


## IRF540, IRF541, IRF542, IRF543 Devices

### Absolute Maximum Ratings

Parameter	IRF540	IRF541	IRF542	IRF543	Units
$V_{DS}$ Drain - Source Voltage ①	100	60	100	60	V
$V_{DGR}$ Drain - Gate Voltage ( $I_{GSS} = 1 \text{ M}\Omega$ ) ①	100	60	100	60	V
$I_D @ T_C = 25^\circ\text{C}$ Continuous Drain Current	27	27	24	24	A
$I_D @ T_C = 100^\circ\text{C}$ Continuous Drain Current	17	17	15	15	A
$I_{DM}$ Pulsed Drain Current ③	108	108	96	96	A
$V_{GS}$ Gate - Source Voltage	$\pm 20$				V
$P_D @ T_C = 25^\circ\text{C}$ Max. Power Dissipation	125 (See Fig. 14)				W
Linear Derating Factor	1.0 (See Fig. 14)				W/K
$I_{LM}$ Inductive Current, Clamped	(See Fig. 15 and 16) $L = 100\mu\text{H}$				A
$T_J$ Operating Junction and Storage Temperature Range	-55 to 150				$^\circ\text{C}$
$T_{stg}$ Lead Temperature	300 (0.063 in. (1.6mm) from case for 10s)				$^\circ\text{C}$

### Electrical Characteristics @ $T_C = 25^\circ\text{C}$ (Unless Otherwise Specified)

Parameter	Type	Min.	Typ.	Max.	Units	Test Conditions	
$BV_{DSS}$ Drain - Source Breakdown Voltage	IRF540 IRF542	100	-	-	V	$V_{GS} = 0\text{V}$	
	IRF541 IRF543	60	-	-	V	$I_D = 250\mu\text{A}$	
$V_{GS(th)}$ Gate Threshold Voltage	ALL	2.0	-	4.0	V	$V_{DS} = V_{GS}$ , $I_D = 250\mu\text{A}$	
$I_{GSS}$ Gate-Source Leakage Forward	ALL	-	-	500	nA	$V_{GS} = 20\text{V}$	
$I_{GSS}$ Gate-Source Leakage Reverse	ALL	-	-	-500	nA	$V_{GS} = -20\text{V}$	
$I_{DSS}$ Zero Gate Voltage Drain Current	ALL	-	-	250	$\mu\text{A}$	$V_{DS} = \text{Max. Rating}$ , $V_{GS} = 0\text{V}$	
		-	-	1000	$\mu\text{A}$	$V_{DS} = \text{Max. Rating} \times 0.8$ , $V_{GS} = 0\text{V}$ , $T_C = 125^\circ\text{C}$	
$I_{D(on)}$ On-State Drain Current ②	IRF540 IRF541	27	-	-	A	$V_{DS} > I_{D(on)} \times R_{DS(on) \text{ max.}}$ , $V_{GS} = 10\text{V}$	
	IRF542 IRF543	24	-	-	A		
$R_{DS(on)}$ Static Drain-Source On-State Resistance ②	IRF540 IRF541	-	0.07	0.085	$\Omega$	$V_{GS} = 10\text{V}$ , $I_D = 15\text{A}$	
	IRF542 IRF543	-	0.09	0.11	$\Omega$		
$g_{fs}$ Forward Transconductance ②	ALL	6.0	10	-	S (d)	$V_{DS} > I_{D(on)} \times R_{DS(on) \text{ max.}}$ , $I_D = 15\text{A}$	
$C_{iss}$ Input Capacitance	ALL	-	1275	1600	pF	$V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1.0 \text{ MHz}$	
$C_{oss}$ Output Capacitance	ALL	-	550	800	pF	See Fig. 10	
$C_{rss}$ Reverse Transfer Capacitance	ALL	-	160	300	pF		
$t_{d(on)}$ Turn-On Delay Time	ALL	-	16	30	ns	$V_{DD} = 30\text{V}$ , $I_D = 15\text{A}$ , $Z_{\theta} = 4.7\Omega$	
$t_r$ Rise Time	ALL	-	27	60	ns	See Fig. 17	
$t_{d(off)}$ Turn-Off Delay Time	ALL	-	38	80	ns	(MOSFET switching times are essentially independent of operating temperature.)	
$t_f$ Fall Time	ALL	-	14	30	ns		
$Q_g$ Total Gate Charge (Gate-Source Plus Gate-Drain)	ALL	-	38	60	nC	$V_{GS} = 10\text{V}$ , $I_D = 34\text{A}$ , $V_{DS} = 0.8 \text{ Max. Rating}$ . See Fig. 18 for test circuit. (Gate charge is essentially independent of operating temperature.)	
$Q_{gs}$ Gate-Source Charge	ALL	-	17	-	nC		
$Q_{gd}$ Gate-Drain ("Miller") Charge	ALL	-	21	-	nC		
$L_D$ Internal Drain Inductance	ALL	-	3.5	-	nH	Measured from the contact screw on tab to center of die.	Modified MOSFET symbol showing the internal device inductances. 
		-	4.5	-	nH	Measured from the drain lead, 6mm (0.25 in.) from package to center of die.	
$L_S$ Internal Source Inductance	ALL	-	7.5	-	nH	Measured from the source lead, 6mm (0.25 in.) from package to source bonding pad.	

### Thermal Resistance

$R_{thJC}$ Junction-to-Case	ALL	-	-	1.0	K/W	
$R_{thCS}$ Case-to-Sink	ALL	-	1.0	-	K/W	Mounting surface flat, smooth, and greased.
$R_{thJA}$ Junction-to-Ambient	ALL	-	-	80	K/W	Free Air Operation