

# 2N6659/2N6660, VQ1004J/P

**TEMIC**  
Semiconductors

## N-Channel Enhancement-Mode MOSFET Transistors

### Product Summary

Part Number	$V_{(BR)DSS}$ Min (V)	$r_{DS(on)}$ Max ( $\Omega$ )	$V_{GS(th)}$ (V)	$I_D$ (A)
2N6659	35	1.8 @ $V_{GS} = 10$ V	0.8 to 2	1.4
2N6660	60	3 @ $V_{GS} = 10$ V	0.8 to 2	1.1
VQ1004J/P		3.5 @ $V_{GS} = 10$ V	0.8 to 2.5	0.46

### Features

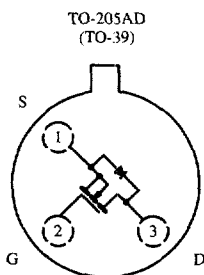
- Low On-Resistance: 1.3  $\Omega$
- Low Threshold: 1.7 V
- Low Input Capacitance: 35 pF
- Fast Switching Speed: 8 ns
- Low Input and Output Leakage

### Benefits

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

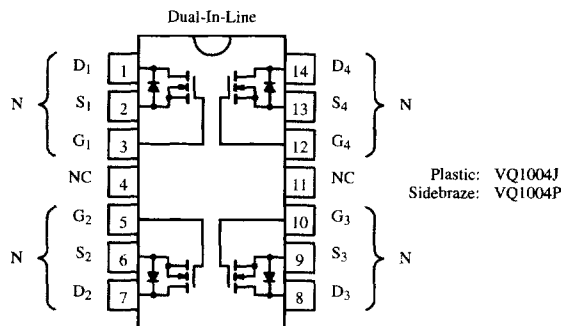
### Applications

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



Top View

2N6659  
2N6660



Top View

Plastic: VQ1004J  
Sidebrazed: VQ1004P

### Absolute Maximum Ratings ( $T_C = 25^\circ\text{C}$ Unless Otherwise Noted)

Parameter	Symbol	2N6659	2N6660	Single		Total Quad	Unit	
				VQ1004J	VQ1004P	VQ1004J/P		
Drain-Source Voltage	$V_{DS}$	35	60	60	60		V	
Gate-Source Voltage	$V_{GS}$	$\pm 20$	$\pm 20$	$\pm 30$	$\pm 20$			
Continuous Drain Current ( $T_J = 150^\circ\text{C}$ )	$I_D$	$T_C = 25^\circ\text{C}$	1.4	1.1	0.46	$\pm 0.46$	A	
		$T_C = 100^\circ\text{C}$	1	0.8	0.26	0.26		
Pulsed Drain Current <sup>a</sup>	$I_{DM}$	3	3	2	2			
Power Dissipation	$P_D$	$T_C = 25^\circ\text{C}$	6.25	6.25	1.3	1.3	2	W
		$T_C = 100^\circ\text{C}$	2.5	2.5	0.52	0.52	0.8	
Maximum Junction-to-Ambient <sup>b</sup>	$R_{thJA}$	170	170	0.96	0.96	62.5	$^\circ\text{C/W}$	
Maximum Junction-to-Case	$R_{thJC}$	20	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.
- This parameter not registered with JEDEC.

Updates to this data sheet may be obtained via facsimile by calling Siliconix FaxBack, 1-408-970-5600. Please request FaxBack document #70222.

**Specifications<sup>a</sup>**

Parameter	Symbol	Test Conditions	Typ <sup>b</sup>	Limits						Unit
				2N6659		2N6660		VQ1004J/P		
				Min	Max	Min	Max	Min	Max	
<b>Static</b>										
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 10\ \mu\text{A}$	75	35		60		60		V
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 1\ \text{mA}$	1.7	0.8	2	0.8	2	0.8	2.5	
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\ \text{V}, V_{GS} = \pm 15\ \text{V}$ $T_C = 125^\circ\text{C}$			$\pm 100$		$\pm 100$		$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 60\ \text{V}, V_{GS} = 0\ \text{V}$					10			$\mu\text{A}$
		$V_{DS} = 35\ \text{V}, V_{GS} = 0\ \text{V}$			10					
		$V_{DS} = 48\ \text{V}, V_{GS} = 0\ \text{V}$ $T_C = 125^\circ\text{C}$					500		500	
		$V_{DS} = 28\ \text{V}, V_{GS} = 0\ \text{V}$ $T_C = 125^\circ\text{C}$			500					
On-State Drain Current <sup>c</sup>	$I_{D(on)}$	$V_{DS} = 10\ \text{V}, V_{GS} = 10\ \text{V}$	3	1.5		1.5		1.5		A
Drain-Source On-Resistance <sup>c</sup>	$r_{DS(on)}$	$V_{GS} = 5\ \text{V}, I_D = 0.3\ \text{A}^e$	2		5		5		5	$\Omega$
		$V_{GS} = 10\ \text{V}, I_D = 1\ \text{A}$	1.3		1.8		3		3.5	
		$T_C = 125^\circ\text{C}^e$	2.4		3.6		4.2		4.9	
Forward Transconductance <sup>c</sup>	$g_{fs}$	$V_{DS} = 10\ \text{V}, I_D = 0.5\ \text{A}$	350	170		170		170		mS
Common Source Output Conductance <sup>c</sup>	$g_{os}$	$V_{DS} = 10\ \text{V}, I_D = 0.1\ \text{A}$	1							
Diode Forward Voltage	$V_{SD}$	$I_S = 0.99\ \text{A}, V_{GS} = 0\ \text{V}$	0.8							V
<b>Dynamic</b>										
Input Capacitance	$C_{iss}$	$V_{DS} = 24\ \text{V}, V_{GS} = 0\ \text{V}$ $f = 1\ \text{MHz}$	35		50		50		60	$\text{pF}$
Output Capacitance	$C_{oss}$		25		40		40		50	
Reverse Transfer Capacitance	$C_{rss}$		7		10		10		10	
Drain-Source Capacitance	$C_{ds}$		30		40		40			
<b>Switching<sup>d</sup></b>										
Turn-On Time	$t_{ON}$	$V_{DD} = 25\ \text{V}, R_L = 23\ \Omega$ $I_D = 1\ \text{A}, V_{GEN} = 10\ \text{V}$ $R_G = 25\ \Omega$	8		10		10		10	ns
Turn-Off Time	$t_{OFF}$		8.5		10		10		10	

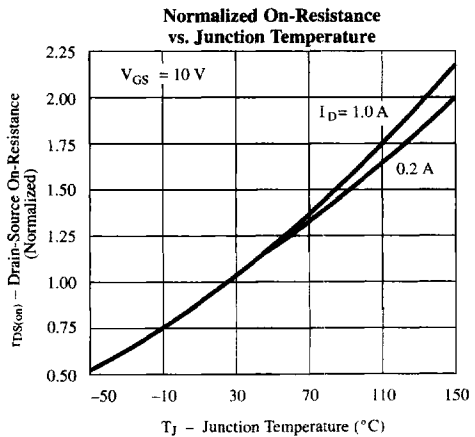
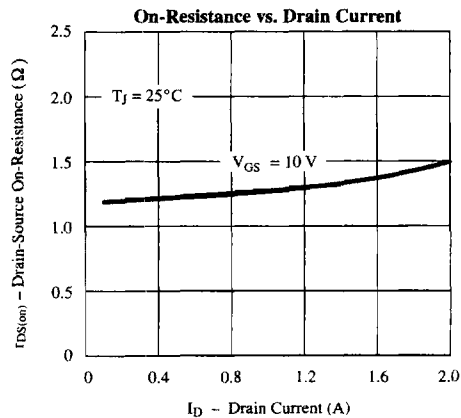
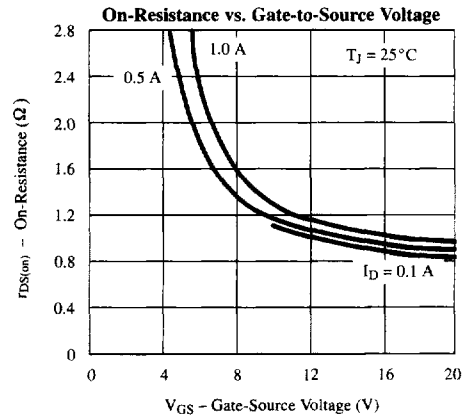
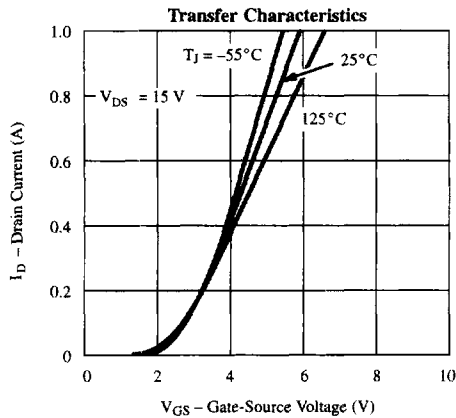
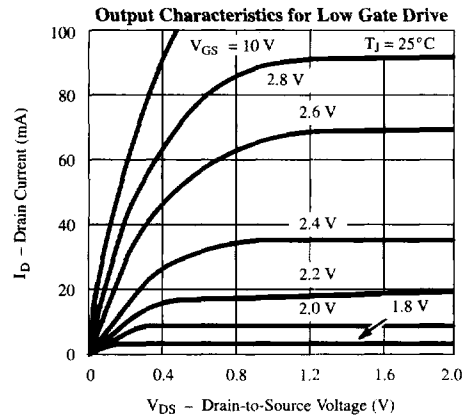
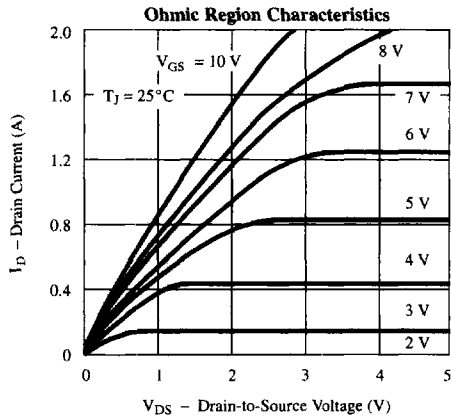
Notes

- a.  $T_A = 25^\circ\text{C}$  unless otherwise noted.
- b. For DESIGN AID ONLY, not subject to production testing.
- c. Pulse test:  $PW \leq 80\ \mu\text{s}$  duty cycle  $\leq 1\%$ .
- d. Switching time is essentially independent of operating temperature.
- e. This parameter not registered with JEDEC on 2N6659 and 2N6660.

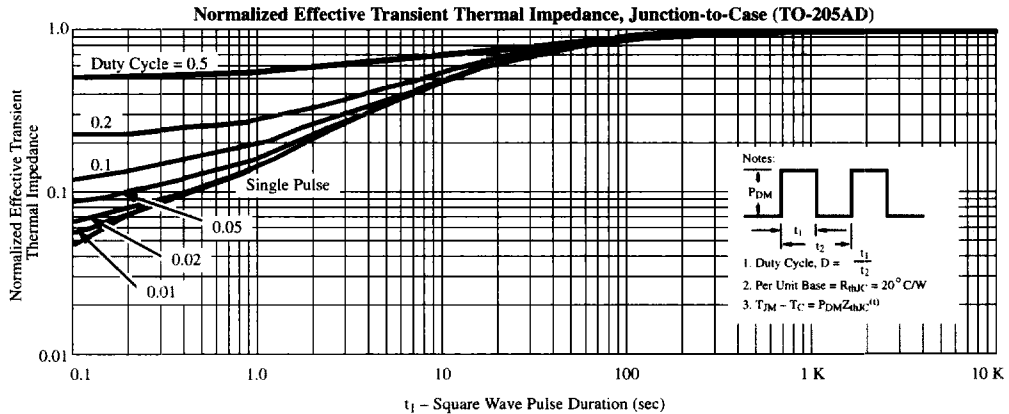
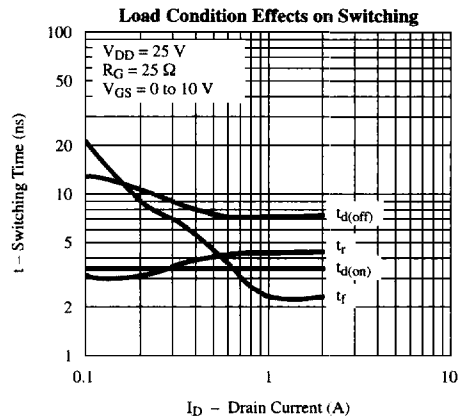
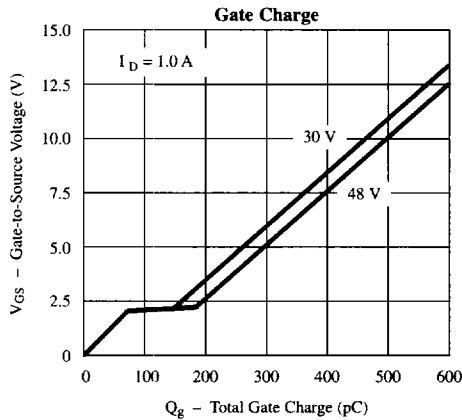
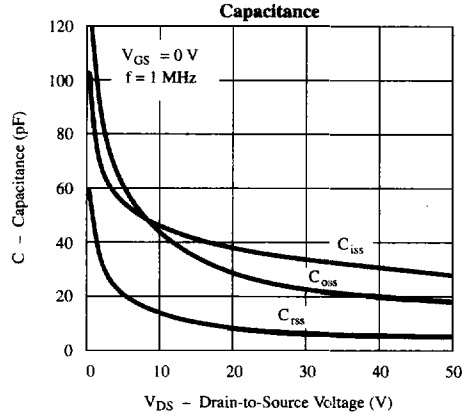
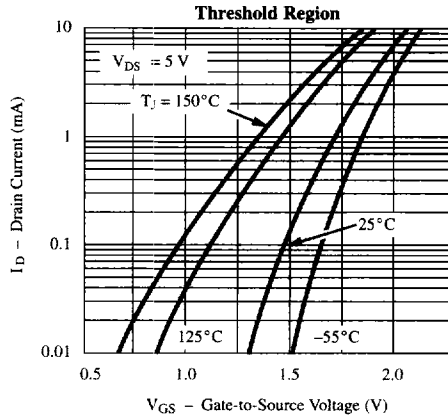
VNDQ06



## Typical Characteristics (25°C Unless Otherwise Noted)



**Typical Characteristics (25°C Unless Otherwise Noted)**



Low Power MOSFETs