

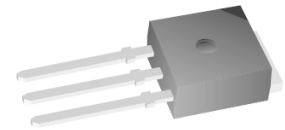
## 50V/5.3A P-Channel Power MOSFET (Discontinued)

### General Description

- Low on resistance
- Improved inductive ruggedness
- Fast switching time
- Rugged polysilicon gate cell structure
- Lower input capacitance
- Extended safe operating area
- Improved high temperature reliability



**DPAK  
(TO-252)**



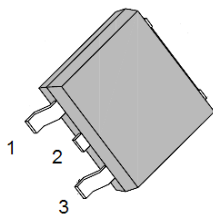
**IPAK  
(TO-251)**

### Features

- $V_{DS} = -50V$ ,  $I_D = -5.3A$
- $R_{DS(ON)} \leq 0.5 \Omega @ V_{GS} = -10V$

### Pin Configuration

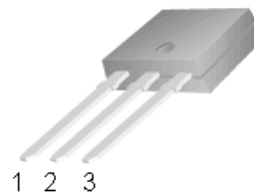
**IRFR9010**



1: GATE 2: DRAIN 3: SOURCE

**DPAK (TO-252)**

**IRFU9010**



1: GATE 2: DRAIN 3: SOURCE

**IPAK (TO-251)**

## Absolute Maximum Ratings

Symbol	Description	P-Channel	Unit
<b>V<sub>DSS</sub></b>	Drain-Source Voltage (1)	-50	Vdc
<b>V<sub>DGR</sub></b>	Drain-Gate Voltage ( $R_{GS} = 1.0M\Omega$ ) (1)	-50	Vdc
<b>V<sub>GS</sub></b>	Gate-Source Voltage	$\pm 20$	Vdc
<b>I<sub>D</sub></b>	Drain Current –Continuous $T_c=25^\circ C$	-5.3	Adc
<b>I<sub>D</sub></b>	Drain Current –Continuous $T_c=100^\circ C$	-3.3	Adc
<b>I<sub>DM</sub></b>	Drain Current - Pulsed (2)	-21	Adc
<b>I<sub>GM</sub></b>	Gate Current - Pulsed	$\pm 1.5$	Adc
<b>E<sub>AS</sub></b>	Single Pulsed Avalanche Energy (3)	240	mJ
<b>I<sub>AS</sub></b>	Avalanche Current	-5.3	A
<b>P<sub>D</sub></b>	Total Power Dissipation $T_c=25^\circ C$ Derate above $25^\circ C$	25 0.20	W W/ $^\circ C$
<b>T<sub>J</sub></b>	Junction Temperature	+150	$^\circ C$
<b>T<sub>STG</sub></b>	Storage Temperature Range	-55 to +150	$^\circ C$
<b>T<sub>L</sub></b>	Maximum Lead Temp. for Soldering Purposes, 1/8" from case for 5 seconds	300	$^\circ C$

Note: (1)  $T_J=25^\circ C$  to  $150^\circ C$

(2) Repetitive rating: Pulse width limited by max. junction temperature

(3)  $L=9.7mH$ ,  $V_{dd}=-25V$ ,  $R_G=25\Omega$ , Starting  $T_J=25^\circ C$

Electrical Characteristics ( $T_c = 25^\circ C$  unless otherwise specified)

## Off Characteristics

Symbol	Description	Min.	Typ.	Max.	Unit	Conditions
<b>V<sub>(BR)DSS</sub></b>	Drain-Source Breakdown Voltage	-50	-	-	V	$V_{GS}=0V$ , $I_D=-250\mu A$
<b>I<sub>DSS</sub></b>	Zero Gate Voltage Drain Current	-	-	-250	uA	$V_{DS}=-Max.$ Rating, $V_{GS}=0V$
		-	-	-1000		$V_{DS}=-0.8$ Max. Rating, $V_{GS}=0V$ , $T_c=125^\circ C$
<b>I<sub>GSS</sub></b>	Gate-Source Leakage Current	-	-	$\pm 100$	nA	$V_{GS}=\pm 20V$

## On Characteristics

Symbol	Description	Min.	Typ.	Max.	Unit	Conditions
<b>V<sub>GS(th)</sub></b>	Gate Threshold Voltage	-2.0	-	-4.0	V	$V_{DS}=V_{GS}$ , $I_D=-250\mu A$

Symbol	Description	Min.	Typ.	Max.	Unit	Conditions
<b>R<sub>DS(ON)</sub></b>	Static Drain-Source On-State Resistance (4)	-	-	0.50	Ω	V <sub>GS</sub> =-10V, I <sub>D</sub> =-2.7A
<b>g<sub>FS</sub></b>	Forward Transconductance (4)	1.1	-	-	S	V <sub>DS</sub> >=-50V, I <sub>D</sub> =-2.7A

Note: (4) Pulse test: Pulse width ≤300us, Duty cycle≤2%

### Dynamic Characteristics

Symbol	Description	Min.	Typ.	Max.	Unit	Conditions
<b>C<sub>iss</sub></b>	Input Capacitance	-	308	-	pF	V <sub>DS</sub> =-25V, V <sub>GS</sub> =0V, f=1MHz
<b>C<sub>oss</sub></b>	Output Capacitance	-	123	-		
<b>C<sub>rss</sub></b>	Reverse Transfer Capacitance	-	55	-		

### Switching Characteristics

Symbol	Description	Min.	Typ.	Max.	Unit	Conditions
<b>t<sub>D(on)</sub></b>	Turn-On Delay Time	-	-	9.2	ns	V <sub>DD</sub> =-05BV <sub>DSS</sub> , R <sub>L</sub> =24Ω, I <sub>D</sub> =-5.3A, (MOSFET switching times are essentially independent of operating temperature)
<b>t<sub>r</sub></b>	Turn-On Rise Time	-	-	71		
<b>t<sub>D(off)</sub></b>	Turn-Off Delay Time	-	-	20		
<b>t<sub>f</sub></b>	Turn-Off Fall Time	-	-	59		
<b>Q<sub>g</sub></b>	Total Gate Charge (Gate- Source Plus Gate-Drain)	-	-	17.5	nC	V <sub>GS</sub> =-10V, I <sub>D</sub> =-5.3A, V <sub>DS</sub> =0.8 Max. Rating, (Gate charge is essentially independent of operating temperature)
<b>Q<sub>gs</sub></b>	Gate-Source Charge	-	4.6	-		
<b>Q<sub>gd</sub></b>	Gate-Drain Charge	-	6.1	-		

### Drain-Source Diode Characteristics and Maximum Ratings

Symbol	Description	Min.	Typ.	Max.	Unit	Conditions
<b>I<sub>S</sub></b>	Continuous Source Current (Body Diode)	-	-	-5.3	A	Modified MOSFET symbol showing the integral reverse P-N junction rectifier-
<b>I<sub>SM</sub></b>	Pulse Source Current (Body Diode) (note)	-	-	-21	A	
<b>V<sub>sd</sub></b>	Diode Forward Voltage	-	-	-5.5	V	I <sub>S</sub> =-5.3A, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C
<b>T<sub>rr</sub></b>	Reverse Recovery Time	-	-	160	ns	I <sub>F</sub> =-5.3A, dI <sub>F</sub> /dt=100A/μS, T <sub>J</sub> =25°C

Note: Repetitive rating: Pulse width limited by max. junction temperature

Thermal Resistance

Symbol	Description	Typ.	Max.	Unit	Remark
R $\theta$ JC	Junction-to-Case	-	5.0	K/W	
R $\theta$ CS	Case-to-Sink	1.7	-	K/W	Mounting surface flat, smooth and greased
R $\theta$ JA	Junction-to-Ambient	-	110	K/W	Free air operation

Typical Characteristics Curves

Fig.1- Typical Output Characteristics

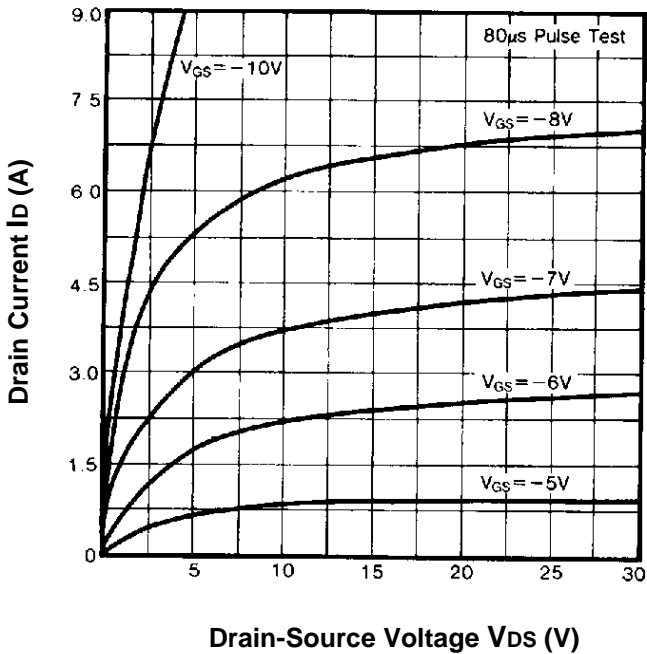


Fig.2- Typical Transfer Characteristics

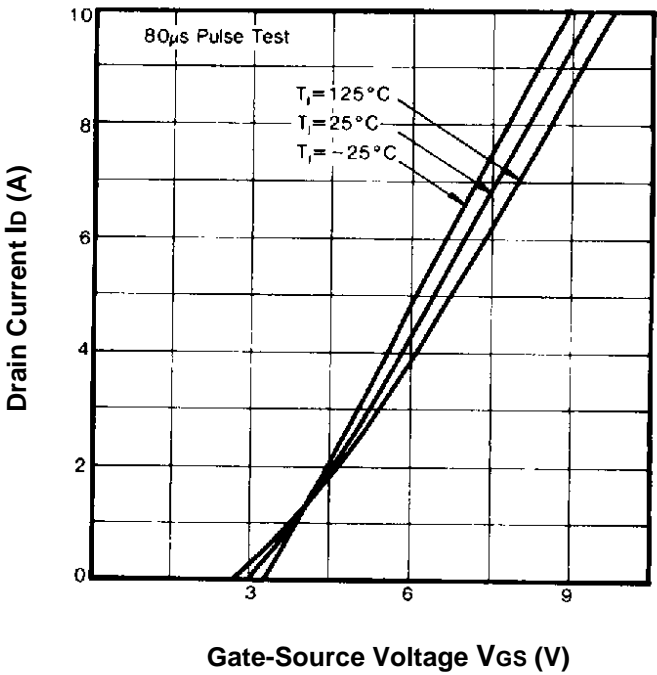


Fig.3- Typical Saturation Characteristics

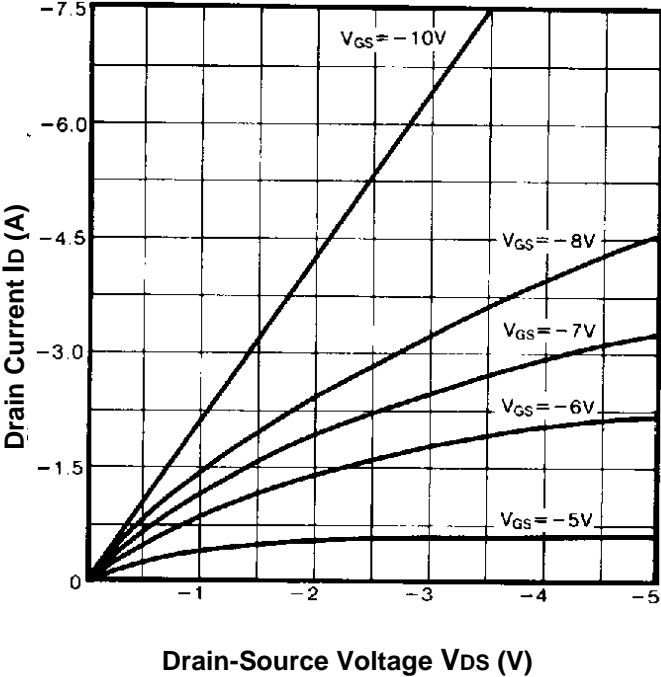


Fig.4- Maximum Safe Operation Area

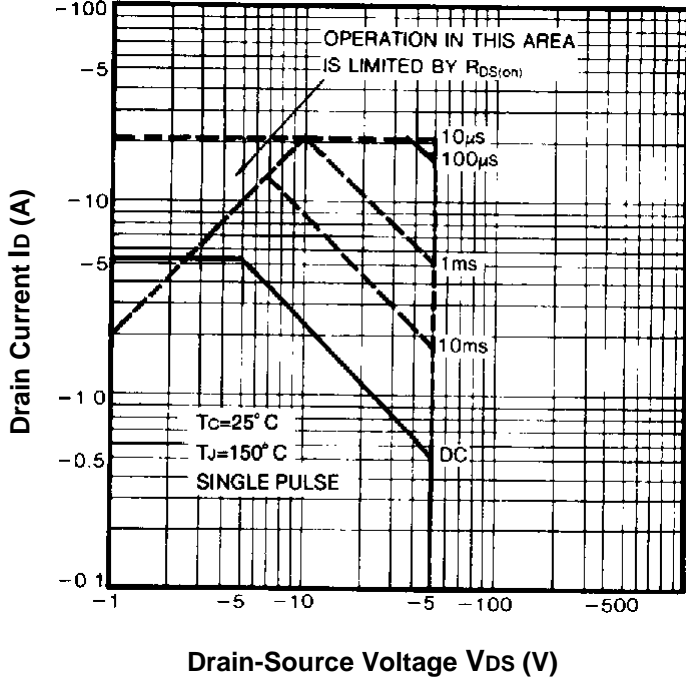


Fig.5- Maximum Effective Transient Thermal Response Junction-Case VS. Pulse Duration

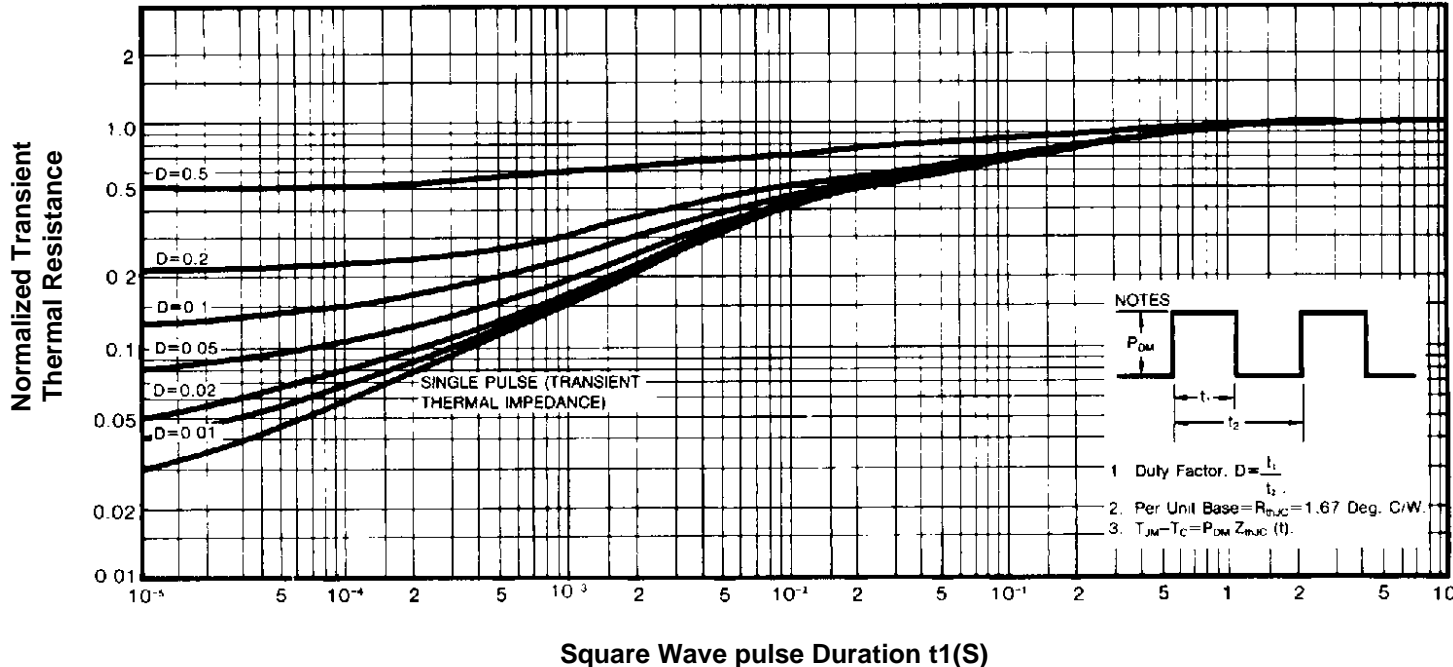


Fig.6- Typical Transconductance Vs. Drain Current

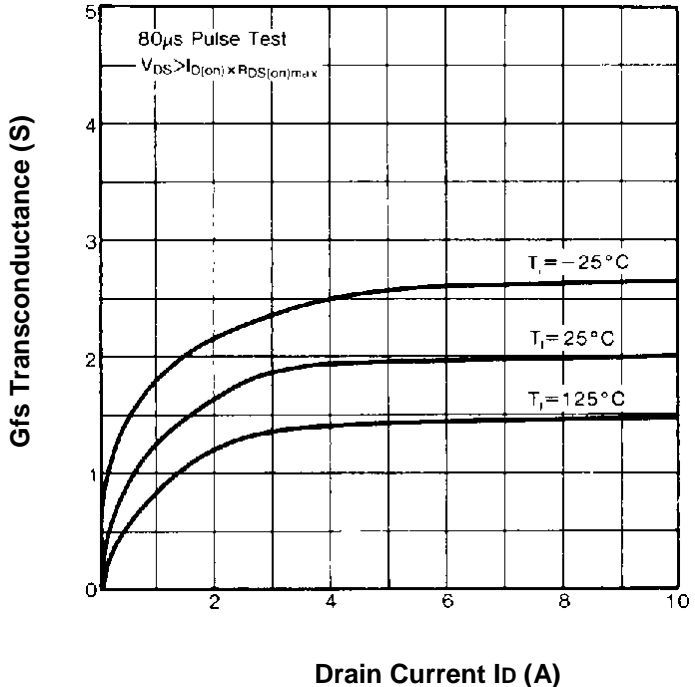


Fig.7- Typical Source-Drain Diode Forward Voltage

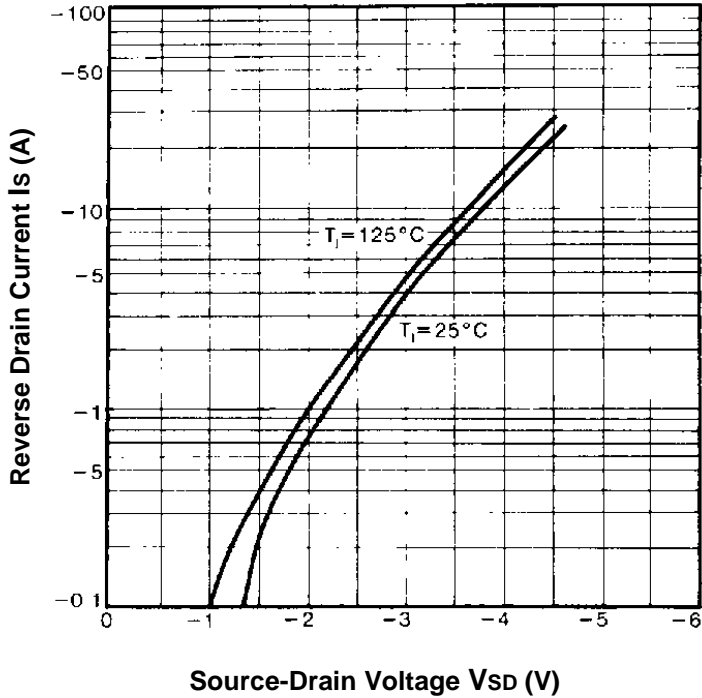


Fig.8- Breakdown Voltage Vs. Temperature

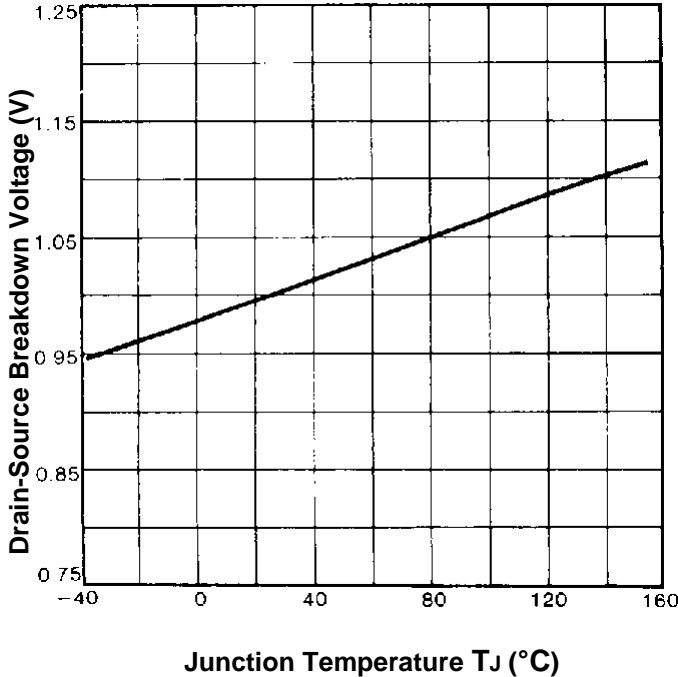


Fig.9- Normalized On-Resistance Vs. Temperature

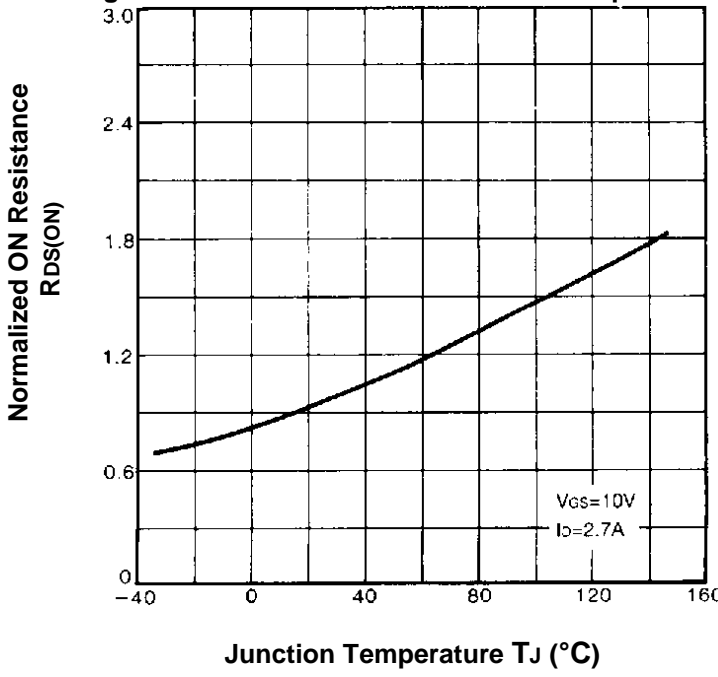


Fig.10- Typical Gate Charge Vs. Gate-Source Voltage

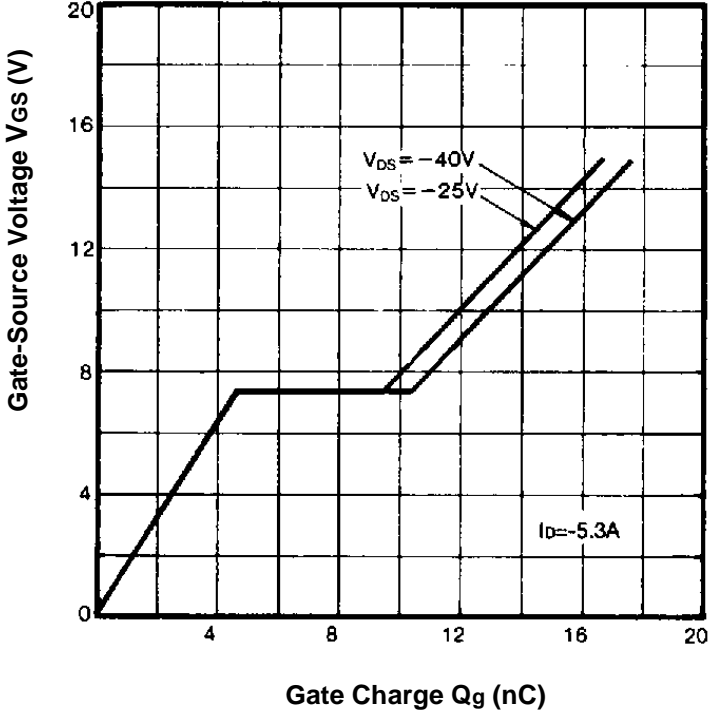


Fig.11- Typical Capacitance Vs. Drain-Source Voltage

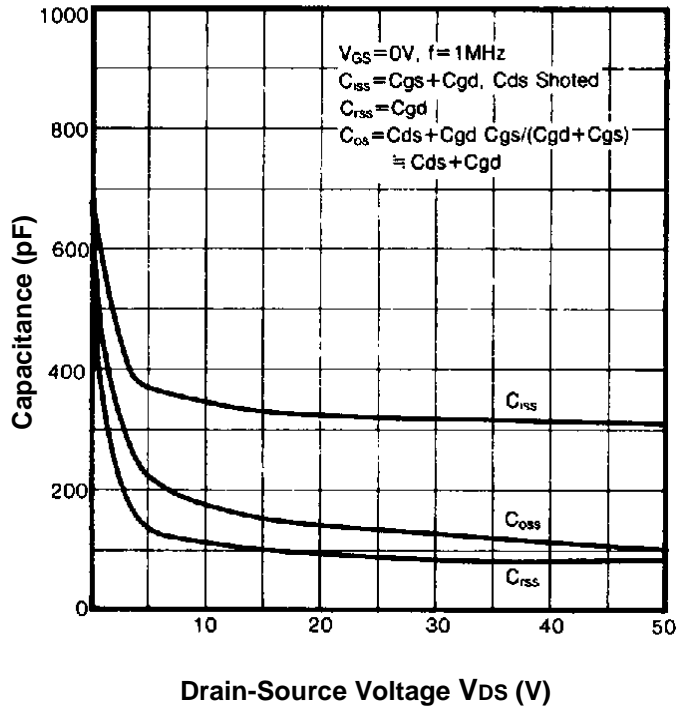


Fig.12- Typical On-Resistance Vs. Drain Current

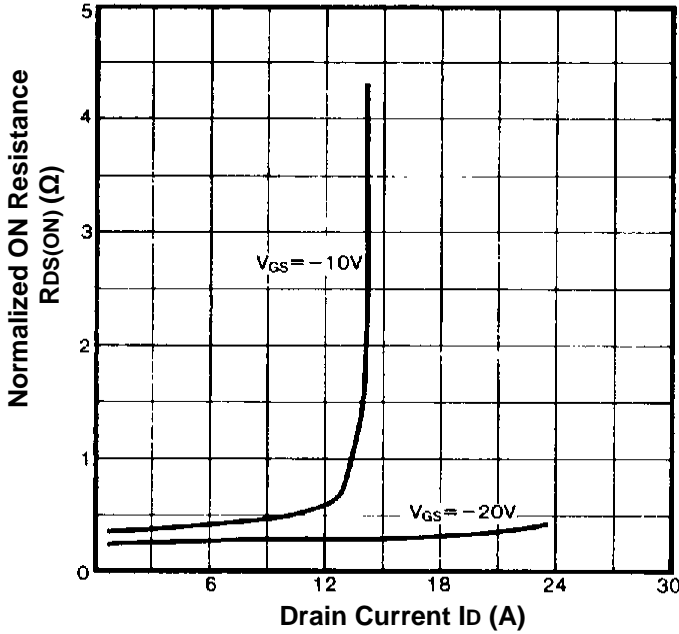


Fig.13- Maximum Drain Current Vs. Case Temperature

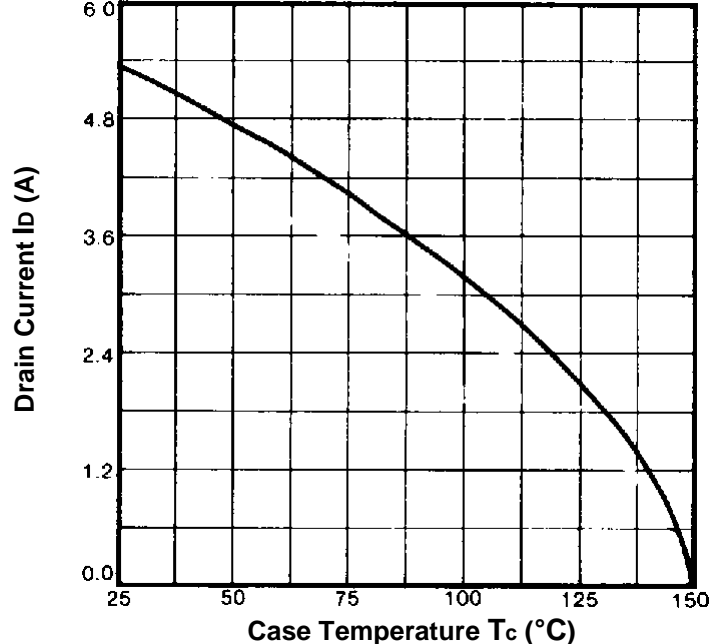
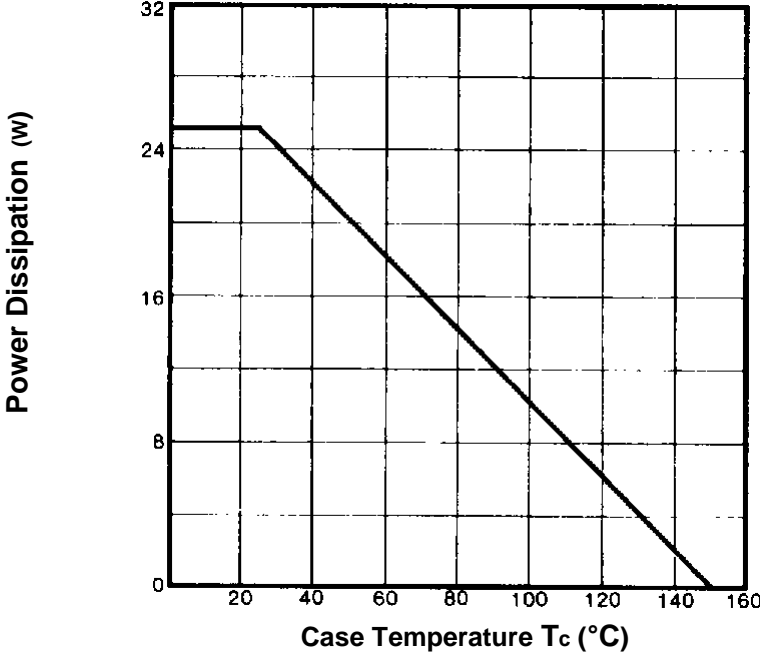
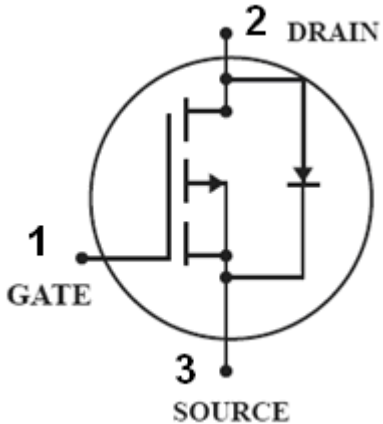


Fig.14-Power Vs. Temperature Derating Curve



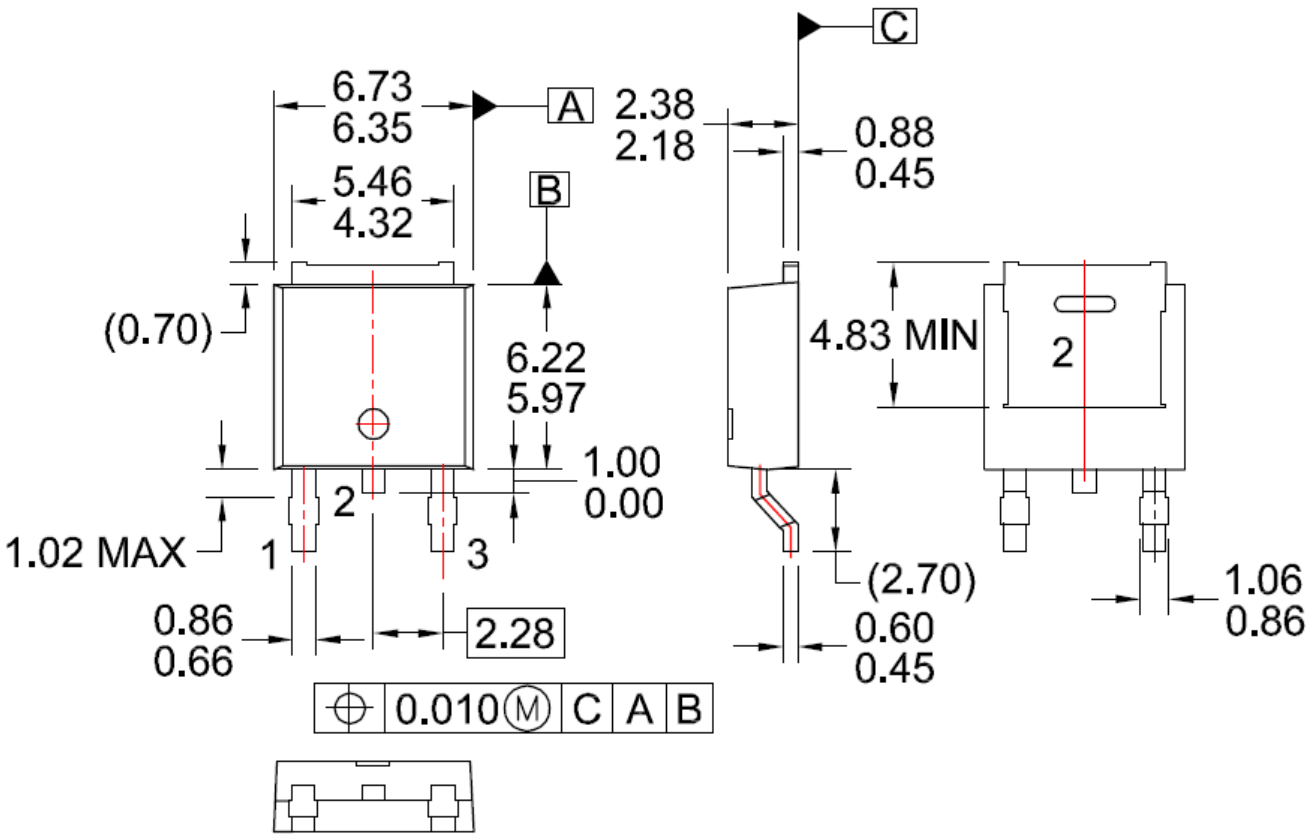
Equivalent Circuit



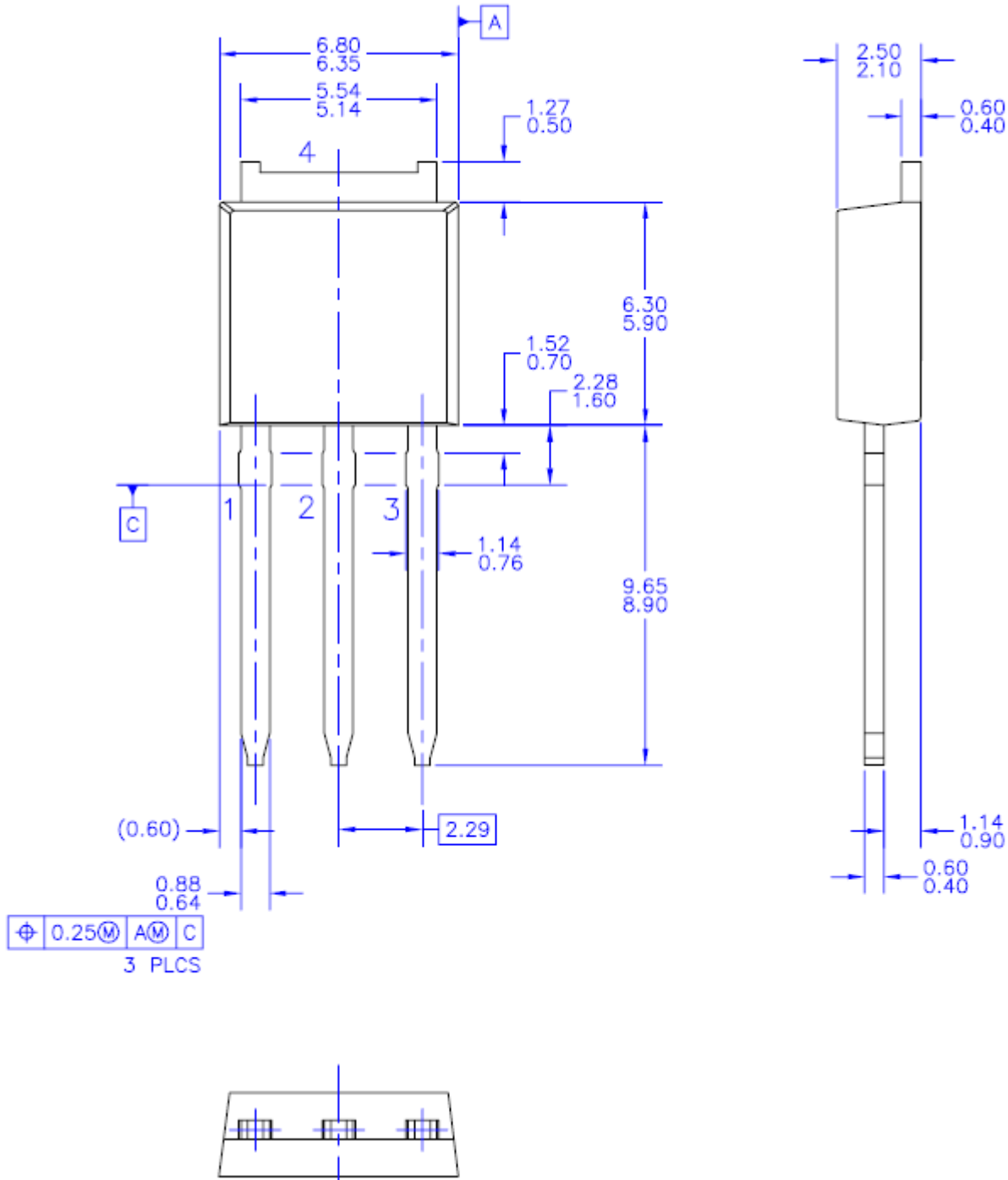


Dimensions in mm

DPAK  
(TO-252)



IPAK  
(TO-251)



### Order Information

Part # to order	Manufacturer	Outline	Packing	RoHS Status
IRFR9010-SM-T	SAMSUNG	DPAK	Tape and Reel	NO
IRFU9010-SM-C	SAMSUNG	IPAK	Tube	NO

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