

60V/9.9A 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

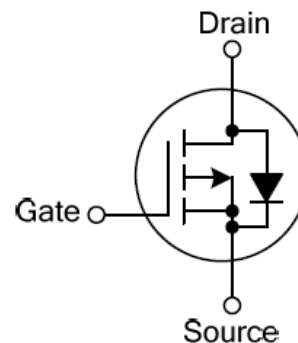
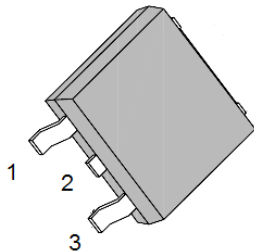


**DPAK
(TO-252)**

Features

- $V_{DS} = -60V$, $I_D = -9.9A$
- $R_{DS(ON)} \leq 0.28 \Omega @ V_{GS} = -10V$

Pin Configuration



1: GATE 2: DRAIN 3: SOURCE

DPAK (TO-252)

Absolute Maximum Ratings

Symbol	Description	IRFR9024	Unit
V_{DSS}	Drain-Source Voltage (1)	-60	Vdc
V_{DGR}	Drain-Gate Voltage ($R_{GS} = 1.0M\Omega$) (1)	-60	Vdc
V_{GS}	Gate-Source Voltage	± 20	Vdc
I_D	Drain Current –Continuous $T_c=25^\circ C$	-9.9	Adc
I_D	Drain Current –Continuous $T_c=100^\circ C$	-6.3	Adc
I_{DM}	Drain Current - Pulsed (2)	-35	Adc
I_{GM}	Gate Current - Pulsed	± 1.5	Adc
E_{AS}	Single Pulsed Avalanche Energy (3)	440	mJ
I_{AS}	Avalanche Current	-9.9	A
P_D	Total Power Dissipation $T_c=25^\circ C$ Derate above $25^\circ C$	42 0.30	W W/ $^\circ C$
T_J	Junction Temperature	+150	$^\circ C$
T_{STG}	Storage Temperature Range	-55 to +150	$^\circ C$
T_L	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) $L=5.1mH$, $V_{dd}=-25V$, $R_G=25\Omega$, 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
V_{(BR)DSS}	Drain-Source Breakdown Voltage	-60	-	-	V	$V_{GS}=0V$, $I_D=-250\mu A$
I_{DSS}	Zero Gate Voltage Drain Current	-	-	-250	uA	$V_{DS}=-Max.$ Rating, $V_{GS}=0V$
		-	-	-1000		$V_{DS}=-0.8$ Max. Rating, $V_{GS}=0V$, $T_c=125^\circ C$
I_{GSS}	Gate-Source Leakage Current	-	-	± 100	nA	$V_{GS}=\pm 20V$

On Characteristics

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

Symbol	Description	Min.	Typ.	Max.	Unit	Conditions
R_{DS(ON)}	Static Drain-Source On-State Resistance (4)	-	-	0.28	Ω	V _{GS} =-10V, I _D =-5.0A
g_{FS}	Forward Transconductance (4)	2.3	-	-	S	V _{DS} >=-50V, I _D =-5.0A

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

Dynamic Characteristics

Symbol	Description	Min.	Typ.	Max.	Unit	Conditions
C_{iss}	Input Capacitance	-	650	-	pF	V _{DS} =-25V, V _{GS} =0V, f=1MHz
C_{oss}	Output Capacitance	-	220	-		
C_{rss}	Reverse Transfer Capacitance	-	110	-		

Switching Characteristics

Symbol	Description	Min.	Typ.	Max.	Unit	Conditions
t_{D(on)}	Turn-On Delay Time	-	15.4	-	ns	V _{DD} =-05BV _{DSS} , R _L =18Ω, I _D =-9.9A, (MOSFET switching times are essentially independent of operating temperature)
t_r	Turn-On Rise Time	-	25.4	-		
t_{D(off)}	Turn-Off Delay Time	-	20.5	-		
t_f	Turn-Off Fall Time	-	48.1	-		
Q_g	Total Gate Charge (Gate- Source Plus Gate-Drain)	-	15.4	29	nC	V _{GS} =-10V, I _D =-9.9A, V _{DS} =0.8 Max. Rating, (Gate charge is essentially independent of operating temperature)
Q_{gs}	Gate-Source Charge	-	7.5	-		
Q_{gd}	Gate-Drain Charge	-	9.5	-		

Drain-Source Diode Characteristics and Maximum Ratings

Symbol	Description	Min.	Typ.	Max.	Unit	Conditions
I_S	Continuous Source Current (Body Diode)	-	-	-9.9	A	Modified MOSFET symbol showing the integral reverse P-N junction rectifier-
I_{SM}	Pulse Source Current (Body Diode) (note)	-	-	-35	A	
V_{sd}	Diode Forward Voltage	-	-	-6.3	V	I _S =-9.9A, V _{GS} =0V, T _J =25°C
T_{rr}	Reverse Recovery Time	-	-	280	ns	I _F =-9.9A dI _F /dt=100A/μS, T _J =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	-	3.0	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

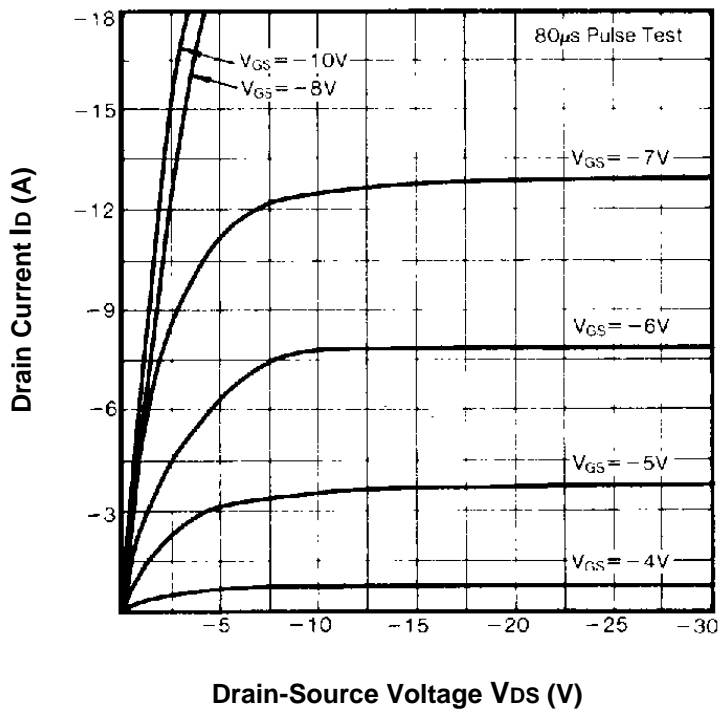


Fig.2- Typical Transfer Characteristics

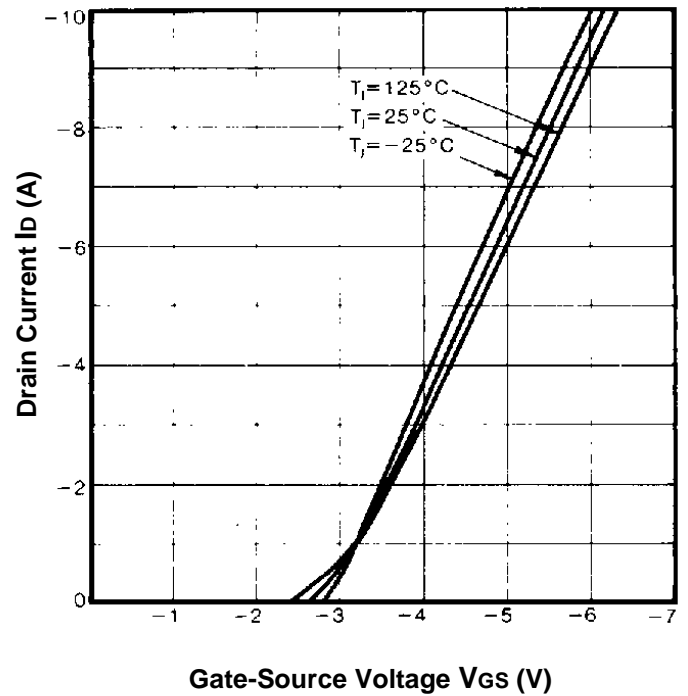


Fig.3- Typical Saturation Characteristics

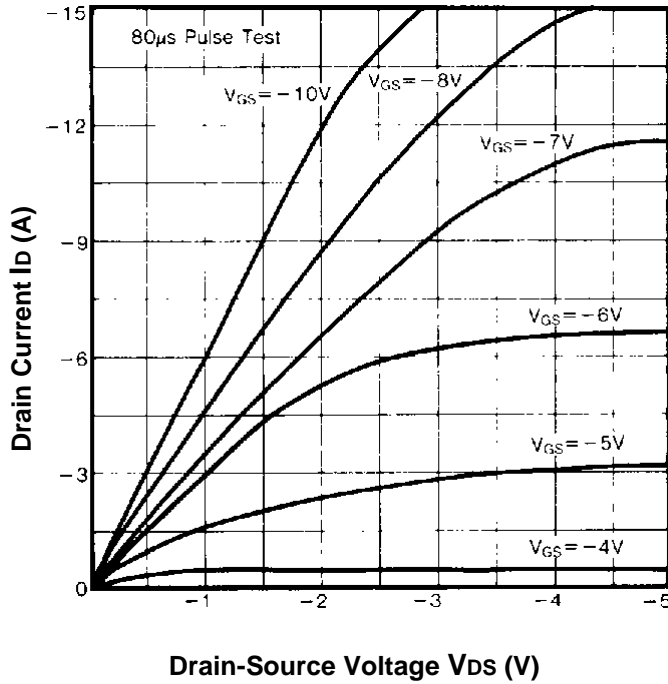


Fig.4- Maximum Safe Operation Area

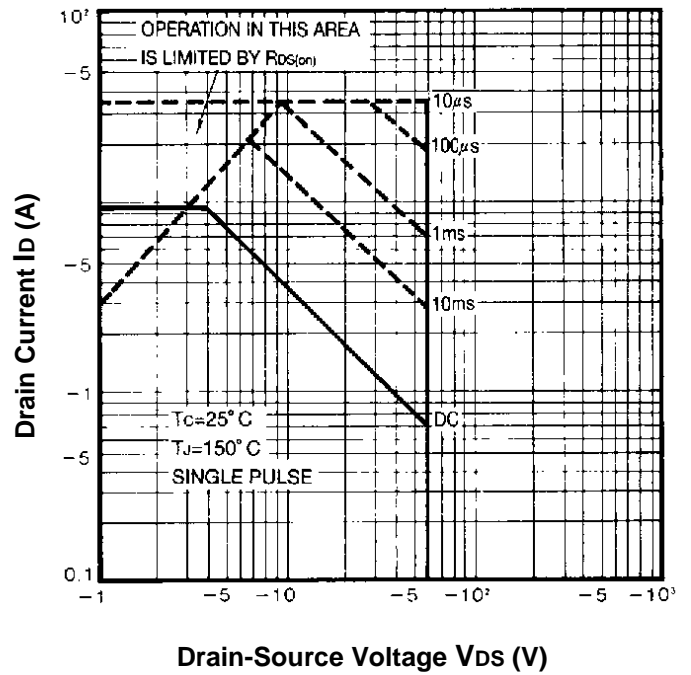


Fig.5- Maximum Effective Transient Thermal Response Junction-Case VS. Pulse Duration

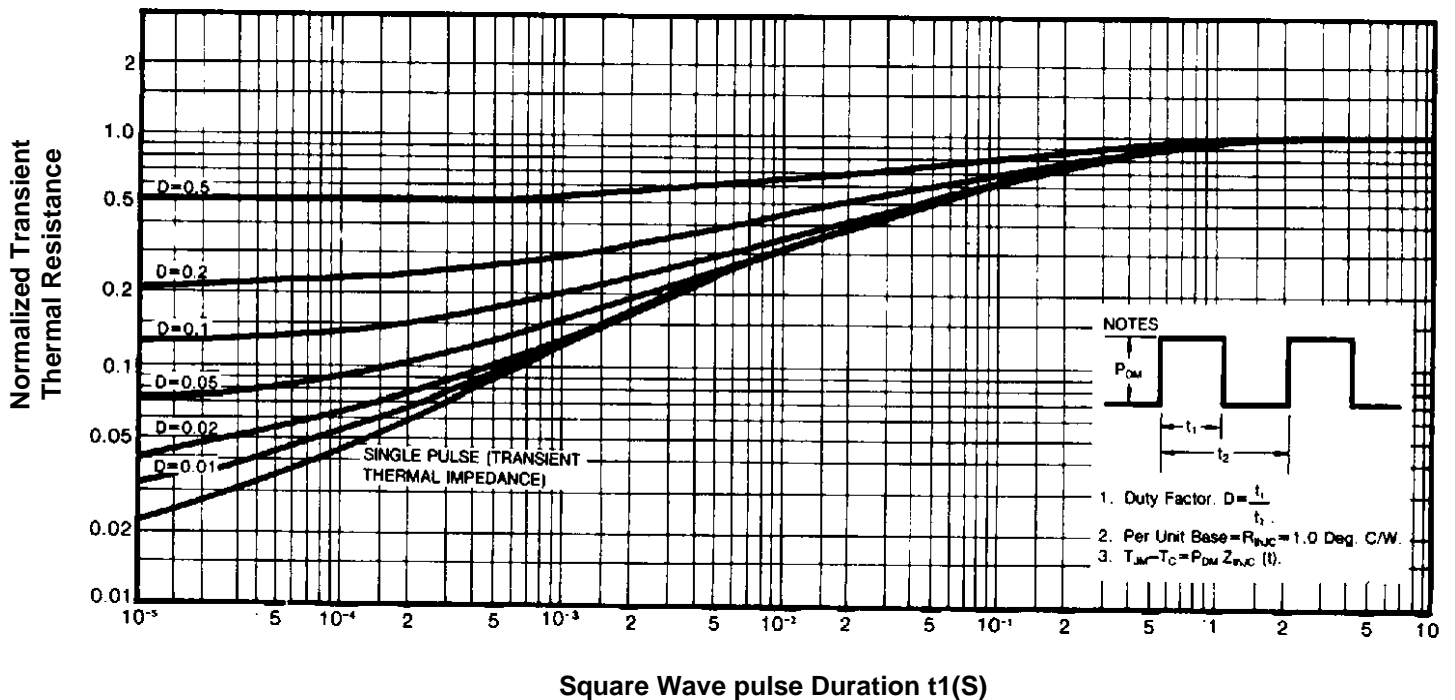


Fig.6- Typical Transconductance Vs. Drain Current

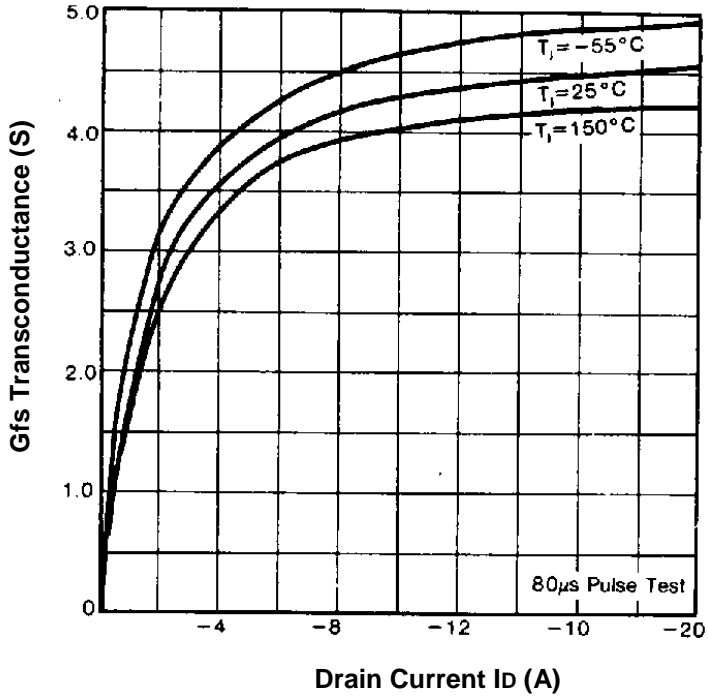


Fig.7- Typical Source-Drain Diode Forward Voltage

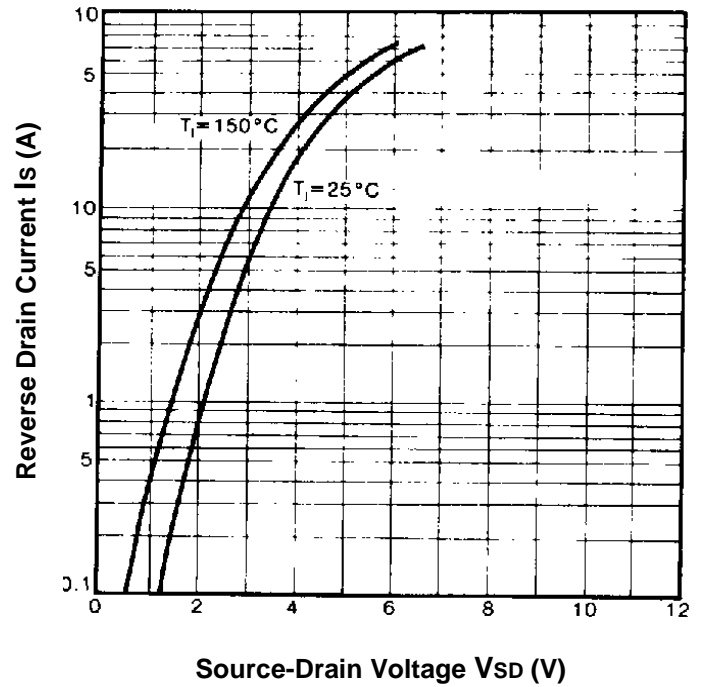


Fig.8- Breakdown Voltage Vs. Temperature

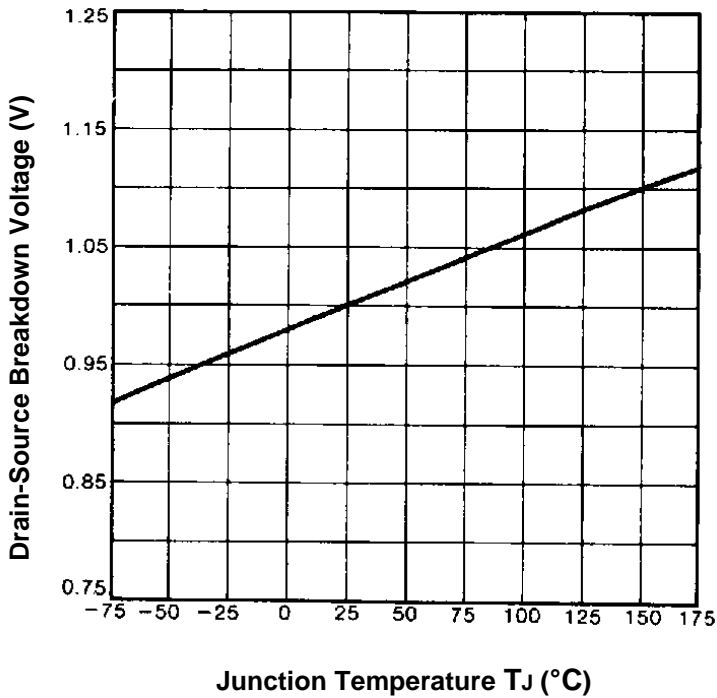


Fig.9- Normalized On-Resistance Vs. Temperature

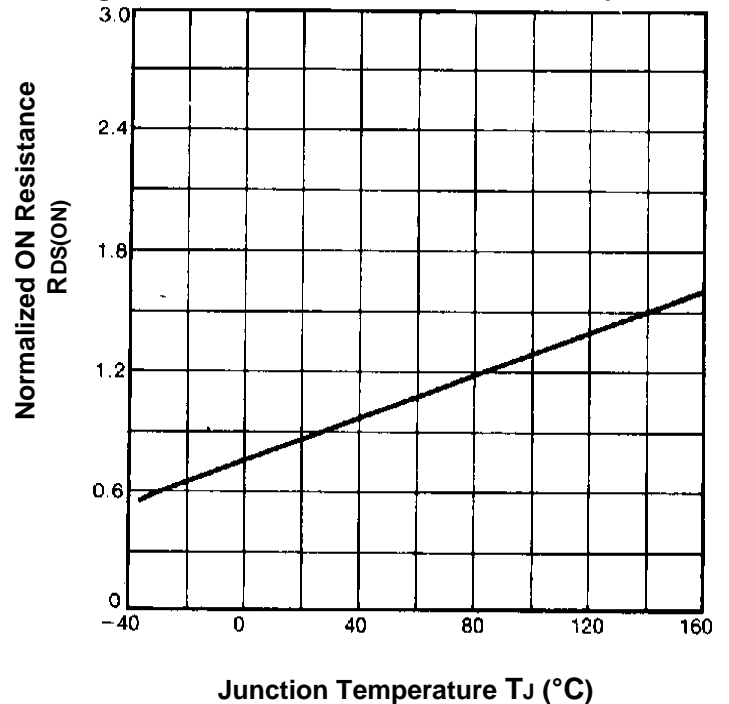


Fig.10- Typical Gate Charge Vs. Gate-Source Voltage

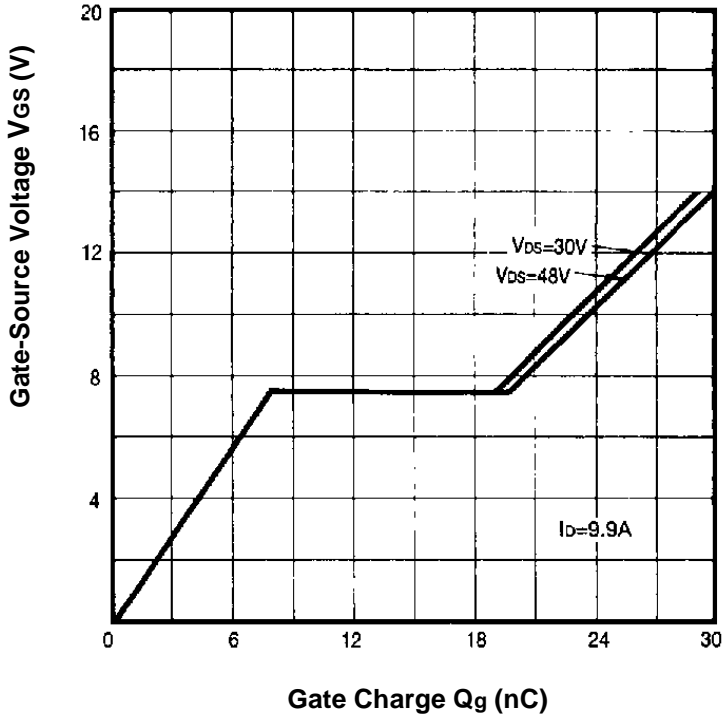


Fig.11- Typical Capacitance Vs. Drain-Source Voltage

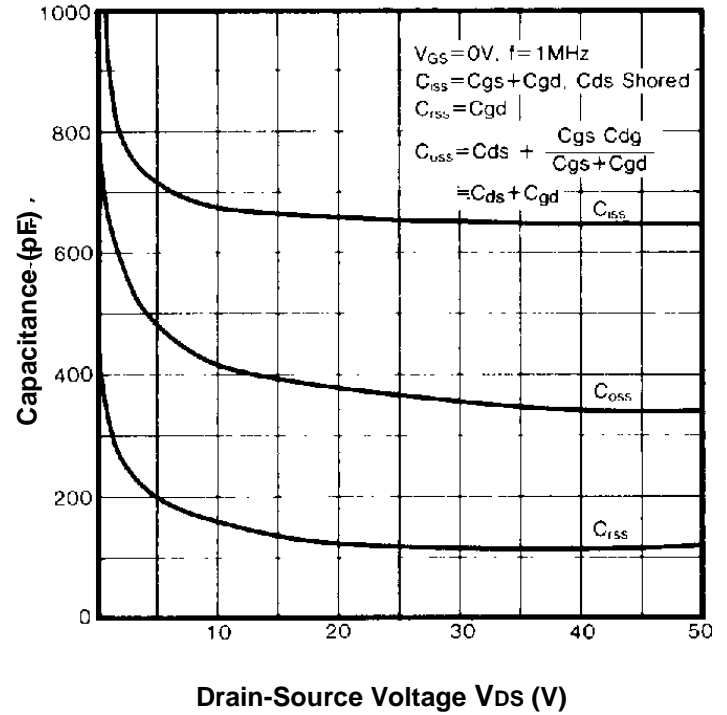


Fig.12- Typical On-Resistance Vs. Drain Current

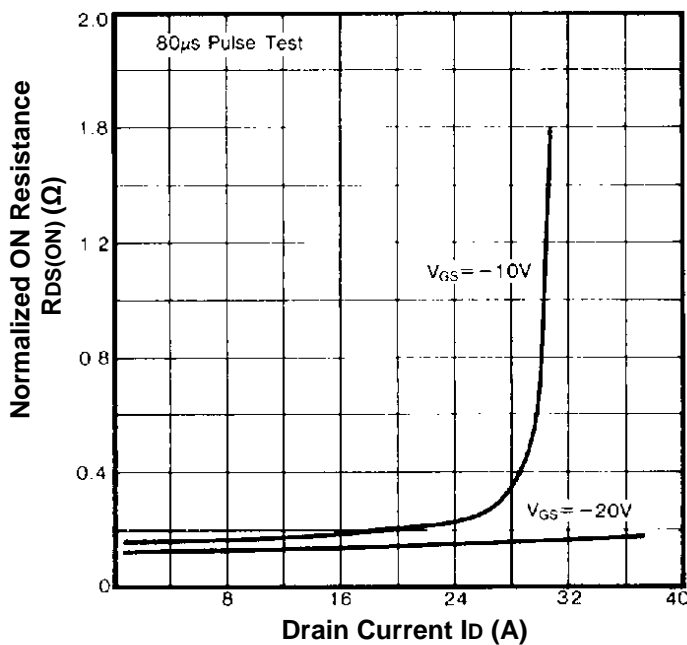


Fig.13- Maximum Drain Current Vs. Case Temperature

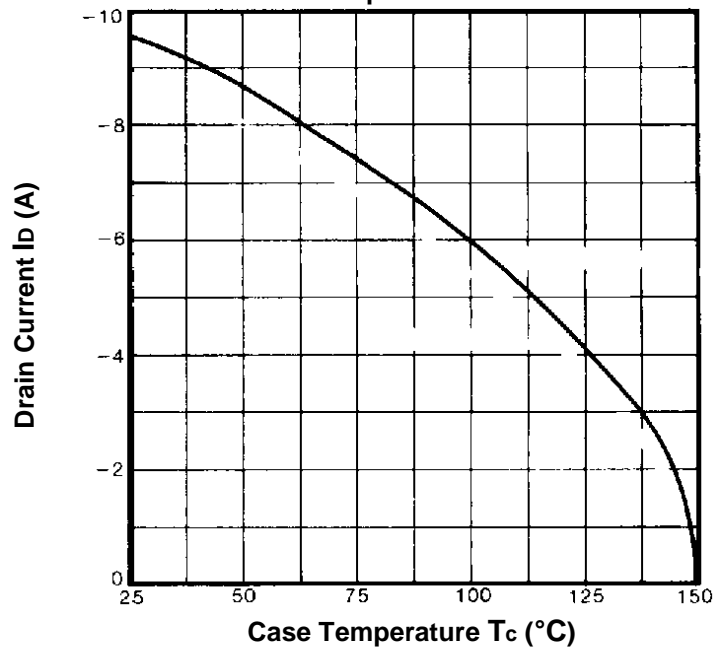
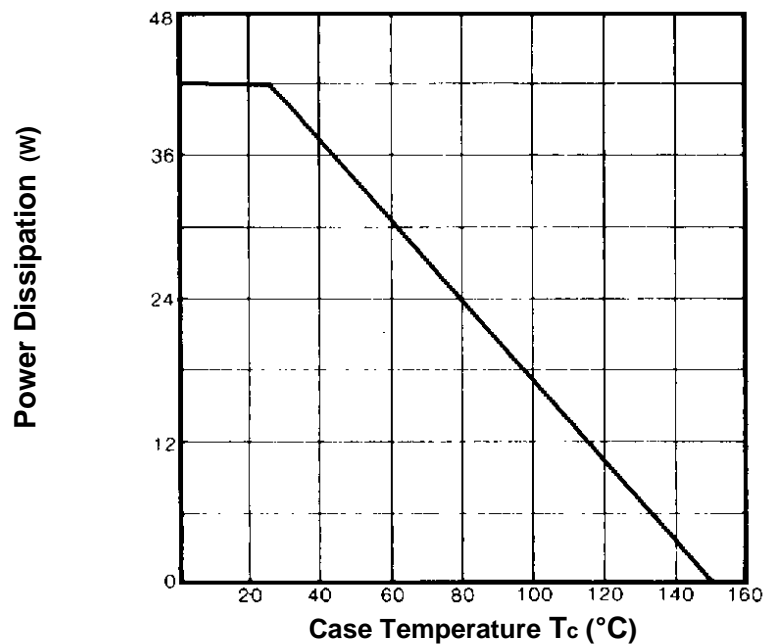
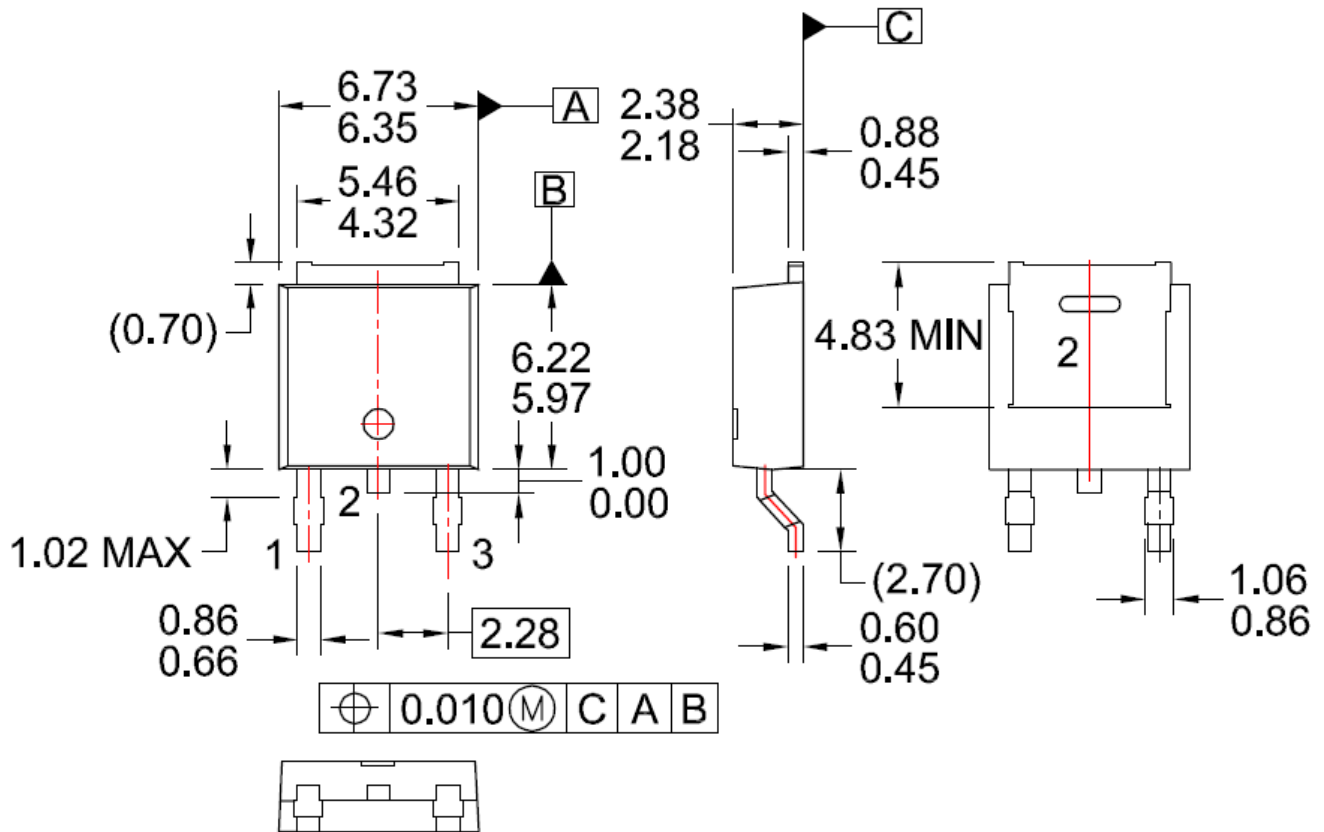


Fig.14-Power Vs. Temperature Derating Curve



Dimensions in mm

DPAK
(TO-252)



Order Information

Part # to order	Manufacturer	Outline	Packing	RoHS Status
IRFR9024-SM-T	SAMSUNG	DPAK	Tape and Reel	NO

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