Advanced Power MOSFET

IRF540A

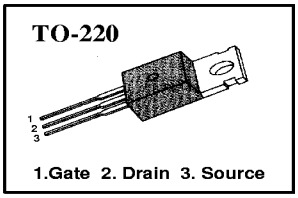
FEATURES

- Avalanche Rugged Technology
- Rugged Gate Oxide Technology
- Lower Input Capacitance
- Improved Gate Charge
- Extended Safe Operating Area
- 175℃ Operating Temperature
- Lower Leakage Current : 10 μA (Max.) @ V_{DS} = 100V
- Lower $R_{DS(ON)}$: 0.041 Ω(Typ.)

BV_{DSS} = 100 V

$R_{DS(on)}$ = 0.052Ω

I_D = 28 A



1.Gate 2. Drain 3. Source

Absolute Maximum Ratings

Symbol	Characteristic	Value	Units
V_{DSS}	Drain-to-Source Voltage	100	V
I_D	Continuous Drain Current (T_C=25℃)	28	A
	Continuous Drain Current (T_C=100℃)	19.8	
I_{DM}	Drain Current-Pulsed ①	110	A
V_{GS}	Gate-to-Source Voltage	±20	V
E_{AS}	Single Pulsed Avalanche Energy ②	523	mJ
I_{AR}	Avalanche Current ①	28	A
E_{AR}	Repetitive Avalanche Energy ①	10.7	mJ
dv/dt	Peak Diode Recovery dv/dt ③	6.5	V/ns
P_D	Total Power Dissipation (T_C=25℃)	107	W
	Linear Derating Factor	0.71	W/℃
T_J , T_{STG}	Operating Junction and Storage Temperature Range	- 55 to +175	℃
T_L	Maximum Lead Temp. for Soldering Purposes, 1/8" from case for 5-seconds	300	

Thermal Resistance

Symbol	Characteristic	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	--	1.4	℃/W
$R_{\theta CS}$	Case-to-Sink	0.5	--	
$R_{\theta JA}$	Junction-to-Ambient	--	62.5	

Rev. B

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Electrical Characteristics (T_C=25℃ unless otherwise specified)

Symbol	Characteristic	Min.	Typ.	Max.	Units	Test Condition
BV_{DSS}	Drain-Source Breakdown Voltage	100	--	--	V	V_{GS}=0V, I_D=250 μA
$\Delta BV/\Delta T_J$	Breakdown Voltage Temp. Coeff.	--	0.11	--	V ℃	I_D=250 μA ***See Fig 7***
$V_{GS(th)}$	Gate Threshold Voltage	2.0	--	4.0	V	V_{DS}=5V, I_D=250μA
I_{GSS}	Gate-Source Leakage , Forward	--	--	100	nA	V_{GS}=20V
	Gate-Source Leakage , Reverse	--	--	-100		V_{GS}=-20V
I_{DSS}	Drain-to-Source Leakage Current	--	--	10	μA	V_{DS}=100V
		--	--	100		V_{DS}=80V, T_C=150℃
$R_{DS(on)}$	Static Drain-Source On-State Resistance	--	--	0.052	Ω	V_{GS}=10V, I_D=14A ④
g_{fs}	Forward Transconductance	--	22.56	--	Ω	V_{DS}=40V, I_D=14A ④
C_{iss}	Input Capacitance	--	1320	1710	pF	V_{GS}=0V, V_{DS}=25V, f =1MHz ***See Fig 5***
C_{oss}	Output Capacitance	--	325	380		
C_{rss}	Reverse Transfer Capacitance	--	148	170		
$t_{d(on)}$	Turn-On Delay Time	--	18	50	ns	V_{DD}=50V, I_D=28A, R_G=9.1Ω ***See Fig 13*** ④⑤
t_r	Rise Time	--	18	50		
$t_{d(off)}$	Turn-Off Delay Time	--	90	180		
t_f	Fall Time	--	56	120		
Q_g	Total Gate Charge	--	60	78	nC	V_{DS}=80V, V_{GS}=10V, I_D=28A ***See Fig 6 & Fig 12*** ④⑤
Q_{gs}	Gate-Source Charge	--	10.8	--		
Q_{gd}	Gate-Drain(“Miller”) Charge	--	27.9	--		

Source-Drain Diode Ratings and Characteristics

Symbol	Characteristic	Min.	Typ.	Max.	Units	Test Condition
I_S	Continuous Source Current	--	--	28	A	Integral reverse pn-diode in the MOSFET
I_{SM}	Pulsed-Source Current ①	--	--	110		
V_{SD}	Diode Forward Voltage ④	--	--	1.5	V	T_J=25℃, I_S=28A, V_{GS}=0V
t_{rr}	Reverse Recovery Time	--	132	--	ns	T_J=25℃, I_F=28A
Q_{rr}	Reverse Recovery Charge	--	0.63	--	μC	di_F/dt=100A/μs ④

Notes ;

① Repetitive Rating : Pulse Width Limited by Maximum Junction Temperature
② L=1mH, I_{AS}=28A, V_{DD}=25V, R_G=27 Ω, Starting T_J=25 °C
③ I_{SD} ≤ 28A, di/dt ≤ 400A/μs, V_{DD}≤ BV_{DSS} , Starting T_J=25 °C
④ Pulse Test : Pulse Width = 250 μs, Duty Cycle ≤2%
⑤ Essentially Independent of Operating Temperature

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Fig 1. Output Characteristics

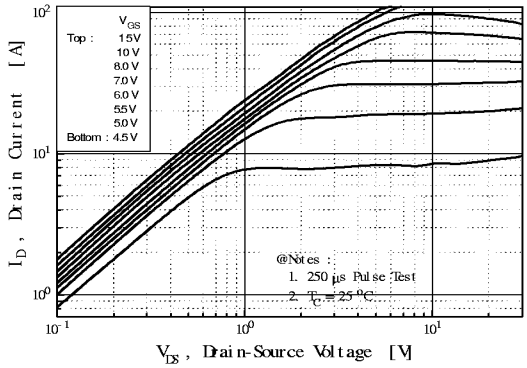

Fig 2. Transfer Characteristics

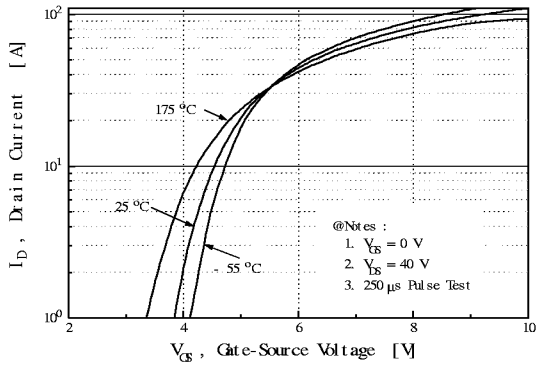

Fig 3. On-Resistance vs. Drain Current

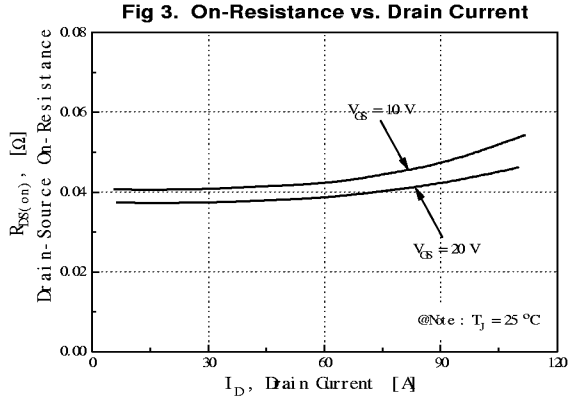

Fig 4. Source-Drain Diode Forward Voltage

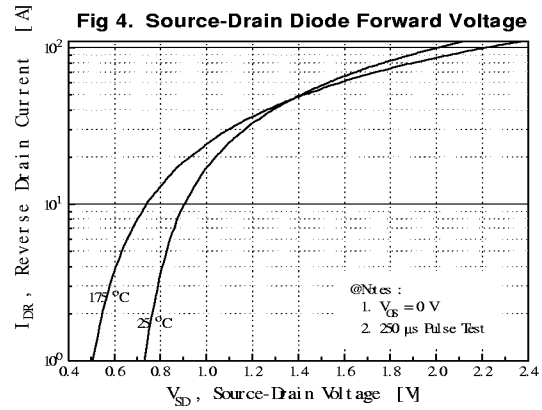

Fig 5. Capacitance vs. Drain-Source Voltage

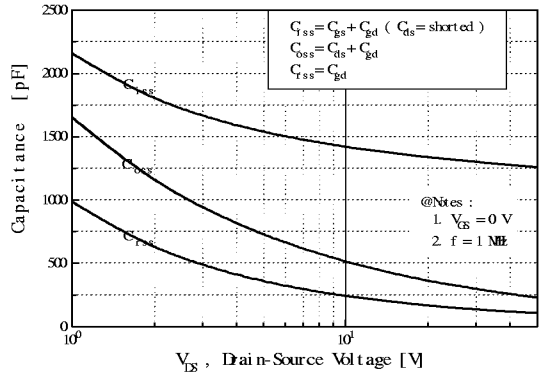

Fig 6. Gate Charge vs. Gate-Source Voltage

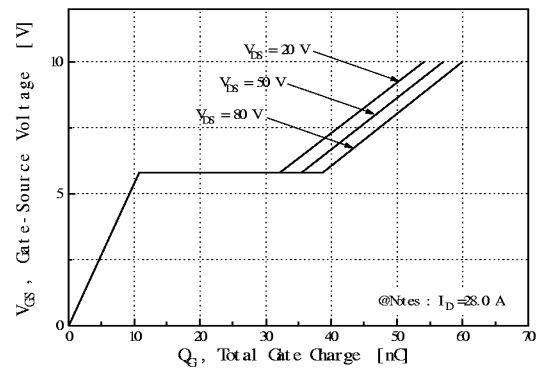

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Fig 7. Breakdown Voltage vs. Temperature

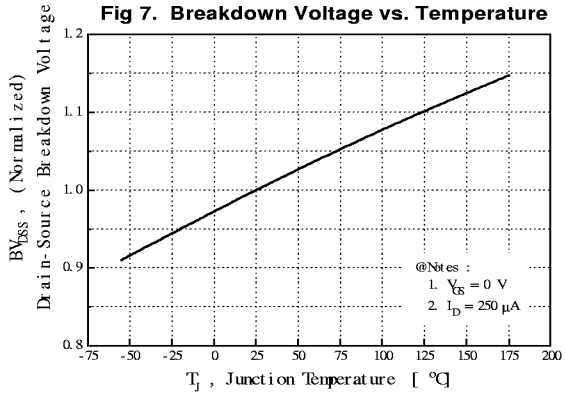

Fig 8. On-Resistance vs. Temperature

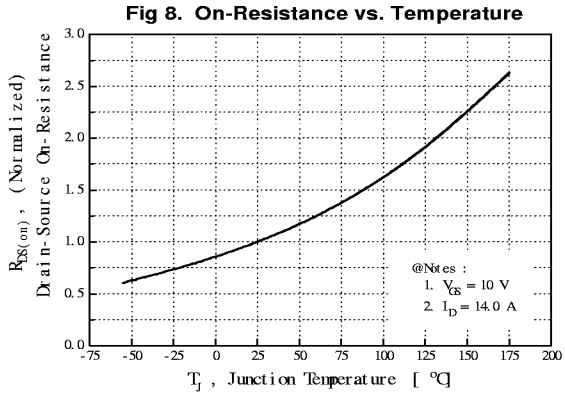

Fig 9. Max. Safe Operating Area

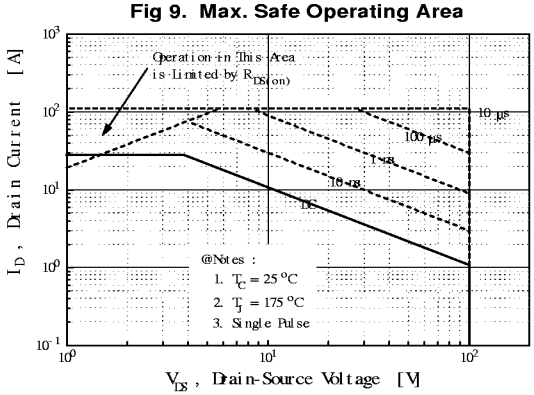

Fig 10. Max. Drain Current vs. Case Temperature

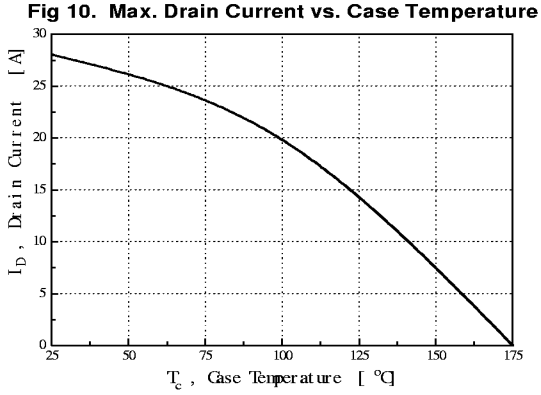

Fig 11. Thermal Response

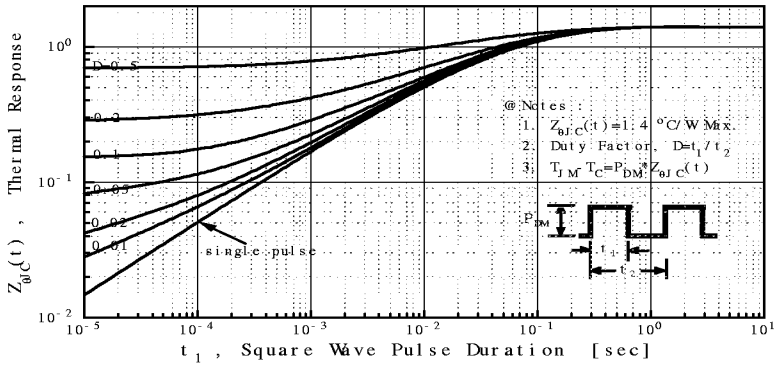

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Fig 12. Gate Charge Test Circuit & Waveform

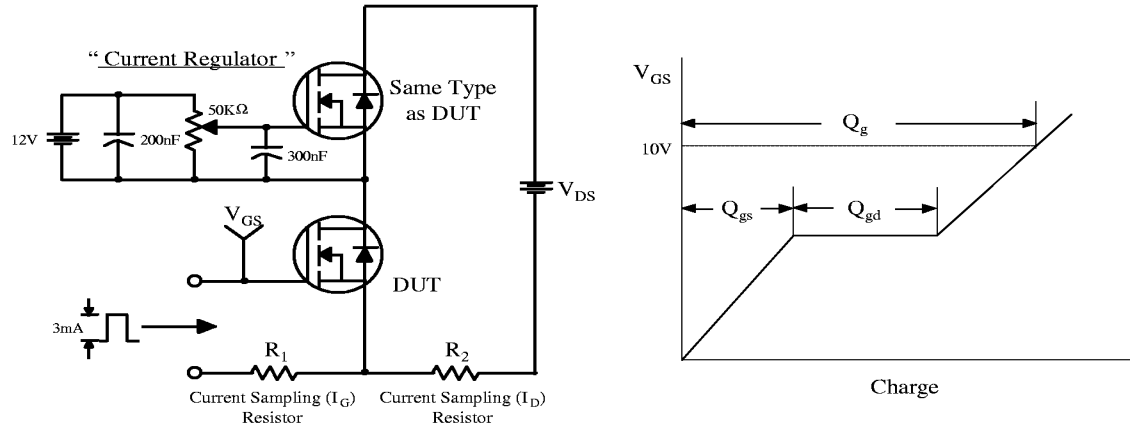

Fig 13. Resistive Switching Test Circuit & Waveforms

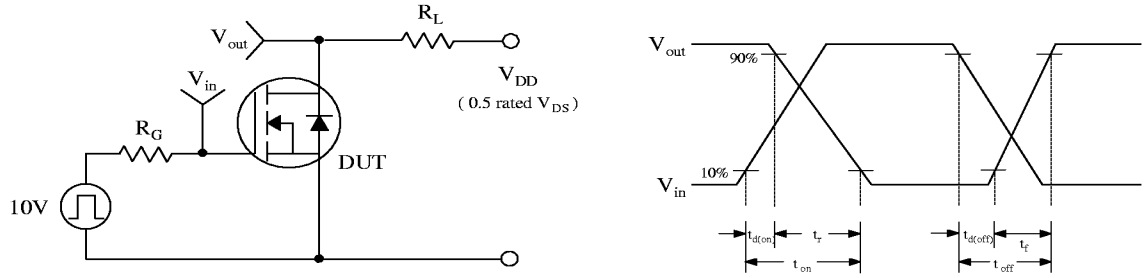

Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms

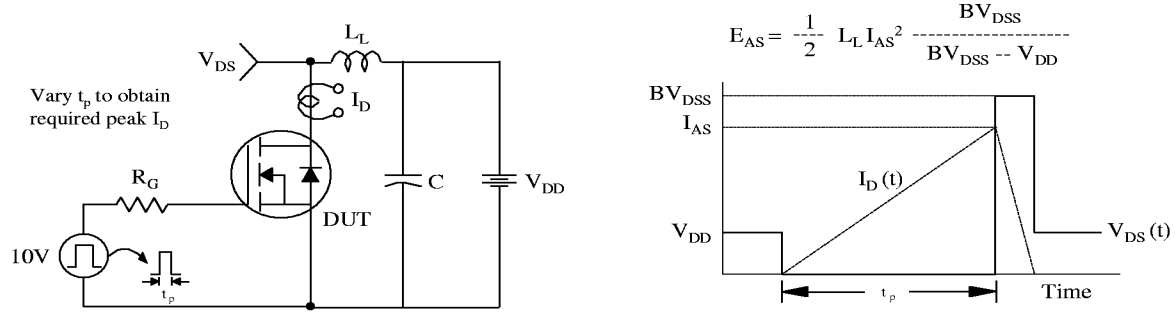

Fig 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms