

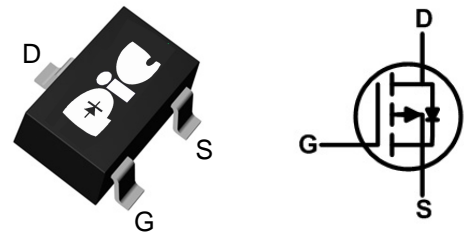
➤ General Description

This PAP2013B P-Channel enhancement mode power field effect transistor is the high density trench technology and this advanced technology can provide excellent $R_{ds(On)}$ 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

- Low Offset (Error) Voltage
- Low-Voltage Operation
- High-Speed Circuits
- Low Battery Voltage Operation
- SOT-523 package design

➤ SOT-523



➤ Application

- Drivers: Relays, Solenoids, Lamps, Hammers, Displays, Memories
- Battery Operated Systems
- Power Supply Converter Circuits
- Load/Power Switching Smart Phones, Pagers

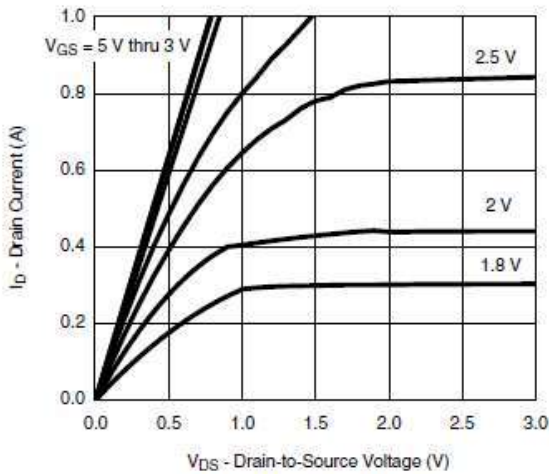
➤ Absolute Maximum Ratings

| Parameter | Symbol | Rating | Unit |
|---|-----------|------------------|------------|
| Drain-Source Voltage | V_{DSS} | -20 | V |
| Gate -Source Voltage | V_{GSS} | ± 12 | V |
| Continuous Drain Current($T_J=150^\circ C$) | I_D | $T_A=25^\circ C$ | -0.7 |
| | | $T_A=70^\circ C$ | -0.4 |
| Pulsed Drain Current | I_{DM} | -1.0 | A |
| Continuous Source Current(Diode Conduction) | I_S | -0.3 | A |
| Power Dissipation | P_D | $T_A=25^\circ C$ | 0.27 |
| | | $T_A=70^\circ C$ | 0.16 |
| Operating Junction Temperature | T_J | -55/150 | $^\circ C$ |
| Storage Temperature Range | T_{STG} | -55/150 | $^\circ C$ |

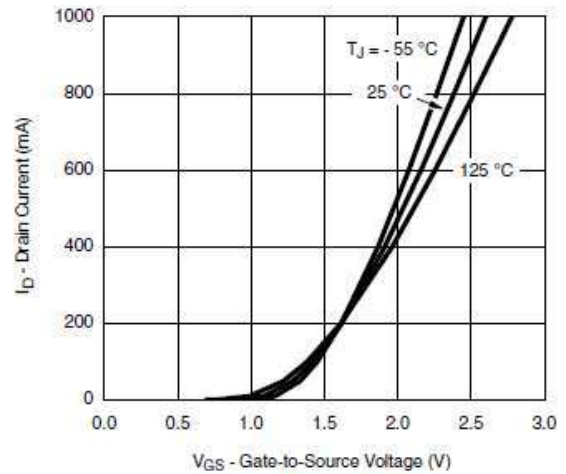
➤ Electrical Characteristics (T_A=25°C Unless otherwise noted)

| Parameter | Symbol | Conditions | Min. | Typ | Max. | Unit |
|---------------------------------|---------------|---|------|------|-----------|------|
| Static | | | | | | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS}=0V, I_D=-250\mu A$ | -20 | | | V |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=-250\mu A$ | -0.4 | | -1.0 | V |
| Gate Leakage Current | I_{GSS} | $V_{DS}=0V, V_{GS}=\pm 12V$ | | | ± 100 | nA |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS}=-20V, V_{GS}=0V$ | | | -1 | uA |
| | | $V_{DS}=-20V, V_{GS}=0V$ $T_J=85^\circ C$ | | | -5 | |
| On-State Drain Current | $I_{D(on)}$ | $V_{DS} \geq 5V, V_{GS}=4.5V$ | 0.7 | | | A |
| Drain-Source On-Resistance | $R_{DS(on)}$ | $V_{GS}=-4.5V, I_D=-0.6A$ | | 500 | 620 | mΩ |
| | | $V_{GS}=-2.5V, I_D=-0.5A$ | | 700 | 860 | |
| | | $V_{GS}=-1.8V, I_D=-0.4A$ | | 1000 | 1450 | |
| Forward Transconductance | g_{FS} | $V_{DS}=-10V, I_D=-0.4A$ | | 1 | | S |
| Diode Forward Voltage | V_{SD} | $I_S=-0.15A, V_{GS}=0V$ | | 0.65 | 1.2 | V |
| Dynamic | | | | | | |
| Input Capacitance | C_{iss} | $V_{DS}=-10V, V_{GS}=0V$ $f=1MHz$ | | 70 | 100 | pF |
| Output Capacitance | C_{oss} | | | 20 | | |
| Reverse Transfer Capacitance | C_{riss} | | | 10 | | |
| Total Gate Charge | Q_g | $V_{DS}=-10V, V_{GS}=-4.5V$ $I_D=-0.25A$ | | 1.0 | 1.3 | nC |
| Gate-Source Charge | Q_{gs} | | | 0.1 | | |
| Gate-Drain Charge | Q_{gd} | | | 0.3 | | |
| Turn-On Time | $t_{d(on)}$ | $V_{DD}=-10V, R_L=30\Omega$ $I_D=-0.2A, V_{GEN}=-4.5V$ $R_G=10\Omega$ | | 10 | 15 | ns |
| | t_r | | | 10 | 15 | |
| Turn-Off Time | $t_{d(off)}$ | | | 40 | 60 | |
| | t_f | | | 30 | 50 | |

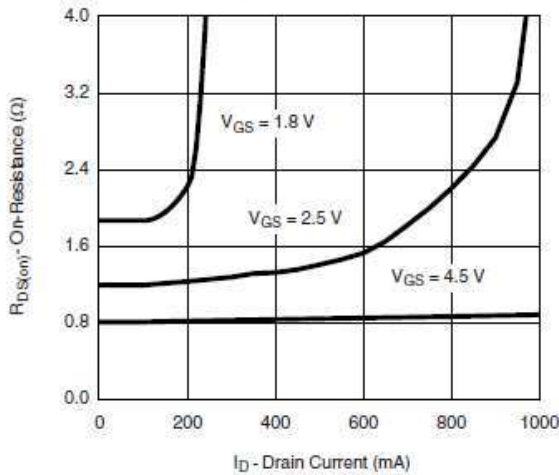
➤ Typical Characteristics



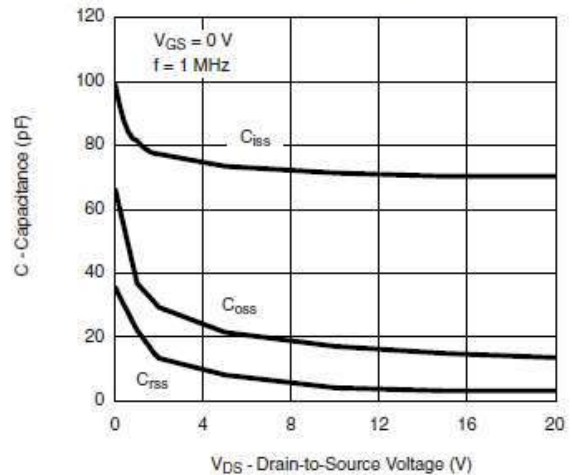
Output Characteristics



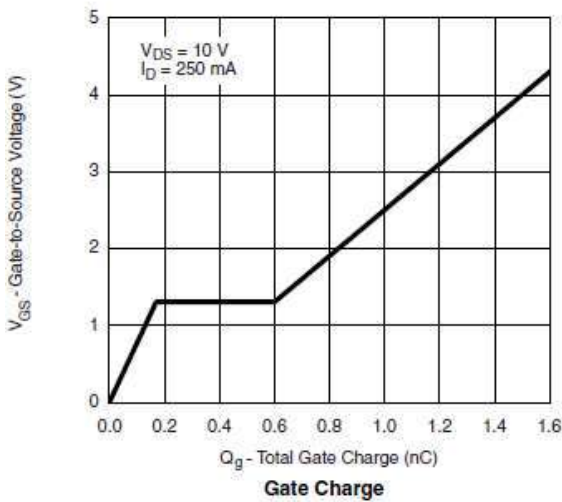
Transfer Characteristics



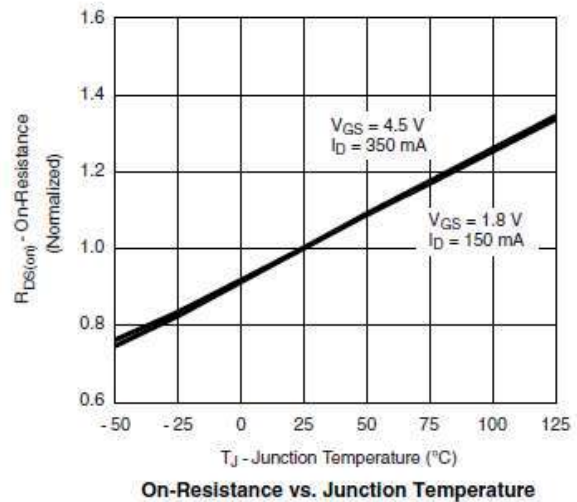
On-Resistance vs. Drain Current



Capacitance

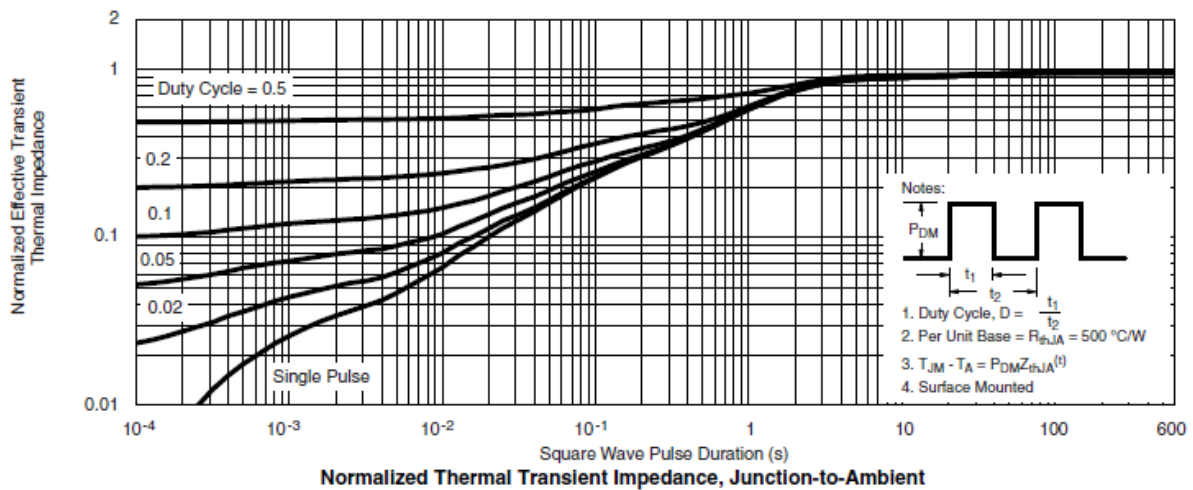
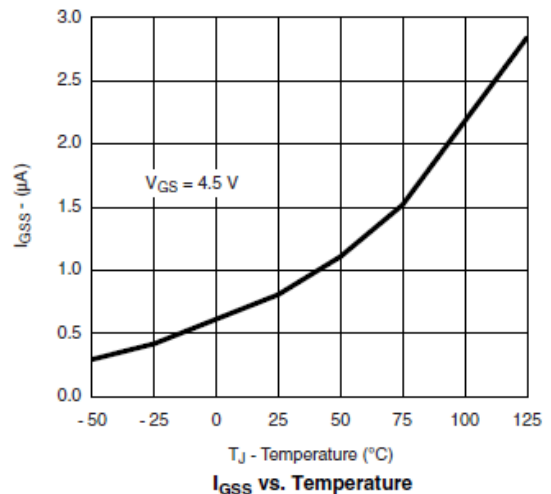
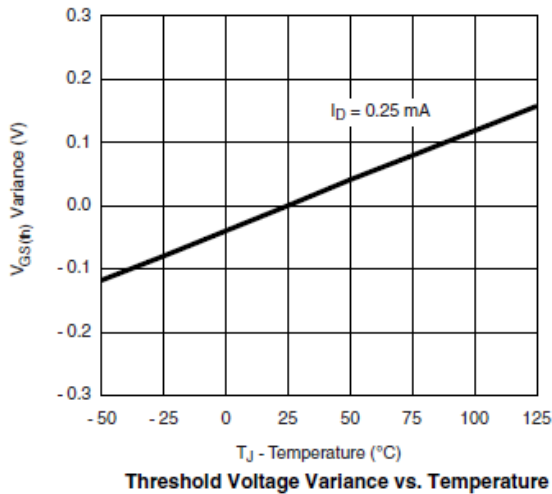
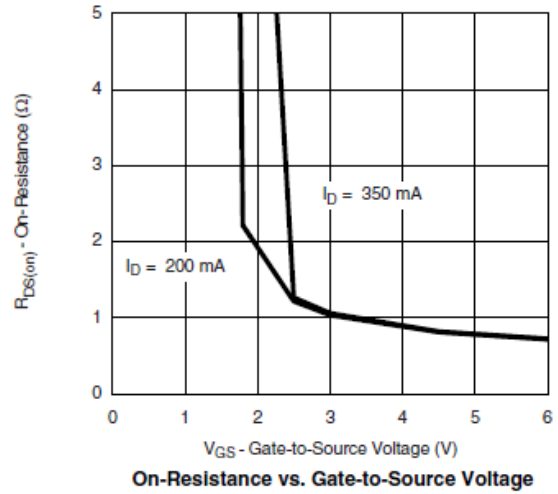
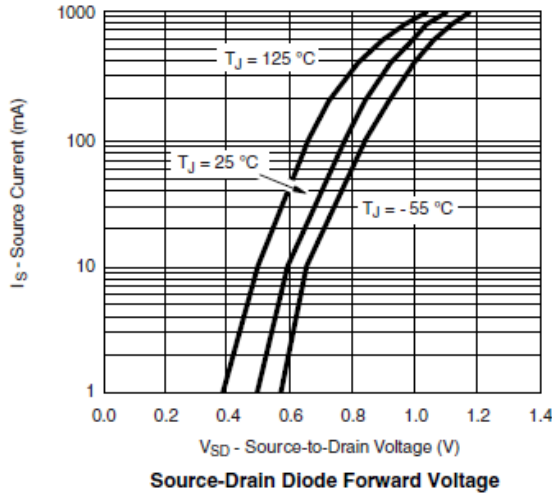


Gate Charge



On-Resistance vs. Junction Temperature

P-Ch -20V Fast Switching MOSFET $V_{DS}=-20V, I_D=-0.7A, R_{DS(ON)}=620m\Omega$



➤ Recommand IR Reflow Soldering Thermal Profile

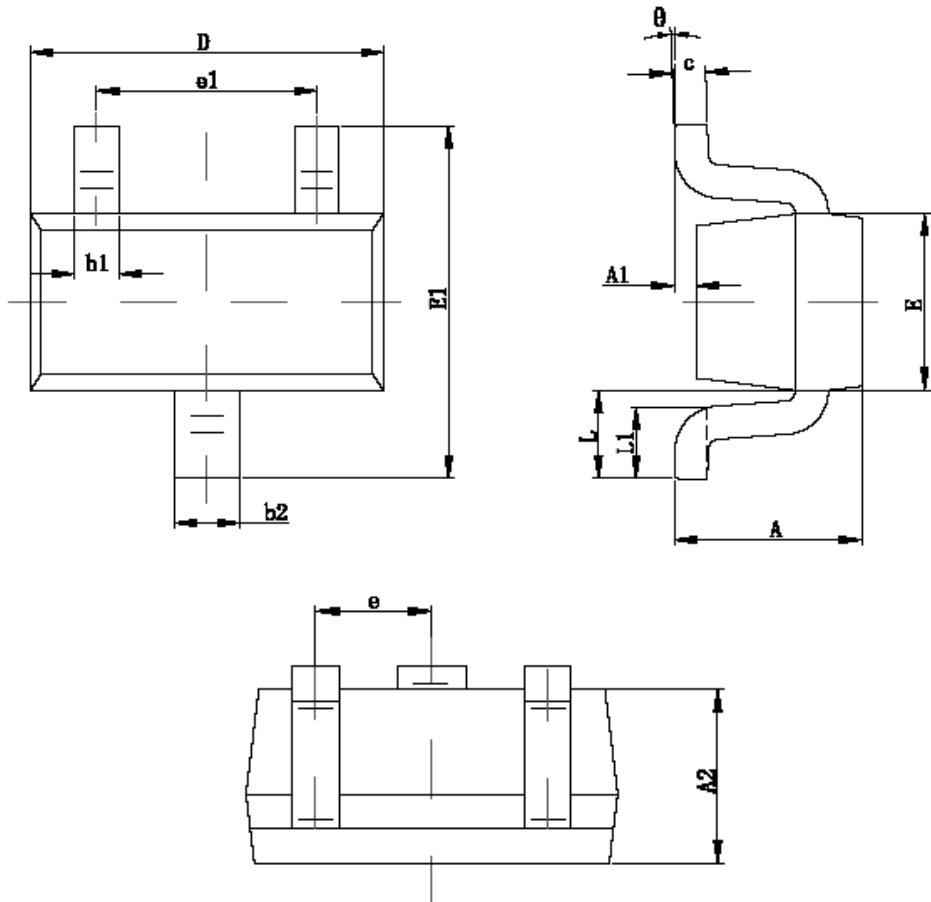


| Profile Feature | Pb-Free Assembly Profile |
|--|--------------------------|
| Temperature Min. (T_{smin}) | 150°C |
| Temperature Max. (T_{smax}) | 200°C |
| Time (t_s) from (T_{smin} to T_{smax}) | 60-120 seconds |
| Average Ramp-up Rate (t_L to t_P) | 3°C/second max. |
| Liquidous Temperature (T_L) | 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 |
|-------------|--------------|----------|
| PAP2013B | SOT-523 Reel | 3000 pcs |

➤ Package Information (SOT-523)



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min | Max | Min | Max |
| A | 0.700 | 0.900 | 0.028 | 0.035 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| A2 | 0.700 | 0.800 | 0.028 | 0.031 |
| b1 | 0.150 | 0.250 | 0.006 | 0.010 |
| b2 | 0.250 | 0.325 | 0.010 | 0.013 |
| c | 0.100 | 0.200 | 0.004 | 0.008 |
| D | 1.500 | 1.700 | 0.059 | 0.067 |
| E | 0.750 | 0.850 | 0.030 | 0.033 |
| E1 | 1.450 | 1.750 | 0.057 | 0.069 |
| e | 0.500 TYP | | 0.020 TYP | |
| e1 | 0.900 | 1.100 | 0.035 | 0.043 |
| L | 0.550 REF | | 0.022 REF | |
| L1 | 0.280 | 0.440 | 0.011 | 0.017 |
| θ | 0° | 4° | 0° | 4° |

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