2N7500U5; 2N7501U5
2N7562U5

Radiation Hardened N Channel MOSFET (U5-18 pin LLC)

Rev. V6

Introduction

VPT Components' new radiation tolerant power MOSFETs are now available in die and U5-18 Pin LCC standard package options, as well as custom packaging for HiRel environments. Applications within military, aerospace, medical, nuclear power generation and high energy physics research laboratories can benefit from the use of this new series of MOSFETs. VPT Components' Power MOSFETS are radiation tolerant to 100 krad (Si) and SEGR/SEB immune to their full rated breakdown potential.

Operational power losses are minimized by VPT Components' ideal combination of low $r_{DS(on)}$ and gate charge. Die size is optimized for maximum current rating while meeting industry norms. These units are suitable for stand alone and hybrid applications.

These MOSFETs are well suited for low loss switching applications, such as DC to DC converters and solid-state relays. Die performance is drop-in compatible with industry standards.

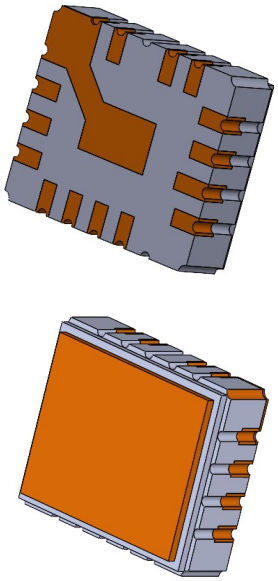
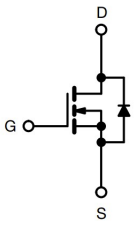


FIGURE 1.
U5-18 Pin LCC
Package



N-Channel MOSFET

Features

- Available in JANSR, JANVR
  Per MIL-PRF-19500/707
- Surface mount U5-18 Pin LCC package
- Hermetically Sealed

Maximum Ratings (T_A = +25°C unless otherwise specified)

Type	P_T T_C = +25°C (1)	P_T T_A= +25°C (free air)	$R_{\theta JC}$	V_{DS}	V_{DG}	V_{GS}	I_{D1} T_C = +25°C	I_{D2} T_C = +100°C	I_S	I_{DM}	T_J & T_{STG}	Max $r_{DS(on)1}$ V_{GS} = 10 V dc, I_D = I_{D2} T_J = +25°C (1)
	W	W	°C/W	V dc	V dc	V dc	A dc	A dc	A dc	A (pk)	°C	Ω
2N7500U5 2N7501U5 2N7562U5	25	1.67	5.0	130 200 250	130 200 250	±20	9.0 6.3 5.0	6.0 4.0 3.2	9.0 6.3 5.0	36.0 25.2 20.0	-55 to +150	0.130 0.621 0.990

NOTES:
1. Derate linearly by 0.2 W/°C for T_C > +25°C.

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Primary Electrical Characteristics (2N7500U5; 2N7501U5; 2N7562U5)

Characteristics	Test Conditions	Symbol	Min.	Max.	Unit
Drain-Source Breakdown Voltage 2N7500U5 2N7501U5 2N7562U5	V_{GS} = 0 V, I_D = 1 mA	$V_{(BR)DSS}$	130 200 250	—	V
Gate-Threshold Voltage	$V_{DS} \geq V_{GS}$, I_D = 1.0 mA	$V_{GS(TH)1}$	2.5	4.5	V
Gate-Body Leakage Forward	V_{GS} = +20V, V_{DS} = 0V	I_{GSSF1}	—	+100	nA
Gate-Body Leakage Reverse	V_{GS} = -20V, V_{DS} = 0V	I_{GSSR1}	—	-100	nA
Zero-Gate Voltage Drain Current 2N7500U5 2N7501U5 2N7562U5	V_{GS} = 0V, V_{DS} = 104V V_{DS} = 160V V_{DS} = 200V	I_{DSS1}	—	10	µA
Forward Voltage Drain Diode 2N7500U5 2N7501U5 2N7562U5	Pulsed dc Voltage V_{GS} = 0V, I_D = 9.0A I_D = 6.3A I_D = 5.0A	V_{SD}	—	1.5 1.5 1.5 1.5	V
Forward Transconductance 2N7500U5 2N7501U5 2N7562U5	V_{DD} = 12V I_D = 4.0A I_D = 6.0A I_D = 3.2A	g_{FS}	5.0 4.2 4.0	—	S
Turn-on Delay Time 2N7500U5 2N7501U5 2N7562U5	V_{GS} = 12V, R_G = 7.5Ω, I_D = 6.0A V_{DD} = 65V I_D = 4.0A V_{DD} = 100V I_D = 3.2A V_{DD} = 125V	$t_{d(on)}$	—	25	ns
Rise Time 2N7500U5 2N7501U5 2N7562U5	V_{GS} = 12V, R_G = 7.5Ω, I_D = 6.0A V_{DD} = 65V I_D = 4.0A V_{DD} = 100V I_D = 3.2A V_{DD} = 125V	t_r	—	100	ns
Turn-off Delay Time 2N7500U5 2N7501U5 2N7562U5	V_{GS} = 12V, R_G = 7.5Ω, I_D = 6.0A V_{DD} = 65V I_D = 4.0A V_{DD} = 100V I_D = 3.2A V_{DD} = 125V	$t_{d(off)}$	—	35	ns
Fall Time 2N7500U5 2N7501U5 2N7562U5	V_{GS} = 12V, R_G = 7.5Ω, I_D = 6.0A V_{DD} = 65V I_D = 4.0A V_{DD} = 100V I_D = 3.2A V_{DD} = 125V	t_f	—	40	ns

NOTE: All voltages and currents are in dc.

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Primary Electrical Characteristics (2N7500U5; 2N7501U5; 2N7562U5)

Characteristics	Test Conditions	Sym-	Min.	Max.	Unit
On-state Gate Charge 2N7500U5 2N7501U5 2N7562U5	V_{GS} = ±20V, T_A = +175°C, t=24 hours I_D = 9.0A V_{DD} = 65V I_D = 6.3A V_{DD} = 100V I_D = 5.0A V_{DD} = 125V	$Q_{G(ON)}$	—	48 47 32	nC
Gate to Source Charge 2N7500U5 2N7501U5 2N7562U5	V_{GS} = ±20V, T_A = +175°C, t=24 hours I_D = 9.0A V_{DD} = 65V I_D = 6.3A V_{DD} = 100V I_D = 5.0A V_{DD} = 125V	Q_{GS}	—	16 12 11	nC
Gate to Drain Charge 2N7500U5 2N7501U5 2N7562U5	V_{GS} = ±20V, T_A = +175°C, t=24 hours I_D = 9.0A V_{DD} = 65V I_D = 6.3A V_{DD} = 100V I_D = 5.0A V_{DD} = 125V	Q_{GD}	—	18 16 16	nC
Reverse Recovery Time 2N7500U5 2N7501U5 2N7562U5	di/dt = 100A/µs, V_{DD} ≤ 50V, I_D = 9.0A I_D = 6.3A I_D = 5.0A	t_{rr}	—	250 274 287	ns

Temperature Testing Electrical Characteristics (2N7500U5; 2N7501U5; 2N7562U5)

Characteristics	Test Conditions	Symbol	Min.	Max.	Unit
High Temperature Operation	$T_C = T_J$ = +125°C	—	—	—	—
Gate-Body Leakage Forward	V_{GS} = +20V, V_{DS} = 0V	I_{GSSF2}	—	+200	nA
Gate-Body Leakage Reverse	V_{GS} = -20V, V_{DS} = 0V	I_{GSSR2}	—	-200	nA
Zero-Gate Voltage Drain Current 2N7500U5 2N7501U5 2N7562U5	V_{GS} = 0V, V_{DS} = 104V V_{DS} = 160V V_{DS} = 200V	I_{DSS2}	—	25	mA
Drain-Source On-Resistance 2N7500U5 2N7501U5 2N7562U5	Pulsed dc Voltage V_{GS} = 12V, I_D = 6.0A I_D = 4.0A I_D = 3.2A	$r_{DS(on)3}$	—	0.247 0.540 0.945	Ω
Gate-Threshold Voltage	$V_{DS} \geq V_{GS}$, I_D = 1 mA	$V_{GS(TH)2}$	1.5	—	V

Characteristics	Test Conditions	Symbol	Min.	Max.	Unit
Low Temperature Operation	$T_C = T_J$ = -55°C	—	—	—	—
Gate-Threshold Voltage	$V_{DS} \geq V_{GS}$, I_D = 1 mA	$V_{GS(TH)3}$	—	5.5	V

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Outline Drawing (U5-18 Pin LLC)

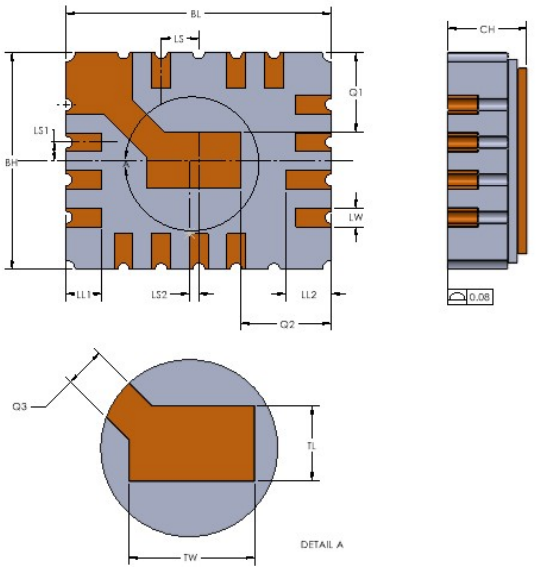

FIGURE 2. Dimensions and configuration of surface mount (U5-18 Pin LCC) package.

Symbol	Inches		mm	
	Min	Max	Min	Max
BL	.345	.360	8.77	9.14
BW	.280	.295	7.12	7.49
CH	.095	.115	2.42	2.92
LL1	.040	.055	1.02	1.39
LL2	.055	.065	1.40	1.65
LS	.050 BSC		1.27 BSC	
LS1	.025 BSC		0.635	
LS2	.008 BSC		0.203 BSC	
LW	.020	.030	0.51	0.76
Q1	.105 REF		2.67 REF	
Q2	.120 REF		3.05 REF	
Q3	.045	.055	1.15	1.39
TL	.070	.080	1.78	2.03
TW	.120	.130	1.78	3.30

NOTES:
1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Dimensions and tolerancing shall be in accordance with ASME Y14.5.

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