

## Advanced Power MOSFET

## IRLW/I640A

### FEATURES

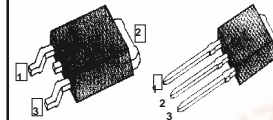
- ◆ Avalanche Rugged Technology
- ◆ Rugged Gate Oxide Technology
- ◆ Lower Input Capacitance
- ◆ Improved Gate Charge
- ◆ Extended Safe Operating Area
- ◆ 150°C Operating Temperature
- ◆ Lower Leakage Current: 10µA (Max.) @  $V_{DS} = 200V$
- ◆ Lower  $R_{DS(ON)}$ : 0.145Ω (Typ.)

$$BV_{DSS} = 200 V$$

$$R_{DS(on)} = 0.18\Omega$$

$$I_D = 18 A$$

**D<sup>2</sup>-PAK I<sup>2</sup>-PAK**



1. Gate 2. Drain 3. Source

### Absolute Maximum Ratings

Symbol	Characteristic	Value	Units
$V_{DSS}$	Drain-to-Source Voltage	200	V
$I_D$	Continuous Drain Current ( $T_C=25^\circ C$ )	18	A
	Continuous Drain Current ( $T_C=100^\circ C$ )	11.4	
$I_{DM}$	Drain Current-Pulsed (1)	63	A
$V_{GS}$	Gate-to-Source Voltage	$\pm 20$	V
$E_{AS}$	Single Pulsed Avalanche Energy (2)	64	mJ
$I_{AR}$	Avalanche Current (1)	18	A
$E_{AR}$	Repetitive Avalanche Energy (1)	11	mJ
dv/dt	Peak Diode Recovery dv/dt (3)	5	V/ns
$P_D$	Total Power Dissipation ( $T_A=25^\circ C$ ) *	3.1	W
	Total Power Dissipation ( $T_C=25^\circ C$ )	110	W
	Linear Derating Factor	0.88	W/ $^\circ C$
$T_J, T_{STG}$	Operating Junction and Storage Temperature Range	- 55 to +150	$^\circ C$
$T_L$	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	--	1.14	$^\circ C/W$
$R_{\theta JA}$	Junction-to-Ambient *	--	40	
$R_{\theta JA}$	Junction-to-Ambient	--	62.5	

\* When mounted on the minimum pad size recommended (PCB Mount).

Rev. B

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### Electrical Characteristics ( $T_C=25^\circ\text{C}$ unless otherwise specified)

Symbol	Characteristic	Min.	Typ.	Max.	Units	Test Condition
$BV_{DSS}$	Drain-Source Breakdown Voltage	200	--	--	V	$V_{GS}=0V, I_D=250\mu A$
$\Delta BV/\Delta T_J$	Breakdown Voltage Temp. Coeff.	--	0.17	--	V/ $^\circ\text{C}$	$I_D=250\mu A$ <b>See Fig 7</b>
$V_{GS(th)}$	Gate Threshold Voltage	1.0	--	2.0	V	$V_{DS}=5V, I_D=250\mu A$
$I_{GSS}$	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	$\mu A$	$V_{DS}=200V$
		--	--	100		$V_{DS}=160V, T_C=125^\circ\text{C}$
$R_{DS(on)}$	Static Drain-Source On-State Resistance	--	--	0.18	$\Omega$	$V_{GS}=5V, I_D=9A$ (4)
$g_{fs}$	Forward Transconductance	--	13.3	--	$\bar{\Omega}$	$V_{DS}=40V, I_D=9A$ (4)
$C_{iss}$	Input Capacitance	--	1310	1705	pF	$V_{GS}=0V, V_{DS}=25V, f=1\text{MHz}$ <b>See Fig 5</b>
$C_{oss}$	Output Capacitance	--	200	250		
$C_{rss}$	Reverse Transfer Capacitance	--	95	120		
$t_{d(on)}$	Turn-On Delay Time	--	11	30	ns	$V_{DD}=100V, I_D=18A,$ $R_G=4.6\Omega$ <b>See Fig 13</b> (4) (5)
$t_r$	Rise Time	--	8	25		
$t_{d(off)}$	Turn-Off Delay Time	--	46	100		
$t_f$	Fall Time	--	15	40		
$Q_g$	Total Gate Charge	--	40	56	nC	$V_{DS}=160V, V_{GS}=5V,$ $I_D=18A$ <b>See Fig 6 &amp; Fig 12</b> (4) (5)
$Q_{gs}$	Gate-Source Charge	--	6.8	--		
$Q_{gd}$	Gate-Drain(. Miller. ) Charge	--	18.6	--		

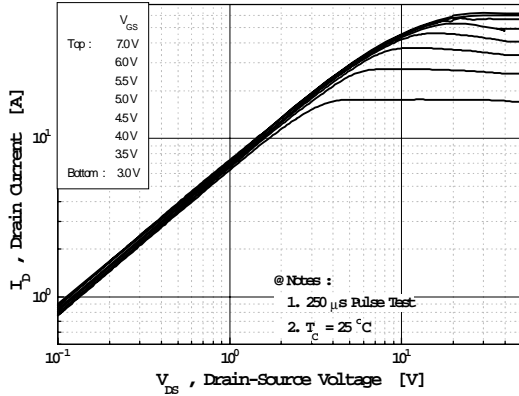
### Source-Drain Diode Ratings and Characteristics

Symbol	Characteristic	Min.	Typ.	Max.	Units	Test Condition
$I_S$	Continuous Source Current	--	--	18	A	Integral reverse pn-diode in the MOSFET
$I_{SM}$	Pulsed-Source Current (1)	--	--	63		
$V_{SD}$	Diode Forward Voltage (4)	--	--	1.5	V	$T_J=25^\circ\text{C}, I_S=18A, V_{GS}=0V$
$t_{rr}$	Reverse Recovery Time	--	224	--	ns	$T_J=25^\circ\text{C}, I_F=18A$
$Q_{rr}$	Reverse Recovery Charge	--	1.55	--	$\mu\text{C}$	$di_F/dt=100A/\mu\text{s}$ (4)

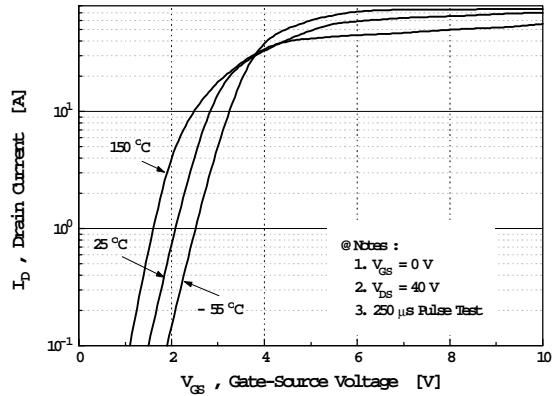
#### Notes;

- (1) Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature
- (2)  $L=0.3\text{mH}, I_{AS}=18A, V_{DD}=50V, R_G=27\Omega$ , Starting  $T_J=25^\circ\text{C}$
- (3)  $I_{SD} \leq 18A, di/dt \leq 260A/\mu\text{s}, V_{DD} \leq BV_{DSS}$ , Starting  $T_J=25^\circ\text{C}$
- (4) Pulse Test: Pulse Width = 250 $\mu\text{s}$ , Duty Cycle  $\leq 2\%$
- (5) Essentially Independent of Operating Temperature

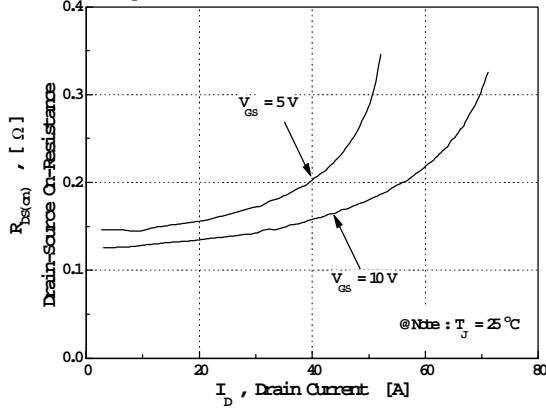
**Fig 1. Output Characteristics**



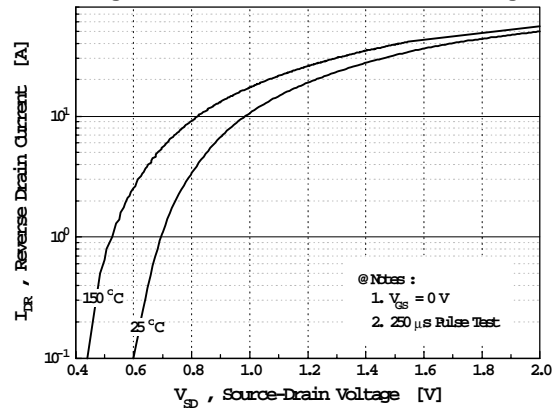
**Fig 2. Transfer Characteristics**



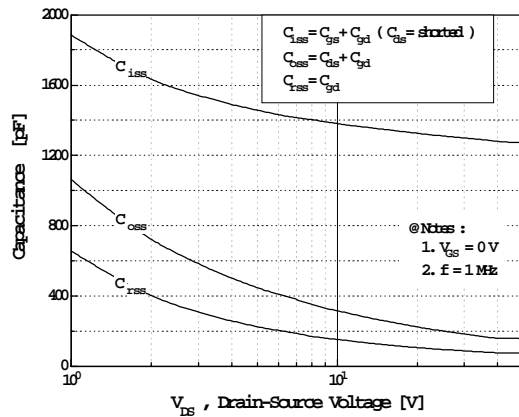
**Fig 3. On-Resistance vs. Drain Current**



**Fig 4. Source-Drain Diode Forward Voltage**



**Fig 5. Capacitance vs. Drain-Source Voltage**



**Fig 6. Gate Charge vs. Gate-Source Voltage**

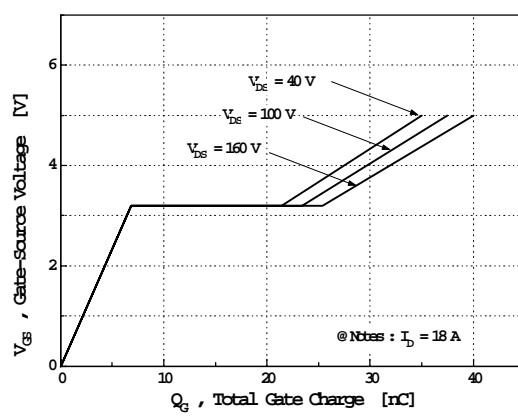


Fig 7. Breakdown Voltage vs. Temperature

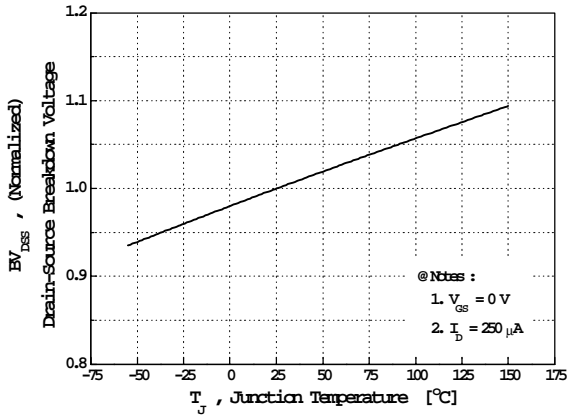


Fig 8. On-Resistance vs. Temperature

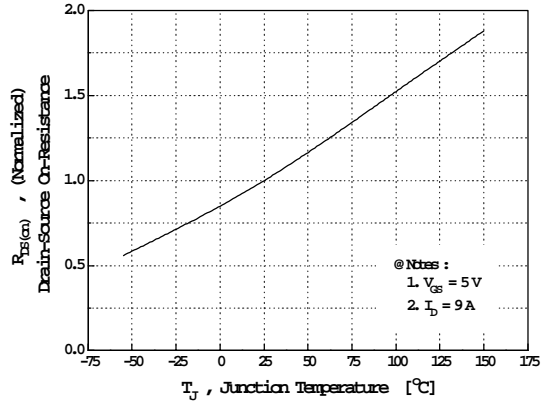


Fig 9. Max. Safe Operating Area

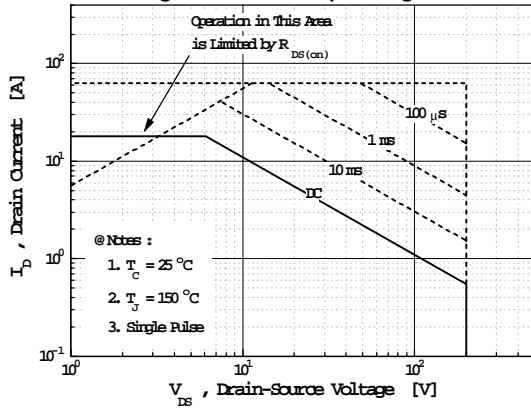


Fig 10. Max. Drain Current vs. Case Temperature

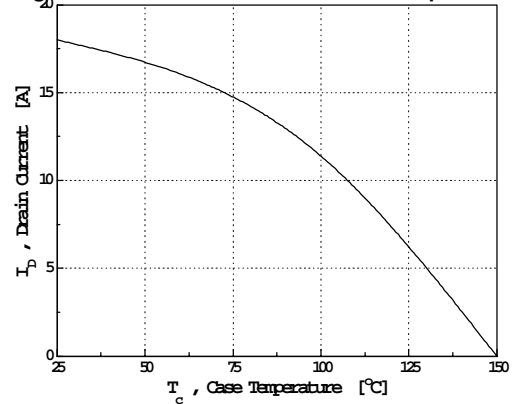
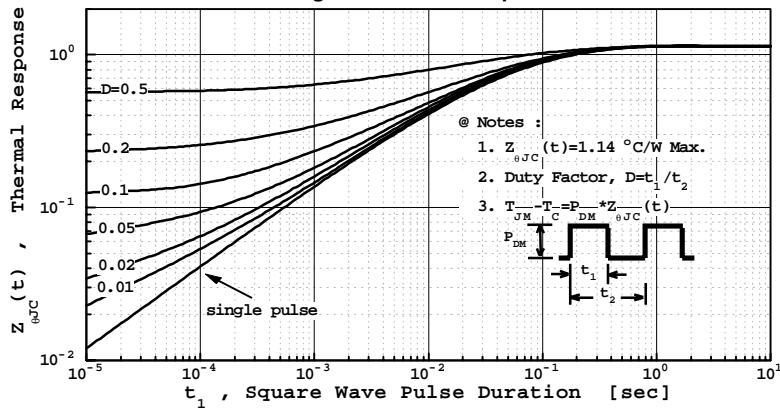
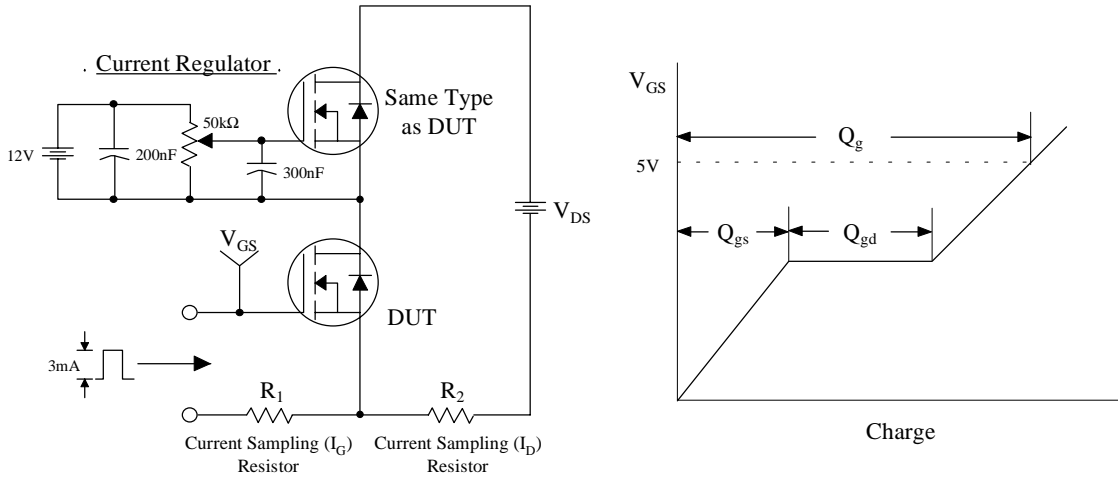


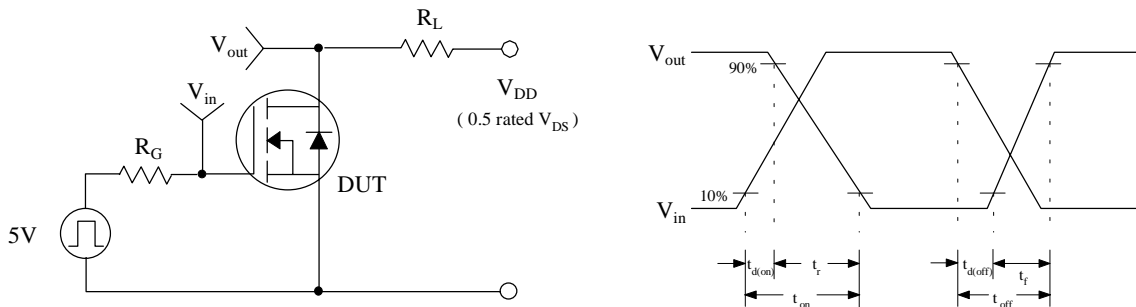
Fig 11. Thermal Response



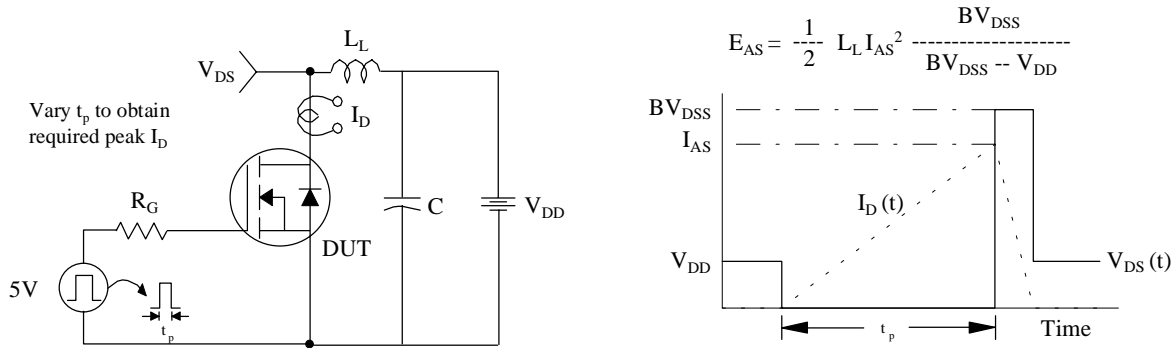
**Fig 12. Gate Charge Test Circuit & Waveform**



**Fig 13. Resistive Switching Test Circuit & Waveforms**



**Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms**





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