

PM15CTM060

FLAT-BASE TYPE
INSULATED PACKAGE

PM15CTM060



- 600V, 15A Current-sense 6kHz IGBT type inverter
- Built in IGBT gate drive circuit
- Built in Fault OC, SC, OT & UV protection Fault output
- 0.75kW class inverter application
- UL Recognized

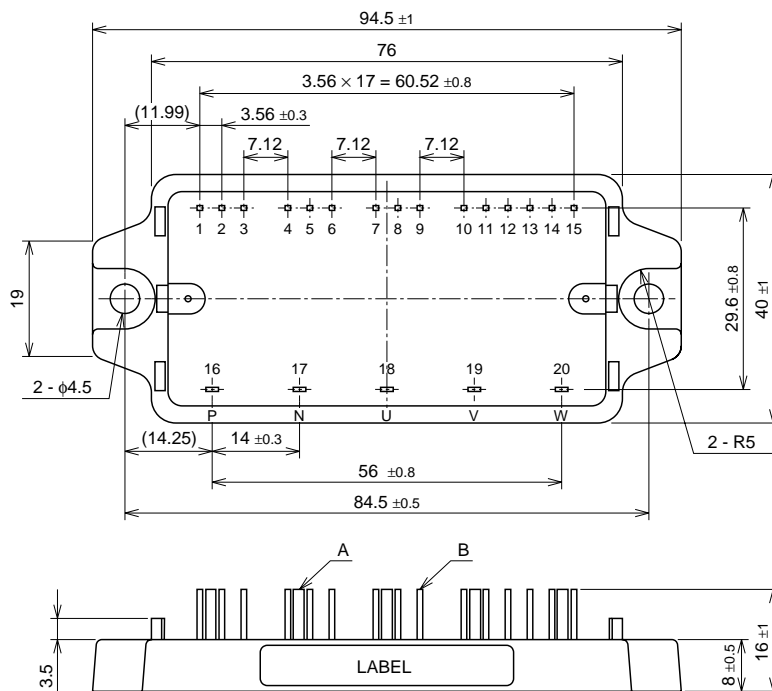
Yellow Card No. E80276 (N)
File No. E80271

APPLICATION

Air conditioner, motor control

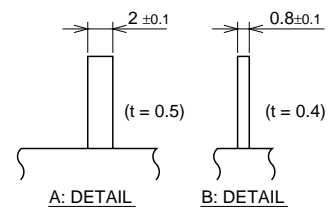
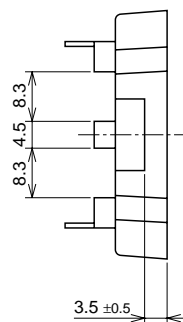
OUTLINE DRAWING

Dimensions in mm



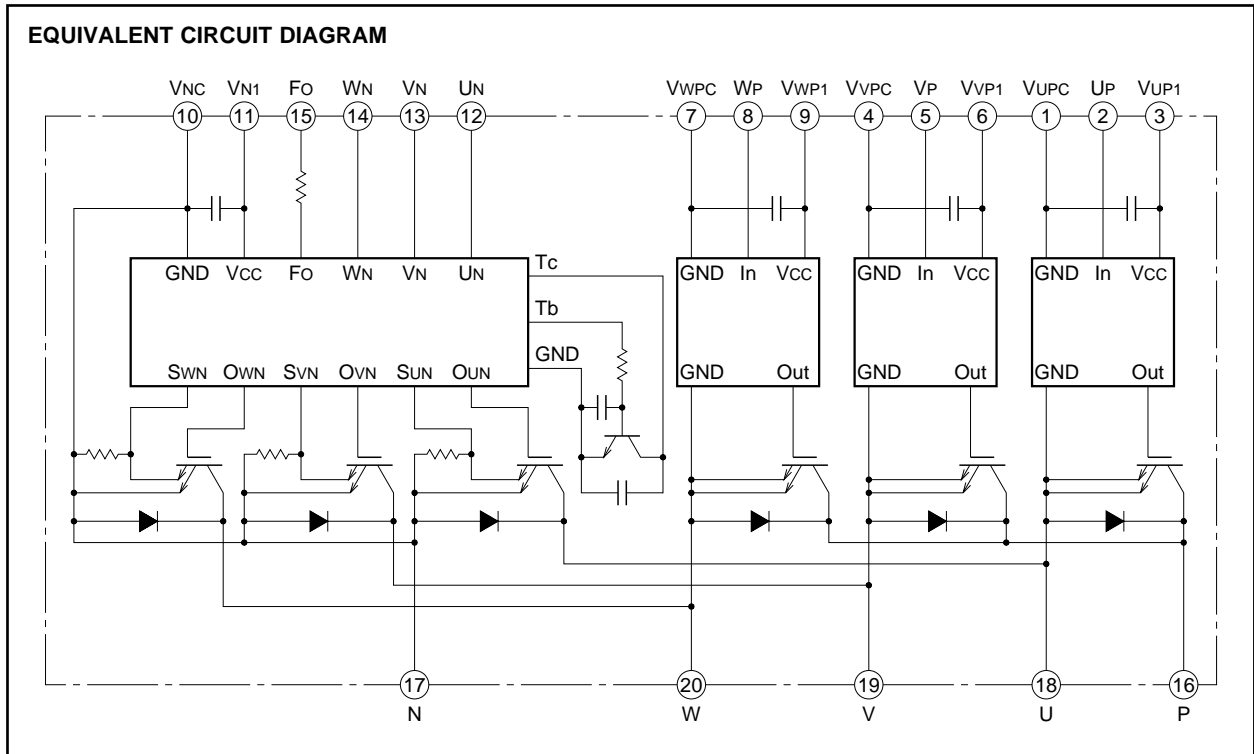
A · B: TERMINAL NAME

| | |
|---------|---------|
| 1. VUPC | 11. VN1 |
| 2. UP | 12. UN |
| 3. VUP1 | 13. VN |
| 4. VVPC | 14. WN |
| 5. VP | 15. FO |
| 6. VVP1 | 16. P |
| 7. VWPC | 17. N |
| 8. WP | 18. U |
| 9. VWP1 | 19. V |
| 10. VNC | 20. W |



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

INVERTER PART

| Symbol | Parameter | Conditions | Ratings | Unit |
|--------------|---------------------------|---|-------------------|------------------|
| V_{CES} | Collector-emitter voltage | $V_D = 15\text{V}$, $I_{CIN} = 0\text{mA}$ | 600 | V |
| $\pm I_C$ | Collector current | $T_C = 25^\circ\text{C}$ | 15 | A |
| $\pm I_{CP}$ | Collector current (peak) | $T_C = 25^\circ\text{C}$ | 30 | A |
| P_C | Collector dissipation | $T_C = 25^\circ\text{C}$ | 43 | W |
| T_j | Junction temperature | | $-20 \sim +125^*$ | $^\circ\text{C}$ |

* maximum instantaneous $T_j \leq 150^\circ\text{C}$

CONTROL PART

| Symbol | Parameter | Conditions | Ratings | Unit |
|-----------|-----------------------------|--|---------|------|
| V_D | Supply voltage | Applied between : $V_{UP1}-V_{UPC}$, $V_{VP1}-V_{VPC}$ $V_{WP1}-V_{WPC}$, $V_{N1}-V_{NC}$ | 20 | V |
| I_{CIN} | Input current | Applied between : U_P-V_{UPC} , V_P-V_{VPC} , W_P-V_{WPC} , $U_N \cdot V_N \cdot W_N-V_{NC}$ | 20 | mA |
| V_{FO} | Fault output supply voltage | Applied between : F_O-V_{NC} | 20 | V |
| I_{FO} | Fault output current | Sink current of F_O terminal | 20 | mA |

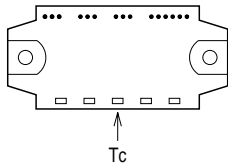
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TOTAL SYSTEM

| Symbol | Parameter | Conditions | Ratings | Unit |
|------------------------|-------------------------------------|--|------------|------------------|
| V _{CC(Prot)} | Supply voltage protected by OC & SC | V _D = 13.5 ~ 16.5V, Inverter part, T _j = 125°C start | 400 | V |
| V _{CC} | Supply voltage | Applied between : P-N, operating time | 450 | V |
| V _{CC(surge)} | Supply voltage (surge) | Applied between : P-N, surge and non-operating time | 500 | V |
| T _C | Module case operating temperature | (Note 1) | -20 ~ +100 | °C |
| T _{stg} | Storage temperature | | -40 ~ +125 | °C |
| V _{iso} | Isolation voltage | 60Hz, sinusoidal, AC · 1 min | 2500 | V _{rms} |

Note 1 : T_C measuring point is as shown below.



ELECTRICAL CHARACTERISTICS (T_j = 25°C, unless otherwise noted)

INVERTER PART

| Symbol | Parameter | Test conditions | Limits | | | Unit |
|----------------------|--------------------------------------|---|--------|------|------|------|
| | | | Min. | Typ. | Max. | |
| V _{CE(sat)} | Collector-emitter saturation voltage | V _D = 15V, I _{CIN} = 10mA | — | 1.8 | 2.6 | V |
| | | I _C = 15A, T _j = 125°C | — | 2.0 | 3.0 | |
| V _{EC} | FWDi forward voltage | -I _C = 15A, V _D = 15V, I _{CIN} = 0mA | — | 2.0 | 3.0 | V |
| t _{on} | Switching time | V _D = 15V, I _{CIN} = 0mA↔10mA V _{CC} = 300V, I _C = 15A T _j = 125°C (Per 1 arm) Inductive Load | 0.5 | 1.0 | 2.0 | μs |
| t _{rr} | | | — | 0.1 | — | μs |
| t _{c(on)} | | | — | 0.2 | 0.8 | μs |
| t _{off} | | | — | 2.5 | 3.5 | μs |
| t _{c(off)} | | | — | 0.9 | 2.0 | μs |
| I _{CES} | Collector-emitter cutoff current | V _{CE} = V _{CEs} , I _{CIN} = 0mA | — | — | 1 | mA |
| | | T _j = 125°C | — | — | 10 | |

CONTROL PART

| Symbol | Parameter | Test conditions | Limits | | | Unit | |
|----------------------|---|---|-------------|------|------|------|---|
| | | | Min. | Typ. | Max. | | |
| I _D | Circuit current | V _D = 15V, I _{CIN} = 0mA | — | 25 | 35 | mA | |
| | | V _{N1} -V _{Nc} V _{XP1} -V _{XPC} | — | 5 | 10 | | |
| I _{th(ON)} | Input on threshold current | Applied between : UP-VU _{PC} , VP-VV _{PC} , WP-VW _{PC} | 1 | 3 | 5 | mA | |
| I _{th(OFF)} | Input off threshold current | UN · VN · WN-V _{Nc} | 1 | 3 | 5 | mA | |
| OC | Over current trip level | -20°C ≤ T _j ≤ 125°C, V _D = 15V (only N side) | 18 | 23 | — | A | |
| SC | Short circuit trip level | -20°C ≤ T _j ≤ 125°C, V _D = 15V (only N side) | — | 34.5 | — | A | |
| t _{off(OC)} | Over current delay time | V _D = 15V | — | 10 | — | μs | |
| OT | Over temperature protection | Base-plate | 100 | 110 | 120 | °C | |
| OT _r | | Temperature detection, V _D = 15V | — | 90 | — | °C | |
| UV | Supply circuit under voltage protection | -20°C ≤ T _j ≤ 125°C | Trip level | 11.5 | 12.0 | 12.5 | V |
| UV _r | | | Reset level | — | 12.5 | — | V |
| I _{FO(H)} | Fault output current (Note 2) | V _D = 15V, V _{FO} = 15V | — | — | 0.01 | mA | |
| I _{FO(L)} | | | — | 10 | 15 | | |
| t _{FO} | Minimum fault output pulse width (Note 2) | V _D = 15V | 1.0 | 1.8 | — | ms | |

Note 2 : Fault output is given only when the internal OC, SC, OT & UV protection. (only N side)
 Fault output of OC, SC protection given pulse.
 Fault output of OT, UV protection given pulse while over level. (OT is only N side)

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THERMAL RESISTANCES

| Symbol | Parameter | Test conditions | Limits | | | Unit |
|-----------------------|--------------------------------------|---|--------|------|------|--------|
| | | | Min. | Typ. | Max. | |
| R _{th(j-c)Q} | Junction to case thermal resistances | Inverter IGBT part, per 1/6 module | — | — | 2.9 | °C / W |
| R _{th(j-c)F} | | Inverter FWDi part, per 1/6 module | — | — | 4.5 | °C / W |
| R _{th(c-f)} | Contact thermal resistance | Case to fin, thermal grease applied, per 1/6 module | — | — | 0.4 | °C / W |

MECHANICAL RATINGS AND CHARACTERISTICS

| Symbol | Parameter | Test conditions | Limits | | | Unit |
|--------|-----------------|---------------------|--------|------|------|-------|
| | | | Min. | Typ. | Max. | |
| — | Mounting torque | Mounting screw : M4 | 0.98 | 1.18 | 1.47 | N·m |
| — | Weight | | 10 | 12 | 15 | kg·cm |
| — | Weight | | — | 60 | — | g |

RECOMMENDED CONDITIONS FOR USE

| Symbol | Parameter | Test conditions | Ratings | Unit |
|-----------------------|---------------------------------|---|----------|------|
| V _{CC} | Supply voltage | Applied between : P-N | ≤ 400 | V |
| V _D | | Applied between : V _{UP1} -V _{UPC} , V _{VP1} -V _{VPC} V _{WP1} -V _{WPC} , V _{UN1} -V _{UNC} (Note 3) | 15 ± 1.5 | V |
| I _{CIN(ON)} | Input on current | Applied between : UP, VP, WP, UN, VN, WN | ≥ 5 | mA |
| I _{CIN(OFF)} | Input off current | | ≤ 1 | mA |
| f _{PWM} | PWM input frequency | Using application circuit Opto-coupler's input signal | ≤ 8 | kHz |
| t _{dead} | Arm shoot-through blocking time | Using application circuit Opto-coupler's input signal | ≥ 3 | μs |

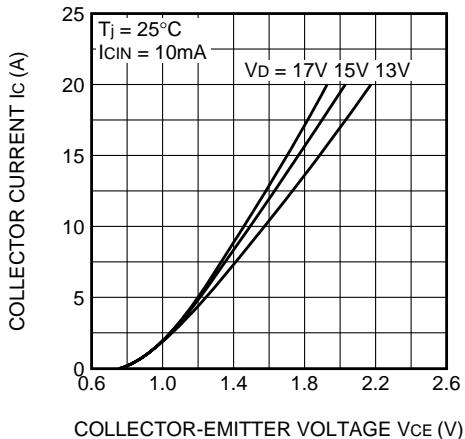
Note 3 : Permissible ripple value : dv/dt ≤ ±5V/μs, V_{ripple} ≤ 2V_{P-P}

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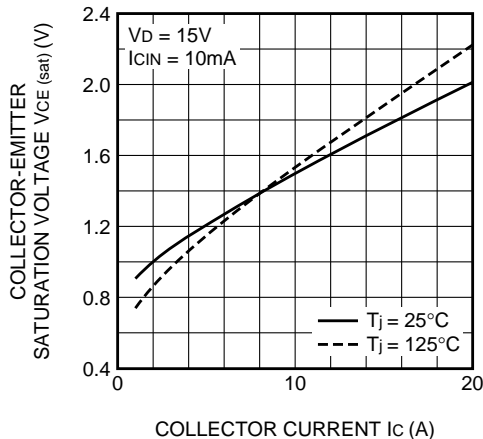
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PERFORMANCE CURVES

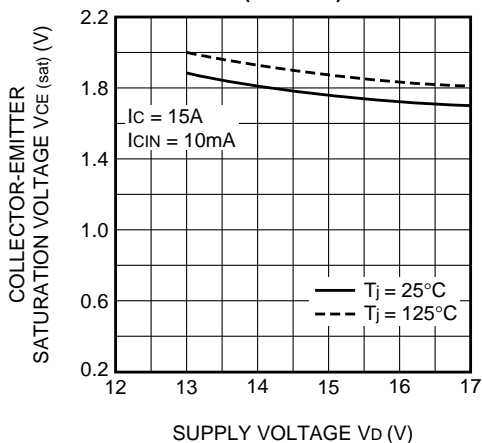
OUTPUT CHARACTERISTICS (TYPICAL)



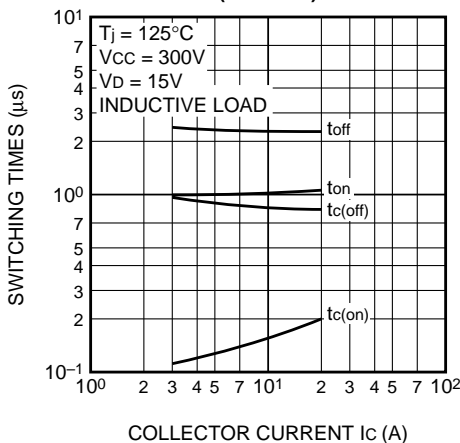
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



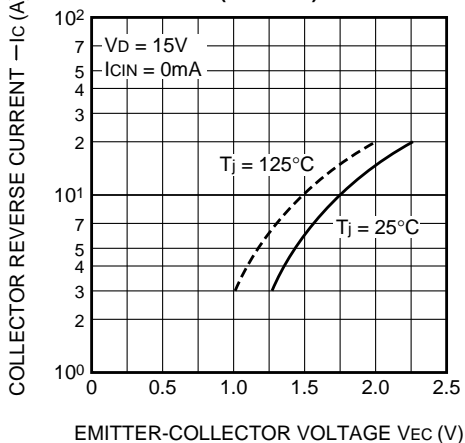
COLLECTOR-EMITTER SATURATION VOLTAGE VS. SUPPLY VOLTAGE (TYPICAL)



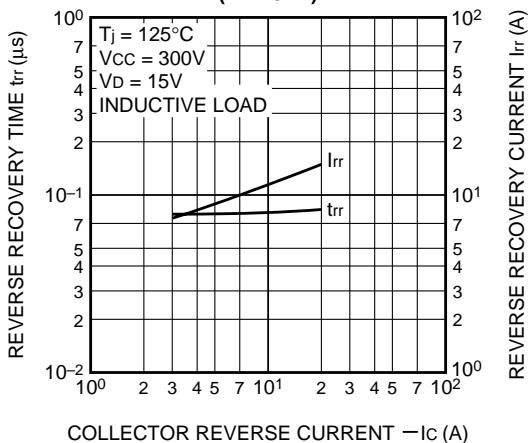
SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)



FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



REVERSE RECOVERY CHARACTERISTICS OF FREE-WHEEL DIODE (TYPICAL)



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