

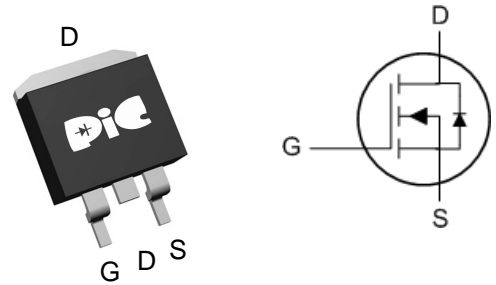
➤ General Description

This PAN30TP04P N-Channel enhancement mode power field effect transistor is the high density technology and this advanced technology can provide excellent Rds(On) performance and efficiency for power switching and load switching application., this device also comply with the RoHS and Green Product requirement with full function reliability approved.

➤ Feature

- Super Low Gate Charge
- Green Device Available Excellent
- Cdv/dt effect decline
- Advanced high cell densit Trench
- TO-263-2L package design

➤ TO-263-2L



➤ Application

- DC-DC Converters
- Power Management
- Analog Switch

➤ Absolute Maximum Ratings

| Parameter | Symbol | Rating | Units |
|---|-------------------------|------------|--------------|
| Drain-Source Voltage | V_{DS} | 30 | V |
| Gate-Source Voltage | V_{GS} | ± 20 | V |
| Continuous Drain Current, V_{GS} @ 10V ₁ | $I_D @ T_C=25^\circ C$ | 65 | A |
| Continuous Drain Current, V_{GS} @ 10V ₁ | $I_D @ T_C=100^\circ C$ | 40 | A |
| Continuous Drain Current, V_{GS} @ 10V ₁ | $I_D @ T_A=25^\circ C$ | 12 | A |
| Continuous Drain Current, V_{GS} @ 10V ₁ | $I_D @ T_A=70^\circ C$ | 9.7 | A |
| Pulsed Drain Current ₂ | I_{DM} | 130 | A |
| Single Pulse Avalanche Energy ₃ | EAS | 58 | mJ |
| Avalanche Current | I_{AS} | 34 | A |
| Total Power Dissipation ₄ | $P_D @ T_C=25^\circ C$ | 58 | W |
| Total Power Dissipation ₄ | $P_D @ T_A=25^\circ C$ | 2 | W |
| Storage Temperature Range | T_{STG} | -55 to 150 | $^\circ C$ |
| Operating Junction Temperature Range | T_J | -55 to 150 | $^\circ C$ |
| Thermal Resistance Junction-ambient (Steady State) ₁ | $R_{\theta JA}$ | 62 | $^\circ C/W$ |
| Thermal Resistance Junction-Case ₁ | $R_{\theta JC}$ | 2.16 | $^\circ C/W$ |

➤ Electrical Characteristics ($T_J=25^\circ C$ Unless otherwise noted)

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|--|------------------------------|--|------|-------|-----------|---------------|
| Drain-Source Breakdown Voltage | BV_{DSS} | $V_{GS}=0V, I_D=250\mu A$ | 30 | --- | --- | V |
| BVDSS Temperature Coefficient | $\Delta BV_{DSS}/\Delta T_J$ | Reference to $25^\circ C, I_D=1mA$ | --- | 0.027 | --- | $V/^\circ C$ |
| Static Drain-Source On-Resistance ² | $R_{DS(ON)}$ | $V_{GS}=10V, I_D=30A$ | --- | --- | 8.5 | m Ω |
| | | $V_{GS}=4.5V, I_D=15A$ | --- | --- | 14 | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{GS}=V_{DS}, I_D=250\mu A$ | 1.2 | --- | 2.5 | V |
| $V_{GS(th)}$ Temperature Coefficient | $\Delta V_{GS(th)}$ | | --- | -5.8 | --- | $mV/^\circ C$ |
| Drain-Source Leakage Current | I_{DSS} | $V_{DS}=24V, V_{GS}=0V, T_J=25^\circ C$ | --- | --- | 1 | μA |
| | | $V_{DS}=24V, V_{GS}=0V, T_J=55^\circ C$ | --- | --- | 5 | |
| Gate-Source Leakage Current | I_{GSS} | $V_{GS}=\pm 20V, V_{DS}=0V$ | --- | --- | ± 100 | nA |
| Forward Transconductance | g_{fs} | $V_{DS}=5V, I_D=30A$ | --- | 38 | --- | S |
| Gate Resistance | R_g | $V_{DS}=0V, V_{GS}=0V, f=1MHz$ | --- | 2.2 | --- | Ω |
| Total Gate Charge (4.5V) | Q_g | $V_{DS}=15V, V_{GS}=4.5V, I_D=15A$ | --- | 12.6 | --- | nC |
| Gate-Source Charge | Q_{gs} | | --- | 4.2 | --- | |
| Gate-Drain Charge | Q_{gd} | | --- | 5.1 | --- | |
| Turn-On Delay Time | $T_{d(on)}$ | $V_{DD}=15V, V_{GS}=10V, R_G=3.3\Omega, I_D=15A$ | --- | 4.6 | --- | ns |
| Rise Time | T_r | | --- | 12.2 | --- | |
| Turn-Off Delay Time | $T_{d(off)}$ | | --- | 26.6 | --- | |
| Fall Time | T_f | | --- | 8 | --- | |
| Input Capacitance | C_{iss} | $V_{DS}=15V, V_{GS}=0V, f=1MHz$ | --- | 1317 | --- | pF |
| Output Capacitance | C_{oss} | | --- | 163 | --- | |
| Reverse Transfer Capacitance | C_{rss} | | --- | 131 | --- | |

➤ Diode Characteristics

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|--|----------|---|------|------|------|------|
| Continuous Source Current ^{1,5} | I_S | $V_G=V_D=0V, \text{Force Current}$ | --- | --- | 65 | A |
| Pulsed Source Current ^{2,5} | I_{SM} | | --- | --- | 130 | A |
| Diode Forward Voltage ² | V_{SD} | $V_{GS}=0V, I_S=1A, T_J=25^\circ C$ | --- | --- | 1.2 | V |
| Reverse Recovery Time | t_{rr} | $I_F=30A, di/dt=100A/\mu s, T_J=25^\circ C$ | --- | 9.2 | --- | nS |
| Reverse Recovery Charge | Q_{rr} | | --- | 2 | --- | nC |

Note :

1. Pulse width limited by maximum junction temperature.
2. The data tested by pulsed , pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$
3. The EAS data shows Max. rating . The test condition is $V_{DD}=25V, V_{GS}=10V, L=0.1mH, I_{AS}=34A$
4. Ensure that the channel temperature does not exceed $150^\circ C$.
5. The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation.

➤ Typical Characteristics

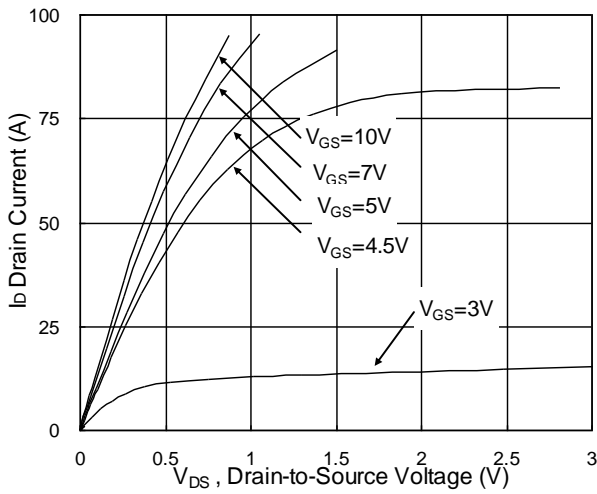


Fig.1 Typical Output Characteristics

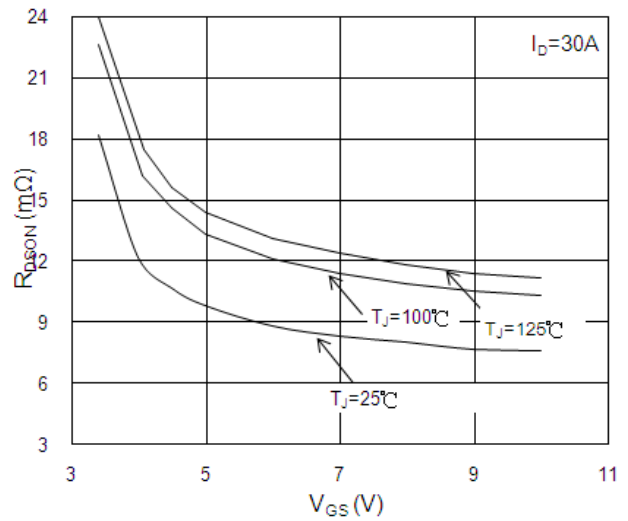


Fig.2 On-Resistance vs. G-S Voltage

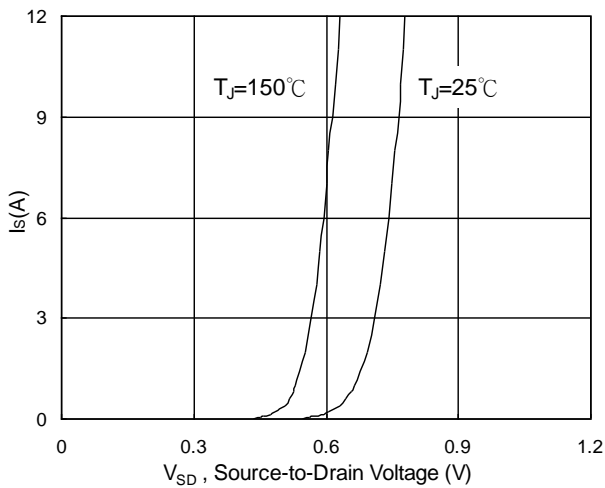


Fig.3 Forward Characteristics of Reverse

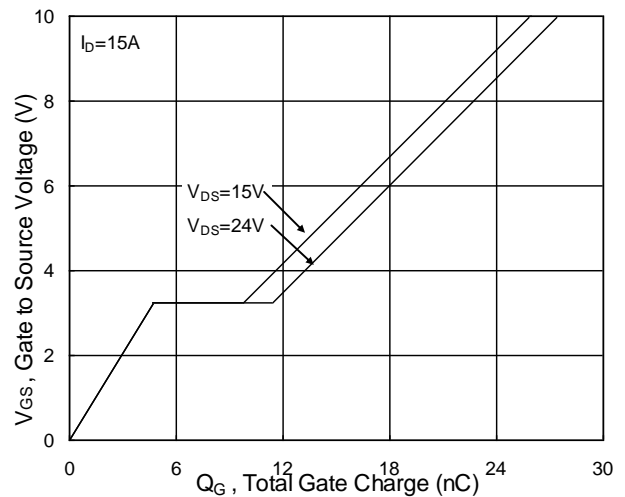


Fig.4 Gate-Charge Characteristics

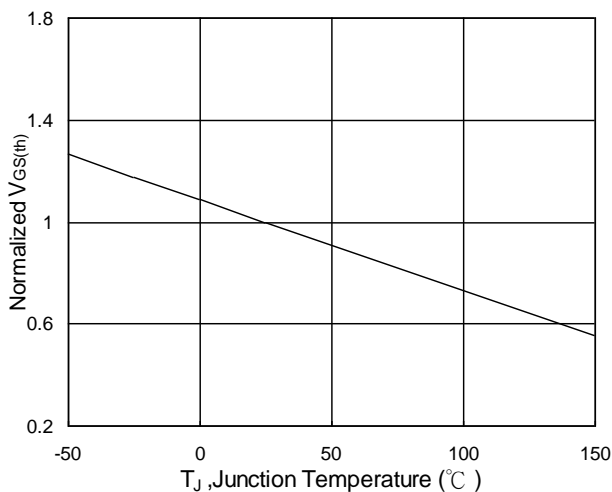


Fig.5 Normalized $V_{GS(th)}$ vs. T_J

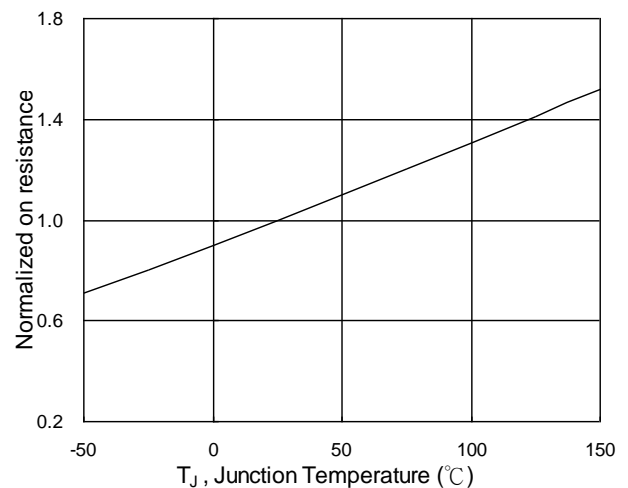


Fig.6 Normalized $R_{DS(on)}$ vs. T_J

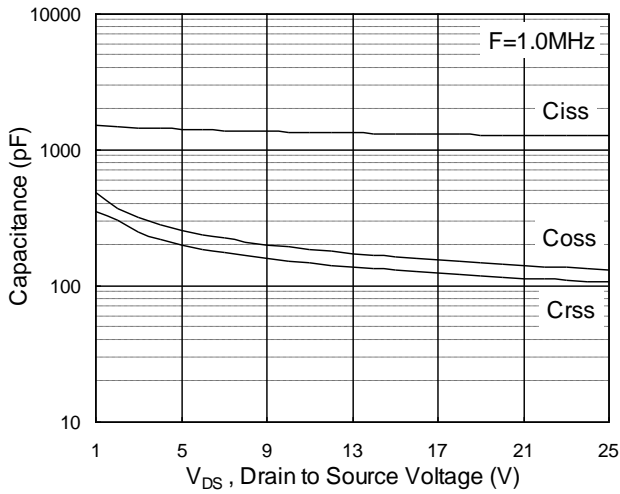


Fig.7 Capacitance

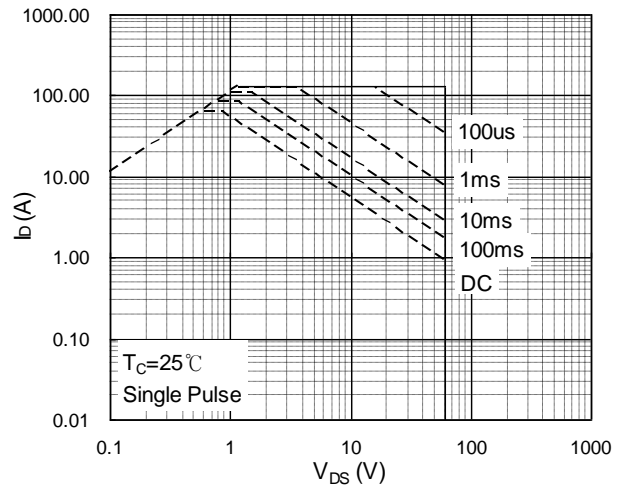


Fig.8 Safe Operating Area

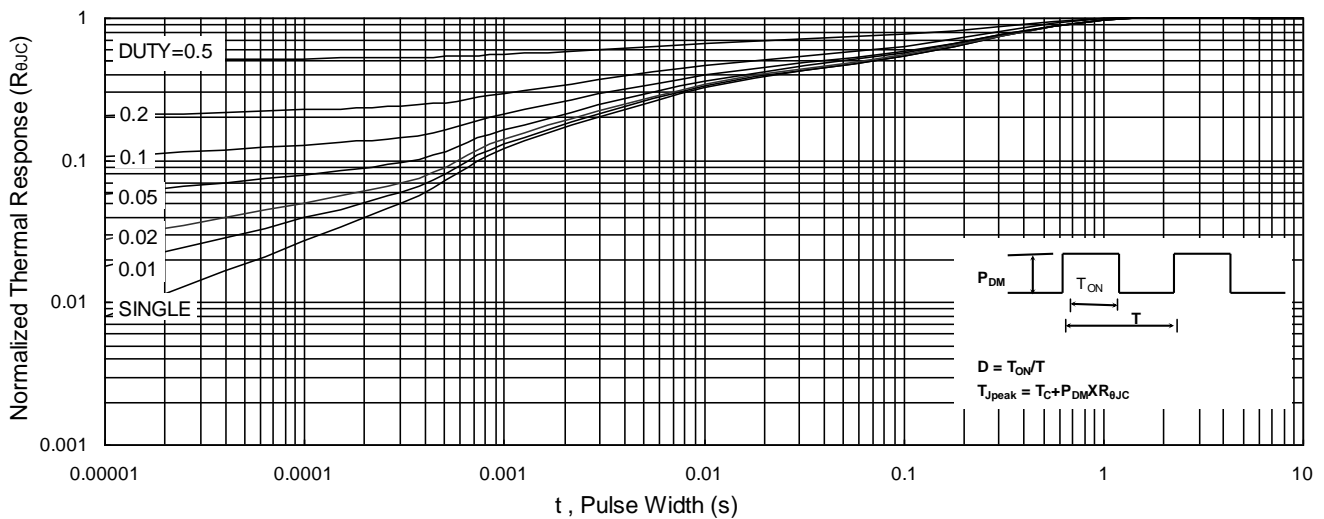


Fig.9 Normalized Maximum Transient Thermal Impedance

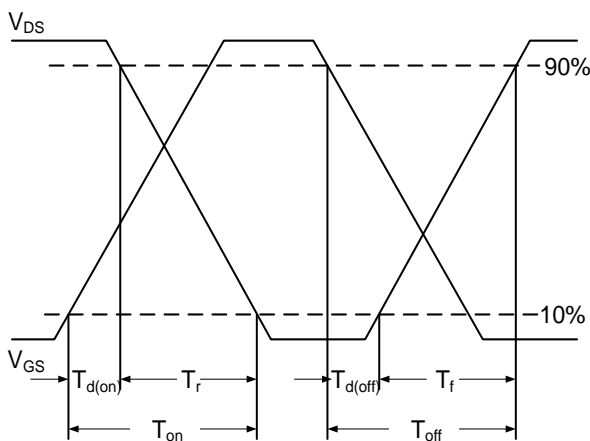


Fig.10 Switching Time Waveform

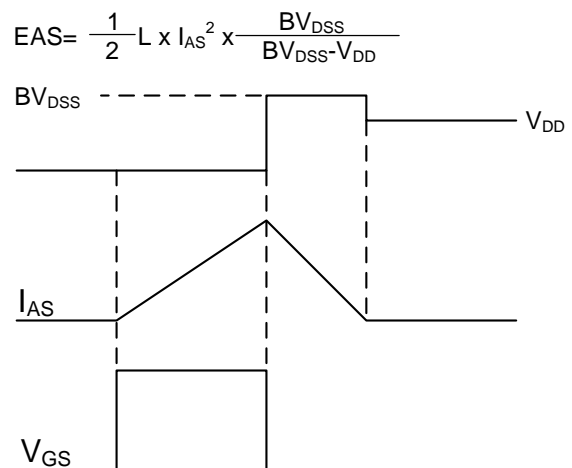


Fig.11 Unclamped Inductive Switching Waveform

➤ Recommend IR Reflow Soldering Thermal Profile

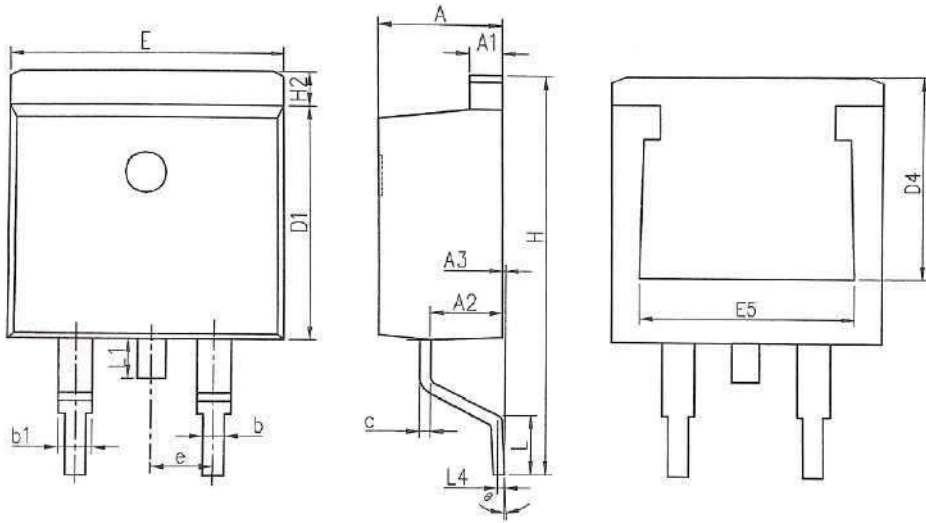


| Profile Feature | Pb-Free Assembly Profile |
|---|--------------------------|
| Temperature Min. (T _{smin}) | 150°C |
| Temperature Max. (T _{smax}) | 200°C |
| Time (t _s) from (T _{smin} to T _{smax}) | 60-120 seconds |
| Average Ramp-up Rate (t _L to t _P) | 3°C/second max. |
| Liquidous Temperature (T _L) | 217°C |
| Time (t _L) Maintained Above (T _L) | 60 – 150 seconds |
| Peak Temperature | 260°C +0°C / -5°C |
| Time (t _P) within 5°C of actual Peak Temperature | 30 seconds |
| Ramp-down Rate (T _P to T _L) | 6°C/second max |
| Time 25°C to Peak Temperature | 8 minutes max. |

➤ Ordering Information

| Part Number | Description | Quantity |
|-------------|----------------|----------|
| PAN30TP04P | TO-263-2L Reel | 800 |

➤ Package Information (TO-263-2L)



| SYMBOLS | MILLIMETERS | | INCHES | |
|---------|-------------|-------|-----------|-------|
| | MIN | MAX | MIN | MAX |
| A | 4.370 | 4.770 | 0.172 | 0.188 |
| A1 | 1.220 | 1.420 | 0.048 | 0.056 |
| A2 | 2.200 | 2.890 | 0.087 | 0.114 |
| A3 | 0.000 | 0.250 | 0.000 | 0.010 |
| b | 0.700 | 0.960 | 0.028 | 0.038 |
| b1 | 1.170 | 1.470 | 0.046 | 0.058 |
| c | 0.300 | 0.530 | 0.012 | 0.021 |
| D1 | 8.500 | 9.300 | 0.335 | 0.366 |
| D4 | 6.600 | - | 0.260 | - |
| E | 9.860 | 10.36 | 0.388 | 0.408 |
| E5 | 7.060 | - | 0.278 | - |
| e | 2.540 BSC | | 0.100 BSC | |
| H | 14.70 | 15.70 | 0.579 | 0.618 |
| H2 | 1.070 | 1.470 | 0.042 | 0.058 |
| L | 2.000 | 2.600 | 0.079 | 0.102 |
| L1 | 1.400 | 1.750 | 0.055 | 0.069 |
| L4 | 0.250 BSC | | 0.010 BSC | |
| θ | 0° | 9° | 0° | 9° |

Notice.

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