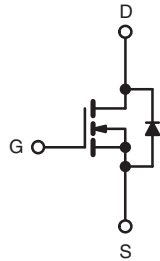
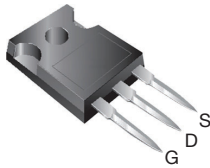


## Power MOSFET

PRODUCT SUMMARY		
$V_{DS}$ (V)	60	
$R_{DS(on)}$ ( $\Omega$ )	$V_{GS} = 10$ V	0.014
$Q_g$ (Max.) (nC)	160	
$Q_{gs}$ (nC)	48	
$Q_{gd}$ (nC)	54	
Configuration	Single	

**TO-247AC**


N-Channel MOSFET

### FEATURES

- Dynamic dV/dt Rating
- Isolated Central Mounting Hole
- 175 °C Operating Temperature
- Fast Switching
- Ease of Paralleling
- Simple Drive Requirements
- Compliant to RoHS Directive 2002/95/EC


**RoHS\***  
 COMPLIANT

### 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

Package	TO-247AC
Lead (Pb)-free	IRFP054PbF SiHFP054-E3
SnPb	IRFP054 SiHFP054

### ABSOLUTE MAXIMUM RATINGS ( $T_C = 25$ °C, unless otherwise noted)

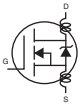

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	$V_{DS}$	60	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	
Continuous Drain Current <sup>e</sup>	$I_D$	$T_C = 25$ °C	A
Continuous Drain Current		$T_C = 100$ °C	
Pulsed Drain Current <sup>a</sup>	$I_{DM}$	360	
Linear Derating Factor		1.5	W/°C
Single Pulse Avalanche Energy <sup>b</sup>	$E_{AS}$	373	mJ
Maximum Power Dissipation	$P_D$	230	W
Peak Diode Recovery dV/dt <sup>c</sup>	dV/dt	4.5	V/ns
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to + 175	°C
Soldering Recommendations (Peak Temperature) <sup>d</sup>	for 10 s	300	
Mounting Torque	6-32 or M3 screw	10	lbf · in
		1.1	N · m

#### Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- $V_{DD} = 25$  V, starting  $T_J = 25$  °C,  $L = 92$   $\mu$ H,  $R_g = 25$   $\Omega$ ,  $I_{AS} = 90$  A (see fig. 12).
- $I_{SD} \leq 90$  A,  $dI/dt \leq 200$  A/ $\mu$ s,  $V_{DD} \leq V_{DS}$ ,  $T_J \leq 175$  °C.
- 1.6 mm from case.
- Current limited by the package, (die current = 90 A).

\* Pb containing terminations are not RoHS compliant, exemptions may apply

THERMAL RESISTANCE RATINGS				
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	$R_{thJA}$	-	40	°C/W
Case-to-Sink, Flat, Greased Surface	$R_{thCS}$	0.24	-	
Maximum Junction-to-Case (Drain)	$R_{thJC}$	-	0.65	

SPECIFICATIONS ( $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	60	-	-	V
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^\circ\text{C}$ , $I_D = 1\text{ mA}$	-	0.056	-	V/°C
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	2.0	-	4.0	V
Gate-Source Leakage	$I_{GSS}$	$V_{GS} = \pm 20\text{ V}$	-	-	$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}$	-	-	25	$\mu\text{A}$
		$V_{DS} = 48\text{ V}, V_{GS} = 0\text{ V}, T_J = 150\text{ }^\circ\text{C}$	-	-	250	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$   $I_D = 54\text{ A}^b$	-	-	0.014	$\Omega$
Forward Transconductance	$g_{fs}$	$V_{DS} = 25\text{ V}, I_D = 54\text{ A}^b$	25	-	-	S
<b>Dynamic</b>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V},$ $V_{DS} = 25\text{ V},$ $f = 1.0\text{ MHz}$ , see fig. 5	-	4500	-	pF
Output Capacitance	$C_{oss}$		-	2000	-	
Reverse Transfer Capacitance	$C_{rss}$		-	300	-	
Total Gate Charge	$Q_g$	$V_{GS} = 10\text{ V}$   $I_D = 64\text{ A}, V_{DS} = 48\text{ V},$ see fig. 6 and 13 <sup>b</sup>	-	-	160	nC
Gate-Source Charge	$Q_{gs}$		-	-	48	
Gate-Drain Charge	$Q_{gd}$		-	-	54	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 30\text{ V}, I_D = 64\text{ A},$ $R_g = 6.2\text{ }\Omega, R_D = 0.45\text{ }\Omega$ , see fig. 10 <sup>b</sup>	-	20	-	ns
Rise Time	$t_r$		-	160	-	
Turn-Off Delay Time	$t_{d(off)}$		-	83	-	
Fall Time	$t_f$		-	150	-	
Internal Drain Inductance	$L_D$	Between lead, 6 mm (0.25") from package and center of die contact 	-	5.0	-	nH
Internal Source Inductance	$L_S$		-	13	-	
<b>Drain-Source Body Diode Characteristics</b>						
Continuous Source-Drain Diode Current	$I_S$	MOSFET symbol showing the integral reverse p - n junction diode 	-	-	70	A
Pulsed Diode Forward Current <sup>a</sup>	$I_{SM}$		-	-	360	
Body Diode Voltage	$V_{SD}$	$T_J = 25\text{ }^\circ\text{C}, I_S = 90\text{ A}, V_{GS} = 0\text{ V}^b$	-	-	2.5	V
Body Diode Reverse Recovery Time	$t_{rr}$	$T_J = 25\text{ }^\circ\text{C}, I_F = 6.4\text{ A}, di/dt = 100\text{ A}/\mu\text{s}^b$	-	270	540	ns
Body Diode Reverse Recovery Charge	$Q_{rr}$		-	1.1	2.2	$\mu\text{C}$
Forward Turn-On Time	$t_{on}$	Intrinsic turn-on time is negligible (turn-on is dominated by $L_S$ and $L_D$ )				

### Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- Pulse width  $\leq 300\text{ }\mu\text{s}$ ; duty cycle  $\leq 2\%$ .

## TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

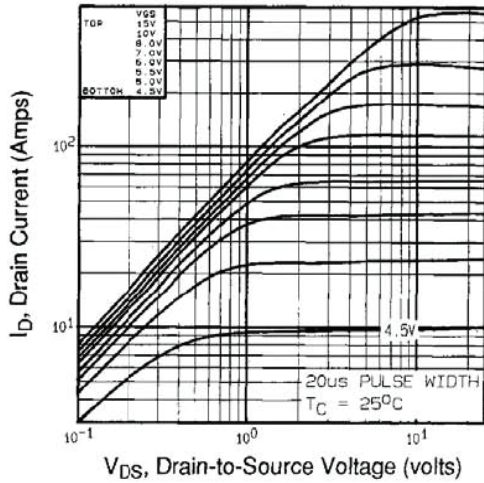


Fig. 1 - Typical Output Characteristics,  $T_C = 25\text{ }^\circ\text{C}$

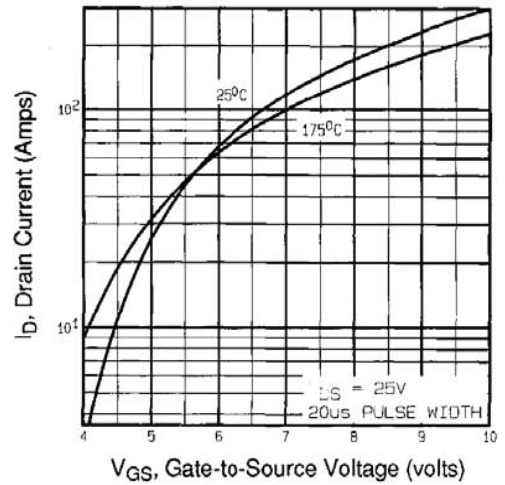


Fig. 3 - Typical Transfer Characteristics

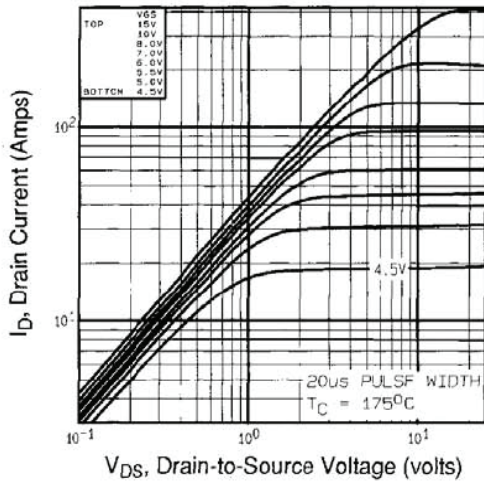


Fig. 2 - Typical Output Characteristics,  $T_C = 175\text{ }^\circ\text{C}$

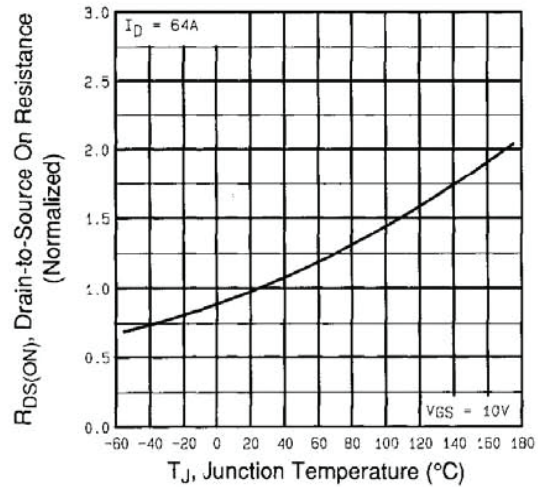


Fig. 4 - Normalized On-Resistance vs. Temperature

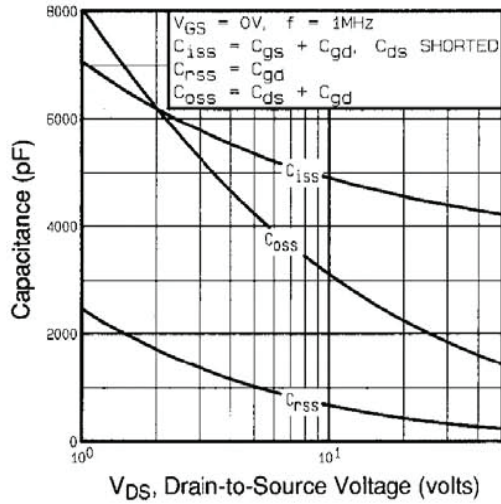


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

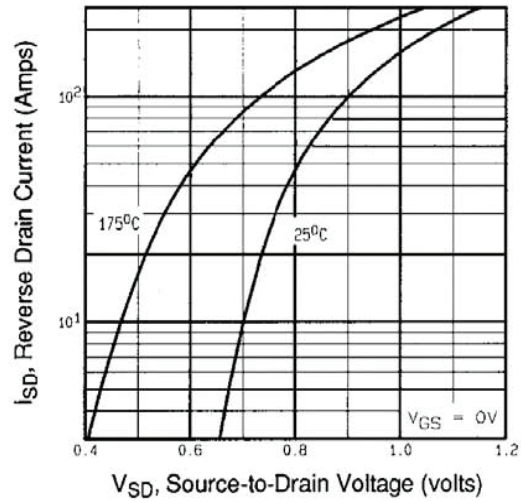


Fig. 7 - Typical Source-Drain Diode Forward Voltage

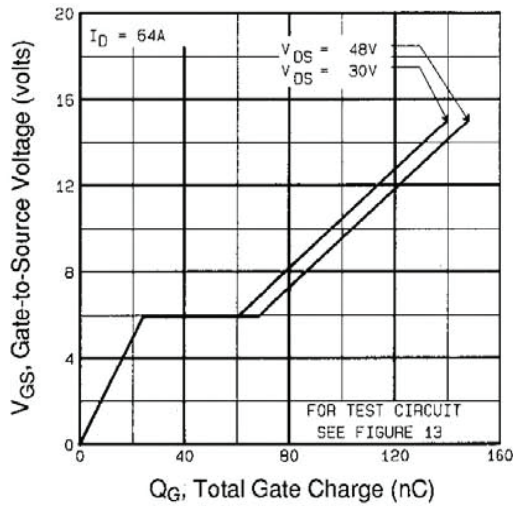


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

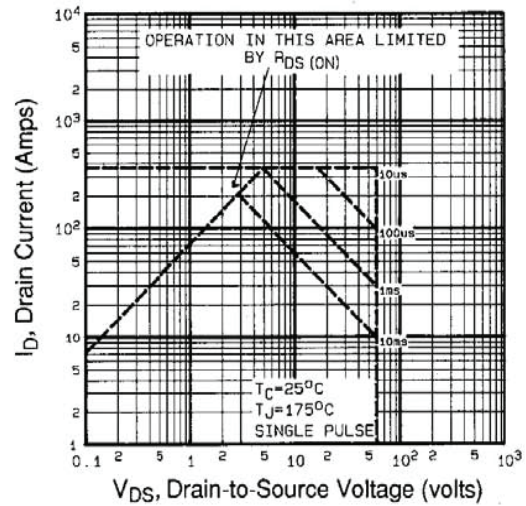


Fig. 8 - Maximum Safe Operating Area

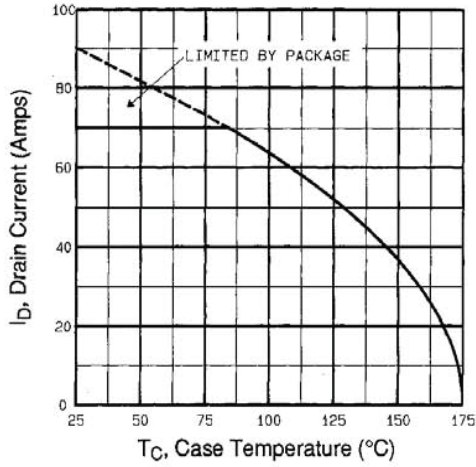


Fig. 9 - Maximum Drain Current vs. Case Temperature



Fig. 10a - Switching Time Test Circuit



Fig. 10b - Switching Time Waveforms

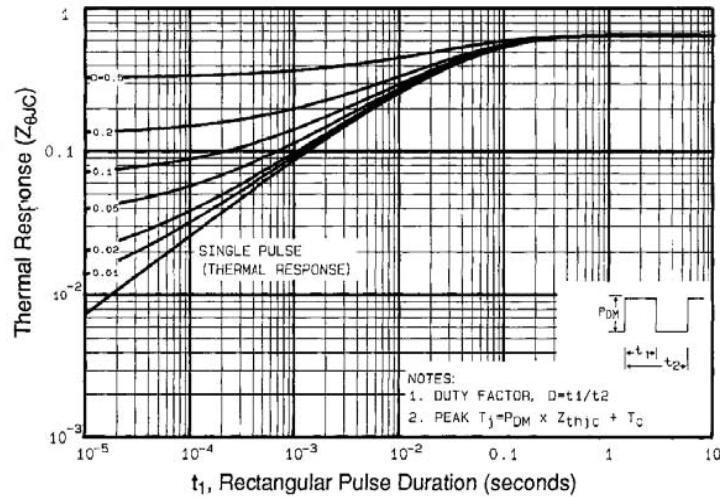


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

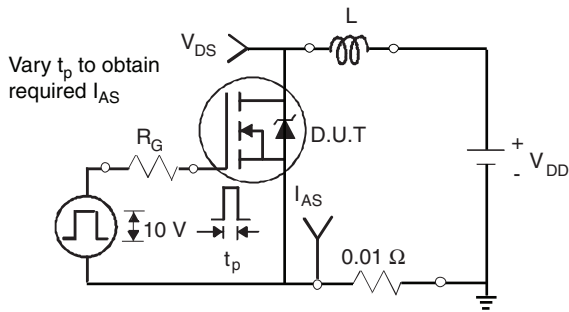


Fig. 12a - Unclamped Inductive Test Circuit

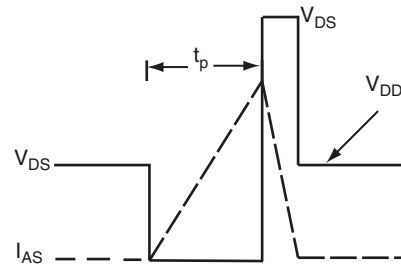


Fig. 12b - Unclamped Inductive Waveforms

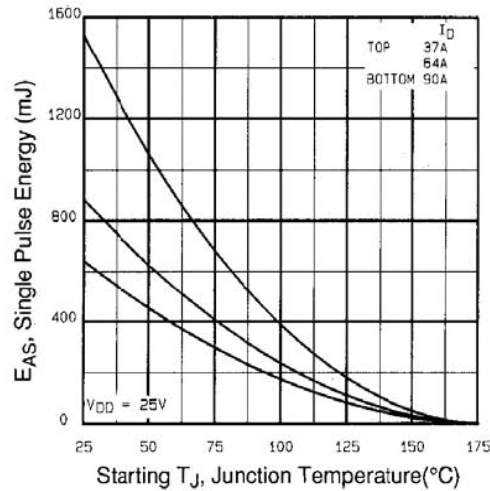


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

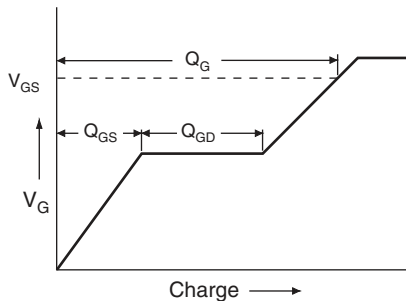


Fig. 13a - Basic Gate Charge Waveform

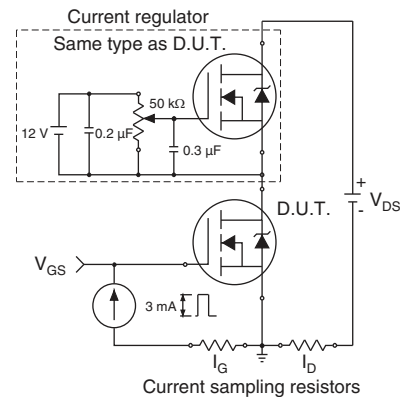
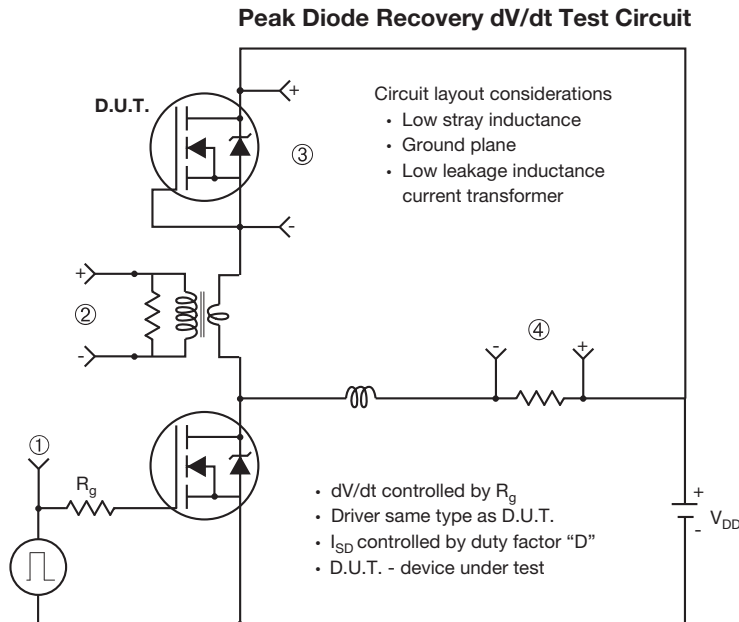


Fig. 13b - Gate Charge Test Circuit



**Note**

a.  $V_{GS} = 5 V$  for logic level devices

**Fig. 14 - For N-Channel**

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