

2N6660, 2N6661

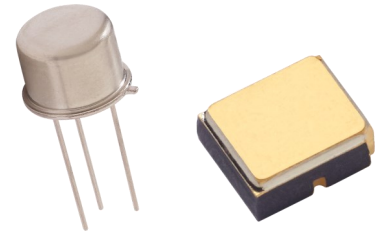


N Channel Power MOSFET

Rev. V2

Features

- Available in JAN, JANTX, JANTXV and JANS per MIL-PRF-19500/547
- Features Low On-Resistance, Fast Switching Speed and Low Threshold
- Low Input Capacitance
- Ideal for Hi-Rel Solid-State Relays, Battery Operated Systems and Driver Applications for Relays, Solenoids, Lamps, Displays, Memories, etc.
- TO-39 (TO-205AD) and Surface Mount UB Package Types



Electrical Characteristics ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Test Conditions	Symbol	Units	Min.	Max.
Drain-Source Breakdown Voltage	$V_{DS} = 0, I_G = 1.0 \mu\text{A dc}$ 2N6660, UB $V_{DS} = 0, I_G = 1.0 \mu\text{A dc}$ 2N6661, UB	V_{DS}	V dc	60 90	—
Gate-Source Threshold Voltage	$V_{DS} = V_{GS}, I_D = 1 \text{ mA dc}$	$V_{GS(th)}$	V dc	0.8	2.0
Gate Current	$V_{DS} = 0, V_{GS} = \pm 20\text{V}$	I_{GSS}	nA dc	—	± 100
Zero Gate Voltage Drain Current	$V_{GS} = 0 \text{ V}, V_{DS} = 48 \text{ V dc}$ 2N6660, UB $V_{GS} = 0 \text{ V}, V_{DS} = 72 \text{ V dc}$ 2N6661, UB	I_{DSS}	$\mu\text{A dc}$	—	1.0
Drain-Source On-State Resistance	$V_{GS} = 10 \text{ V dc}, I_D = 1.0 \text{ A dc}$ 2N6660, UB $V_{GS} = 10 \text{ V dc}, I_D = 1.0 \text{ A dc}$ 2N6661, UB	$r_{DS(on)}^1$	Ω	—	3.0 4.0
Drain-Source On-State Resistance	$V_{GS} = 5\text{V}, I_D = 0.3\text{A}$ 2N6660, UB $V_{GS} = 5\text{V}, I_D = 0.3\text{A}$ 2N6661, UB	$r_{DS(on)}^2$	Ω	—	5.0 5.3
Forward Transconductance	$V_{DS} = V_{GS} = 7.5\text{V}, I_{D1} = 525 \text{ mA dc}$ 2N6660, UB $V_{DS} = V_{GS} = 7.5\text{V}, I_{D2} = 475 \text{ mA dc}$ 2N6661, UB	g_{fs}	mS	170	—
Diode Forward Voltage	$I_S = 0.99 \text{ A}, V_{GS} = 0 \text{ V}$ 2N6660, UB $I_S = 0.86 \text{ A}, V_{GS} = 0 \text{ V}$ 2N6661, UB	V_{SD}	V (pk)	0.7	1.6 1.4

Electrical Characteristics

Parameter	Test Conditions	Symbol	Units	Min.	Max.
Dynamic Characteristics					
Static, Drain-Source On State Resistance	$V_{GS} = 10 \text{ V dc}; I_D = 1.0 \text{ A dc}; T_C = +125^\circ\text{C}$ 2N6660, UB 2N6661, UB	$r_{DS(on)3}$	Ω	—	5.6 7.5
Drain Current	$T_C = +125^\circ\text{C}; V_{GS} = 0 \text{ V}$ $V_{DS} = 48 \text{ V}$ 2N6660, UB $V_{DS} = 72 \text{ V}$ 2N6661, UB	I_{DSS2}	μA	—	100
Small-Signal, Common-Source Short Circuit Reverse Transfer Capacitance	$V_{DS} = 25 \text{ V dc}; V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$	C_{rss}	pF	—	10
Small-Signal, Common-Source Short Circuit Input Capacitance	$V_{DS} = 25 \text{ V dc}; V_{GS} = 0 \text{ V}; f = 1.0 \text{ MHz}$	C_{iss}	pF	—	50
Small-Signal, Common-Source Short Circuit Output Capacitance	$V_{DS} = 25 \text{ V dc}; V_{GS} = 0 \text{ V}; f = 1.0 \text{ MHz}$	C_{oss}	pF	—	40
Switching Characteristics					
Turn-On Delay Time	$R_{GS} = 23\Omega, R_L = 23\Omega, V_{GEN} = 10 \text{ V}$ $V_{DD} = 25 \text{ V dc}; I_D = 1 \text{ A dc}$	$t_{d(on)}$	ns	—	10
Turn-Off Delay Time	$R_{GS} = 23\Omega, R_L = 23\Omega, V_{GEN} = 10 \text{ V}$ $V_{DD} = 25 \text{ V dc}; I_D = 1 \text{ A dc}$	$t_{d(off)}$	ns	—	10

Absolute Maximum Ratings ($T_A = +25^\circ\text{C}$ unless otherwise noted)

Ratings	Symbol	Value
Gate-Source Voltage	V_{GS}	± 20 V dc
Drain-Source Voltage	V_{DS}	2N6660, UB 60 V dc 2N6661, UB 90 V dc
Drain-Gate Voltage	V_{DGR}	2N6660, UB 60 V dc 2N6661, UB 90 V dc
Continuous Drain-Current	$I_{D1}^{(3)}$	2N6660, UB 0.99 A dc 2N6661, UB 0.86 A dc
Continuous Drain-Current $T_C = +100^\circ\text{C}$	$I_{D2}^{(3)}$	2N6660, UB 0.62 A dc 2N6661, UB 0.54 A dc
Source Current	I_S	2N6660, UB -0.99 A dc 2N6661, UB -0.86 A dc
Peak Drain Current	I_{DM}	3 A (pk)
Maximum Power Dissipation (TO-39) @ $T_C = 25^\circ\text{C}^{(1)}$ @ $T_A = 25^\circ\text{C}$	P_T	6.25 W 725 mW
Maximum Power Dissipation (UB) @ $T_C = 25^\circ\text{C}^{(1)}$ @ $T_A = 25^\circ\text{C}$	P_T	2.5 W 570 mW
Junction & Storage Temperature Range	T_J and T_{STG}	-65°C to $+150^\circ\text{C}$
Thermal Resistance, Junction to Case Thermal Resistance, Junction to Case (UB)	$R_{\theta JC}$	20°C/W 40°C/W

(1) Derate linearly $0.05 \text{ W}/^\circ\text{C}$ for $T_C > +25^\circ\text{C}$

(2) $R_{GS} \leq 1 \text{ M ohm}$

(3) The following formula derives the maximum theoretical I_D limit. I_D is limited by package and internal construction.

$$I_D = \sqrt{\frac{T_{JM} - T_C}{(R_{\theta JC}) \times (R_{DS(on)} \text{ at } T_{JM})}}$$

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Outline Drawing TO-205AD (TO-39)

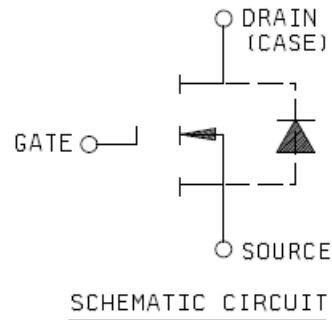
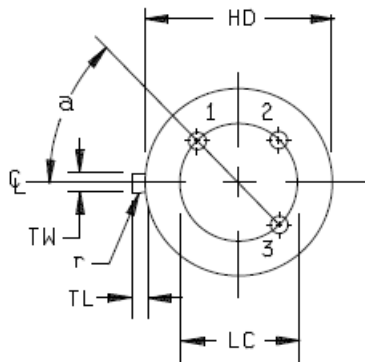
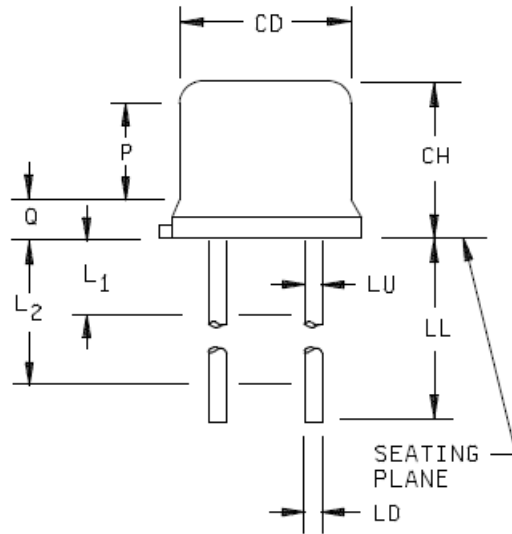


FIGURE 1. Physical dimensions (TO-205AD).

Outline Drawing TO-205AD (TO-39)

MIL-PRF-19500/547D

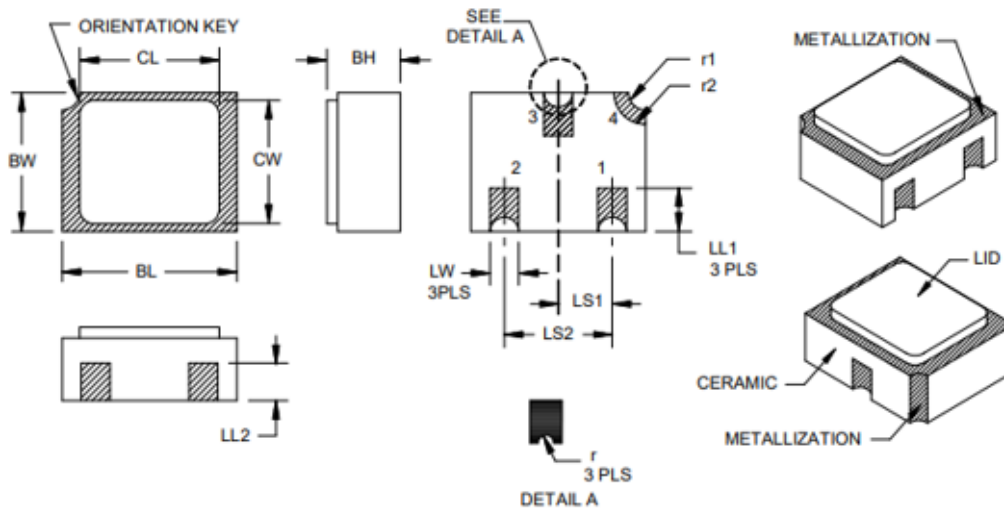
Ltr	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
CD	.305	.335	7.75	8.51	
CH	.240	.260	6.10	6.60	
HD	.335	.370	8.51	9.40	
TW	.028	.034	0.71	0.86	2
TL	.029	.045	0.74	1.14	3
LD	.016	.021	0.41	0.53	7,8
LL	.500	.750	12.70	19.05	7,8
LC	0.200 TP		5.08 TP		6
LU	.016	.019	0.41	0.48	7,8
L ₁		.050		1.27	7,8
L ₂	.250		6.35		7,8
P	.100		2.54		5
Q		.050		1.27	4
R		.010		0.25	9
α	45° TP		45° TP		6

NOTES:

1. Dimensions are in inches. Millimeters are given for general information only.
2. Beyond radius (r) maximum, TW shall be held for a minimum length of .011 inch (0.28 mm).
3. Dimension TL measured from maximum HD.
4. Outline in this zone is not controlled.
5. Dimension CD shall not vary more than .010 inch (0.25 mm) in zone P. This zone is controlled for automatic handling.
6. Leads at gauge plane .054 +.001, -.000 inch (1.37 +0.03, -0.00 mm) below seating plane shall be within .007 inch (0.18 mm) radius of true position (TP) at maximum material condition (MMC) relative to tab at MMC.
7. LU applies between L₁ and L₂. LD applies between L₂ and L minimum. Diameter is uncontrolled in L₁ and beyond LL minimum.
8. All three leads.
9. Radius (r) applies to both inside corners of tab.
10. Drain is electrically connected to the case.

FIGURE 1. Physical dimensions(TO-205AD) - Continued.

Outline Drawing (UB)



Symbol	Dimensions				Notes	Symbol	Dimensions				Notes
	Inches		Millimeters				Inches		Millimeters		
	Min	Max	Min	Max			Min	Max	Min	Max	
BL	.115	.128	2.92	3.25		LL2	.009	.036	0.23	0.89	6
BW	.085	.108	2.16	2.74		LS1	.035	.040	0.89	1.02	
BH	.040	.056	1.02	1.42	4	LS2	.071	.079	1.80	2.01	
BH	.055	.069	1.40	1.75	5	LW	.016	.024	0.41	0.61	6
CL		.128		3.25		r		.008		0.20	
CW		.108		2.74		r1		.012		0.30	7
LL1	.022	.038	0.56	0.97	6	r2		.022		0.56	

NOTES:

1. Dimensions are in inches. Millimeters are given for general information only.
2. Hatched areas on package denote metallized areas.
3. Pad 1 = Gate, 2 = Source, 3 = Drain, 4 = shielding connected to the lid (UB only) or lid braze ring (UBC only).
4. Dimension BH for UB packages with metal lid.
5. Dimension BH for UBC packages with ceramic lid.
6. Three places.
7. For design reference only.
8. In accordance with ASME Y14.5M, diameters are equivalent to Øx symbology.

FIGURE 2. Physical dimensions for UB and UBC style surface mount package.

Graphs

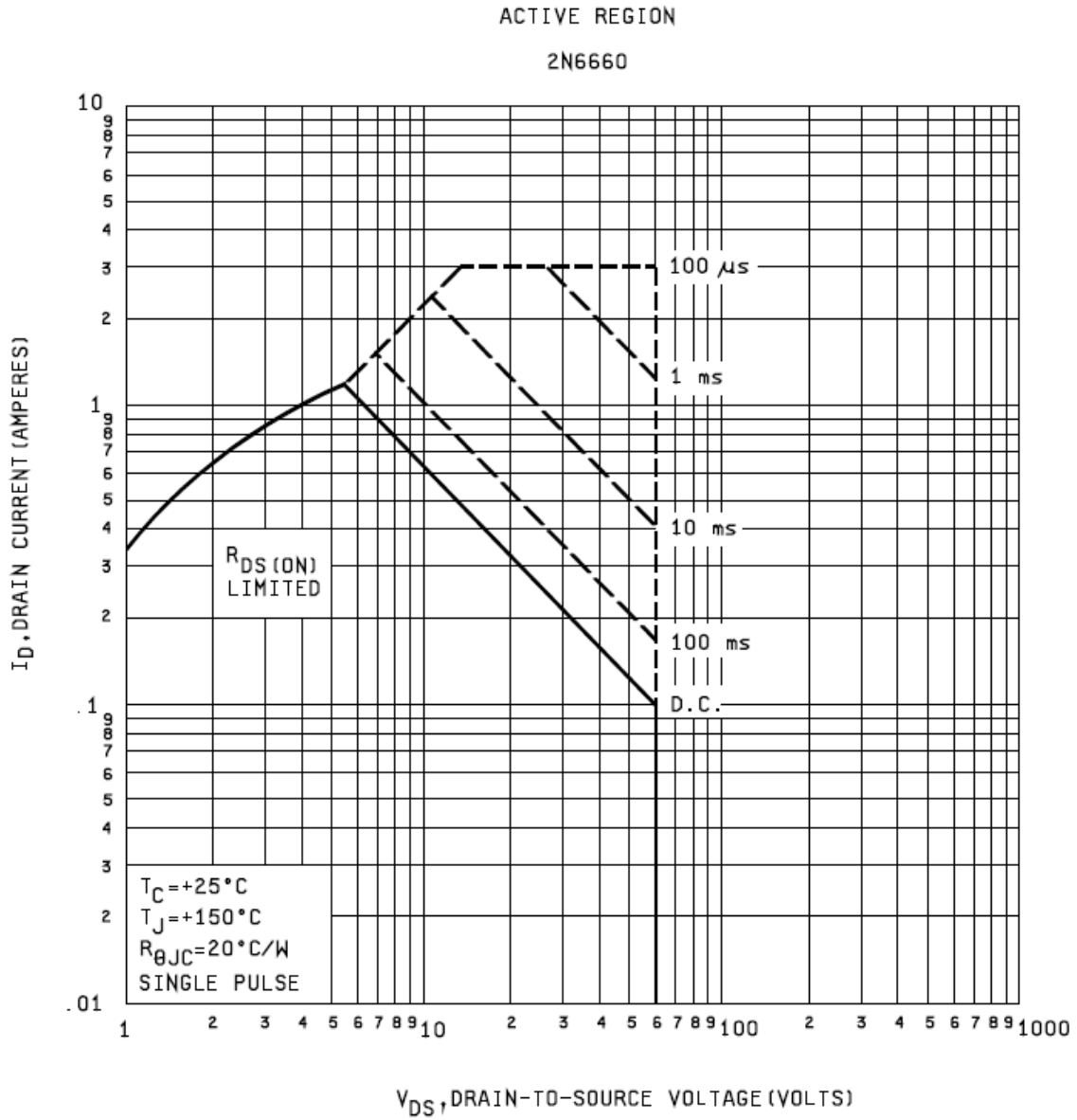


FIGURE 2. Maximum safe operating area.

Graphs

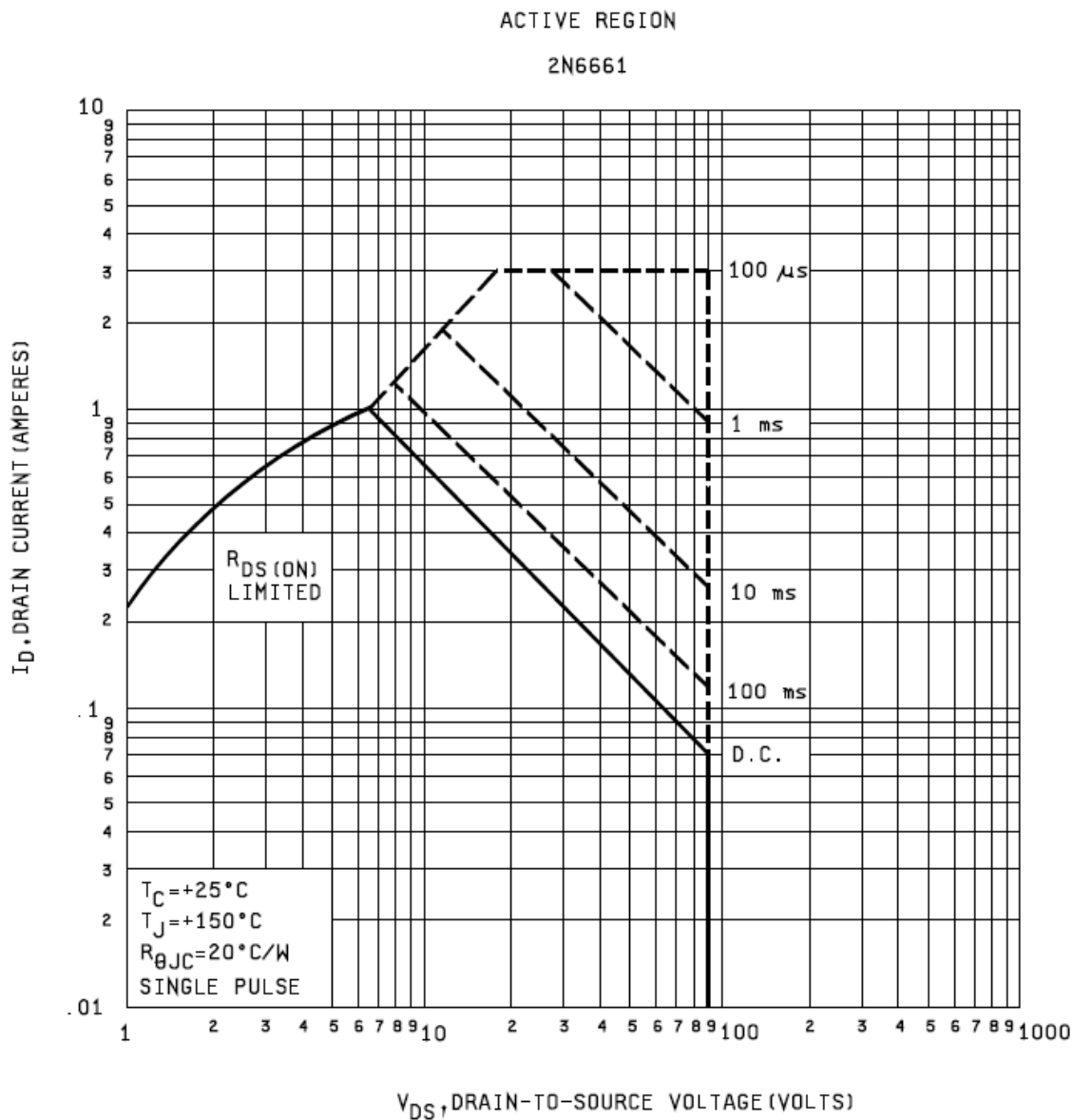


FIGURE 2. Maximum safe operating area - Continued.

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