IRFP460A
20A, 500V, 0.22 Ohm, N-Channel SMPS Power MOSFET

Applications
• Switch Mode Power Supplies (SMPS)
• Uninterruptable Power Supply
• High Speed Power Switching

Features
• Low Gate Charge Qg results in Simple Drive Requirement
• Improved Gate, Avalanche and Dynamic dv/dt Ruggedness
• Improved rDS(ON)
• Reduced Miller Capacitance

Absolute Maximum Ratings $T_A = 25^\circ C$ unless otherwise noted

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Ratings</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{DSS}$</td>
<td>Drain to Source Voltage</td>
<td>500</td>
<td>V</td>
</tr>
<tr>
<td>$V_{GS}$</td>
<td>Gate to Source Voltage</td>
<td>±30</td>
<td>V</td>
</tr>
<tr>
<td>$I_D$</td>
<td>Drain Current</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continuous ($T_C = 25^\circ C$, $V_{GS} = 10V$)</td>
<td>20</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>Continuous ($T_C = 100^\circ C$, $V_{GS} = 10V$)</td>
<td>13</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>Pulsed</td>
<td>80</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>$P_D$</td>
<td>Power dissipation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continuous</td>
<td>280</td>
<td>W</td>
<td></td>
</tr>
<tr>
<td>Derate above 25°C</td>
<td>2.2</td>
<td>W/°C</td>
<td></td>
</tr>
<tr>
<td>$T_J, T_{STG}$</td>
<td>Operating and Storage Temperature</td>
<td>-55 to 150</td>
<td>°C</td>
</tr>
<tr>
<td>Soldering Temperature for 10 seconds</td>
<td>300 (1.6mm from case)</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>Mounting Torque, 8-32 or M3 Screw</td>
<td>10ibf&quot;in (1.1N&quot;m)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Thermal Characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Value</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R_{JIC}$</td>
<td>Thermal Resistance Junction to Case</td>
<td>0.45</td>
<td>°C/W</td>
</tr>
<tr>
<td>$R_{ICS}$</td>
<td>Thermal Resistance Case to Sink, Flat, Greased Surface</td>
<td>0.24 TYP</td>
<td>°C/W</td>
</tr>
<tr>
<td>$R_{JUA}$</td>
<td>Thermal Resistance Junction to Ambient</td>
<td>40</td>
<td>°C/W</td>
</tr>
</tbody>
</table>
**Package Marking and Ordering Information**

<table>
<thead>
<tr>
<th>Device Marking</th>
<th>Device</th>
<th>Package</th>
<th>Reel Size</th>
<th>Tape Width</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>IRFP460A</td>
<td>IRFP460A</td>
<td>TO-247</td>
<td>-</td>
<td>-</td>
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</tr>
</tbody>
</table>

**Electrical Characteristics**  \[ T_J = 25^\circ C \] (unless otherwise noted)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$B_{\text{VDSS}}$</td>
<td>Drain to Source Breakdown Voltage</td>
<td>$I_D = 250\mu A, V_{GS} = 0V$</td>
<td>500</td>
<td>-</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>$\Delta B_{\text{VDSS}}/\Delta T_J$</td>
<td>Breakdown Voltage Temp. Coefficient</td>
<td>$V/\circ C$ Reference to $25^\circ C$, $Id = 1mA$</td>
<td>-</td>
<td>0.61</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>$I_{\text{DSON}}$</td>
<td>Drin to Source On-Resistance</td>
<td>$V_{GS} = 10V, I_D = 12A$</td>
<td>-</td>
<td>0.17</td>
<td>0.22</td>
<td>\Omega</td>
</tr>
<tr>
<td>$V_{\text{GS(RH)}}$</td>
<td>Gate Threshold Voltage</td>
<td>$V_{DS} = V_{GS}, I_D = 250\mu A$</td>
<td>2.0</td>
<td>3.3</td>
<td>4.0</td>
<td>V</td>
</tr>
<tr>
<td>$I_{\text{DSS}}$</td>
<td>Zero Gate Voltage Drain Current</td>
<td>$V_{DS} = 25V$</td>
<td>-</td>
<td>-</td>
<td>25</td>
<td>\mu A</td>
</tr>
<tr>
<td>$I_{\text{GS}}$</td>
<td>Gate to Source Leakage Current</td>
<td>$V_{GS} = \pm 20V$</td>
<td>-</td>
<td>-</td>
<td>100</td>
<td>nA</td>
</tr>
</tbody>
</table>

**Statics**

- $B_{\text{VDSS}}$: Drain to Source Breakdown Voltage
- $\Delta B_{\text{VDSS}}/\Delta T_J$: Breakdown Voltage Temp. Coefficient
- $I_{\text{DSON}}$: Drin to Source On-Resistance
- $V_{\text{GS(RH)}}$: Gate Threshold Voltage
- $I_{\text{DSS}}$: Zero Gate Voltage Drain Current
- $I_{\text{GS}}$: Gate to Source Leakage Current

**Dynamics**

- $g_{m}$: Forward Transconductance
- $Q_{q(TOT)}$: Total Gate Charge
- $Q_{qg}$: Gate to Source Gate Charge
- $Q_{qd}$: Gate to Drain “Miller” Charge
- $t_{\text{ON}}$: Turn-On Delay Time
- $I_{\text{R}}$: Rise Time
- $t_{\text{OFF}}$: Turn-Off Delay Time
- $I_{\text{off}}$: Fall Time
- $C_{\text{ISS}}$: Input Capacitance
- $C_{\text{OSS}}$: Output Capacitance
- $C_{\text{RSS}}$: Reverse Transfer Capacitance

**Avalanche Characteristics**

- $E_{\text{AS}}$: Single Pulse Avalanche Energy
- $I_{\text{AR}}$: Avalanche Current
- $E_{\text{AR}}$: Repetitive Avalanche Energy

**Drain-Source Diode Characteristics**

- $I_{\text{S}}$: Continuous Source Current (Body Diode)
- $I_{\text{SM}}$: Pulsed Source Current (Body Diode)
- $V_{\text{SD}}$: Source to Drain Diode Voltage
- $I_{\text{RR}}$: Reverse Recovered Charge

Notes:
1. Repetitive rating; pulse width limited by maximum junction temperature
2. $V_{DC} = 50V$, $\text{Stating } T_J = 25^\circ C$, $L = 7.0mH$, $R_D = 25\Omega$, $I_{AS} = 14A$
3. $I_{SD} < 14A$, $dI/dt < 100A/\mu s$, $V_{DD} < V_{ds(on)}$, $T_J < 150^\circ C$
4. Pulse width $< 300\mu s$, duty cycle $< 2\%$

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Typical Characteristics

Figure 1. Output Characteristics

Figure 2. Output Characteristics

Figure 3. Transfer Characteristics

Figure 4. Drain To Source On Resistance vs Junction Temperature

Figure 5. Capacitance vs Drain To Source Voltage

Figure 6. Gate Charge Waveforms For Constant Gate Current
Typical Characteristics (Continued)

Figure 7. Body Diode Forward Voltage vs Body Diode Current

Figure 8. Maximum Safe Operating Area

Figure 9. Maximum Drain Current vs Case Temperature

Figure 10. Normalized Transient Thermal Impedance, Junction to Case
Test Circuits and Waveforms

Figure 11. Unclamped Energy Test Circuit

Figure 12. Unclamped Energy Waveforms

Figure 13. Gate Charge Test Circuit

Figure 14. Gate Charge Waveforms

Figure 15. Switching Time Test Circuit

Figure 16. Switching Time Waveform
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