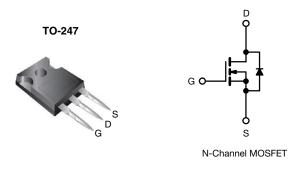
Vishay Siliconix



## Power MOSFET



PRODUCT SUMMARY					
V <sub>DS</sub> (V)	500				
R <sub>DS(on)</sub> (Ω)	V <sub>GS</sub> = 10 V	0.40			
Q <sub>g</sub> (Max.) (nC)	74				
Q <sub>gs</sub> (nC)	19				
Q <sub>gd</sub> (nC)	3	5			
Configuration	Single				

#### **FEATURES**

- Ultra Low Gate Charge
- Reduced Gate Drive Requirement
- Enhanced 30 V V<sub>GS</sub> Rating
- Reduced C<sub>iss</sub>, C<sub>oss</sub>, C<sub>rss</sub>
- Isolated Central Mounting Hole
- Dynamic dV/dt Rated
- Repetitive Avalanche Rated
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

#### DESCRIPTION

This new series of low charge Power MOSFETs achieve significantly lower gate charge over conventional MOSFETs. Utilizing advanced Power MOSFET technology the device improvements allow for reduced gate drive requirements, faster switching speeds and increased total system savings. These device improvements combined with the proven ruggedness and reliability of Power MOSFETs offer the designer a new standard in power transistors for switching applications.

The TO-247 package is preferred for commercial-industrial applications where higher power levels preclude the use of TO-220 devices. The TO-247 is similar but superior to the earlier TO-218 package because of its isolated mounting hole.

ORDERING INFORMATION	
Package	TO-247
Lead (Pb)-free	IRFP450LCPbF

PARAMETER			SYMBOL	LIMIT	UNIT
Drain-Source Voltage			V <sub>DS</sub>	500	V
Gate-Source Voltage			V <sub>GS</sub>	± 30	v
Continuous Drain Current	V <sub>GS</sub> at 10 V	T <sub>C</sub> = 25 °C	1_	14	
$V_{GS}$ at 10 V $T_C = 100 ^{\circ}C$			I <sub>D</sub>	8.6	A
Pulsed Drain Current <sup>a</sup>			I <sub>DM</sub>	56	
Linear Derating Factor				1.5	W/°C
Single Pulse Avalanche Energy <sup>b</sup>			E <sub>AS</sub>	760	mJ
Repetitive Avalanche Current <sup>a</sup>			I <sub>AR</sub>	14	A
Repetitive Avalanche Energy <sup>a</sup>			E <sub>AR</sub>	19	mJ
Maximum Power Dissipation	T <sub>C</sub> =	25 °C	PD	190	W
Peak Diode Recovery dV/dt <sup>c</sup>			dV/dt	3.5	V/ns
Operating Junction and Storage Temperature Range			T <sub>J</sub> , T <sub>stg</sub>	- 55 to + 150	°C
Soldering Recommendations (Peak Temperature) for 10 s				300 <sup>d</sup>	
Mounting Torque	6 20 or 1	12 aarow		10	lbf ∙ in
Mounting Torque	6-32 or M3 screw		F	1.1	N · m

Notes

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

b.  $V_{DD} = 25 \text{ V}$ , starting  $T_J = 25 \text{ °C}$ , L = 7.0 mH,  $R_G = 25 \Omega$ ,  $I_{AS} = 14 \text{ A}$  (see fig. 12). c.  $I_{SD} \leq 14 \text{ A}$ ,  $dI/dt \leq 130 \text{ A/}\mu\text{s}$ ,  $V_{DD} \leq V_{DS}$ ,  $T_J \leq 150 \text{ °C}$ . d. 1.6 mm from case.



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IRFP450LC

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Maximum Junction-to-Ambient $P_{In_{JA}}$ -         40           Case-to-Sink, Flat, Greased Surface $P_{In_{JC}}$ 0.24         -         0.65           SPECIFICATIONS T <sub>J</sub> = 25 °C, unless otherwise noted         Test conditions         Min.         TVP.         MAX.         UN           Static         Drain-Source Breakdown Voltage         V <sub>DS</sub> V <sub>OS</sub> = 0 V, I <sub>0</sub> = 250 µÅ         500         -         -         V           Qog Temperature Coefficient $\Delta V_{DS} T_J$ Reference to 25 °C, I <sub>0</sub> = 1 mÅ         -         0.59         -         V           Gate-Source Threshold Voltage         V <sub>GS</sub> = 0 V, I <sub>0</sub> = 250 µÅ         2.0         -         4.0         V           Zero Gate Voltage Drain Current         I <sub>DS</sub> V <sub>DS</sub> = 400 V, V <sub>OS</sub> = 0 V, I <sub>J</sub> = 125 °C         -         -         250         µÅ           Orain-Source On-State Resistance         P <sub>DS(M)</sub> V <sub>DS</sub> = 400 V, V <sub>OS</sub> = 0 V, I <sub>J</sub> = 84 Å <sup>b</sup> -         -         0.40 $\Omega$ Optamic         P         V <sub>DS</sub> = 400 V, V <sub>OS</sub> = 0 V, I <sub>J</sub> = 84 Å <sup>b</sup> -         -         2200         -           Orain-Source On-State Resistance         P <sub>OS(M)</sub> V <sub>DS</sub> = 10 V         I <sub>D</sub> = 84 Å <sup>b</sup> -         -         10         0.	THERMAL RESISTANCE RATI	NGS							
Case-to-Sink, Flat, Greased Surface $R_{\rm fb,C}$ $0.24$ "C/W           Maximum Junction-to-Case (Drain) $R_{\rm fb,C}$ - $0.65$ SPECIFICATIONS T <sub>J</sub> = 25 °C, unless otherwise noted           PARAMETER         SYMBOL         TEST CONDITIONS         MIN.         TYP.         MAX.         UN           Optimination of the symbol state           Optimination of the symbol state           Optimination of the symbol symbol state           Optimination of the symbol showing the symbol sym	PARAMETER	SYMBOL	TYP.		MAX.			UNIT	
Waximum Junction-to-Case (Drain) $R_{BUC}$ -       0.65         SPECIFICATIONS T <sub>J</sub> = 25 °C, unless otherwise noted         PARAMETER       SYMBOL       TEST CONDITIONS       MIN.       TYP.       MAX.       UN         Static       Drain-Source Breakdown Voltage $V_{DS}$ $V_{OS} = 0$ V, $I_D = 250 \mu A$ 500       -       -       V         Static       Vig. Temperature Coefficient $\Delta V_{DS}/T_J$ Reference to 25 °C, $I_D = 1 m A$ -       0.59       -       V/V         State-Source Threshold Voltage $V_{DS}/T_J$ Reference to 25 °C, $I_D = 1 m A$ -       0.59       -       V/V         State-Source Threshold Voltage $V_{DS}/T_J$ Reference to 25 °C, $I_D = 100$ -       -       4.00 $V_V$ State-Source Chreshold Voltage $V_{DS} = 400$ V, $V_{CS} = 0$ V.       -       -       2.00 $\rho$ <t< td=""><td>Maximum Junction-to-Ambient</td><td>R<sub>thJA</sub></td><td>-</td><td></td><td>40</td><td></td><td></td><td></td><td></td></t<>	Maximum Junction-to-Ambient	R <sub>thJA</sub>	-		40				
SPECIFICATIONS T <sub>J</sub> = 25 °C, unless otherwise noted         SPECIFICATIONS T <sub>J</sub> = 25 °C, unless otherwise noted         State         Structure Coefficient       SYMBOL       TEST CONDITIONS       MIN.       TYP.       MAX       UN         Structure Coefficient $\Delta V_{DS}/T_J$ Reference to 25 °C, lp = 1 mA       -       V/P         Structure Coefficient $\Delta V_{DS}/T_J$ Reference to 25 °C, lp = 1 mA       -       V/P         Structure Coefficient $\Delta V_{DS}/T_J$ Reference to 25 °C, lp = 1 mA       -       V/P         Structure Coefficient $\Delta V_{DS}/T_J$ Reference to 25 °C, lp = 1 mA       -       V/P         Constance       V_DS = 600 V, V_DS = 0 V       -       2       P         Max       V_DS = 500 V, lp = 84 Ab       -       -       2       P         Organ       V_DS = 0 V, lp = 14 A, V_DS = 400 V, lp = 14 A, V_DS =	Case-to-Sink, Flat, Greased Surface	R <sub>thCS</sub>	0.24		-			°C/W	
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	Maximum Junction-to-Case (Drain)	R <sub>thJC</sub>	-		0.65				
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$									
Static         Vos         V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 µA         500         -         -         V           Orain-Source Breakdown Voltage $\Delta D_O / J_J$ Reference to 25 $(r, I_D = 1 \text{ mA})$ -         0.59         -         V//2           State-Source Threshold Voltage $V_{GS} = W_{GS}$ $V_{CS} = V_{GS}$ , $I_D = 250 \mu A$ -         4.0         V//2           State-Source Leakage         Ioss $V_{GS} = 420 V$ -         -         4.0         V//2           Zero Gate Voltage Drain Current         Ioss $V_{GS} = 500 V$ , $V_{GS} = 0 V$ -         -         250 $\mu$ //2           Orain-Source On-State Resistance $R_{DS(m)}$ $V_{GS} = 10 V$ $I_D = 8.4 A^D$ -         -         0.40 $\Omega$ Optimatic         Duptor Capacitance $C_{GS}$ $V_{GS} = 0 V$ , $V_{CS} = 25 V$ , $f = 1.0 \text{ MHz}$ , see fig. 5         -         2200         -         -         -         320         -         -         74         -         -         320         -         -         74         -         -         -         320         -         -         -         74         -         -         -         -         -         -	SPECIFICATIONS T <sub>J</sub> = 25 °C, u	nless otherwi	se noted						
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	PARAMETER	SYMBOL	TEST	CONDIT	IONS	MIN.	TYP.	MAX.	UNIT
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Static								
Sate-Source Threshold Voltage $V_{GS(th)}$ $V_{DS} = V_{GS}$ , $I_D = 250 \ \mu$ A $2.0$ $ 4.0$ $V$ Sate-Source Leakage $I_{GSS}$ $V_{GS} = \pm 20 \ V$ $ \pm \pm 100$ $nA$ Zero Gate Voltage Drain Current $I_{DSS}$ $V_{CS} = 500 \ V, V_{GS} = 0 \ V, T_J = 125 \ C$ $  2.50$ $\mu^{\mu}$ Drain-Source On-State Resistance $R_{DS(on)}$ $V_{GS} = 10 \ V$ $I_D = 8.4 \ A^{D}$ $  0.40 \ \Omega_{O}$ $\Omega_{S}$ Opmanic $V_{DS} = 500 \ V, V_{GS} = 0 \ V, \ V_{DS} = 50 \ V, \ I_D = 8.4 \ A^{D}$ $ 0.40 \ \Omega_{O}$ $\Omega_{S}$ Dutput Capacitance $C_{ciss}$ $V_{OS} = 50 \ V, \ I_D = 8.4 \ A^{D}$ $ 2.00 \   3.20 \   2.200 \   2.200 \   2.200 \   2.200 \   2.200 \   2.200 \   2.200 \   2.200 \   2.200 \   2.200 \   2.200 \   2.200 \   2.200 \ -$	Drain-Source Breakdown Voltage	V <sub>DS</sub>	$V_{GS} = 0$	V, I <sub>D</sub> = 2	50 μA	500	-	-	V
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	V <sub>DS</sub> Temperature Coefficient	$\Delta V_{DS}/T_{J}$	Reference to 25 °C, $I_D = 1 \text{ mA}$		-	0.59	-	V/°C	
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Gate-Source Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V	<sub>GS</sub> , I <sub>D</sub> = 2	250 μA	2.0	-	4.0	V
Zero Gate Voltage Drain Current         I         <	Gate-Source Leakage	I <sub>GSS</sub>	V <sub>G</sub>	<sub>S</sub> = ± 20	V	-	-	± 100	nA
Vos       400 V, Vos       0 V, Vos       0 V, Vos       -       -       250         Drain-Source On-State Resistance       R <sub>DS(on)</sub> V <sub>GS</sub> = 10 V       I <sub>D</sub> = 8.4 A <sup>b</sup> -       -       0.40 $\Omega$ Forward Transconductance       grs       V <sub>DS</sub> = 50 V, I <sub>D</sub> = 8.4 A <sup>b</sup> 8.7       -       -       S         Dynamic       nput Capacitance       C <sub>IBS</sub> V <sub>OS</sub> = 0 V, V <sub>OS</sub> = 25 V, f = 1.0 MHz, see fig. 5       -       2200       -         Reverse Transfer Capacitance       C <sub>rss</sub> V <sub>OS</sub> = 25 V, f = 1.0 MHz, see fig. 5       -       28       -         Total Gate Charge       Qg       V <sub>OS</sub> = 10 V       I <sub>D</sub> = 14 A, V <sub>DS</sub> = 400 V, see fig. 6 and 13 <sup>b</sup> -       -       19       nc         Gate-Source Charge       Qgd       V <sub>OS</sub> = 10 V       I <sub>D</sub> = 14 A, V <sub>DS</sub> = 400 V, see fig. 6 and 13 <sup>b</sup> -       -       14       -       -       -       30       -       -       14       -       -       30       -       -       30       -       -       14       -       -       30       -       -       30       -       -       30       -       -       14       -       -       30       -       -       30       -			$V_{DS} = 5$	00 V, V <sub>GS</sub>	<sub>s</sub> = 0 V	-	-	25	•
orward Transconductance $g_{fs}$ $V_{DS} = 50 \text{ V}, \text{ I}_D = 8.4 \text{ Ab}$ $8.7$ $  S$ Dynamic         mut Capacitance $C_{0ss}$ $V_{GS} = 0 \text{ V}, V_{DS} = 25 \text{ V}, f = 1.0 \text{ MHz}, \text{ see fig. 5}$ $ 320$ $  320$ $  320$ $  320$ $  320$ $  320$ $  320$ $  320$ $  320$ $  320$ $  320$ $  320$ $  320$ $  74$ $  74$ $  74$ $  74$ $  74$ $  74$ $  74$ $  74$ $  74$ $  74$ $ 74$ $ 74$ $ 74$ $ 74$	Zero Gate voltage Drain Current	IDSS	V <sub>DS</sub> = 400 V, V	/ <sub>GS</sub> = 0 V	, T <sub>J</sub> = 125 °C	-	-	250	μA
DynamicInput CapacitanceCiss $V_{GS} = 0 V$ , $V_{DS} = 25 V$ , f = 1.0 MHz, see fig. 5-2200-Dutput CapacitanceCoss $V_{GS} = 0 V$ , $V_{DS} = 25 V$ , f = 1.0 MHz, see fig. 5-2200-Reverse Transfer CapacitanceCrss $\Gamma = 1.0 \text{ MHz}$ , see fig. 5-2200-Total Gate ChargeQgQg $V_{GS} = 10 \text{ V}$ Ip = 14 A, $V_{DS} = 400 \text{ V}$ , see fig. 6 and 13b74Gate-Drain ChargeQgd $V_{GS} = 10 \text{ V}$ Ip = 14 A, $V_{DS} = 400 \text{ V}$ , see fig. 6 and 13b74Sate-Drain ChargeQgd $V_{GS} = 10 \text{ V}$ Ip = 14 A, $V_{DS} = 400 \text{ V}$ , see fig. 6 and 13b74Sate-Drain ChargeQgd $V_{GS} = 10 \text{ V}$ Ip = 14 A, $V_{DS} = 400 \text{ V}$ , see fig. 6 and 13b74Sate-Drain ChargeQgd $V_{GS} = 10 \text{ V}$ Ip = 14 A, $V_{DS} = 400 \text{ V}$ , see fig. 10b14-Turn-Of Delay Timet_d(off) $V_{GS} = 250 \text{ V}$ , Ip = 14 A, $R_G = 6.2 \Omega$ , $R_D = 17 \Omega$ , see fig. 10b-14-Turn-Off Delay Timet_rEBetween lead, form package and center of die contact-5.0-Internal Source InductanceL_SMOSFET symbol showing the integral reverse p - n junction diode14-Palsed Diode Forward CurrentaIsMOSFET symbol showing the integral reverse p - n junction diode14-	Drain-Source On-State Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V	ا	<sub>D</sub> = 8.4 A <sup>b</sup>	-	-	0.40	Ω
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Forward Transconductance	9 <sub>fs</sub>	V <sub>DS</sub> = 5	0 V, I <sub>D</sub> =	8.4 A <sup>b</sup>	8.7	-	-	S
Upper Cuput CapacitanceCossVos = 25 V, f = 1.0 MHz, see fig. 5-320-Reverse Transfer CapacitanceCrss $V_{DS} = 25 V,$ f = 1.0 MHz, see fig. 5-320-Total Gate ChargeQgQg $I_D = 14 A, V_{DS} = 400 V,$ see fig. 6 and 13b74Gate-Source ChargeQgd $V_{GS} = 10 V$ $I_D = 14 A, V_{DS} = 400 V,$ see fig. 6 and 13b74Gate-Drain ChargeQgd $V_{GS} = 10 V$ $I_D = 14 A, V_{DS} = 400 V,$ see fig. 6 and 13b14-Turn-On Delay Time $t_{d(on)}$ rurn-Off Delay Time $t_{r}$ $V_{CS} = 10 V$ $I_D = 14 A, V_{DS} = 400 V,$ see fig. 6 and 13b14-Rurn-Off Delay Time $t_{d(off)}$ $V_{CS} = 250 V, I_D = 14 A,$ $R_G = 6.2 \Omega, R_D = 17 \Omega,$ see fig. 10b-14Turn-Off Delay Time $t_{d(off)}$ Between lead, 6 mm (0.25") from package and center of die contact-13Turn-Off Delay Time $L_S$ MOSFET symbol showing the integral reverse $p - n$ junction diode-14Turn-Off Delay Time $I_S$ MOSFET symbol showing the integral reverse $p - n$ junction diode14-Pulsed Diode Forward CurrentaIsMOSFET symbol showing the integral reverse $p - n$ junction diode14-Sody Diode Reverse Recovery Time $T_r$ $T_J = 25 °C, I_F = 14 A, dI/dt = 100 A/µs^b$ -5.07 <td>Dynamic</td> <td></td> <td>•</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	Dynamic		•						
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Input Capacitance	C <sub>iss</sub>	V			-	2200	-	
Reverse Transfer Capacitance $C_{rss}$ $f = 1.0 \text{ MHz}$ , see fig. 5 $ 28$ $-$ Total Gate Charge $Q_g$ Gate-Source Charge $Q_{gd}$ Gate-Drain Charge $Q_{gd}$ Gate-Drain Charge $Q_{gd}$ Turn-On Delay Time $t_{d(on)}$ Rise Time $t_r$ Pun-Off Delay Time $t_{d(off)}$ Rise Time $t_r$ Nurn-Off Delay Time $t_{d(off)}$ Fall Time $t_r$ Nurn-Off Delay Time $t_{d(off)}$ Reg = 6.2 $\Omega$ , $R_D = 17 \Omega$ , see fig. 10 <sup>b</sup> Fall Time $t_r$ Nurn-Off Delay Time $t_{d(off)}$ Reg = 0.2 $\Omega$ , $R_D = 17 \Omega$ , see fig. 10 <sup>b</sup> Fall Time $t_r$ Nurn-Off Delay Time $t_{d(off)}$ Total Gate CharacteristicsDrain-Source Body Diode CharacteristicsContinuous Source-Drain Diode Current $I_S$ MOSFET symbol showing the integral reverse $p - n$ junction diodePulsed Diode Forward Currenta $I_{SM}$ Pulsed Diode Reverse Recovery Time $t_r$ $T_J = 25  ^{\circ}$ , $I_F = 14 A$ , $dI/dt = 100 A/\mu s^b$ $                                 -$ </td <td>Output Capacitance</td> <td>C<sub>oss</sub></td> <td colspan="2"><math>V_{DS} = 25 V</math>,</td> <td>-</td> <td>320</td> <td>-</td> <td>pF</td>	Output Capacitance	C <sub>oss</sub>	$V_{DS} = 25 V$ ,		-	320	-	pF	
Gate-Source Charge $Q_{gs}$ $V_{GS} = 10 V$ $I_D = 14 \text{ A}, V_{DS} = 400 V,$ see fig. 6 and 13b19nCGate-Drain Charge $Q_{gd}$ $Q_{gd}$ $V_{GS} = 10 V$ $I_D = 14 \text{ A}, V_{DS} = 400 V,$ see fig. 6 and 13b14Gate-Drain Charge $Q_{gd}$ $T_d(on)$ $V_{GS} = 10 V$ $V_{GS} = 10 V$ $V_{SD} = 600 V, I_D = 14 A,$ $V_{DD} = 250 V, I_D = 14 A,$ $R_G = 6.2 \Omega, R_D = 17 \Omega, see fig. 10b-144914141414$	Reverse Transfer Capacitance		f = 1.0	MHz, see	e fig. 5	-	28	-	
Calle-Source ChargeCdgsVGS = 10 Vsee fig. 6 and 13b1316Gate-Drain Charge $Q_{gd}$ Turn-On Delay Time $t_{d(on)}$ Rise Time $t_r$ Turn-Off Delay Time $t_d(off)$ Fall Time $t_r$ Turn-Off Delay Time $t_{d(off)}$ Fall Time $t_r$ Nermal Drain Inductance $L_D$ Between lead, 6 mm (0.25") from package and center of die contactInternal Source Inductance $L_S$ Drain-Source Body Diode CharacteristicsContinuous Source-Drain Diode Current $I_S$ Nusse Provese p - n junction diodePulsed Diode Forward Currenta $I_{SM}$ Body Diode Reverse Recovery Time $t_{rr}$ Rody Diode Reverse Recovery Charge $Q_{rr}$ Turn-Source Recovery Charge $Q_{rr}$	Total Gate Charge	Qg				-	-	74	
Gate-Drain Charge $Q_{gd}$ $Ion ng r o m r r r d_{d(on)}$ $  35$ Turn-On Delay Time $t_{d(on)}$ Rise Time $t_r$ Turn-Off Delay Time $t_{d(off)}$ Fall Time $t_r$ $r r r r r r r r r r r r r r r r r r r $	Gate-Source Charge	Q <sub>gs</sub>	V <sub>GS</sub> = 10 V			-	-	19	nC
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Gate-Drain Charge			300 1	ilg. 0 and 10	-	-	35	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Turn-On Delay Time	t <sub>d(on)</sub>				-	14	-	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Rise Time		- 	50 V I	- 14 A	-	49	-	
Internal Drain InductanceLDBetween lead, 6 mm (0.25") from package and center of die contact-5.0Internal Source InductanceLSSetween lead, 	Turn-Off Delay Time	t <sub>d(off)</sub>	$V_{DD} = 2$ $R_G = 6.2 \Omega, R$	$_{\rm D} = 17  \Omega_{\rm s}$	, see fig. 10 <sup>b</sup>	-	30	-	ns
Internal Drain InductanceLD6 mm (0.25") from package and center of die contact-5.0nInternal Source InductanceLS $L_S$ 6 mm (0.25") from package and center of 	Fall Time	t <sub>f</sub>				-	30	-	
Internal Source InductanceLSMOSFET symbol showing the integral reverse-13-Drain-Source Body Diode CharacteristicsContinuous Source-Drain Diode CurrentISMOSFET symbol showing the integral reverse14APulsed Diode Forward CurrentaISMISMT_J = 25 °C, IS = 14 A, VGS = 0 Vb1.4VBody Diode Reverse Recovery TimetrrtrrT_J = 25 °C, IF = 14 A, dI/dt = 100 A/µsb-580870nsBody Diode Reverse Recovery ChargeQrrT_J = 25 °C, IF = 14 A, dI/dt = 100 A/µsb-5.17.7µC	Internal Drain Inductance	L <sub>D</sub>	6 mm (0.25") fro			-	5.0	-	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Internal Source Inductance	L <sub>S</sub>		nter of		-	13	-	nΗ
Continuous Source-Drain Diode CurrentIs Is showing the integral reverse p - n junction diodeshowing the integral reverse p - n junction diode14 14APulsed Diode Forward CurrentaIsmIsmT_J = 25 °C, Is = 14 A, V_Gs = 0 Vb561.4VBody Diode VoltageV_{SDT_J = 25 °C, Is = 14 A, V_Gs = 0 Vb1.4VVBody Diode Reverse Recovery Time $t_{rr}$ T_J = 25 °C, IF = 14 A, dI/dt = 100 A/µsb-580870nsBody Diode Reverse Recovery Charge $Q_{rr}$ 5.17.7µC	Drain-Source Body Diode Characteristic	cs							
Pulsed Diode Forward CurrentaI I SMIntegral reverse p - n junction diode56Body Diode VoltageV SDT T 2 = 25 °C, I S = 14 A, V GS = 0 Vb1.4VBody Diode Reverse Recovery Timet rrt T J = 25 °C, I F = 14 A, dI/dt = 100 A/µsb-580870nsBody Diode Reverse Recovery ChargeQ rrT J = 25 °C, I F = 14 A, dI/dt = 100 A/µsb-5.17.7µC	Continuous Source-Drain Diode Current	۱ <sub>S</sub>	showing the	lbol		-	-	14	Δ
Body Diode Reverse Recovery Time $t_{rr}$ $T_J = 25 \text{ °C}, I_F = 14 \text{ A}, dI/dt = 100 \text{ A/}\mu\text{s}^b$ -580870nsBody Diode Reverse Recovery Charge $Q_{rr}$ $T_J = 25 \text{ °C}, I_F = 14 \text{ A}, dI/dt = 100 \text{ A/}\mu\text{s}^b$ -5.17.7 $\mu\text{C}$	Pulsed Diode Forward Current <sup>a</sup>	I <sub>SM</sub>	p - n junction die			-	-	56	
$T_{\rm J} = 25 \text{ °C}, I_{\rm F} = 14 \text{ A}, dI/dt = 100 \text{ A}/\mu \text{s}^{\rm b}$ $- 5.1  7.7  \mu \text{C}$	Body Diode Voltage	V <sub>SD</sub>	T <sub>J</sub> = 25 °C, I	<sub>S</sub> = 14 A,	$V_{GS} = 0 \ V^{b}$	-	-	1.4	V
Body Diode Reverse Recovery Charge Q <sub>rr</sub> - 5.1 7.7 μC	Body Diode Reverse Recovery Time	t <sub>rr</sub>	T <sub>1</sub> = 25 °C I <sub>2</sub> -	14 A di/	dt = 100 ۵/۱۱۹ <sup>b</sup>	-	580	870	ns
Forward Turn-On Time ton Intrinsic turn-on time is negligible (turn-on is dominated by L <sub>S</sub> and L <sub>D</sub> )	Body Diode Reverse Recovery Charge	Q <sub>rr</sub>	ij - 20 0, if =	, ul/	αι – 100 Αγμο	-	5.1	7.7	μC
	Forward Turn-On Time	t <sub>on</sub>	Intrinsic turn	on time	is negligible (turn	I-on is doi	minated b	y L <sub>S</sub> and	L <sub>D</sub> )

#### Notes

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

b. Pulse width  $\leq$  300 µs; duty cycle  $\leq$  2 %



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## TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

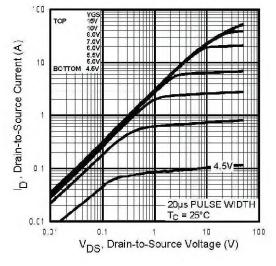


Fig. 1 - Typical Output Characteristics, T<sub>C</sub> = 25 °C

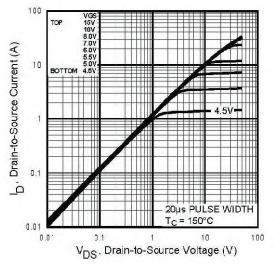


Fig. 2 - Typical Output Characteristics,  $T_C = 150$  °C

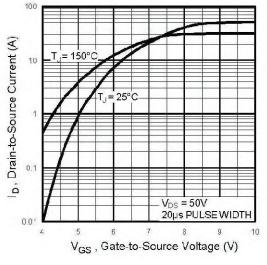


Fig. 3 - Typical Transfer Characteristics

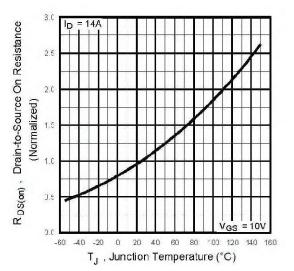


Fig. 4 - Normalized On-Resistance vs. Temperature



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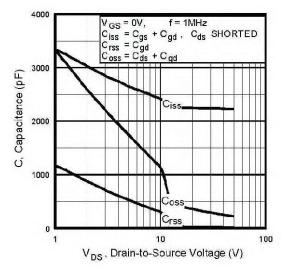


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

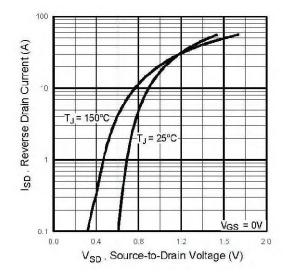


Fig. 7 - Typical Source-Drain Diode Forward Voltage

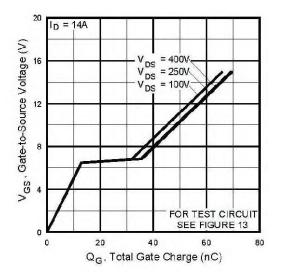


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

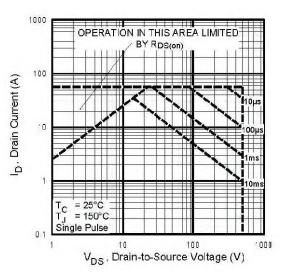


Fig. 8 - Maximum Safe Operating Area



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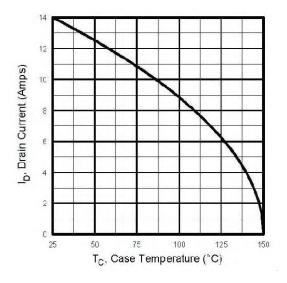


Fig. 9 - Maximum Drain Current vs. Case Temperature

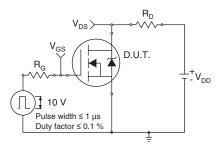


Fig. 10a - Switching Time Test Circuit

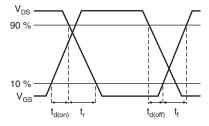


Fig. 10b - Switching Time Waveforms

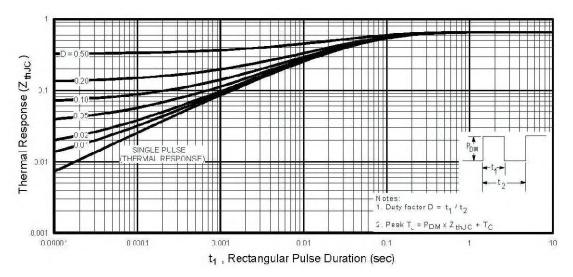


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case



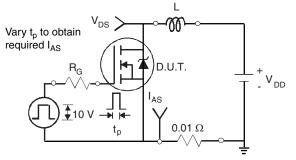


Fig. 12a - Unclamped Inductive Test Circuit

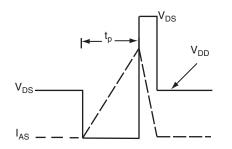


Fig. 12b - Unclamped Inductive Waveforms

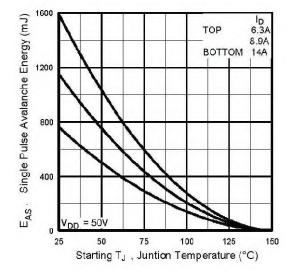
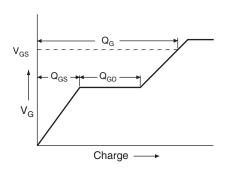
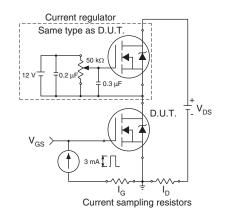


Fig. 12c - Maximum Avalanche Energy vs. Drain Current





S22-0058-Rev. B, 31-Jan-2022





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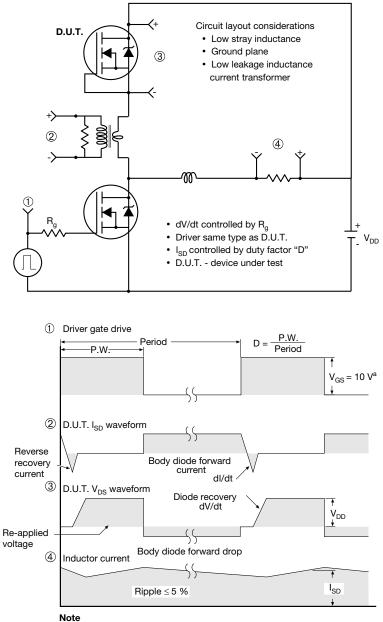
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#### Peak Diode Recovery dV/dt Test Circuit



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

Fig. 14 - For N-Channel

Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see <a href="http://www.vishay.com/ppg?91231">www.vishay.com/ppg?91231</a>.





**TO-247AC (High Voltage)** 

### VERSION 1: FACILITY CODE = 9





(	

	М	ILLIMETERS		
DIM.	MIN.	NOM.	MAX.	NOTES
А	4.83	5.02	5.21	
A1	2.29	2.41	2.55	
A2	1.17	1.27	1.37	
b	1.12	1.20	1.33	
b1	1.12	1.20	1.28	
b2	1.91	2.00	2.39	6
b3	1.91	2.00	2.34	
b4	2.87	3.00	3.22	6, 8
b5	2.87	3.00	3.18	
С	0.40	0.50	0.60	6
c1	0.40	0.50	0.56	
D	20.40	20.55	20.70	4

		MILLIMETERS	S	
DIM.	MIN.	NOM.	MAX.	NOTES
D1	16.46	16.76	17.06	5
D2	0.56	0.66	0.76	
E	15.50	15.70	15.87	4
E1	13.46	14.02	14.16	5
E2	4.52	4.91	5.49	3
е		5.46 BSC		
L	14.90	15.15	15.40	
L1	3.96	4.06	4.16	6
ØР	3.56	3.61	3.65	7
Ø P1	7.19 ref.			
Q	5.31	5.50	5.69	
S		5.51 BSC		

#### Notes

- <sup>(1)</sup> Package reference: JEDEC<sup>®</sup> TO247, variation AC
- (2) All dimensions are in mm
- <sup>(3)</sup> Slot required, notch may be rounded
- <sup>(4)</sup> Dimension D and E do not include mold flash. Mold flash shall not exceed 0.127 mm per side. These dimensions are measured at the outermost extremes of the plastic body
- <sup>(5)</sup> Thermal pad contour optional with dimensions D1 and E1
- (6) Lead finish uncontrolled in L1
- (7) 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
- (8) Dimension b2 and b4 does not include dambar protrusion. Allowable dambar protrusion shall be 0.1 mm total in excess of b2 and b4 dimension at maximum material condition



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### VERSION 2: FACILITY CODE = Y



	MILLIN	IETERS	
DIM.	MIN.	MAX.	NOTES
A	4.58	5.31	
A1	2.21	2.59	
A2	1.17	2.49	
b	0.99	1.40	
b1	0.99	1.35	
b2	1.53	2.39	
b3	1.65	2.37	
b4	2.42	3.43	
b5	2.59	3.38	
С	0.38	0.86	
c1	0.38	0.76	
D	19.71	20.82	
D1	13.08	-	

	MILLIN	IETERS	
DIM.	MIN.	MAX.	NOTES
D2	0.51	1.30	
E	15.29	15.87	
E1	13.72	-	
е	5.46	BSC	
Øk	0.2	254	
L	14.20	16.25	
L1	3.71	4.29	
ØР	3.51	3.66	
Ø P1	-	7.39	
Q	5.31	5.69	
R	4.52	5.49	
S	5.51	BSC	

#### Notes

- <sup>(1)</sup> Dimensioning and tolerancing per ASME Y14.5M-1994
- <sup>(2)</sup> 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
- <sup>(4)</sup> Thermal pad contour optional with dimensions D1 and E1
- <sup>(5)</sup> Lead finish uncontrolled in L1
- <sup>(6)</sup> 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")
- <sup>(7)</sup> Outline conforms to JEDEC outline TO-247 with exception of dimension c

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**Vishay Siliconix** 

### VERSION 3: FACILITY CODE = N



	MILLIMETERS			MILLIMETERS	
DIM.	MIN.	MAX.	DIM.	MIN.	MAX
А	4.65	5.31	D2	0.51	1.35
A1	2.21	2.59	E	15.29	15.87
A2	1.17	1.37	E1	13.46	-
b	0.99	1.40	e	5.46	BSC
b1	0.99	1.35	k	0.:	254
b2	1.65	2.39	L	14.20	16.10
b3	1.65	2.34	L1	3.71	4.29
b4	2.59	3.43	N	7.62	BSC
b5	2.59	3.38	Р	3.56	3.66
С	0.38	0.89	P1	-	7.39
c1	0.38	0.84	Q	5.31	5.69
D	19.71	20.70	R	4.52	5.49
D1	13.08	-	S	5.51	BSC

Notes

<sup>(1)</sup> Dimensioning and tolerancing per ASME Y14.5M-1994

<sup>(2)</sup> 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

<sup>(4)</sup> Thermal pad contour optional with dimensions D1 and E1

<sup>(5)</sup> Lead finish uncontrolled in L1

<sup>(6)</sup> 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")



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