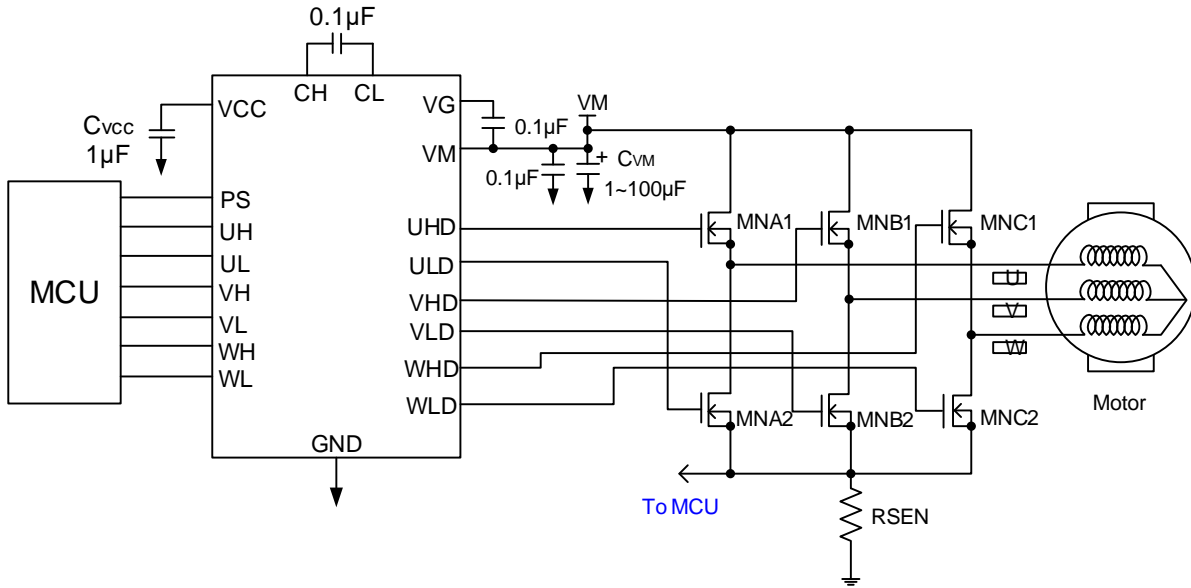
APPLICATIONS

- 3-phase Sensor-Less /hall-sensor controlled BLDC fan motor driver
- 3-phase BLDC motor

BLOCK DIAGRAM



APPLICATION CIRCUIT



External parts

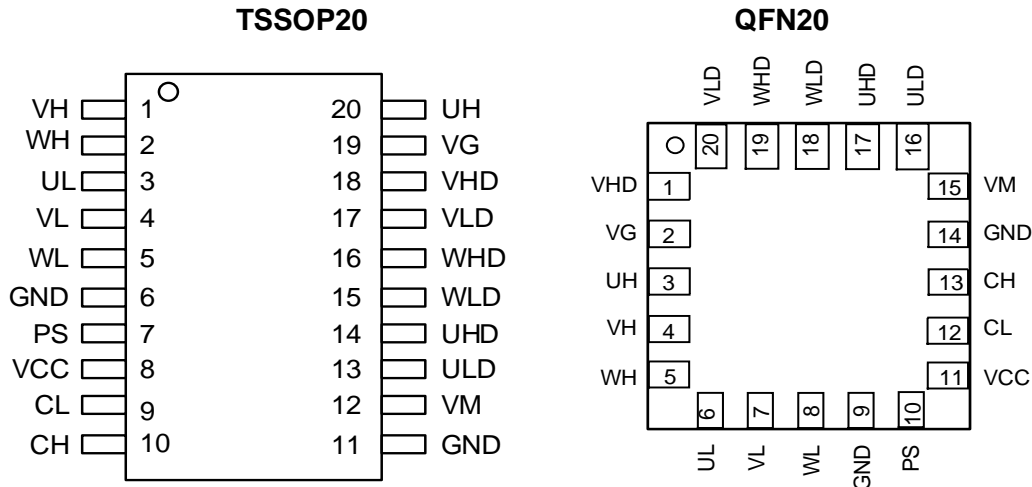
| Item | Symbol | Capacitor value | | | Unit | Remark |
|--|-----------|-----------------|------|------|---------|-------------------------------|
| | | Min | Typ. | Max | | |
| Decoupling Capacitor for Motor driver power supply | C_{VM} | 1.0 | | | μF | Depends on application of PCB |
| Bypass capacitor for Control power supply | C_{VCC} | 0.1 | - | | μF | Depends on application of PCB |
| Charge pump Capacitor 1 | C_{VG} | 0.047 | 0.1 | 0.22 | μF | |
| Charge pump Capacitor 2 | C_{HL} | 0.047 | 0.1 | 0.22 | μF | |

Note: A capacitor of C_{VM} , C_{VCC} should be adjusted by Load current profile, Load Capacitor, resistor of wiring on application board.

ORDER INFORMATION

| Valid Part Number | Package Type | Top Code |
|-------------------|------------------------|-----------|
| PT5671-TX | 20 Pins, TSSOP, 173MIL | PT5671-TX |
| PT5671-QF | 20Pins, QFN, 4*4 | PT5671-QF |

PIN CONFIGURATION



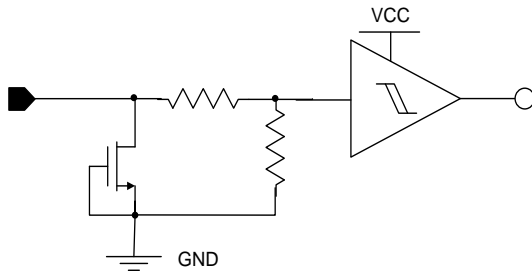
PIN DESCRIPTION

| Pin Name | I/O | Description | Pin No. | |
|----------|-------|---|---------|-------|
| | | | TSSOP20 | QFN20 |
| VH | I | Logic input for high-side gate V-phase driver | 1 | 4 |
| WH | I | Logic input for high-side gate W-phase driver | 2 | 5 |
| UL | I | Logic input for low-side gate U-phase driver | 3 | 6 |
| VL | I | Logic input for low-side gate V-phase driver | 4 | 7 |
| WL | I | Logic input for low-side gate W-phase driver | 5 | 8 |
| GND | GND | GND | 6 | 9 |
| PS | I | Power-saving terminal, when PS=L, all circuit off | 7 | 10 |
| VCC | O | Internal 6V Regulator, supply to internal circuit of low voltage and logic part | 8 | 11 |
| CL | O | Capacitor connect pin for Charge pump | 9 | 12 |
| CH | O | Capacitor connect pin for Charge pump | 10 | 13 |
| GND | GND | GND | 11 | 14 |
| VM | Power | Power supply for driver | 12 | 15 |
| ULD | O | Low-side gate driver U-phase output | 13 | 16 |
| UHD | O | High-side gate driver U-phase output | 14 | 17 |
| WLD | O | Low-side gate driver W-phase output | 15 | 18 |
| WHD | O | High-side gate driver W-phase output | 16 | 19 |
| VLD | O | Low-side gate driver V-phase output | 17 | 20 |
| VHD | O | High-side gate driver V-phase output | 18 | 1 |

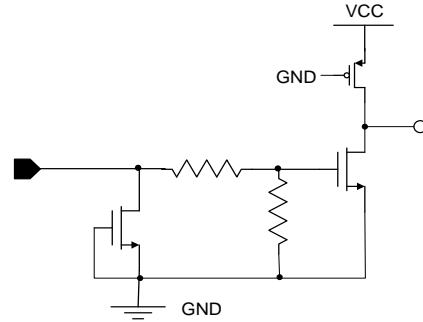
| | | | | |
|----|---|---|----|---|
| VG | O | Capacitor connect pin for regulator | 19 | 2 |
| UH | I | Logic input for high-side gate U-phase driver | 20 | 3 |

INPUT/OUTPUT CONFIGURATION

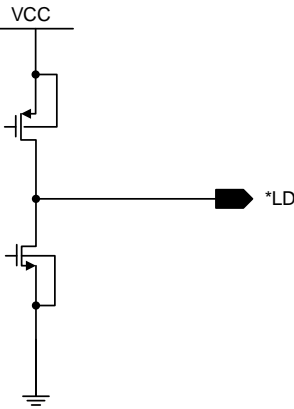
UH, VH, WH, UL, VL, WL



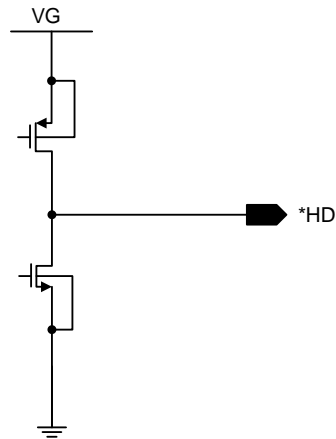
PS



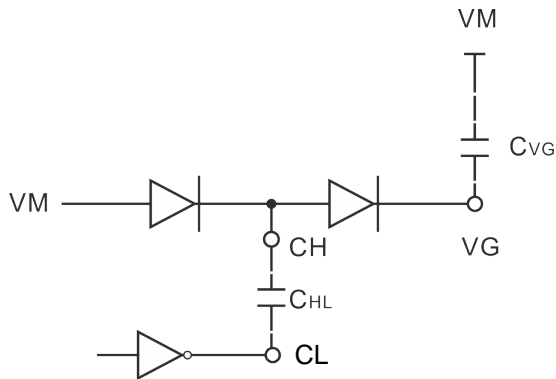
ULD, VLD, WLD (NOTE2)



UHD, VHD, WHD



VG, CH, CL (NOTE1)



Notes:

1. $VG = VM + VCL - 2V_{diode} = VM + 5V$, VCL is created by internal circuit.
 C_{HL} and C_{VG} are the external capacitor for charge pump.
2. VCC is created by internal regulator circuit; it is the power supply of low voltage circuit.

FUNCTION TABLE

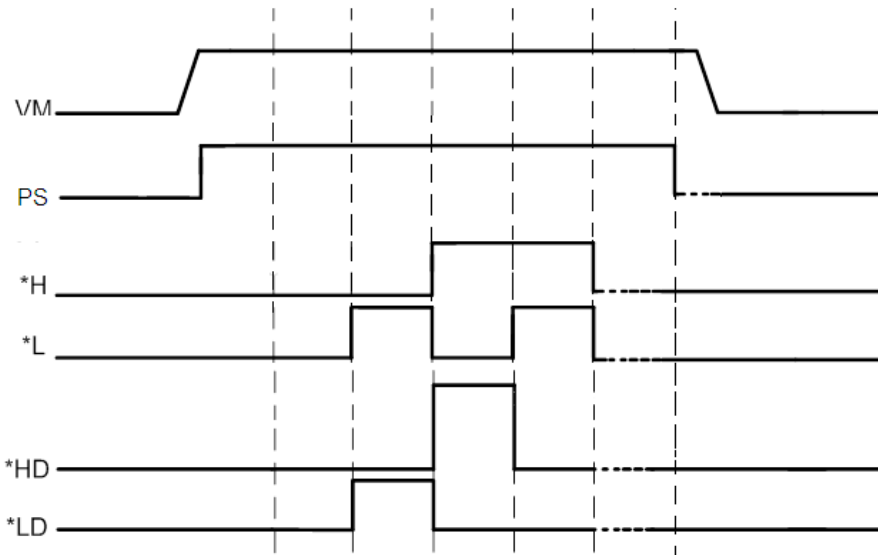
INPUT-OUTPUT LOGIC TABLE

| Input Signal | | | Output Driver | |
|--------------|----|----|---------------|-----|
| PS | *H | *L | *HD | *LD |
| H | L | L | L | L |
| | L | H | L | H |
| | H | L | H | L |
| | H | H | L | L |
| L | X | X | L | L |

Notes:

- *=U, V, W
- X = Don't care

FUNCTION SEQUENCE



Note: VG is created by VM, and it is controlled by PS. After VM is powered on, and PS=H, charge pump work, VG is pulled up high.

ABSOLUTE MAXIMUM RATINGS

| Parameter | Symbol | Min | Max | Unit |
|--|---------|------|-----|------|
| Supply voltage | VM | -0.3 | 40 | V |
| Logic input pin voltage (UH, UL, VH, VL, WH, WL) | Vin max | -0.3 | 6 | V |
| Operating temperature | Ta | -40 | 85 | °C |
| Operating junction temperature | Tjmax | - | 150 | °C |
| Storage temperature | Tstg | -40 | 150 | °C |

RECOMMENDED OPERATION CONDITIONS

| Parameter | Symbol | Min | Typ. | Max | Unit |
|---|--------|-----|------|-----|------|
| Supply voltage | VM | 4.5 | - | 32 | V |
| Logic input frequency | Fin | 0 | - | 200 | KHz |
| Logic input duty for frequency=200KHz (Ta=25°C, VM=6V, Load=1nF) | Duty | 6% | - | 94% | % |

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, Ta=25°C, VM=6V)

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|---|-------------|---|------|------|------|---------|
| Charge Pump | | | | | | |
| Charge Pump output voltage | ΔVG | VG=VM+5 (*H,*L=1KHz) | - | 0 | - | V |
| Charge Pump output Rise time | Tvg | VG=VM+5 CVG=0.1 μ F, CHL=0.1 μ F | 0.1 | 0.2 | 1 | ms |
| Charge pump osc | Fosc | | - | 500 | - | KHz |
| Power supply current | | | | | | |
| VM power save current | IVM_PSAVE | PS=L | - | 0 | 1 | μ A |
| VM work current (no load) | IVM_WORK | PS=H | - | 0.75 | 1.2 | mA |
| Operation circuit current(no load) | IVM_PWM | PS=H, *H,*L=200KHz | - | 3 | 5 | mA |
| Control terminal | | | | | | |
| H level input voltage | VIH | - | 1.5 | - | 5 | V |
| L level input voltage | VIL | | - | - | 0.4 | V |
| H level input current (PS,*H,*L) | IIH | VIN=3.0V | - | 30 | 60 | μ A |
| L level input current (PS,*H,*L) | IIL | VIN=0V | -1 | 0 | 1 | μ A |
| Gate Driver Output characteristics | | | | | | |
| Short circuit pulse current when High Side output is high | IHO+ | VHO=0 | - | 140 | - | mA |
| Short circuit pulse current when High Side output is low | IHO- | VHO=6V | - | 170 | - | mA |
| Short circuit pulse current when Low Side output is high | ILO+ | VLO=0 | - | 80 | - | mA |
| Short circuit pulse current when Low Side output is low | ILO- | VLO=5V | - | 230 | - | mA |
| Protection circuit | | | | | | |



| | | | | | | |
|----------------------------------|---------|---|---|-----|---|----|
| UVLO voltage 1 (output turn off) | VUVLO1 | - | - | 3.8 | - | V |
| UVLO voltage 2 (output turn on) | VUVLO2 | - | - | 3.9 | - | V |
| Thermal shut down temperature | TDET | - | - | 170 | - | °C |
| Hysteresis | TDETHYS | - | - | 35 | - | °C |

Note1: *H means UH, VH and WH; *L means UL, VL and WL.

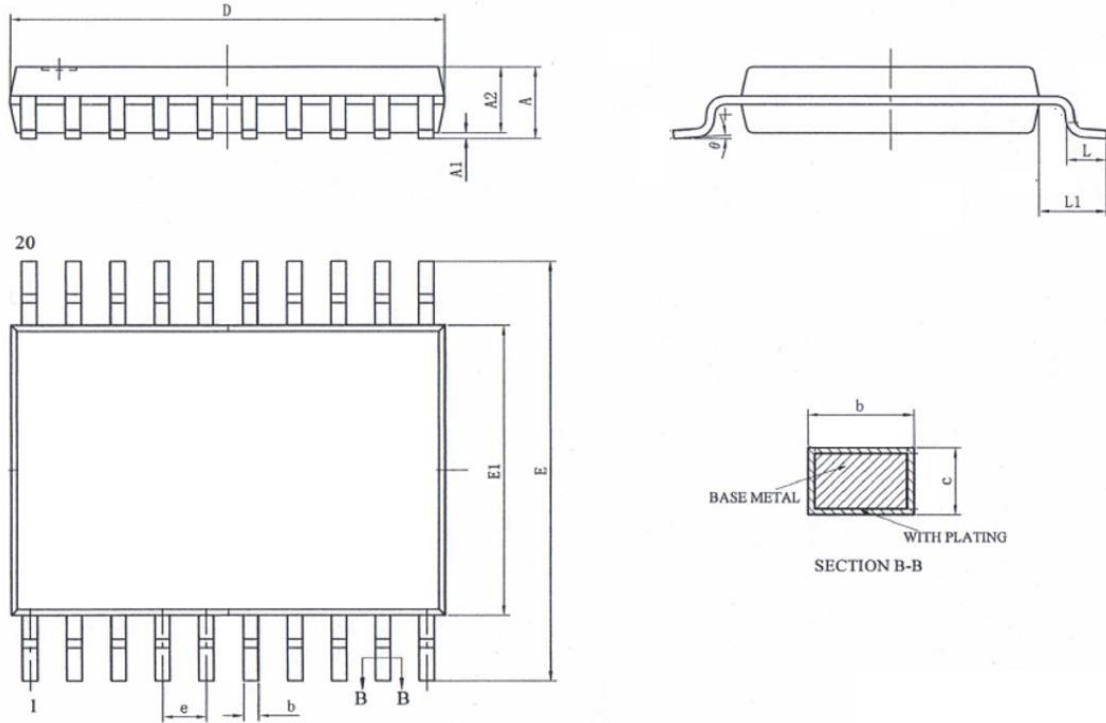
DYNAMIC ELETRICAL CHARACTERISTICS

(Unless otherwise specified, Ta=25°C, Cload=1nF)

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|------------------------------|------------------|-------------------------|------|------|------|------|
| Turn-On propagation delay | t _{ON} | VM=6V | - | 10 | 50 | ns |
| Turn-Off propagation delay | t _{OFF} | VM=6V | - | 10 | 50 | |
| High side turn-on rise time | t _{HR} | VM=6V | - | 50 | - | |
| High side turn-off fall time | t _{HF} | VM=6V | - | 55 | - | |
| Low side turn-on rise time | t _{LR} | VM=6V | - | 35 | - | |
| Low side turn-off fall time | t _{LF} | VM=6V | - | 30 | - | |
| Dead Time | DT | - | 50 | 100 | 200 | |
| Output Pulse-Width Matching | PM | PWIN=10us,PM=PWOUT-PWIN | - | - | 100 | |

PACKAGE INFORMATION

20 PINS, TSSOP, 173MIL

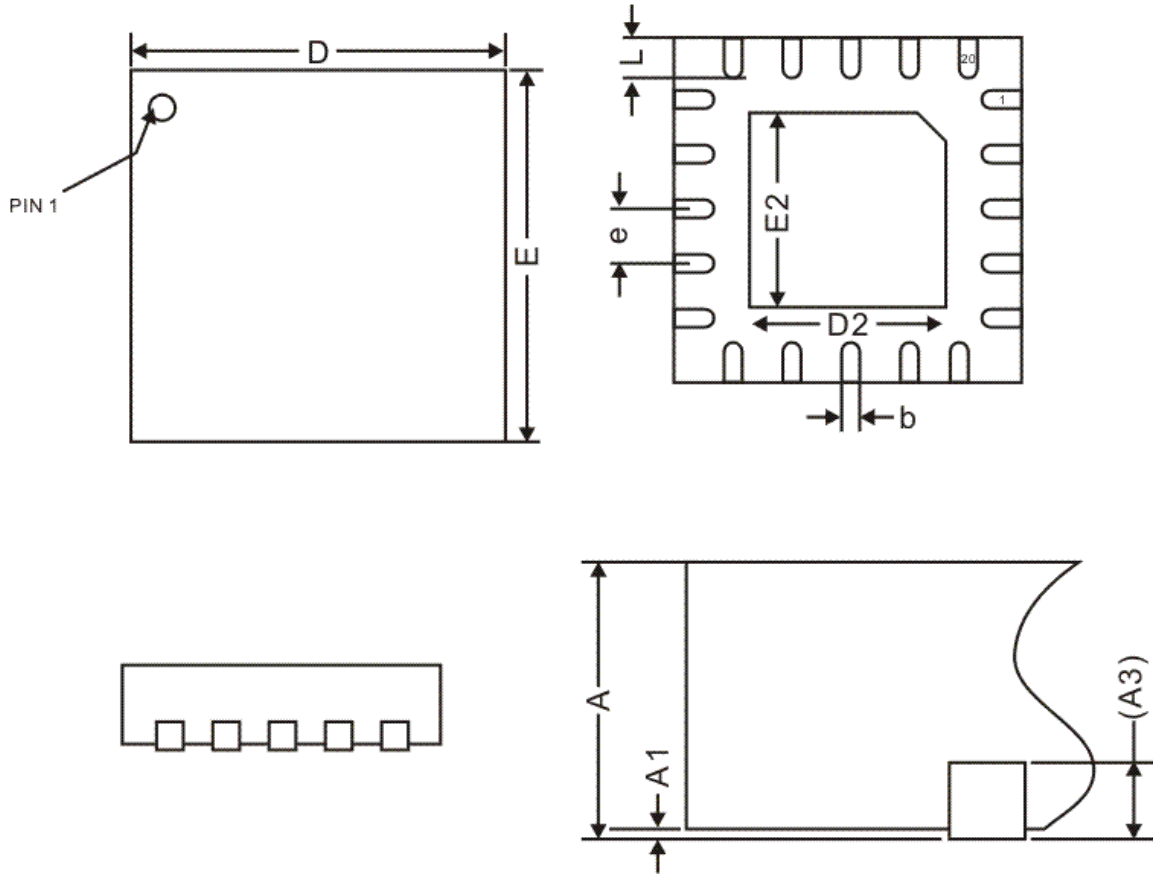


| Symbol | Dimensions | | |
|--------|------------|------|------|
| | Min. | Nom. | Max. |
| A | - | - | 1.20 |
| A1 | 0.05 | - | 0.15 |
| A2 | 0.80 | 1.00 | 1.05 |
| b | 0.19 | - | 0.30 |
| c | 0.09 | - | 0.20 |
| D | 6.40 | 6.50 | 6.60 |
| E1 | 4.30 | 4.40 | 4.50 |
| E | 6.4 BSC | | |
| e | 0.65 BSC | | |
| L | 0.45 | 0.60 | 0.75 |
| L1 | 1.00 REF | | |
| θ | 0 | - | 8° |

Notes:

1. Refer to JEDEC MO-153 AC
2. Unit: mm

20 PINS, QFN, 4mm*4mm



| Symbol | Dimensions | | |
|--------|------------|------|------|
| | Min. | Nom. | Max. |
| A | 0.70 | 0.75 | 0.80 |
| A1 | 0.00 | 0.02 | 0.05 |
| A3 | 0.203 REF. | | |
| b | 0.20 | 0.25 | 0.30 |
| D | 4.00 BSC. | | |
| E | 4.00 BSC. | | |
| e | 0.50 BSC. | | |
| D2 | 1.90 | 2.00 | 2.05 |
| E2 | 1.90 | 2.00 | 2.05 |
| L | 0.30 | 0.40 | 0.50 |

Notes:
3. Refer to JEDEC MO-220 VGGD-1
4. Unit: mm

IMPORTANT NOTICE

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