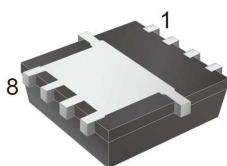


### PDFN56



### Pin Definition:

- |           |          |
|-----------|----------|
| 1. Source | 8. Drain |
| 2. Source | 7. Drain |
| 3. Source | 6. Drain |
| 4. Gate   | 5. Drain |

### Key Parameter Performance

Parameter	Value	Unit
$V_{DS}$	40	V
$R_{DS(on)}(max)$	2.8	m $\Omega$
$Q_g$	78	nC

### Features

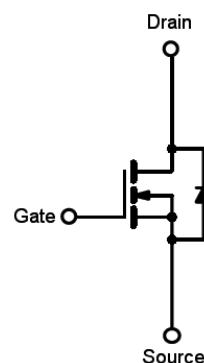
- Low On-Resistance
- Low Input Capacitance
- Low Gate Charge

### Ordering Information

Part No.	Package	Packing
TSM028N04PQ56 RLG	PDFN56	2.5kpcs / 13" Reel

**Note:** "G" denotes for Halogen- and Antimony-free as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

### Block Diagram



N-Channel MOSFET

### Absolute Maximum Ratings ( $T_C=25^{\circ}C$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	40	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current <sup>(Note 3)</sup>	$I_D$	$T_C=25^{\circ}C$	140
		$T_A=25^{\circ}C$	42
Drain Current-Pulsed <sup>(Note 1)</sup>	$I_{DM}$	550	A
Single Pulse Avalanche Energy: L=0.1mH	$E_{AS}$	201	mJ
Maximum Power Dissipation <sup>(Note 2)</sup>	$P_D$	$T_C=25^{\circ}C$	83
		$T_A=25^{\circ}C$	4.4
Storage Temperature Range	$T_{STG}$	-55 to +150	$^{\circ}C$
Operating Junction Temperature Range	$T_J$	-55 to +150	$^{\circ}C$

### Thermal Performance

Parameter	Symbol	Limit	Unit
Thermal Resistance - Junction to Case	$R_{\theta JC}$	1.5	$^{\circ}C/W$
Thermal Resistance - Junction to Ambient	$R_{\theta JA}$	28	$^{\circ}C/W$

### Electrical Specifications (T<sub>J</sub>=25°C unless otherwise noted)

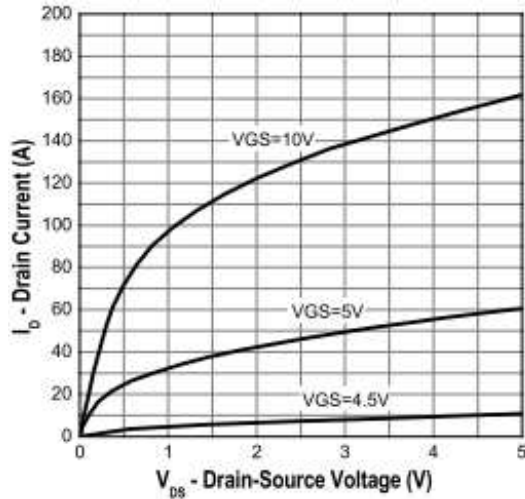
Parameter	Conditions	Symbol	Min	Typ	Max	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA	BV <sub>DSS</sub>	40	--	--	V
Drain-Source On-State Resistance	V <sub>GS</sub> = 10V, I <sub>D</sub> = 30A	R <sub>DS(ON)</sub>	--	2.1	2.8	mΩ
Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA	V <sub>GS(TH)</sub>	2	3	4	V
Zero Gate Voltage Drain Current	V <sub>DS</sub> = 32V, V <sub>GS</sub> = 0V	I <sub>DSS</sub>	--	--	1	μA
Gate Body Leakage	V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V	I <sub>GSS</sub>	--	--	±100	nA
<b>Dynamic</b>						
Total Gate Charge	V <sub>DD</sub> = 20V, I <sub>D</sub> = 30A, V <sub>GS</sub> = 10V	Q <sub>g</sub>	--	78	--	nC
Gate-Source Charge		Q <sub>gs</sub>	--	22	--	
Gate-Drain Charge		Q <sub>gd</sub>	--	4.7	--	
Input Capacitance	V <sub>DS</sub> = 20V, V <sub>GS</sub> = 0V, f = 1.0MHz	C <sub>iss</sub>	--	4222	--	pF
Output Capacitance		C <sub>oss</sub>	--	889	--	
Reverse Transfer Capacitance		C <sub>rss</sub>	--	398	--	
<b>Switching</b>						
Turn-On Delay Time	V <sub>GS</sub> = 10V, V <sub>DD</sub> = 20V, R <sub>G</sub> = 3Ω, I <sub>D</sub> = 13A	t <sub>d(on)</sub>	--	21	--	ns
Turn-On Rise Time		t <sub>r</sub>	--	6	--	
Turn-Off Delay Time		t <sub>d(off)</sub>	--	98	--	
Turn-Off Fall Time		t <sub>f</sub>	--	17	--	
<b>Drain-Source Diode Characteristics and Maximum Rating</b>						
Drain-Source Diode Forward Voltage	V <sub>GS</sub> =0V, I <sub>S</sub> =30A	V <sub>SD</sub>	--	--	1.3	V
Reverse Recovery Time	I <sub>S</sub> = 30A, dI/dt = 100A/μs	t <sub>rr</sub>	--	32	--	ns
Reverse Recovery Charge		Q <sub>rr</sub>	--	120	--	nC

#### Notes:

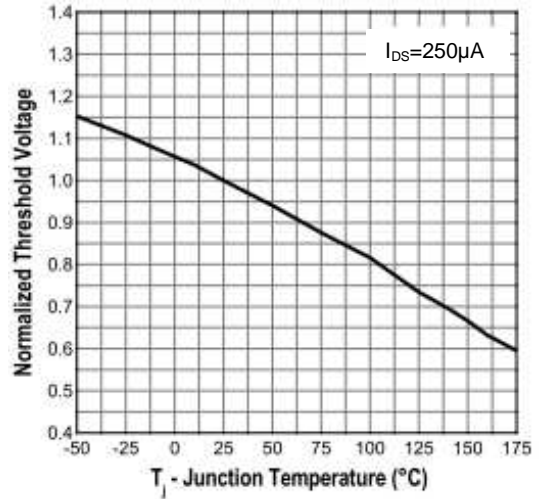
1. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
2. R<sub>θJA</sub> is the sum of the junction-to-case and case-to-ambient thermal resistances. The case thermal reference is defined at the solder mounting surface of the drain pins. R<sub>θJA</sub> is guaranteed by design while R<sub>θCA</sub> is determined by the user's board design. R<sub>θJA</sub> shown below for single device operation on FR-4 PCB in still air.
3. The maximum current rating is limited by package.

## Electrical Characteristics Curves

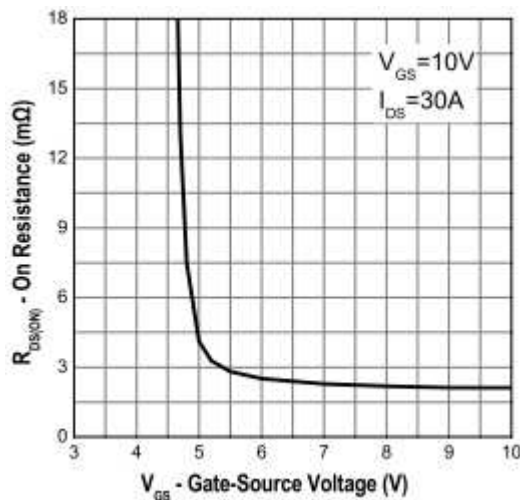
**Output Characteristics**



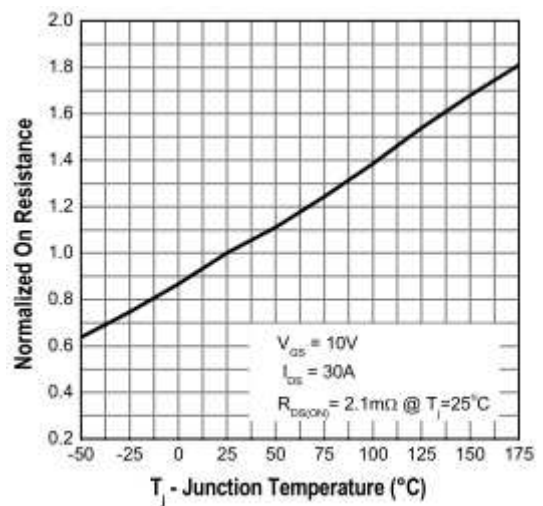
**Gate Threshold Voltage**



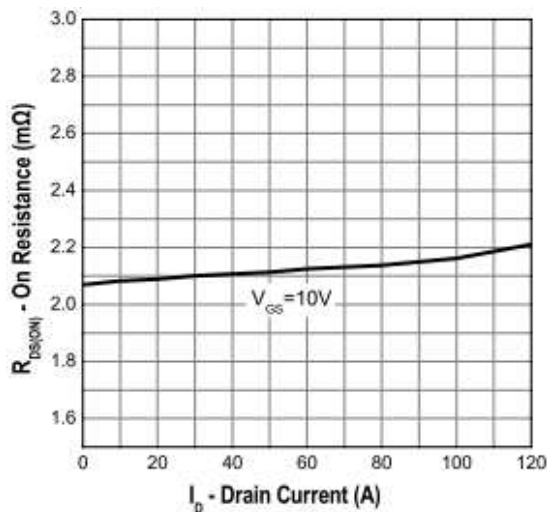
**Gate Source On Resistance**



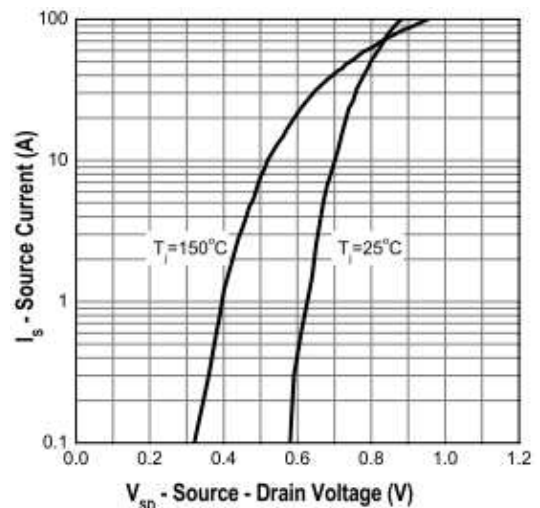
**Drain-Source On Resistance**



**Drain-Source On-Resistance**

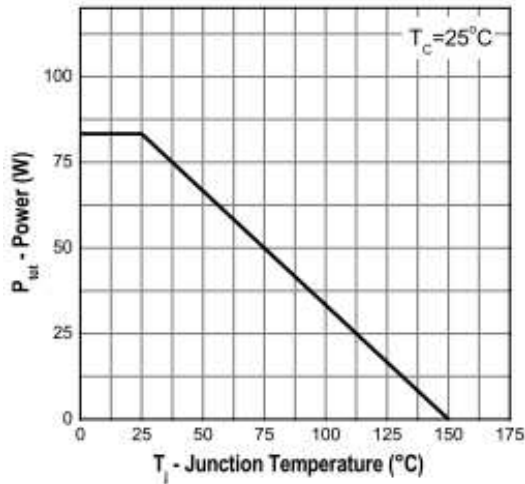


**Source-Drain Diode Forward Voltage**

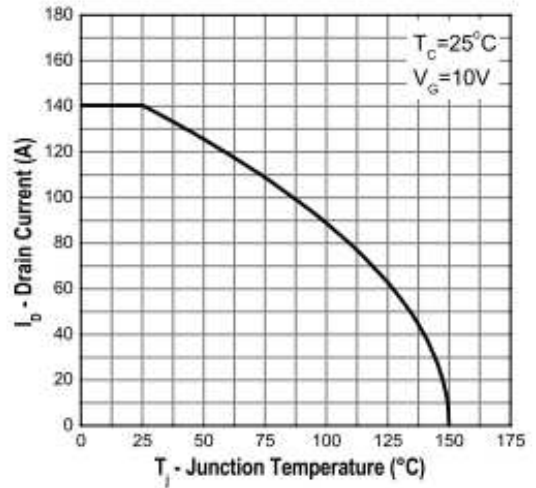


### Electrical Characteristics Curves

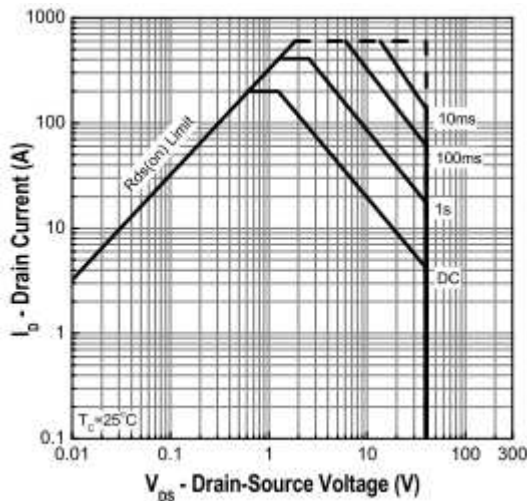
**Power Derating**



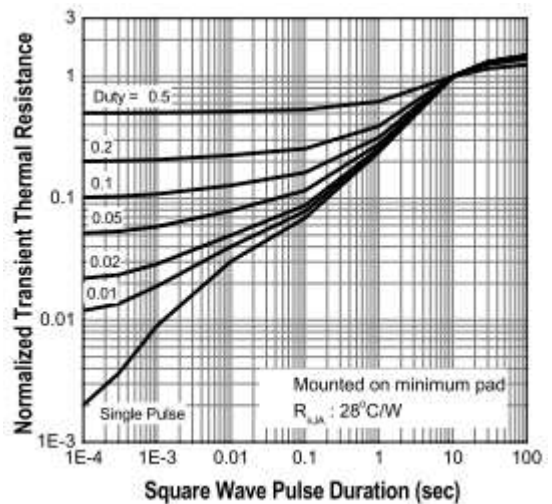
**Drain Current vs. Junction Temperature**



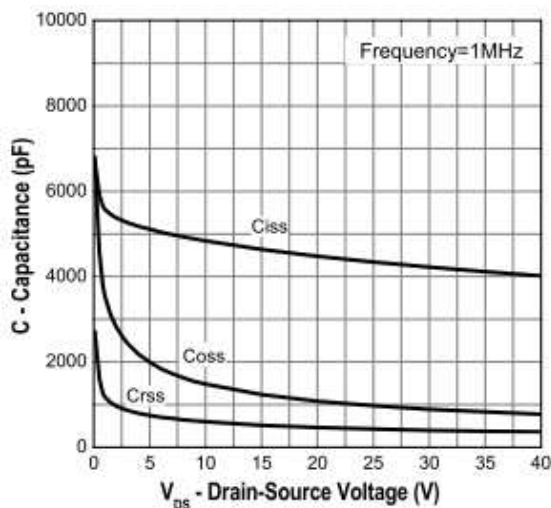
**Safe Operation Area**



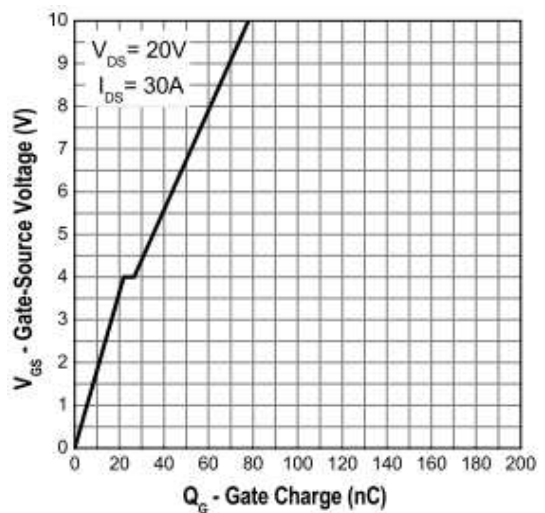
**Transient Thermal Impedance**



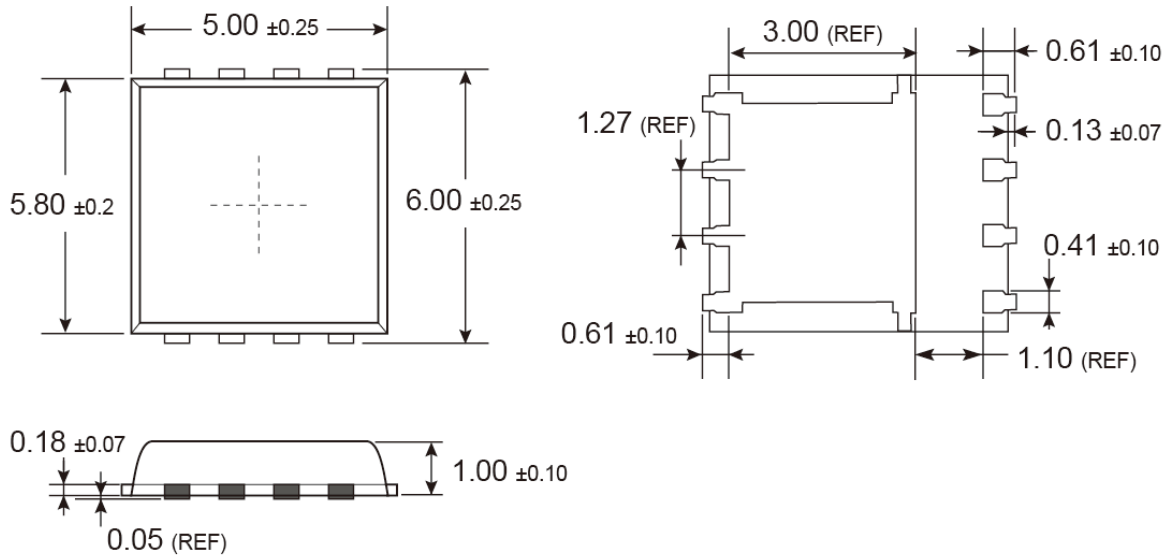
**Capacitance**



**Gate Charge**



**PDFN56 Mechanical Drawing**



Unit: Millimeters

**Marking Diagram**



- Y** = Year Code
- M** = Month Code for Halogen Free Product  
(**O**=Jan, **P**=Feb, **Q**=Mar, **R**=Apr, **S**=May, **T**=Jun, **U**=Jul, **V**=Aug, **W**=Sep, **X**=Oct, **Y**=Nov, **Z**=Dec)
- L** = Lot Code

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