

## 15A, 50V and 60V, 0.140 Ohm, Logic Level N-Channel Power MOSFETs

These are N-Channel enhancement mode silicon gate power field effect transistors designed for applications such as switching regulators, switching converters, motor drivers, relay drivers and drivers for high power bipolar switching transistors requiring high speed and low gate drive power. These types can be operated directly from integrated circuits.

Formerly developmental type TA0522.

### Ordering Information

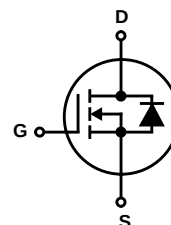
| PART NUMBER | PACKAGE  | BRAND     |
|-------------|----------|-----------|
| RFP15N05L   | TO-220AB | RFP15N05L |
| RFP15N06L   | TO-220AB | RFP15N06L |

NOTE: When ordering, use the entire part number.

### Features

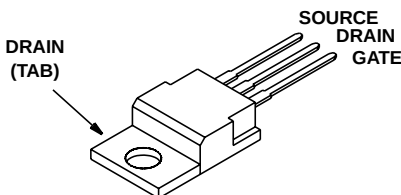
- 15A, 50V and 60V
- $r_{DS(ON)} = 0.140\Omega$
- Design Optimized for 5V Gate Drives
- Can be Driven from QMOS, NMOS, TTL Circuits
- Compatible with Automotive Drive Requirements
- SOA is Power Dissipation Limited
- Nanosecond Switching Speeds
- Linear Transfer Characteristics
- High Input Impedance
- Majority Carrier Device
- Related Literature
  - TB334 "Guidelines for Soldering Surface Mount Components to PC Boards"

### Symbol



### Packaging

#### JEDEC TO-220AB



## RFP15N05L, RFP15N06L

### Absolute Maximum Ratings $T_C = 25^{\circ}\text{C}$ , Unless Otherwise Specified

|                                                                          | RFP15N05L  | RFP15N06L  | UNITS                 |
|--------------------------------------------------------------------------|------------|------------|-----------------------|
| Drain to Source Voltage (Note 1) . . . . .                               | 50         | 60         | V                     |
| Drain to Gate Voltage ( $R_{GS} = 20\text{k}\Omega$ ) (Note 1) . . . . . | 50         | 60         | V                     |
| Continuous Drain Current . . . . .                                       | 15         | 15         | A                     |
| Pulsed Drain Current (Note 3) . . . . .                                  | 40         | 40         | A                     |
| Gate to Source Voltage . . . . .                                         | $\pm 10$   | $\pm 10$   | V                     |
| Maximum Power Dissipation . . . . .                                      | 60         | 60         | W                     |
| Above $T_C = 25^{\circ}\text{C}$ , Derate Linearly . . . . .             | 0.48       | 0.48       | W/ $^{\circ}\text{C}$ |
| Operating and Storage Temperature . . . . .                              | -55 to 150 | -55 to 150 | $^{\circ}\text{C}$    |
| Maximum Temperature for Soldering                                        |            |            |                       |
| Leads at 0.063in (1.6mm) from Case for 10s . . . . .                     | 300        | 300        | $^{\circ}\text{C}$    |
| Package Body for 10s, See Techbrief 334 . . . . .                        | 260        | 260        | $^{\circ}\text{C}$    |

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

#### NOTE:

1.  $T_J = 25^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ .

### Electrical Specifications $T_C = 25^{\circ}\text{C}$ , Unless Otherwise Specified

| PARAMETER                              | SYMBOL          | TEST CONDITIONS                                                                   | MIN | TYP | MAX   | UNITS                |
|----------------------------------------|-----------------|-----------------------------------------------------------------------------------|-----|-----|-------|----------------------|
| Drain to Source Breakdown Voltage      | $BV_{DSS}$      | $I_D = 250\mu\text{A}$ , $V_{GS} = 0\text{V}$                                     | 50  | -   | -     | V                    |
| RFP15N05L                              |                 |                                                                                   |     |     |       |                      |
| RFP15N06L                              |                 |                                                                                   | 60  | -   | -     | V                    |
| Gate Threshold Voltage                 | $V_{GS(TH)}$    | $V_{GS} = V_{DS}$ , $I_D = 250\mu\text{A}$ (Figure 7)                             | 1   | -   | 2     | V                    |
| Zero Gate Voltage Drain Current        | $I_{DSS}$       | $V_{DS} = 48\text{V}$ , $V_{GS} = 50\text{V}$                                     | -   | -   | 1     | $\mu\text{A}$        |
|                                        |                 | $V_{DS} = 48\text{V}$ , $V_{GS} = 50\text{V}$ TC = $125^{\circ}\text{C}$          | -   | -   | 50    | $\mu\text{A}$        |
| Gate to Source Leakage Current         | $I_{GSS}$       | $V_{GS} = \pm 10\text{V}$ , $V_{DS} = 0\text{V}$                                  | -   | -   | 100   | nA                   |
| Drain to Source On Resistance (Note 2) | $r_{DS(ON)}$    | $I_D = 15\text{A}$ , $V_{GS} = 5\text{V}$ (Figures 5, 6)                          | -   | -   | 0.140 | $\Omega$             |
| Input Capacitance                      | $C_{ISS}$       | $V_{DS} = 25\text{V}$ , $V_{GS} = 0\text{V}$ , $f = 1\text{MHz}$ (Figure 8)       | -   | -   | 900   | pF                   |
| Output Capacitance                     | $C_{OSS}$       |                                                                                   | -   | -   | 450   | pF                   |
| Reverse-Transfer Capacitance           | $C_{RSS}$       |                                                                                   | -   | -   | 200   | pF                   |
| Turn-On Delay Time                     | $t_{d(ON)}$     | $V_{DD} = 30\text{V}$ , $I_D = 7.5\text{A}$ , $R_G = 6.25\Omega$ (Figures 10, 11) | -   | 16  | 40    | ns                   |
| Rise Time                              | $t_r$           |                                                                                   | -   | 250 | 325   | ns                   |
| Turn-Off Delay Time                    | $t_{d(OFF)}$    |                                                                                   | -   | 200 | 325   | ns                   |
| Fall Time                              | $t_f$           | $V_{GS} = 5\text{V}$                                                              | -   | 225 | 325   | ns                   |
|                                        | $R_{\theta JC}$ | RFP15N05L, RFP15N06L                                                              | -   | -   | 2.083 | $^{\circ}\text{C/W}$ |

### Source to Drain Diode Specifications

| PARAMETER                              | SYMBOL   | TEST CONDITIONS                                               | MIN | TYP | MAX | UNITS |
|----------------------------------------|----------|---------------------------------------------------------------|-----|-----|-----|-------|
| Source to Drain Diode Voltage (Note 2) | $V_{SD}$ | $I_{SD} = 7.5\text{A}$                                        | -   | -   | 1.4 | V     |
| Diode Reverse Recovery Time            | $t_{rr}$ | $I_{SD} = 4\text{A}$ , $dI_{SD}/dt = 100\text{A}/\mu\text{s}$ | -   | 225 | -   | ns    |

#### NOTE:

2. Pulsed: pulse duration =  $\leq 300\mu\text{s}$  maximum, duty cycle =  $\leq 2\%$ .
3. Repetitive rating: pulse width limited by maximum junction temperature.

# Typical Performance Curves Unless Otherwise Specified

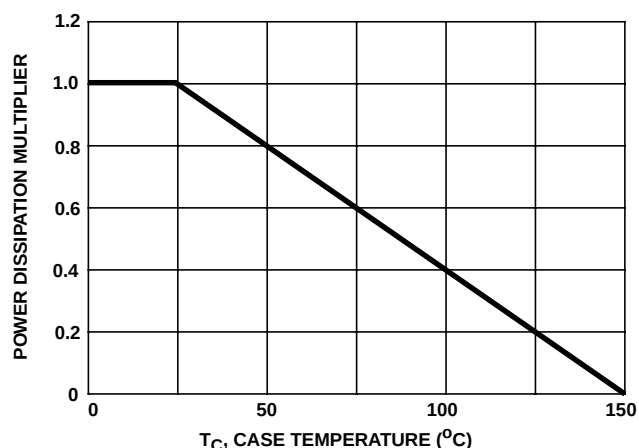


FIGURE 1. NORMALIZED POWER DISSIPATION vs CASE TEMPERATURE

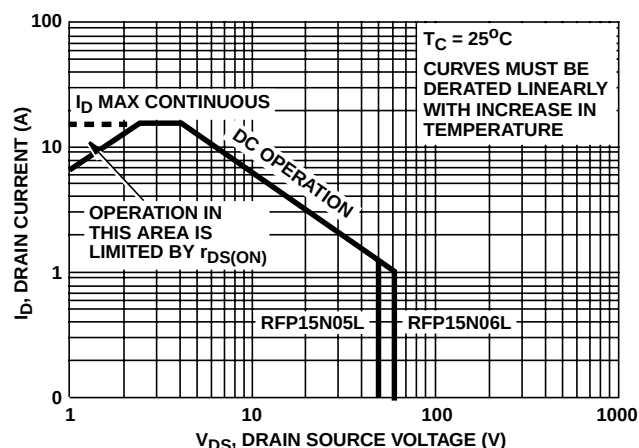


FIGURE 2. FORWARD BIAS SAFE OPERATING AREA

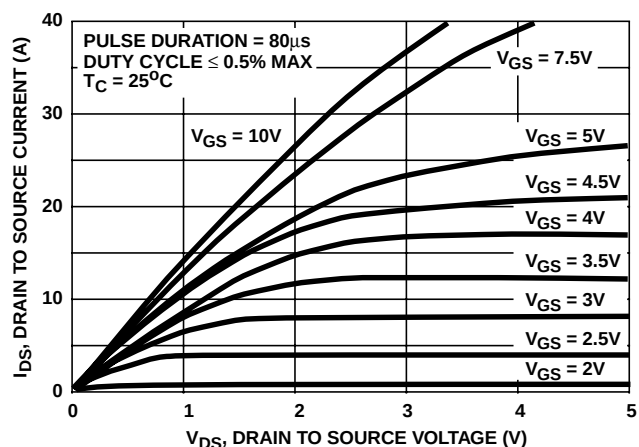


FIGURE 3. SATURATION CHARACTERISTICS

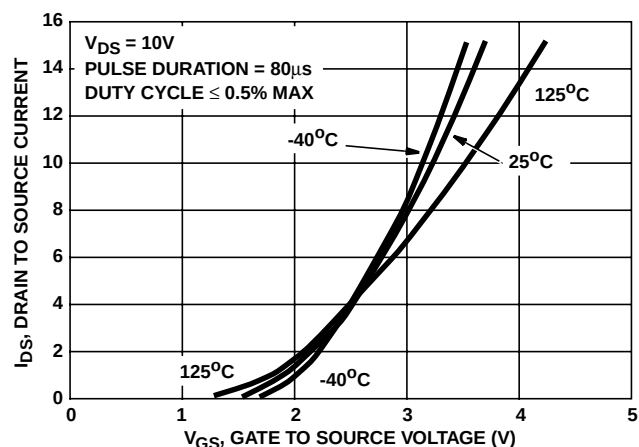


FIGURE 4. TRANSFER CHARACTERISTICS

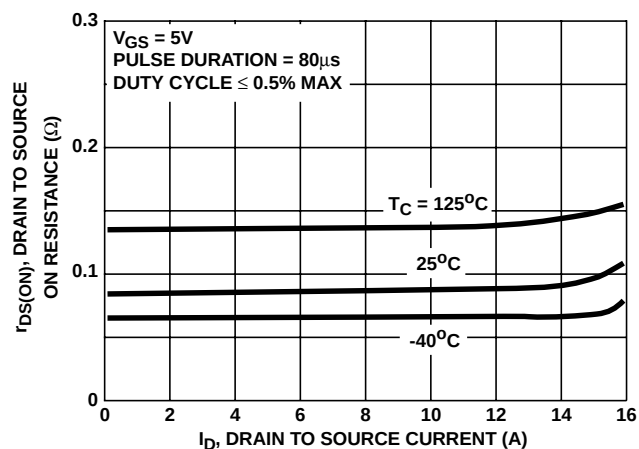


FIGURE 5. DRAIN TO SOURCE ON RESISTANCE vs DRAIN CURRENT

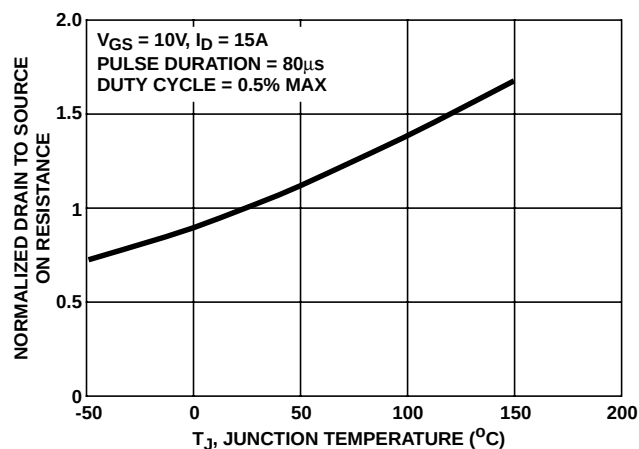


FIGURE 6. NORMALIZED DRAIN TO SOURCE ON RESISTANCE vs JUNCTION TEMPERATURE

## Typical Performance Curves Unless Otherwise Specified (Continued)

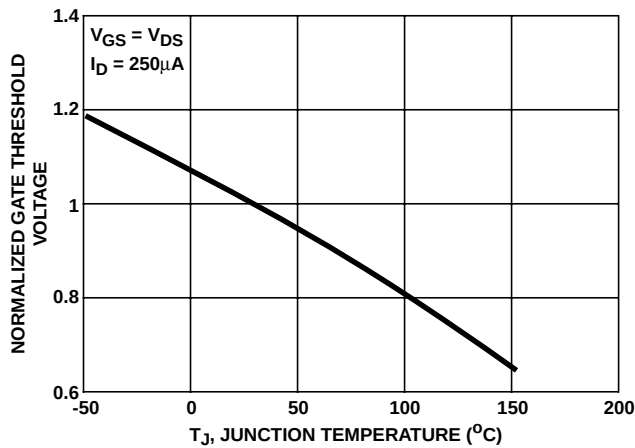


FIGURE 7. NORMALIZED GATE THRESHOLD VOLTAGE vs JUNCTION TEMPERATURE

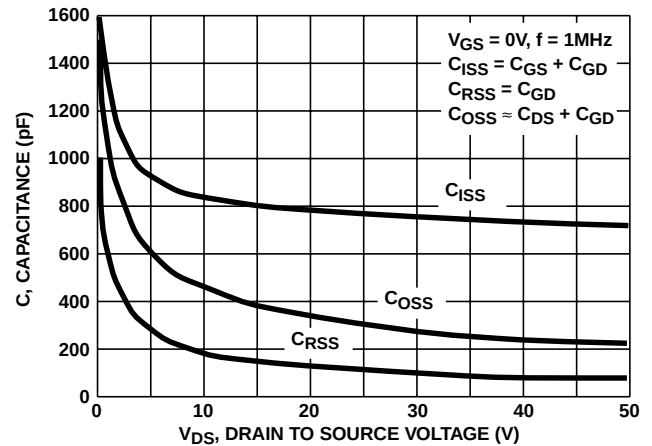
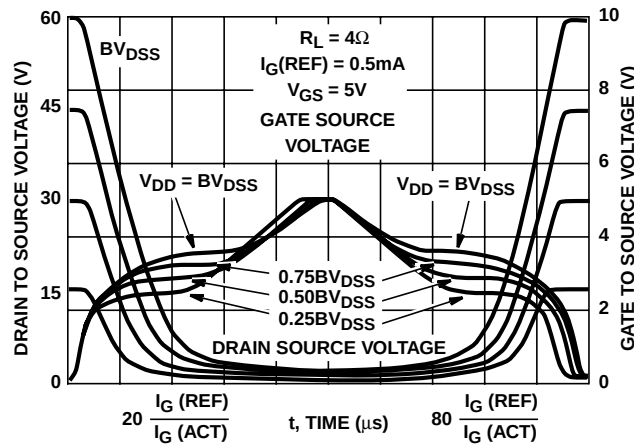


FIGURE 8. CAPACITANCE vs DRAIN TO SOURCE VOLTAGE



NOTE: Refer to Intersil Application Notes AN7254 and AN7260.

FIGURE 9. NORMALIZED SWITCHING WAVEFORMS FOR CONSTANT GATE CURRENT

## Test Circuits and Waveforms

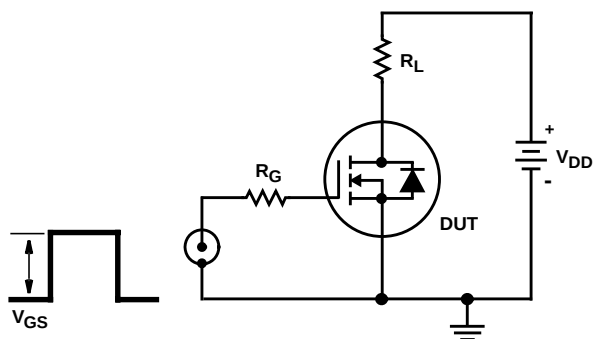


FIGURE 10. SWITCHING TIME TEST CIRCUIT

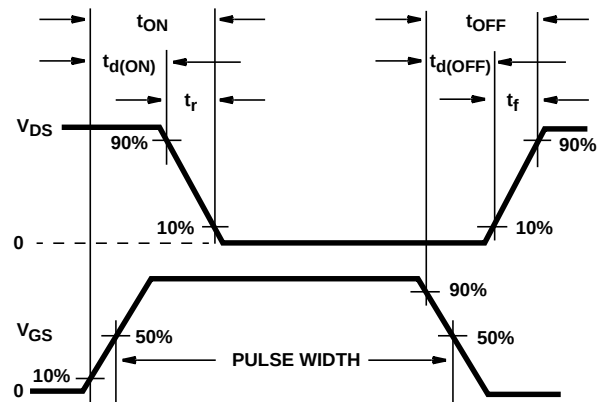


FIGURE 11. RESISTIVE SWITCHING WAVEFORMS

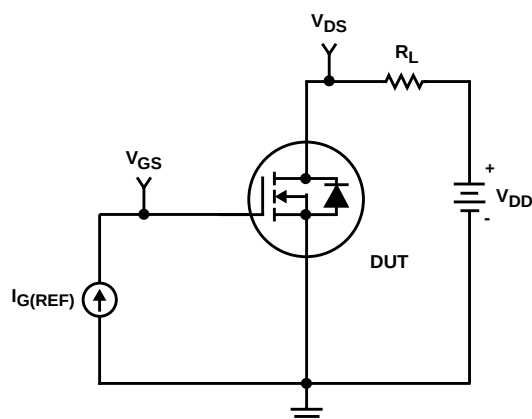
**Test Circuits and Waveforms** (Continued)

FIGURE 12. GATE CHARGE TEST CIRCUIT

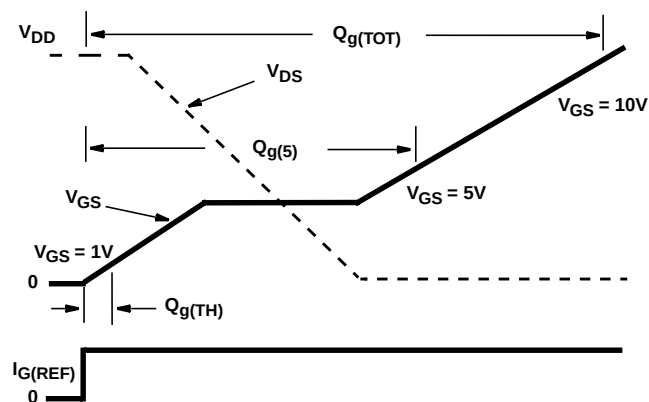


FIGURE 13. GATE CHARGE WAVEFORMS

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