

## N-Channel 90 V (D-S) MOSFET



### PRODUCT SUMMARY

$V_{DS}$ (V)	90
$R_{DS(on)}$ ( $\Omega$ ) at $V_{GS} = 10$ V	4
Configuration	Single

### FEATURES

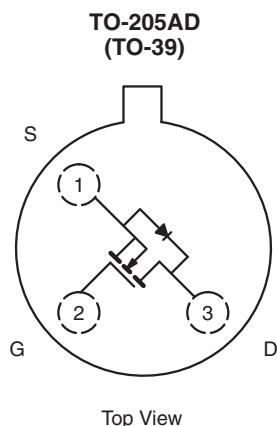
- Military Qualified
- Low On-Resistance:  $3.6 \Omega$
- Low Threshold: 1.6 V
- Low Input Capacitance: 35 pF
- Fast Switching Speed: 6 ns
- Low Input and Output Leakage

### BENEFITS

- Guaranteed Reliability
- Low Offset Voltage
- Low-Voltage Operation
- Easily Driven Without Buffer
- High-Speed Circuits
- Low Error Voltage

### APPLICATIONS

- Hi-Rel Systems
- Direct Logic-Level Interface: TTL/CMOS
- Drivers: Relays, Solenoids, Lamps, Hammers, Displays, Memories, Transistors, etc.
- Battery Operated Systems
- Solid-State Relays



### ORDERING INFORMATION

PART	PACKAGE	DESCRIPTION/DSCC PART NUMBER	VISHAY ORDERING PART NUMBER
2N6661	TO-205AD (TO-39)	Commercial	2N6661
2N6661-2		Commercial, Lead (Pb)-free	2N6661-E3
		See -2 Flow Document	2N6661-2
2N6661JANTX		JANTX2N6661 (std Au leads)	2N6661JTX02
		JANTX2N6661 (with solder)	2N6661JTXL02
		JANTX2N6661P (with PIND)	2N6661JTXP02
2N6661JANTXV		JANTXV2N6661 (std Au leads)	2N6661JTXV02
		JANTXV2N6661P (with PIND)	2N6661JTVP02

### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	$V_{DS}$	90	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	
Continuous Drain Current ( $T_J = 150^\circ\text{C}$ )	$I_D$	$T_C = 25^\circ\text{C}$	A
		$T_C = 100^\circ\text{C}$	
Pulsed Drain Current <sup>a</sup>	$I_{DM}$	3	
Maximum Power Dissipation	$P_D$	$T_C = 25^\circ\text{C}$	W
		$T_A = 25^\circ\text{C}$	
Thermal Resistance, Junction-to-Ambient <sup>b</sup>	$R_{thJA}$	170	$^\circ\text{C/W}$
Thermal Resistance, Junction-to-Case	$R_{thJC}$	20	
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to 150	$^\circ\text{C}$

#### Notes

- Pulse width limited by maximum junction temperature.
- Not required by military spec.



SPECIFICATIONS (T <sub>A</sub> = 25 °C, unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS		LIMITS			UNIT
				MIN.	TYP. <sup>b</sup>	MAX.	
Static							
Drain-Source Breakdown Voltage	V <sub>DS</sub>	V <sub>DS</sub> = 0 V, I <sub>D</sub> = 10 μA		90	125	-	V
Gate-Source Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 1 mA		0.8	1.6	2	
		T <sub>A</sub> = - 55 °C		-	1.8	2.5	
		T <sub>A</sub> = 125 °C		0.3	1.3	-	
Gate-Body Leakage	I <sub>GSS</sub>	V <sub>GS</sub> = ± 20 V	V <sub>DS</sub> = 0 V	-	-	± 100	nA
			T <sub>A</sub> = 125 °C	-	-	± 500	
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>GS</sub> = 0 V	V <sub>DS</sub> = 72 V	-	-	1	μA
			T <sub>A</sub> = 125 °C	-	-	100	
On-State Drain Current <sup>b</sup>	I <sub>D(on)</sub>	V <sub>GS</sub> = 10 V	V <sub>DS</sub> = 10 V	-	1.8	-	mA
Drain-Source On-State Resistance <sup>b</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = 5 V	I <sub>D</sub> = 0.3 A	-	3.8	5.3	Ω
		V <sub>GS</sub> = 10 V	I <sub>D</sub> = 1 A	-	3.6	4	
			T <sub>A</sub> = 125 °C <sup>d</sup>	-	6.7	7.5	
Forward Transconductance <sup>b</sup>	g <sub>fs</sub>	V <sub>DS</sub> = 7.5 V, I <sub>D</sub> = 0.475 A		170	340	-	mS
Diode Forward Voltage	V <sub>SD</sub>	V <sub>GS</sub> = 0 V	I <sub>S</sub> = 0.86 A	0.7	0.9	1.4	V
Dynamic							
Input Capacitance	C <sub>iss</sub>	V <sub>GS</sub> = 0 V	V <sub>DS</sub> = 25 V, f = 1 MHz	-	35	50	pF
Output Capacitance	C <sub>oss</sub>			-	15	40	
Reverse Transfer Capacitance	C <sub>rss</sub>			-	2	10	
Drain-Source Capacitance	C <sub>ds</sub>			-	30	-	
Switching <sup>c</sup>							
Turn-On Time	t <sub>ON</sub>	V <sub>DD</sub> = 25 V, R <sub>L</sub> = 23 Ω		-	6	10	ns
Turn-Off Time	t <sub>OFF</sub>	I <sub>D</sub> ≅ 1 A, V <sub>GEN</sub> = 10 V, R <sub>g</sub> = 23 Ω		-	8	10	

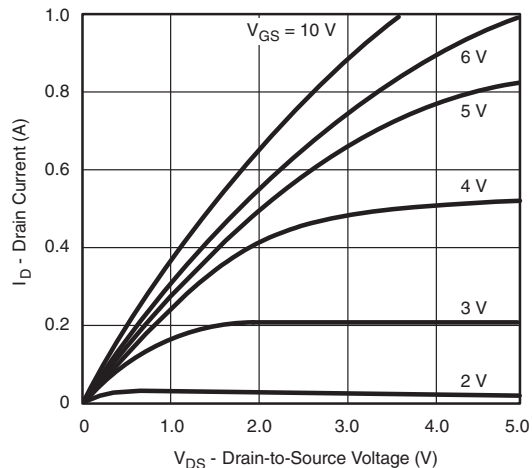
#### Notes

- FOR DESIGN AID ONLY, not subject to production testing.
- Pulse test:  $PW \leq 300\text{ }\mu\text{s}$  duty cycle  $\leq 2\%$ .
- Switching time is essentially independent of operating temperature.
- This parameter not registered with JEDEC.

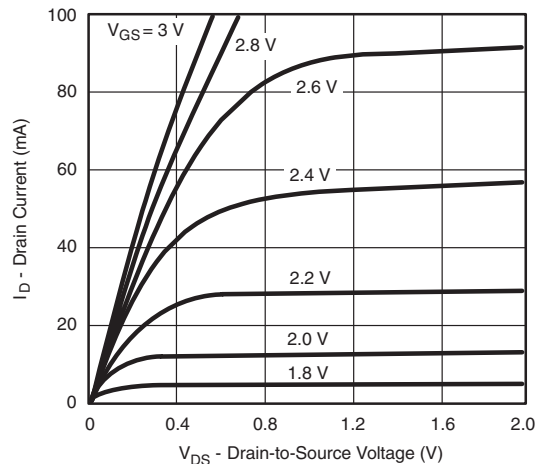
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.



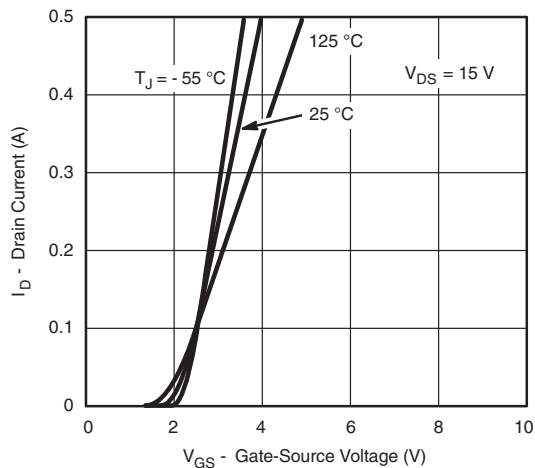
## TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



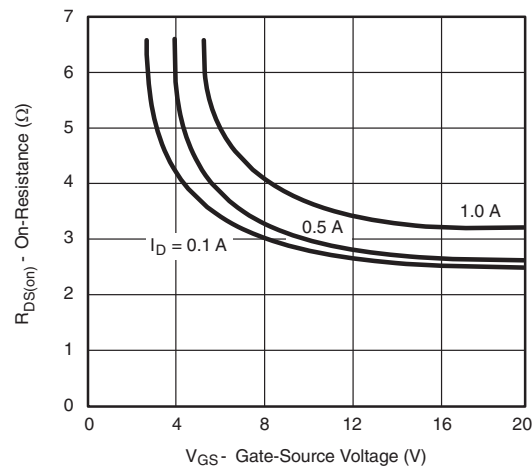
Ohmic Region Characteristics



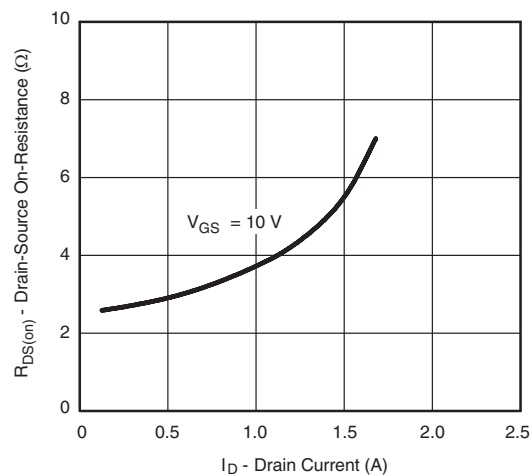
Output Characteristics for Low Gate Drive



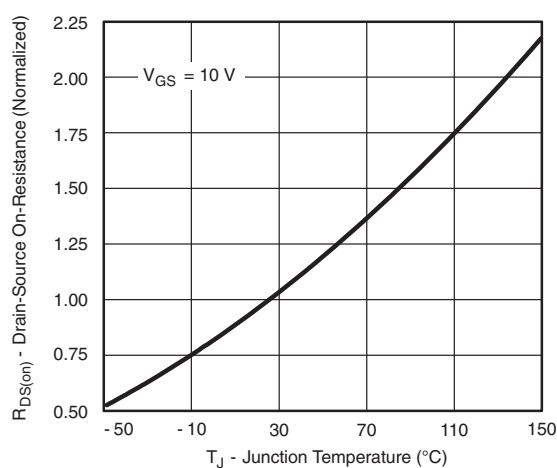
Transfer Characteristics



On-Resistance vs. Gate-to-Source Voltage



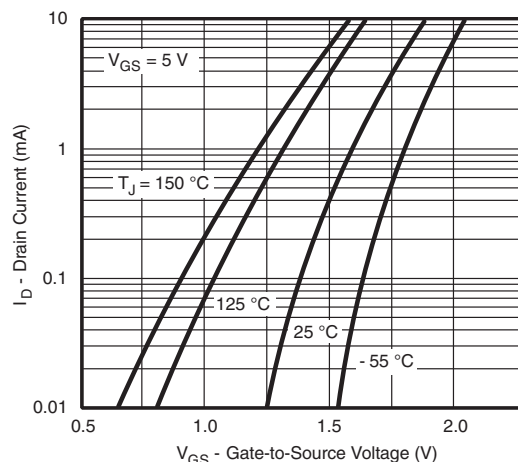
On-Resistance vs. Drain Current



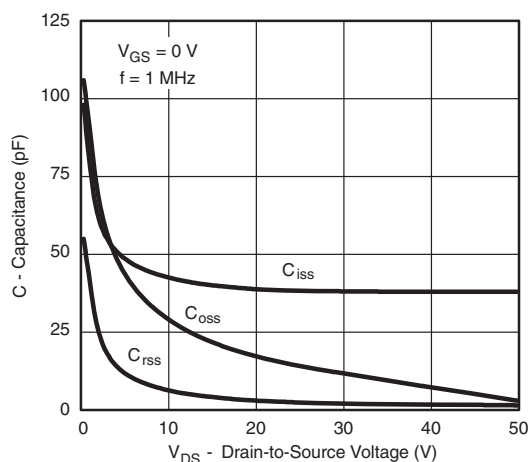
Normalized On-Resistance vs. Junction Temperature



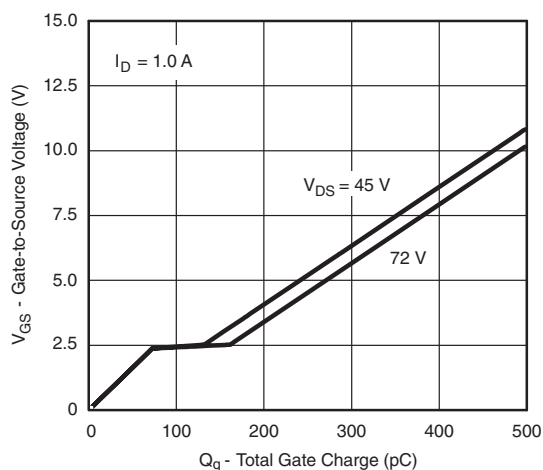
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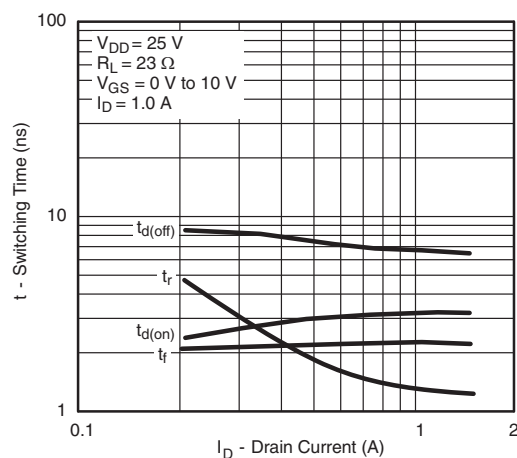
Threshold Region



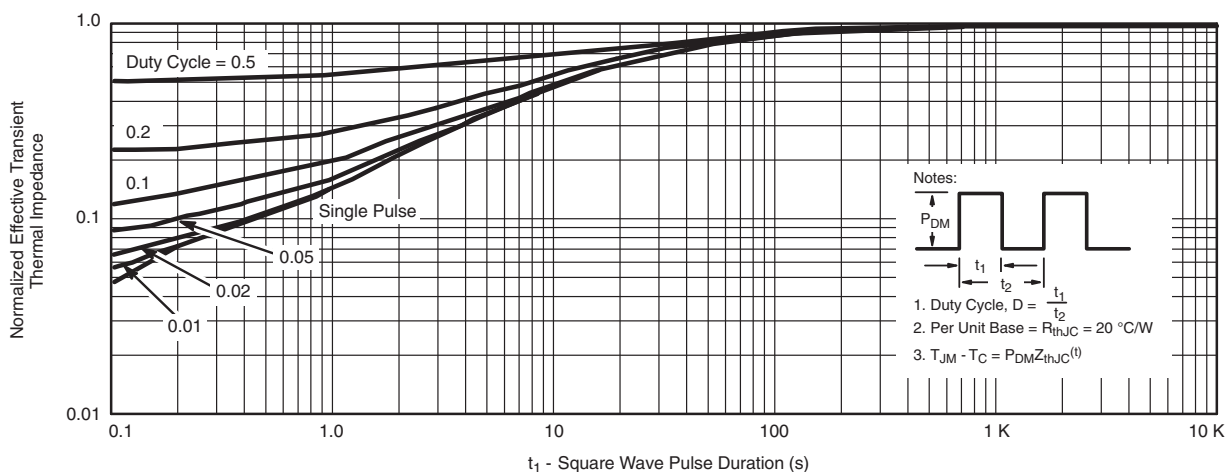
Capacitance



Gate Charge



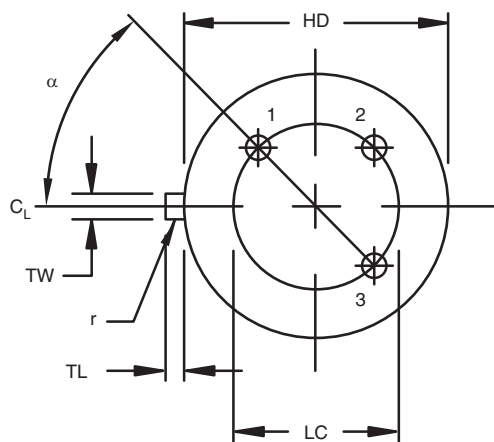
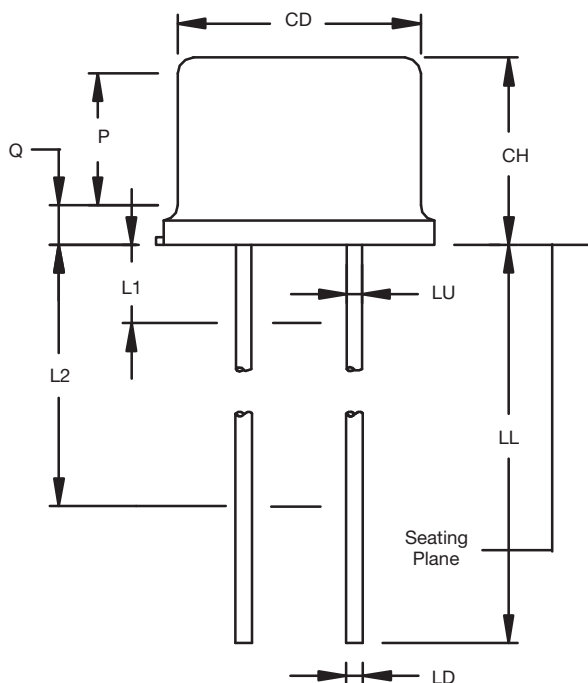
Load Condition Effects on Switching



Normalized Thermal Transient Impedance, Junction-to-Ambient

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## TO-205AD (TO-39 TALL LID)



DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
CD	0.305	0.335	7.75	8.51
CH	0.240	0.260	6.10	6.60
HD	0.335	0.370	8.51	9.40
LC <sup>(6)</sup>	0.200 TP		5.08 TP	
LD <sup>(7)(8)</sup>	0.016	0.021	0.41	0.53
LL <sup>(7)(8)</sup>	0.500	0.750	12.70	19.05
LU <sup>(7)(8)</sup>	0.016	0.019	0.41	0.48
L1 <sup>(7)(8)</sup>	—	0.050	—	1.27
L2 <sup>(7)(8)</sup>	0.250	—	6.35	—
P <sup>(5)</sup>	0.100	—	2.54	—
Q <sup>(4)</sup>	—	0.050	—	1.27
r <sup>(9)</sup>	—	0.010	—	0.25
TL <sup>(3)</sup>	0.029	0.045	0.74	1.14
TW <sup>(2)</sup>	0.028	0.034	0.71	0.86
α <sup>(6)</sup>	45° TP		45° TP	
ECN: S15-1675-Rev. D, 27-Jul-15				
DWG: 5511				

### Notes

- (1) Dimensions are in inches. Metric equivalents are given for general information only.
- (2) Beyond radius (r) maximum, TW shall be held for a minimum length of 0.011" (0.028 mm).
- (3) Dimension TL measured from maximum HD.
- (4) Outline in this zone is not controlled.
- (5) Dimension CD shall not vary more than 0.010 (0.25 mm) in zone P. This zone is controlled for automatic handling.
- (6) Leads at gauge plane 0.054" + 0.001", - 0.000" (1.37 mm + 0.03 mm, - 0.00 mm) below seating plane shall be within 0.007" (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 maximum. 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.



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