

SuperMOS – TO-252 -60V BV_{DSS} , 27m Ω $R_{DS(on)}$, P-channel MOSFET

1. Description

The IRFR9024NTRPBF(ES) is P-Channel enhancement MOS Field Effect Transistor. Uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. Device is suitable for use in DC-DC conversion, power switch and charging circuit. Standard Product IRFR9024NTRPBF(ES) is Pb-free.

2. Features

- -60V, $R_{DS(ON)}=27m\Omega(TYP.) @V_{GS}=-10V$
 $R_{DS(ON)}=31m\Omega(TYP.) @V_{GS}=-4.5V$
- Fast Switching
- High density cell design for low $R_{DS(on)}$
- Material: Halogen free
- Reliable and rugged
- Avalanche Rated
- Low leakage current

3. Applications

- PWM applications
- Load switch
- Power management in portable/desktop PCs
- DC/DC conversion

100% UIS TESTED

4. Ordering Information

Part Number	Package	Marking	Material	Packing	Quantity per Reel	Flammability Rating	Reel sizes
IRFR9024NTRPBF(ES)	TO-252	ESD409/lot	Halogen free	Tape & Reel	2,500 PCS	UL 94V-0	13 inches

Table-1 Ordering information

5. Pin Configuration and Functions

Pin	Function	Outline	Circuit Diagram
3	Source	Note b	
1	Gate		

IRFR9024NTRPBF(ES)

Rev-1.7

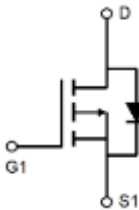
2	Drain		
---	-------	---	---

Table-2 Pin configuration

6. Specification

Absolute Maximum Rating & Thermal Characteristics

Ratings at 25 °C ambient temperature unless otherwise specified.

Parameter		Symbol	Limit	Unit
Drain-Source Voltage		BV_{DSS}	-60	V
Gate-Source Voltage		V_{GS}	± 20	V
Continuous Drain Current	$T_C=25^\circ\text{C}$	I_D	-28	A
	$T_C=75^\circ\text{C}$		-22	
Maximum Power Dissipation	$T_C=25^\circ\text{C}$	P_D	50	W
	$T_C=75^\circ\text{C}$		30	
Pulsed Drain Current		I_{DM}	-132	A
Avalanche current single pulse ^a		I_{AS}	-29	A
Avalanche energy single pulse ^a		E_{AS}	136	mJ
Operating Junction Temperature		T_J	150	$^\circ\text{C}$
Storage Temperature Range		T_{stg}	-55 to +150	$^\circ\text{C}$

Thermal resistance ratings

Single Operation				
Parameter	Symbol	Typical	Maximum	Unit
Junction-to- Case Thermal Resistance($t \leq 10\text{s}$)	$R_{\theta JC}$	1.9	2.5	$^\circ\text{C/W}$

Note

a: $R_G=25\Omega$, $V_{DD}=-60\text{V}$, $V_{GS}=-10\text{V}$, $L=0.3\text{mH}$, $T_J=25^\circ\text{C}$

b: This diagram is only an electrical schematic, and the actual pin size is based on POD.

IRFR9024NTRPBF(ES)

Rev-1.7

Electrical Characteristics

At TA = 25°C unless otherwise specified

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
OFF CHARACTERISTICS						
Drain-to-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V, I _D =-250uA	-60			V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =-60V, V _{GS} =0V			-1	uA
Gate-to-source Leakage Current	I _{GSS}	V _{DS} =0V, V _{GS} =±20V			±100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	V _{GS(TH)}	V _{GS} =V _{DS} , I _D =-250uA	-1.1	-1.6	-2.1	V
Drain-to-source On-resistance	R _{DS(on)}	V _{GS} =-10V, I _D =-20A		27	34	mΩ
		V _{GS} =-4.5V, I _D =-20A		31	38	
Forward Transconductance	g _{FS}	V _{DS} =-5V, I _D =-20A			60	S
CHARGES, CAPACITANCES AND GATE RESISTANCE						
Input Capacitance	C _{ISS}	V _{GS} =0V, V _{DS} =-20V f=1MHz		3020		pF
Output Capacitance	C _{OSS}			180		
Reverse Transfer Capacitance	C _{RSS}			160		
Total Gate Charge	Q _{G(TOT)}	V _{GS} =-10V, V _{DS} =-20V I _D =-10A		46.6		nC
Gate-to-Source Charge	Q _{GS}			9.1		
Gate-to-Drain Charge	Q _{GD}			6.2		
SWITCHING CHARACTERISTICS						
Turn-On Delay Time	t _{d(ON)}	V _{GS} =-10V, V _{DS} =-15V, I _D =-1A, R _G =3Ω		45		ns
Rise Time	t _r			28		
Turn-Off Delay Time	t _{d(OFF)}			80		
Fall Time	t _f			6.6		
BODY DIODE CHARACTERISTICS						
Forward Voltage	V _{SD}	V _{GS} =0V, I _S =-1.0A			-1.5	V

7. Typical Characteristic

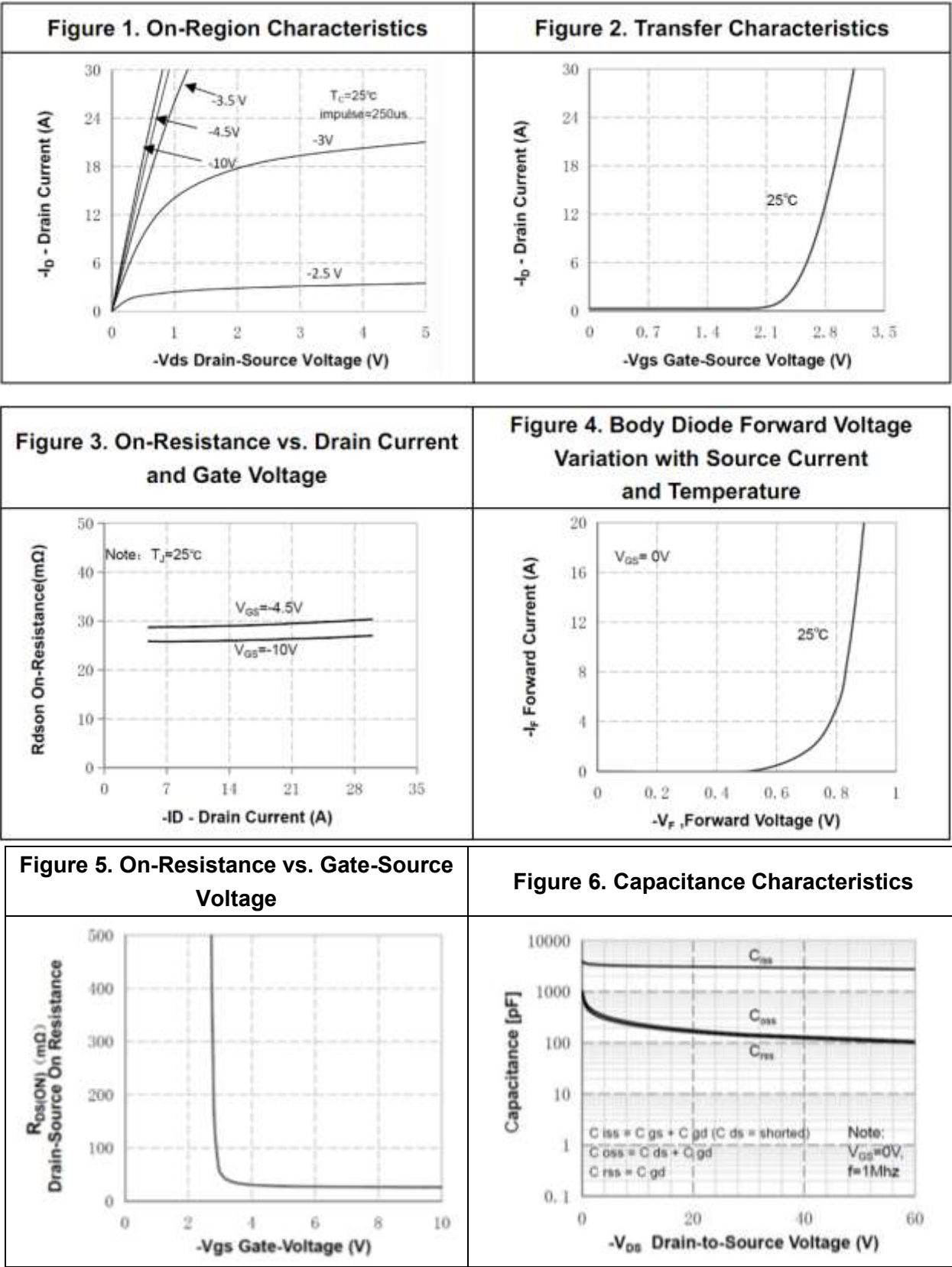
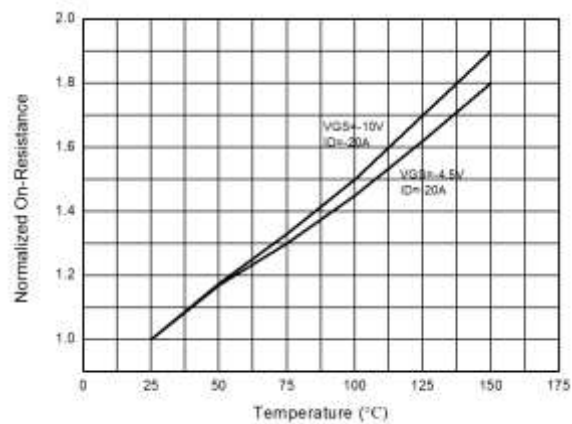
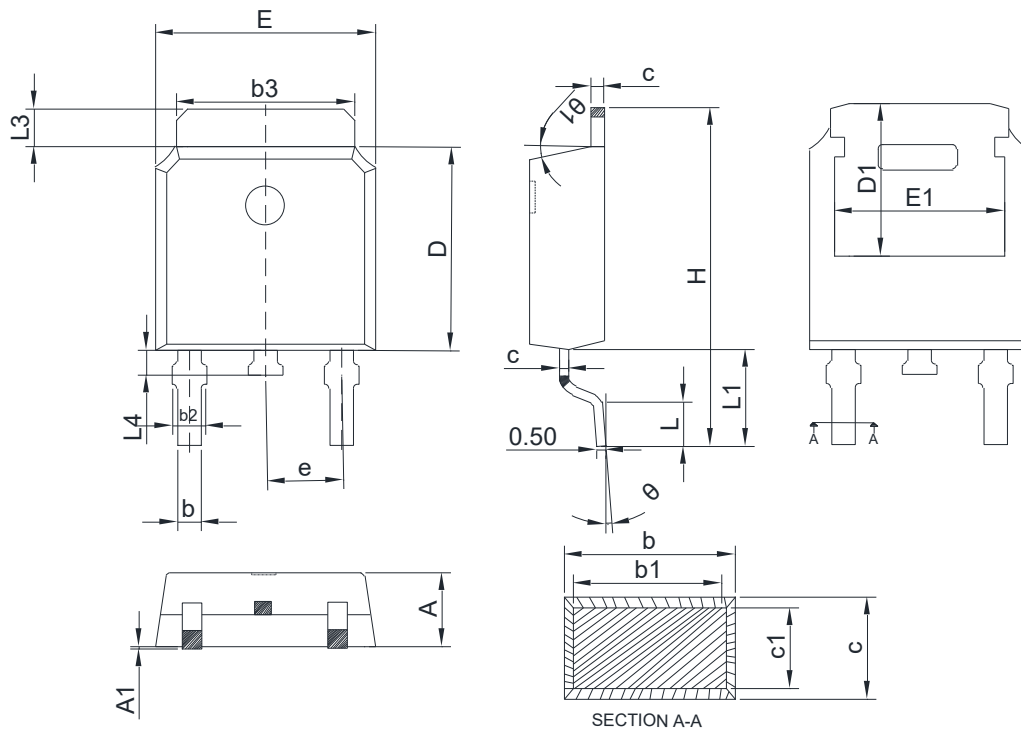


Figure 7. Normalized On-Resistance vs Temperature



8. Dimension (TO-252)

POD A(Q)

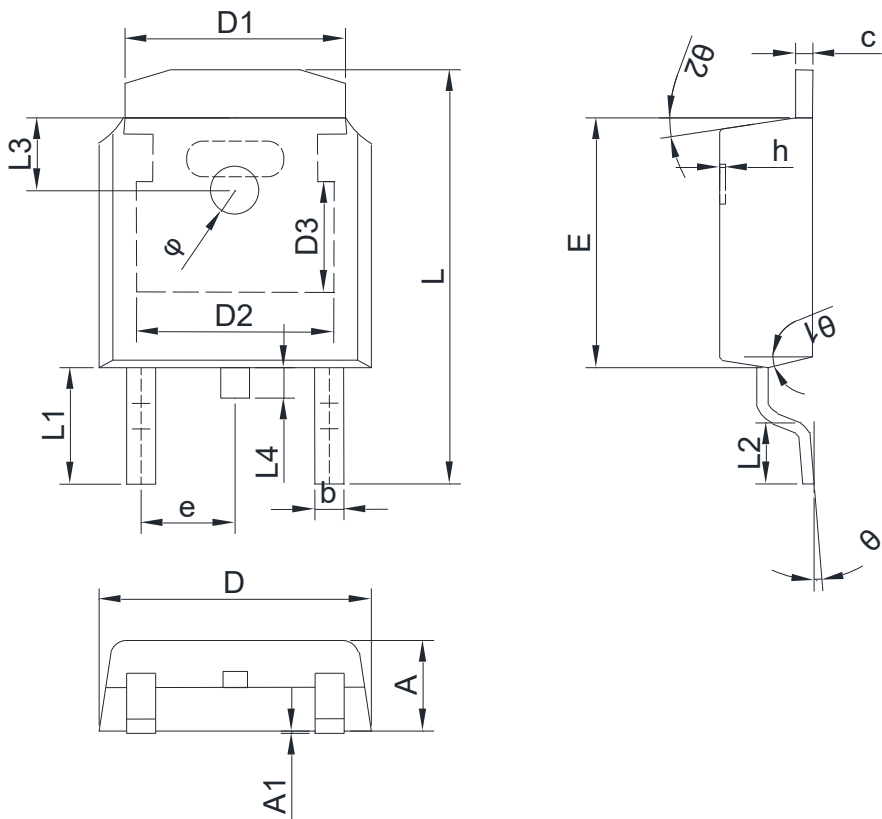


COMMON DIMENSIONS CUNITS MEASURE=MILLIMETER							
SYMBOL	MIN	TYP	MAX	SYMBOL	MIN	TYP	MAX
A	2.20	2.30	2.40	D1	5.21	-	-
A1	0.00	-	0.12	E	6.50	6.60	6.70
b	0.65	-	0.89	E1	4.32	-	-
b1	0.64	0.76	0.79	H	9.70	9.95	10.20
b2	0.76	0.86	1.10	L	1.40	1.50	1.60
b3	5.20	5.33	5.46	L1	2.84REF		
c	0.48	-	0.60	e	2.29BSC		
c1	0.47	0.51	0.55	θ	0°	-	10°
D	6.00	6.10	6.20	θ1	0°	-	15°
L3	0.90	-	1.27	L4	0.60	0.80	1.00

IRFR9024NTRPBF(ES)

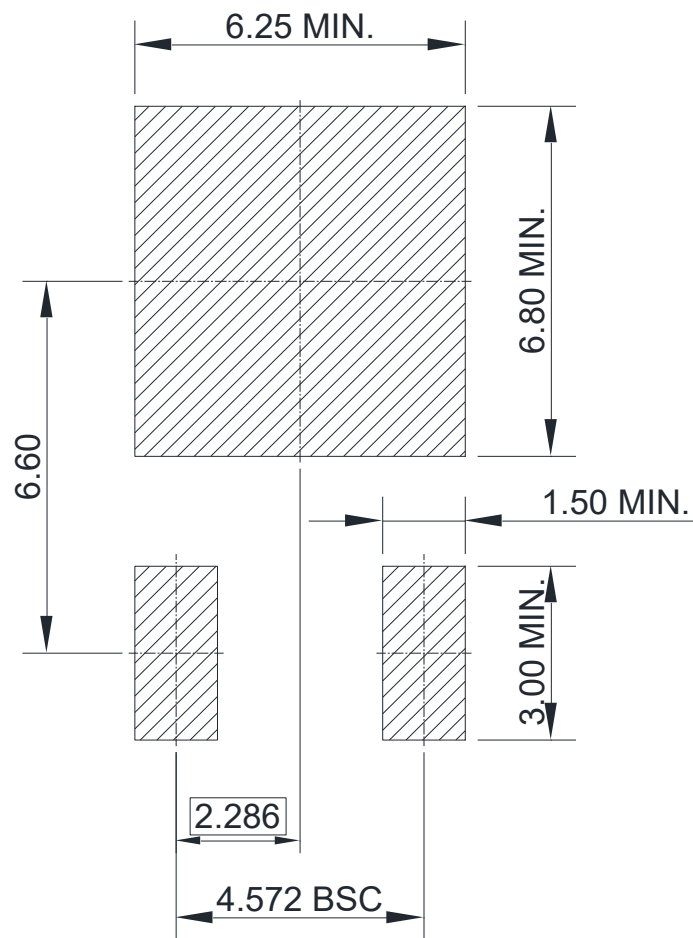
Rev-1.7

POD B(X)



COMMON DIMENSIONS CUNITS MEASURE=MILLIMETER							
SYMBOL	MIN	TYP	MAX	SYMBOL	MIN	TYP	MAX
A	2.200	2.300	2.400	h	0.000	0.100	0.200
A1	0.000		0.127	L	9.900	10.100	10.300
b	0.640	0.690	0.740	L1	2.888 REF		
c(电镀后)	0.460	0.520	0.580	L2	1.400	1.550	1.700
D	6.500	6.600	6.700	L3	1.600 REF		
D1	5.334 REF			L4	0.600	0.800	1.000
D2	4.826 REF			ϕ	1.100	1.200	1.300
D3	3.166 REF			θ	0°		8°
E	6.000	6.100	6.200	θ_1	9° TYP		
e	2.286 TYP			θ_2	9° TYP		

9. Recommended Soldering Footprint



DIMENSIONS: MILLIMETERS

DISCLAIMER

ELECSUPER PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, SAFETY INFORMATION, AND OTHER RESOURCES “AS IS” AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with ElecSuper products. You are solely responsible for

(1) selecting the appropriate ElecSuper products for your application;

(2) designing, validating and testing your application;

(3) ensuring your application meets applicable standards, and any other safety, security, or other requirements.

These resources are subject to change without notice. ElecSuper grants you permission to use these resources only for development of an application that uses the ElecSuper products described in the resource. Other reproduction and display of these resources are prohibited. No license is granted to any other ElecSuper intellectual property right or to any third party intellectual property right. ElecSuper disclaims responsibility for, and you will fully indemnify ElecSuper and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources. ElecSuper's products are provided subject to ElecSuper's Terms of Sale or other applicable terms available either on www.elecsuper.com or provided in conjunction with such ElecSuper products. ElecSuper's provision of these resources does not expand or otherwise alter ElecSuper's applicable warranties or warranty disclaimers for ElecSuper products.