**Power MOSFET**

**PRODUCT SUMMARY**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Limit</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>VGS (V)</td>
<td></td>
<td>200</td>
<td>V</td>
</tr>
<tr>
<td>RDson (Ω)</td>
<td>VGS = 10 V</td>
<td>0.055</td>
<td></td>
</tr>
<tr>
<td>Qgs (Max.) (nC)</td>
<td></td>
<td>230</td>
<td></td>
</tr>
<tr>
<td>Qgs (nC)</td>
<td></td>
<td>42</td>
<td></td>
</tr>
<tr>
<td>Qgs (nC)</td>
<td></td>
<td>110</td>
<td></td>
</tr>
<tr>
<td>Configuration</td>
<td></td>
<td>Single</td>
<td></td>
</tr>
</tbody>
</table>

**FEATURES**

- Dynamic dV/dt Rating
- Repetitive Avalanche Rated
- Isolated Central Mounting Hole
- Fast Switching
- Ease of Paralleling
- Simple Drive Requirements
- Compliant to RoHS Directive 2002/95/EC

**DESCRIPTION**

Third generation Power MOSFETs from Vishay provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness. The TO-247AC package is preferred for commercial-industrial applications where higher power levels preclude the use of TO-220AB devices. The TO-247AC is similar but superior to the earlier TO-218 package because of its isolated mounting hole. It also provides greater creepage distance between pins to meet the requirements of most safety specifications.

**ORDERING INFORMATION**

<table>
<thead>
<tr>
<th>Package</th>
<th>TO-247AC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead (Pb)-free</td>
<td>IRFP260PbF</td>
</tr>
<tr>
<td></td>
<td>SiHFP260-E3</td>
</tr>
<tr>
<td>SnPb</td>
<td>IRFP260</td>
</tr>
<tr>
<td></td>
<td>SiHFP260</td>
</tr>
</tbody>
</table>

**ABSOLUTE MAXIMUM RATINGS** *(TC = 25 °C, unless otherwise noted)*

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SYMBOL</th>
<th>LIMIT</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drain-Source Voltage</td>
<td>VDS</td>
<td>200</td>
<td>V</td>
</tr>
<tr>
<td>Gate-Source Voltage</td>
<td>VGS</td>
<td>± 20</td>
<td></td>
</tr>
<tr>
<td>Continuous Drain Current</td>
<td>I0(T)</td>
<td>25 °C</td>
<td>A</td>
</tr>
<tr>
<td>Continuous Drain Current</td>
<td>I0(T)</td>
<td>100 °C</td>
<td>A</td>
</tr>
<tr>
<td>Pulsed Drain Currenta</td>
<td>IOLM</td>
<td>180</td>
<td>A</td>
</tr>
<tr>
<td>Linear Derating Factor</td>
<td>2.2</td>
<td>W/°C</td>
<td></td>
</tr>
<tr>
<td>Single Pulse Avalanche Energyb</td>
<td>EAS</td>
<td>1000</td>
<td>mJ</td>
</tr>
<tr>
<td>Repetitive Avalanche Currentb</td>
<td>IAR</td>
<td>46</td>
<td>mJ</td>
</tr>
<tr>
<td>Repetitive Avalanche Energya</td>
<td>EAR</td>
<td>28</td>
<td>mJ</td>
</tr>
<tr>
<td>Maximum Power Dissipation</td>
<td>PD</td>
<td>280</td>
<td>W</td>
</tr>
<tr>
<td>Peak Diode Recovery dV/dt&lt;sup&gt;c&lt;/sup&gt;</td>
<td>5.0</td>
<td>V/ns</td>
<td></td>
</tr>
<tr>
<td>Operating Junction and Storage Temperature Range</td>
<td>Tj, Tstg</td>
<td>-55 to +150</td>
<td>°C</td>
</tr>
<tr>
<td>Soldering Recommendations (Peak Temperature)</td>
<td>for 10 s</td>
<td>300&lt;sup&gt;d&lt;/sup&gt;</td>
<td>°C</td>
</tr>
<tr>
<td>Mounting Torque</td>
<td>6-32 or M3 screw</td>
<td>10</td>
<td>lbf · in</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.1</td>
<td>N · m</td>
</tr>
</tbody>
</table>

**Notes**

a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
b. VDD = 50 V, starting TJ = 25 °C, L = 708 µH, RDO = 25 Ω, IAS = 46 A (see fig. 12).
c. IAS ≤ 46 A, dV/dt ≤ 230 A/µs, VDD ≤ VDS, TJ ≤ 150 °C.
d. 1.6 mm from case.

* Pb containing terminations are not RoHS compliant, exemptions may apply
IRFP260, SiHFP260
Vishay Siliconix

### THERMAL RESISTANCE RATINGS

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SYMBOL</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Junction-to-Ambient</td>
<td>R_{thJA}</td>
<td>-</td>
<td>40</td>
<td>°C/W</td>
</tr>
<tr>
<td>Case-to-Sink, Flat, Greased Surface</td>
<td>R_{thCS}</td>
<td>0.24</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Maximum Junction-to-Case (Drain)</td>
<td>R_{thJC}</td>
<td>-</td>
<td>0.45</td>
<td></td>
</tr>
</tbody>
</table>

### SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SYMBOL</th>
<th>TEST CONDITIONS</th>
<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Static</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drain-Source Breakdown Voltage</td>
<td>V_DS</td>
<td>V_{GS} = 0 V, I_D = 250 μA</td>
<td>200</td>
<td>-</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>V_DS Temperature Coefficient</td>
<td>ΔV_DS/T_J</td>
<td>Reference to 25 °C, I_D = 1 mA</td>
<td>-</td>
<td>0.24</td>
<td>-</td>
<td>V/°C</td>
</tr>
<tr>
<td>Gate-Source Threshold Voltage</td>
<td>V_{GS(th)}</td>
<td>V_DS = V_{GS}, I_D = 250 μA</td>
<td>2.0</td>
<td>-</td>
<td>4.0</td>
<td>V</td>
</tr>
<tr>
<td>Gate-Source Leakage</td>
<td>I_GSS</td>
<td>V_DS = ± 20 V</td>
<td>-</td>
<td>-</td>
<td>± 100</td>
<td>nA</td>
</tr>
<tr>
<td>Zero Gate Voltage Drain Current</td>
<td>I_DSS</td>
<td>V_DS = 200 V, V_{GS} = 0 V</td>
<td>-</td>
<td>-</td>
<td>25</td>
<td>μA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_DS = 160 V, V_{GS} = 0 V, T_J = 125 °C</td>
<td>-</td>
<td>-</td>
<td>250</td>
<td>μA</td>
</tr>
<tr>
<td>Drain-Source On-State Resistance</td>
<td>R_{DS(on)}</td>
<td>V_{GS} = 10 V</td>
<td>28</td>
<td>-</td>
<td>28</td>
<td>A</td>
</tr>
<tr>
<td>Forward Transconductance</td>
<td>g_f</td>
<td>V_DS = 50 V, I_D = 28 A^b</td>
<td>24</td>
<td>-</td>
<td>-</td>
<td>S</td>
</tr>
<tr>
<td>Dynamic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input Capacitance</td>
<td>C_{iss}</td>
<td>V_{GS} = 0 V, V_DS = 25 V, f = 1.0 MHz, see fig. 5</td>
<td>-</td>
<td>5200</td>
<td>-</td>
<td>pF</td>
</tr>
<tr>
<td>Output Capacitance</td>
<td>C_{oss}</td>
<td></td>
<td>-</td>
<td>1200</td>
<td>-</td>
<td>pF</td>
</tr>
<tr>
<td>Reverse Transfer Capacitance</td>
<td>C_{rss}</td>
<td></td>
<td>-</td>
<td>310</td>
<td>-</td>
<td>pF</td>
</tr>
<tr>
<td>Total Gate Charge</td>
<td>Q_g</td>
<td>V_{GS} = 10 V</td>
<td>-</td>
<td>-</td>
<td>230</td>
<td>nC</td>
</tr>
<tr>
<td>Gate-Source Charge</td>
<td>Q_{gss}</td>
<td>I_D = 46 A, V_DS = 160 V, see fig. 6 and 13^b</td>
<td>-</td>
<td>-</td>
<td>42</td>
<td>nC</td>
</tr>
<tr>
<td>Gate-Drain Charge</td>
<td>Q_{gd}</td>
<td></td>
<td>-</td>
<td>-</td>
<td>110</td>
<td>nC</td>
</tr>
<tr>
<td>Turn-On Delay Time</td>
<td>t_{d(on)}</td>
<td>V_DD = 100 V, I_D = 46 A, R_g = 4.3 Ω, R_D = 2.1 Ω, see fig. 10^c</td>
<td>-</td>
<td>23</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>Rise Time</td>
<td>t_r</td>
<td></td>
<td>-</td>
<td>120</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>Turn-Off Delay Time</td>
<td>t_{d(off)}</td>
<td></td>
<td>-</td>
<td>100</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>Fall Time</td>
<td>t_f</td>
<td></td>
<td>-</td>
<td>94</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>Internal Drain Inductance</td>
<td>L_D</td>
<td>Between lead, 6 mm (0.25&quot;) from package and center of die contact</td>
<td>-</td>
<td>5.0</td>
<td>-</td>
<td>nH</td>
</tr>
<tr>
<td>Internal Source Inductance</td>
<td>L_S</td>
<td></td>
<td>-</td>
<td>13</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Drain-Source Body Diode Characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continuous Source-Drain Diode Current</td>
<td>I_S</td>
<td>MOSFET symbol showing the integral reverse p-n junction diode</td>
<td>-</td>
<td>-</td>
<td>46</td>
<td>A</td>
</tr>
<tr>
<td>Pulsed Diode Forward Current^a</td>
<td>I_{SM}</td>
<td></td>
<td>-</td>
<td>-</td>
<td>180</td>
<td></td>
</tr>
<tr>
<td>Body Diode Voltage</td>
<td>V_{SD}</td>
<td>T_J = 25 °C, I_S = 46 A, V_{GS} = 0 V^b</td>
<td>-</td>
<td>-</td>
<td>1.8</td>
<td>V</td>
</tr>
<tr>
<td>Body Diode Reverse Recovery Time</td>
<td>t_{rr}</td>
<td>T_J = 25 °C, I_F = 46 A, dI/dt = 100 A/μs^b</td>
<td>-</td>
<td>390</td>
<td>590</td>
<td>ns</td>
</tr>
<tr>
<td>Body Diode Reverse Recovery Charge</td>
<td>Q_{rr}</td>
<td>T_J = 25 °C, I_F = 46 A, dI/dt = 100 A/μs^b</td>
<td>-</td>
<td>4.8</td>
<td>7.2</td>
<td>μC</td>
</tr>
<tr>
<td>Forward Turn-On Time</td>
<td>t_{on}</td>
<td>Intrinsic turn-on time is negligible (turn-on is dominated by L_S and L_D)</td>
<td></td>
<td>-</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes**

a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).

b. Pulse width ≤ 300 μs; duty cycle ≤ 2 %.
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)

- **Fig. 1** - Typical Output Characteristics, $T_C = 25$ °C
- **Fig. 2** - Typical Output Characteristics, $T_C = 150$ °C
- **Fig. 3** - Typical Transfer Characteristics
- **Fig. 4** - Normalized On-Resistance vs. Temperature
IRFP260, SiHFP260

Vishay Siliconix

Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

Fig. 7 - Typical Source-Drain Diode Forward Voltage

Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

Fig. 8 - Maximum Safe Operating Area
**Fig. 9 - Maximum Drain Current vs. Case Temperature**

**Fig. 10a - Switching Time Test Circuit**

**Fig. 10b - Switching Time Waveforms**

**Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case**
Fig. 12a - Unclamped Inductive Test Circuit

Vary $t_p$ to obtain required $I_{AS}$

Fig. 12b - Unclamped Inductive Waveforms

Fig. 12c - Maximum Avalanche Energy vs. Drain Current

Fig. 13a - Basic Gate Charge Waveform

Vary $t_p$ to obtain required $I_{AS}$

Fig. 13b - Gate Charge Test Circuit

Current regulator
Same type as D.U.T.

Current sampling resistors

Same type as D.U.T.
**Fig. 14 - For N-Channel**

**Peak Diode Recovery dV/dt Test Circuit**

- **D.U.T.**
- **D = P.W. Period**
- **V\text{DD} = 10 V**
- **P.W.**
- **D**
- **V\text{GS} = 10 V**
- **R_{gs}**
- **D.U.T. - device under test**
- **dV/dt controlled by R_{gs}**
- **Driver same type as D.U.T.**
- **I_{DS} controlled by duty factor “D”**
- **Low stray inductance**
- **Ground plane**
- **Low leakage inductance current transformer**
- **Re-applied voltage**
- **Body diode forward drop**
- **Ripple ≤ 5 %**
- **I_{DS}**
- **Diode recovery dv/dt**
- **Drive gate drive**
- **Reverse recovery current**
- **Inductor current**
- **D.U.T. V_{DS} waveform**
- **Body diode forward current**
- **dI/dt**
- **Re-applied voltage**
- **Note**
- a. \( V_{GS} = 5 \) V for logic level devices
### MILLIMETERS | INCHES
---|---
A | 4.58-5.31 | 0.180-0.209
A1 | 2.21-2.59 | 0.087-0.102
A2 | 1.17-2.49 | 0.046-0.098
b | 0.99-1.40 | 0.039-0.055
b1 | 0.99-1.35 | 0.039-0.053
b2 | 1.53-2.39 | 0.060-0.094
b3 | 1.65-2.37 | 0.065-0.093
b4 | 2.42-3.43 | 0.095-0.135
b5 | 2.59-3.38 | 0.102-0.133
c | 0.38-0.86 | 0.015-0.034
c1 | 0.38-0.76 | 0.015-0.030
D | 19.71-20.82 | 0.776-0.820
D1 | 13.08- | 0.515-

### MILLIMETERS | INCHES
---|---
D2 | 0.51-1.30 | 0.020-0.051
E | 15.29-15.87 | 0.602-0.625
E1 | 13.72- | 0.540-
e | 5.46 BSC | 0.215 BSC
Ø k | 0.254 | 0.010
L | 14.20-16.25 | 0.559-0.640
L1 | 3.71-4.29 | 0.146-0.169
N | 7.62 BSC- | 0.300 BSC
Ø P | 3.51-3.66 | 0.138-0.144
Ø P1 | 7.39- | 0.291
Q | 5.31-5.69 | 0.209-0.224
R | 4.52-5.49 | 0.178-0.216
S | 5.51 BSC- | 0.217 BSC

**Notes:**
2. Contour of slot optional.
3. Dimension D and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outermost extremes of the plastic body.
4. Thermal pad contour optional with dimensions D1 and E1.
5. Lead finish uncontrolled in L1.
6. Ø P to have a maximum draft angle of 1.5 to the top of the part with a maximum hole diameter of 3.91 mm (0.154").
7. Outline conforms to JEDEC outline TO-247 with exception of dimension c.
8. Xian and Mingxin actually photo.
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