

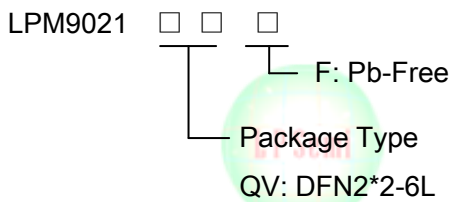


## Single P-Channel, -12V, -6.5A, Power MOSFET

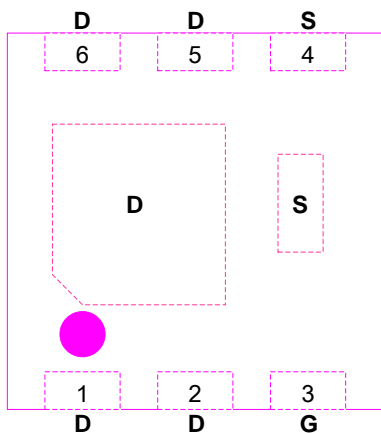
### General Description

The LPM9021 is P-Channel enhancement MOSFET Effect Transistor. It uses advanced trench technology and design to provide excellent RDS (ON) with low gate charge. This device is suitable for using in DC-DC conversion, power switch and charging circuit. Standard Product LPM9021QVF is Pb-free and Halogen-free.

### Order Information



### Pin Configurations



### Features

- Trench Technology
- Super high density cell design
- Excellent ON resistance for higher DC current
- Extremely Low Threshold Voltage
- Small package DFN2\*2-6L

### Applications

- ◇ Driver for Relay, Solenoid, Motor, LED etc.
- ◇ DC-DC converter circuit
- ◇ Power Switch
- ◇ Load Switch
- ◇ Charging

### Marking Information

Device	Marking	Package	Shipping
LPM9021QVF		DFN2*2-6L	3K/REEL

### Pin Description

Pin Number	Pin Description
1,2	Drain Pin
3	Gate Pin
4	Source Pin
5,6	Drain Pin



## Absolute Maximum Ratings

Parameter		Symbol	10 S	Steady State	Unit
Drain-Source Voltage		VDS	-12		V
Gate-Source Voltage		VGS	±12		
Continuous Drain Current	T <sub>A</sub> =25°C	ID	-6.5	-5.6	A
	T <sub>A</sub> =70°C		-5.2	-4.4	
Maximum Power Dissipation	T <sub>A</sub> =25°C	PD	1.9	1.4	W
	T <sub>A</sub> =70°C		1.2	0.9	
Continuous Drain Current	T <sub>A</sub> =25°C	ID	-4.8	-3.9	A
	T <sub>A</sub> =70°C		-3.8	-3.9	
Maximum Power Dissipation	T <sub>A</sub> =25°C	PD	1.0	0.6	W
	T <sub>A</sub> =70°C		0.6	0.4	
Pulsed Drain Current c		IDM	-24		A
Operating Junction Temperature		TJ	150		°C
Lead Temperature		TL	260		°C
Storage Temperature Range		Tstg	-55 to 150		°C

## Thermal resistance ratings

Parameter		Symbol	Typical	Maximum	Unit
Junction-to-Ambient Thermal Resistance	t ≤10 s	RθJA	49	64	°C/W
	Steady State		66	88	
Junction-to-Ambient Thermal Resistance	t ≤10 s	RθJA	84	118	
	Steady State		125	180	
Junction-to-Case Thermal Resistance	Steady State	RθJC	32	42	

a Surface mounted on FR-4 Board using 1 square inch pad size, 1oz copper

b Surface mounted on FR-4 board using minimum pad size, 1oz copper

c Pulse width<380μs, Duty Cycle<2%

d Maximum junction temperature T<sub>J</sub>=150°C.

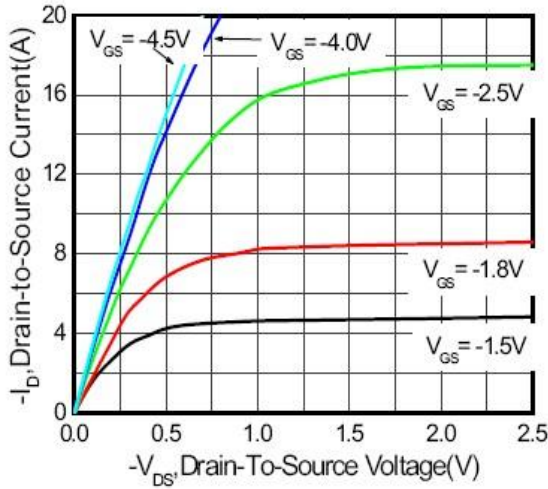


## Electrical Characteristics

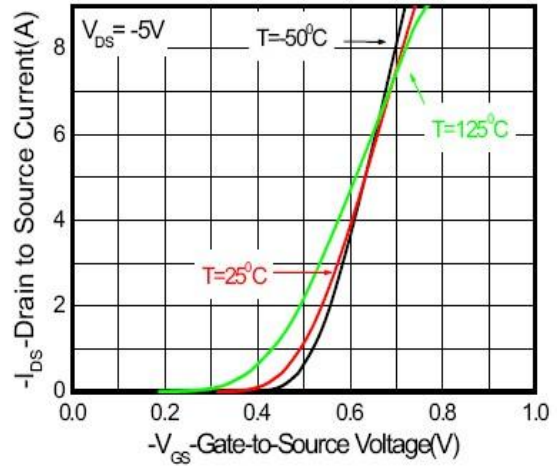
Parameter	Symbol	Test Condition	Min	Typ.	Max	Units
<b>OFF CHARACTERISTICS</b>						
Drain-to-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS} = 0\text{ V}, I_D = -250\mu\text{A}$	-12			V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = -12\text{ V}, V_{GS} = 0\text{ V}$			-1	$\mu\text{A}$
Gate-to-source Leakage Current	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 12\text{ V}$			$\pm 100$	nA
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = -250\mu\text{A}$	-0.4	-0.52	-0.9	V
Drain-to-source On-resistance b, c	$R_{DS(on)}$	$V_{GS} = -4.5\text{ V}, I_D = -5.5\text{ A}$		23	29	m $\Omega$
		$V_{GS} = -2.5\text{ V}, I_D = -2.5\text{ A}$		30	39	
		$V_{GS} = -1.8\text{ V}, I_D = -1.8\text{ A}$		39	50	
		$V_{GS} = -1.5\text{ V}, I_D = -1.5\text{ A}$		48	90	
Forward Transconductance	$g_{FS}$	$V_{DS} = -5.0\text{ V}, I_D = -5.5\text{ A}$		23		S
<b>CAPACITANCES, CHARGES</b>						
Input Capacitance	$C_{ISS}$	$V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$ $V_{DS} = -10\text{ V}$		1970		pF
Output Capacitance	$C_{OSS}$			205		
Reverse Transfer Capacitance	$C_{RSS}$			195		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = -4.5\text{ V},$ $V_{DS} = -10\text{ V},$ $I_D = -6.5\text{ A}$		21.0		nC
Threshold Gate Charge	$Q_{G(TH)}$			0.95		
Gate-to-Source Charge	$Q_{GS}$			1.30		
Gate-to-Drain Charge	$Q_{GD}$			7.60		
<b>SWITCHING CHARACTERISTICS</b>						
Turn-On Delay Time	$t_d(ON)$	$V_{GS} = -4.5\text{ V},$ $V_{DD} = -10\text{ V},$ $I_D = -6.5\text{ A},$ $R_G = 6\ \Omega$		16		ns
Rise Time	$t_r$			15.5		
Turn-Off Delay Time	$t_d(OFF)$			78		
Fall Time	$t_f$			44		
<b>BODY DIODE CHARACTERISTICS</b>						
Forward Voltage	$V_{SD}$	$V_{GS} = 0\text{ V}, I_S = -1.0\text{ A}$	-	-0.76	1.5	V



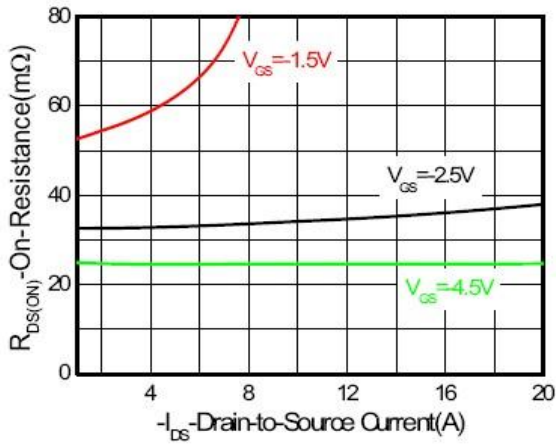
### Typical Characteristics (Ta=25°C, unless otherwise noted)



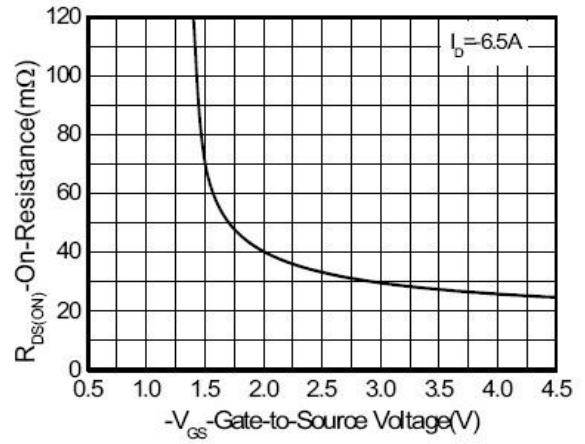
Output characteristics



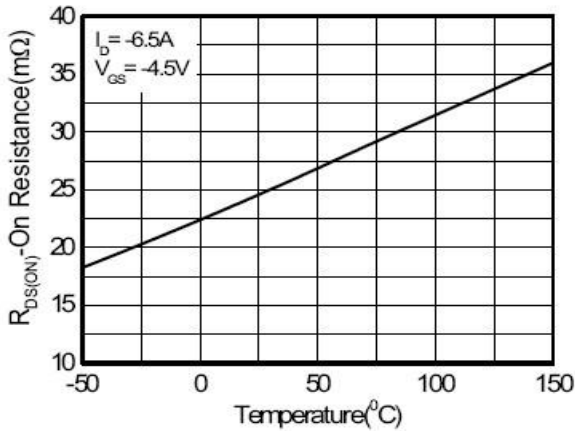
Transfer characteristics



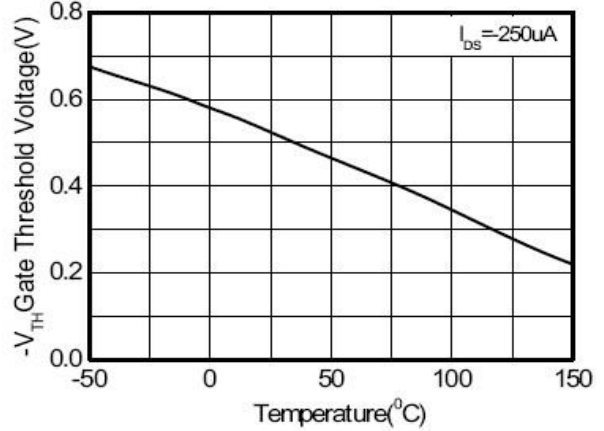
On-Resistance vs. Drain current



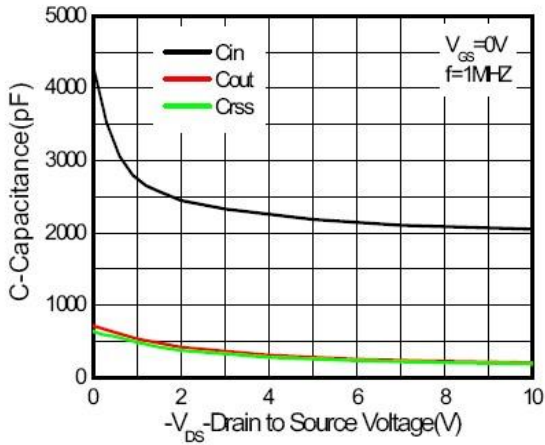
On-Resistance vs. Gate-to-Source voltage



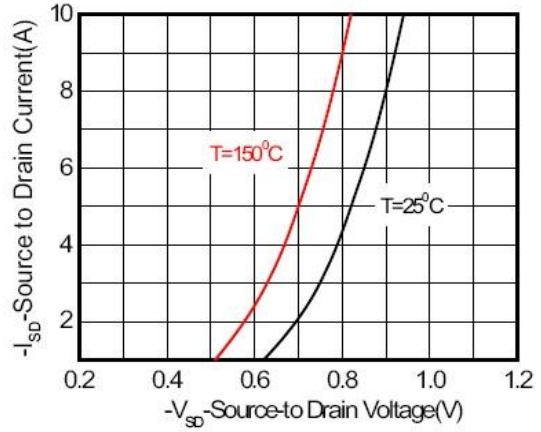
On-Resistance vs. Junction temperature



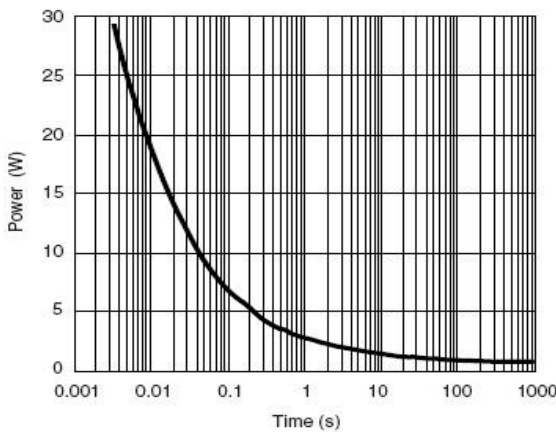
Threshold voltage vs. Temperature



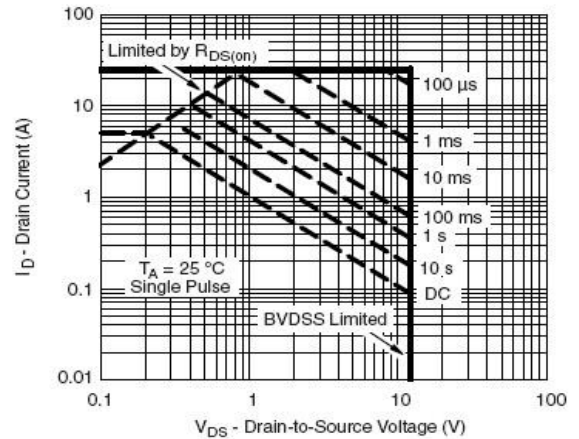
Capacitance



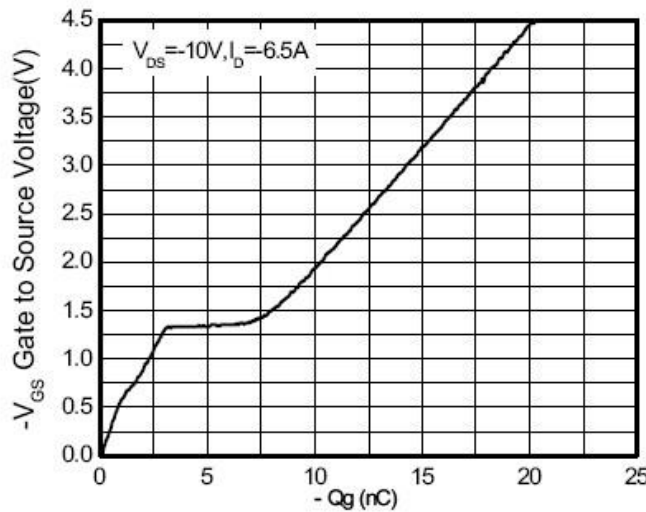
Body diode forward voltage



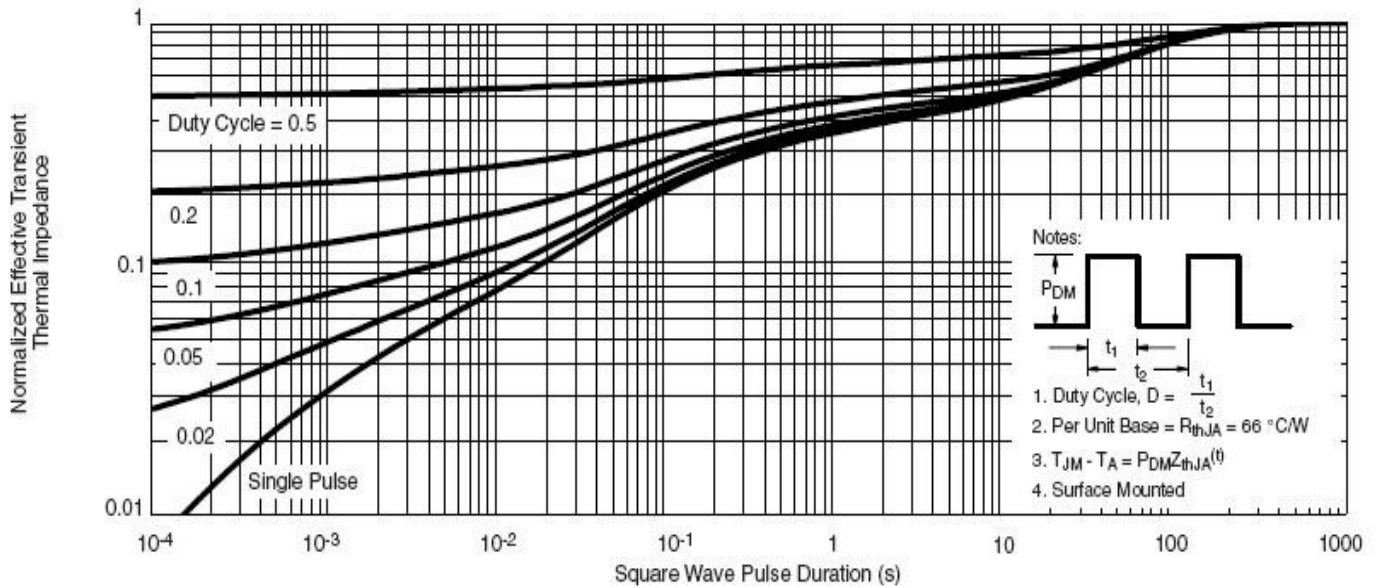
Single pulse power



Safe operating power



Gate Charge Characteristics

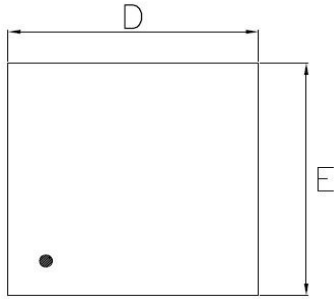


Transient thermal response (Junction-to-Ambient)

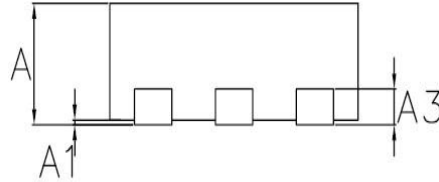




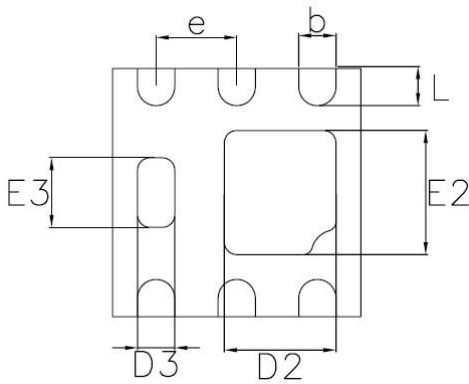
## Packaging Information



Top View



Side View



Bottom View

Symbol	Dimensions in millimeter		
	Min	Typ	Max
A	0.70	0.75	0.80
A1	0.00	-	0.05
A3	0.203 Ref.		
D	1.95	2.00	2.05
E	1.95	2.00	2.05
D2	0.85	0.90	0.95
E2	0.75	0.80	0.85
D3	0.25	0.30	0.35
E3	0.51	0.56	0.61
b	0.25	0.30	0.35
L	0.30	0.35	0.40
e	0.65 BSC.		