



**WANSEMI**  
万芯半导体

**WP4614C**

# Enhancement Mode N+P-Channel Power MOSFET

SOP8/N+PMOS/40V/ $\pm 20V$ /1.5V/4A/43m $\Omega$

-40V/ $\pm 20V$ /-1.5V/-4A/96m $\Omega$

Rev1.2

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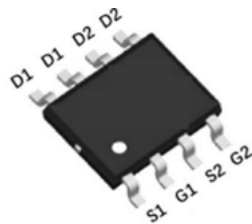
## 40V N+P-Channel MOSFET

### 1.Features

- ◆ High power and current handling capability
- ◆ Lead free product is acquired
- ◆ Fast switching
- ◆ Surface mount package

### 2.Applications

- ◆ Power Switching Application
- ◆ Load Switching
- ◆ BLDC Motor driver



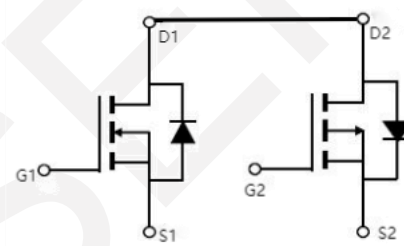
SOP8  
Pin Description

#### ◆ N-Channel

$V_{DS}$	$R_{DS(on)}$ Typ.	$I_D$
40V	43m $\Omega$ @ 10V	4A
	53m $\Omega$ @ 4.5V	

#### ◆ P-Channel

$V_{DS}$	$R_{DS(on)}$ Typ.	$I_D$
-40V	96m $\Omega$ @ -10V	-4A
	120m $\Omega$ @ -4.5V	



N-Channel P-Channel  
Schematic Diagram

### 3.Package Marking and Ordering Information

Part no.	Marking	Package	PCS/Reel	PCS/CTN.
WP4614C	4614C	SOP8	4,000	48,000

### 4.Absolute Max Ratings at Ta=25°C (Note1)

Parameter	Symbol	N-channel	P-channel	Units	
Drain to Source Voltage	$V_{DSS}$	40	-40	V	
Gate to Source Voltage	$V_{GSS}$	$\pm 20$	$\pm 20$	V	
Drain Current (DC),	TA=25 °C	$I_D$	4	-4	A
	TA=70 °C	$I_D$	2.8	-2.8	A
Drain Current (Pulse), PW $\leq$ 300 $\mu$ s	$I_{DM}$	16	-16	A	
Avalanche Energy, Single Pulsed	$E_{AS}$	6.7	10.3	mJ	
Total Dissipation	TA=25 °C	$P_D$	0.6	0.6	W
Junction Temperature	$T_j$	150	150	°C	

Parameter	Symbol	N-channel	P-channel	Units
Storage Temperature	$T_{stg}$	-55 to +150	-55 to +150	°C

Note 1: Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

### 5. Thermal Resistance Ratings (Note 2)

Parameter	Symbol	Value	Unit
Maximum Junction-to-Ambient	$R_{\theta JA}$	192	°C/W

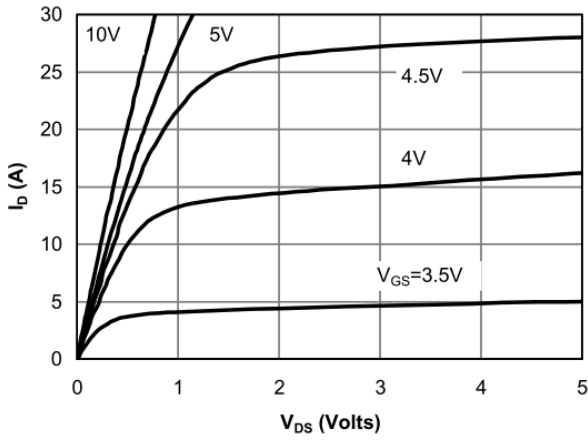
Note 2: When mounted on 1 inch square copper board  $t \leq 10$ sec The value in any given application depends on the user's specific board design.

### 6. NMOS Electrical Characteristics at $T_a=25^\circ\text{C}$ (Note 3)

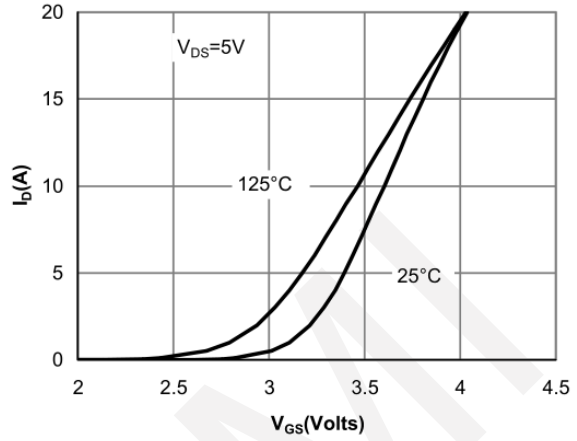
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Drain to Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	40	43	-	V
Zero-Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 40\text{V}, V_{GS} = 0\text{V}$	-	-	1	$\mu\text{A}$
Gate to Source Leakage Current	$I_{GSS}$	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$	-	-	$\pm 100$	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_{DS}=250\mu\text{A}$	1.0	1.5	2.5	V
Static Drain to Source On-State Resistance	$R_{DS(on)}$	$I_D = 3\text{A}, V_{GS} = 10\text{V}$	-	43	55	m $\Omega$
		$I_D = 3\text{A}, V_{GS} = 4.5\text{V}$	-	53	75	m $\Omega$
Input Capacitance	$C_{iss}$	$V_{GS}=0\text{V},$ $V_{DS}=15\text{V},$ Frequency=1.0MHz	-	371	-	pF
Output Capacitance	$C_{oss}$		-	170	-	pF
Reverse Transfer Capacitance	$C_{rss}$		-	58	-	pF
Turn-ON Delay Time	$t_{d(on)}$	$V_{DD} = 20\text{V},$ $V_{GS} = 10\text{V},$ $R_{GEN} = 2.5\Omega,$ $I_D = 4\text{A}$	-	6.8	-	ns
Rise Time	$t_r$		-	40.6	-	ns
Turn-OFF Delay Time	$t_{d(off)}$		-	13.4	-	ns
Fall Time	$t_f$		-	2.7	-	ns
Total Gate Charge	$Q_g$	$V_{DS} = 20\text{V},$	-	5.1	-	nC
	$Q_{gs}$	$V_{GS} = 10\text{V},$	-	1.3	-	nC
	$Q_{gd}$	$I_D = 4\text{A}$	-	1.5	-	nC
Diode Forward Voltage	$V_{FSD}$	$I_S = 3\text{A}, V_{GS} = 0\text{V}$	-	0.85	1.2	V



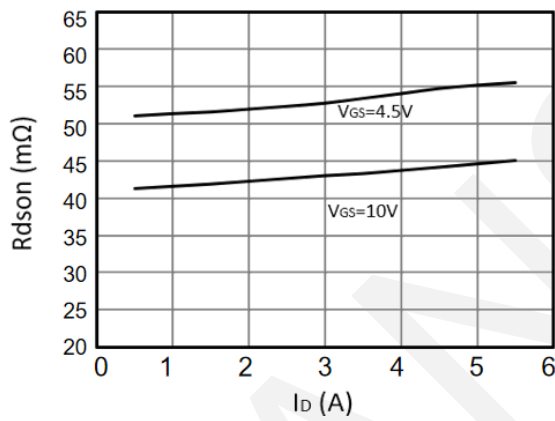
**NMOS Typical electrical and thermal characteristics**



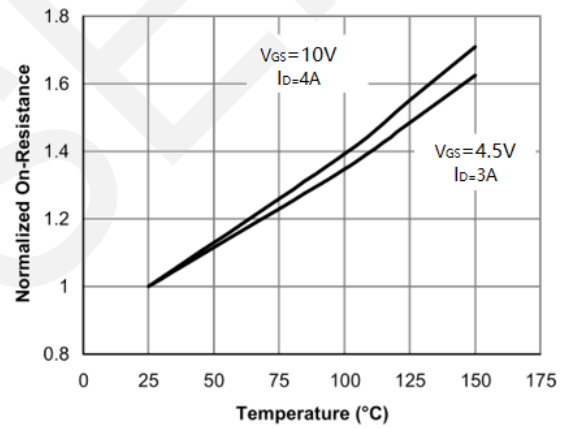
Output Characteristics



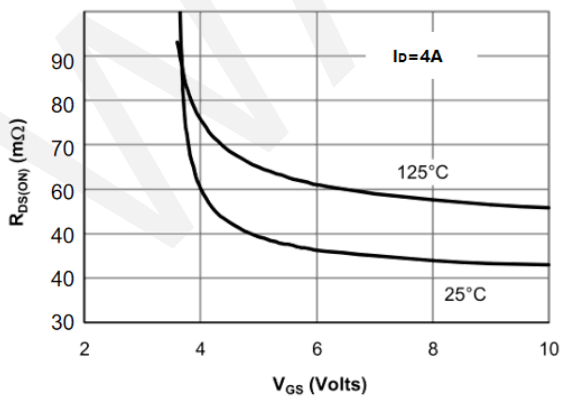
Transfer Characteristics



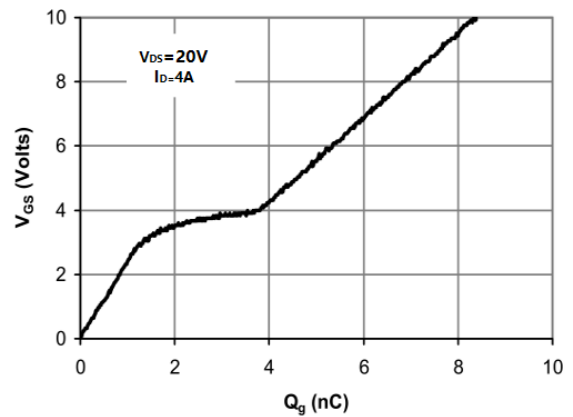
Drain-Source On-Resistance



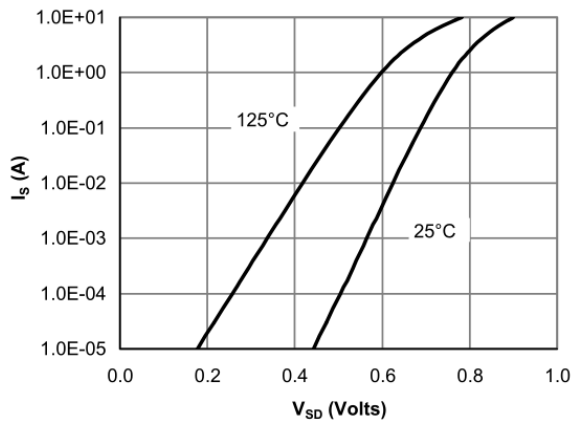
Drain-Source On-Resistance



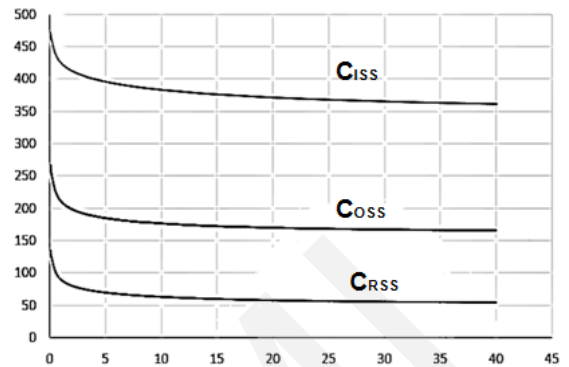
Rdson vs Vgs



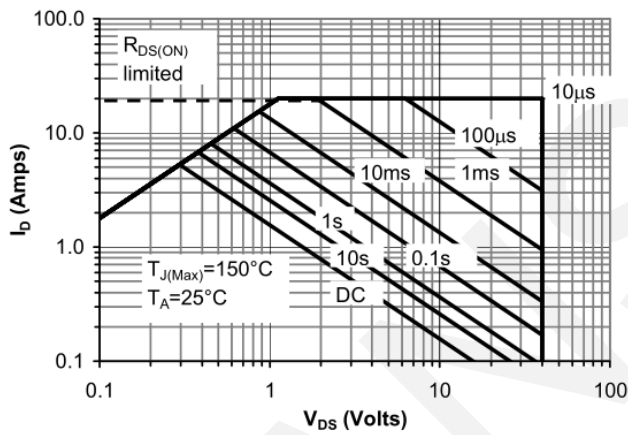
Gate Charge



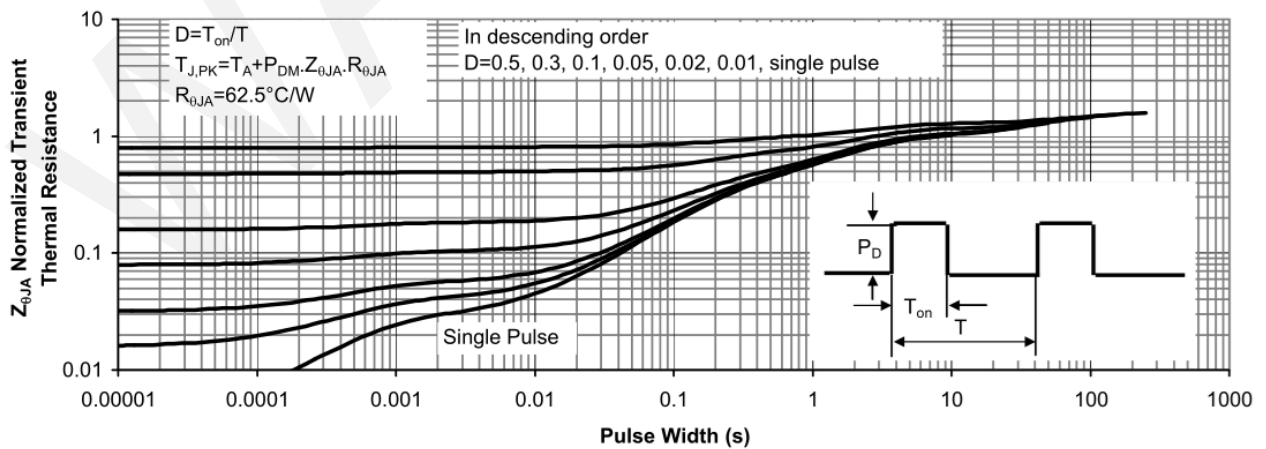
Source- Drain Diode Forward



Capacitance vs Vds



Safe Operating Area



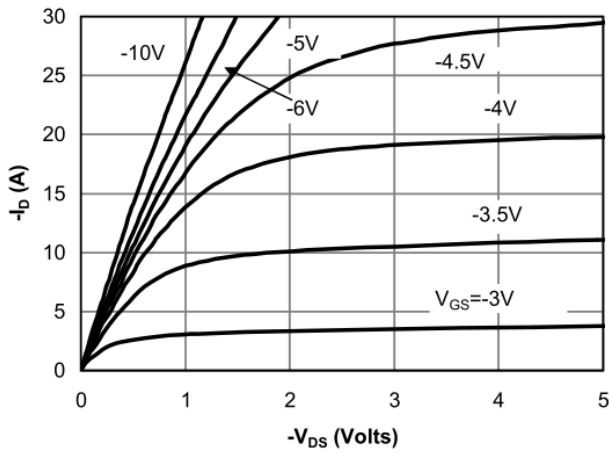
Normalized Maximum Transient Thermal Impedance

**7.PMOS Electrical Characteristics at Ta=25°C**

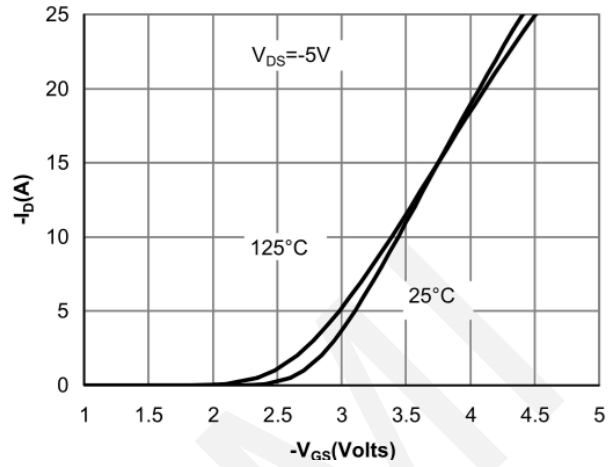
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Drain to Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D = -250\mu A, V_{GS} = 0V$	-40	-47	-	V
Zero-Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = -40V, V_{GS} = 0V$	-	-	-1	$\mu A$
Gate to Source Leakage Current	$I_{GSS}$	$V_{GS} = \pm 20V, V_{DS} = 0V$	-	-	$\pm 100$	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_{DS}=-250\mu A$	-1.0	-1.5	-2.5	V
Static Drain to Source On-State Resistance	$R_{DS(on)}$	$I_D = -3A, V_{GS} = -10V$	-	96	120	m $\Omega$
		$I_D = -3A, V_{GS} = -4.5V$	-	120	165	m $\Omega$
Input Capacitance	$C_{iss}$	$V_{GS}=0V,$ $V_{DS}=-15V,$ Frequency=1.0MHz	-	647	-	pF
Output Capacitance	$C_{oss}$		-	433	-	pF
Reverse Transfer Capacitance	$C_{rss}$		-	280	-	pF
Turn-ON Delay Time	$t_{d(on)}$	$V_{DD} = -20V$ $I_D = -5A$ $V_{GS} = -10V$ $R_{GEN} = 2.5\Omega$	-	6.5	-	ns
Rise Time	$t_r$		-	14	-	ns
Turn-OFF Delay Time	$t_{d(off)}$		-	34	-	ns
Fall Time	$t_f$		-	18	-	ns
Total Gate Charge	$Q_g$		$V_{DS} = -20V,$	-	13.5	-
	$Q_{gs}$	$V_{GS} = -10V,$	-	1.5	-	nC
	$Q_{gd}$	$I_D = -5A$	-	1.8	-	nC
Diode Forward Voltage	$V_{FSD}$	$I_S = -3A, V_{GS} = 0V$	-	-0.9	-1.2	V

Note 3: Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

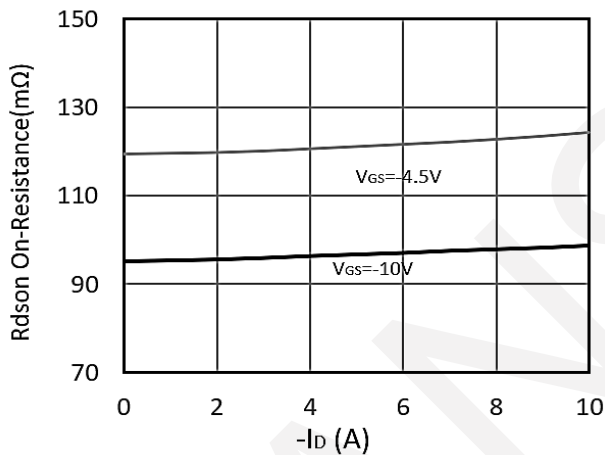
**PMOS Typical electrical and thermal characteristics**



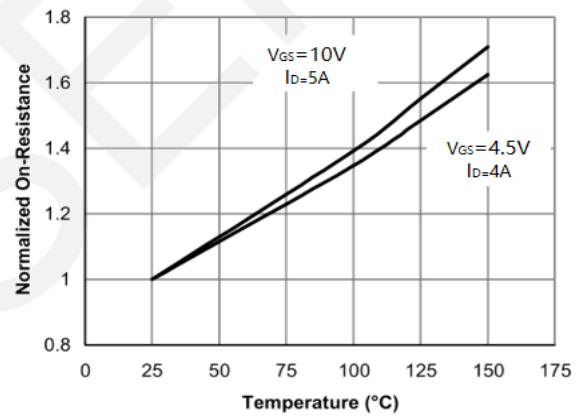
Output Characteristics



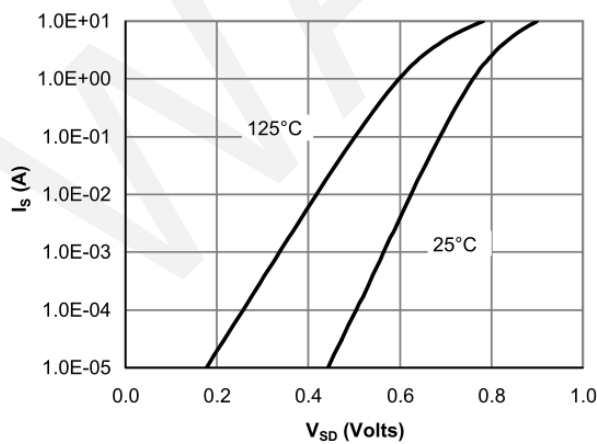
Transfer Characteristics



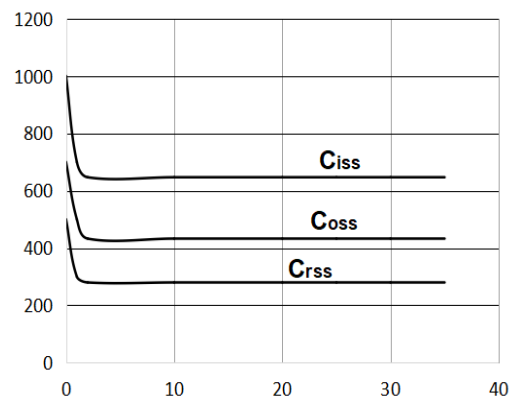
Rdson- Drain Current



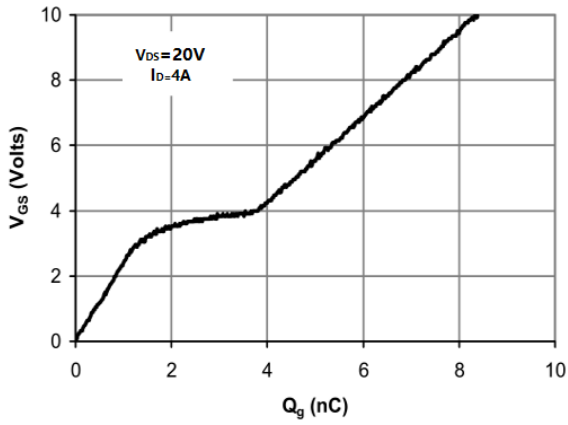
Rdson-Junction Temperature



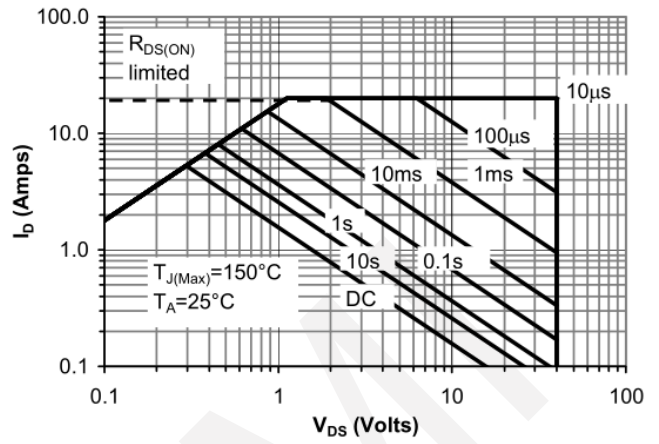
Source- Drain Diode Forward



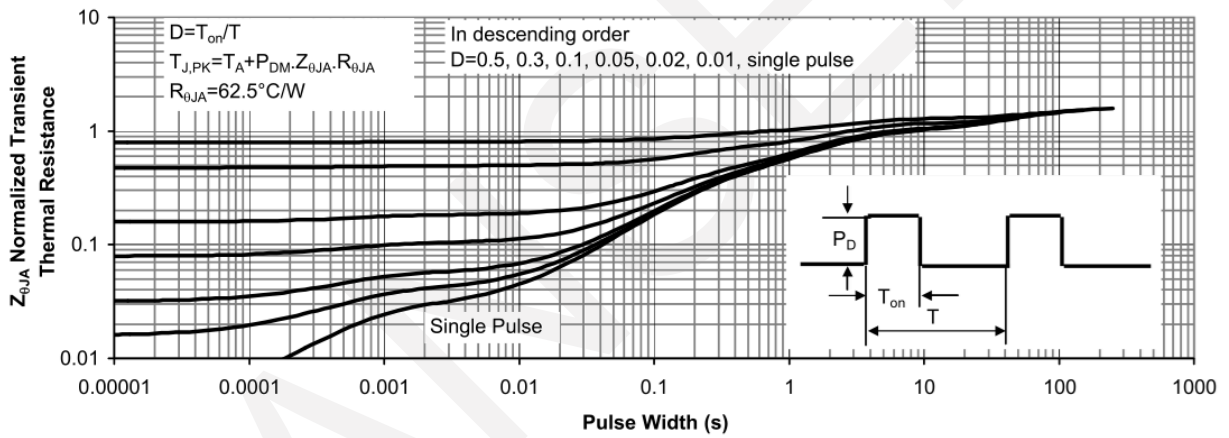
Capacitance vs Vds



Gate-Charge



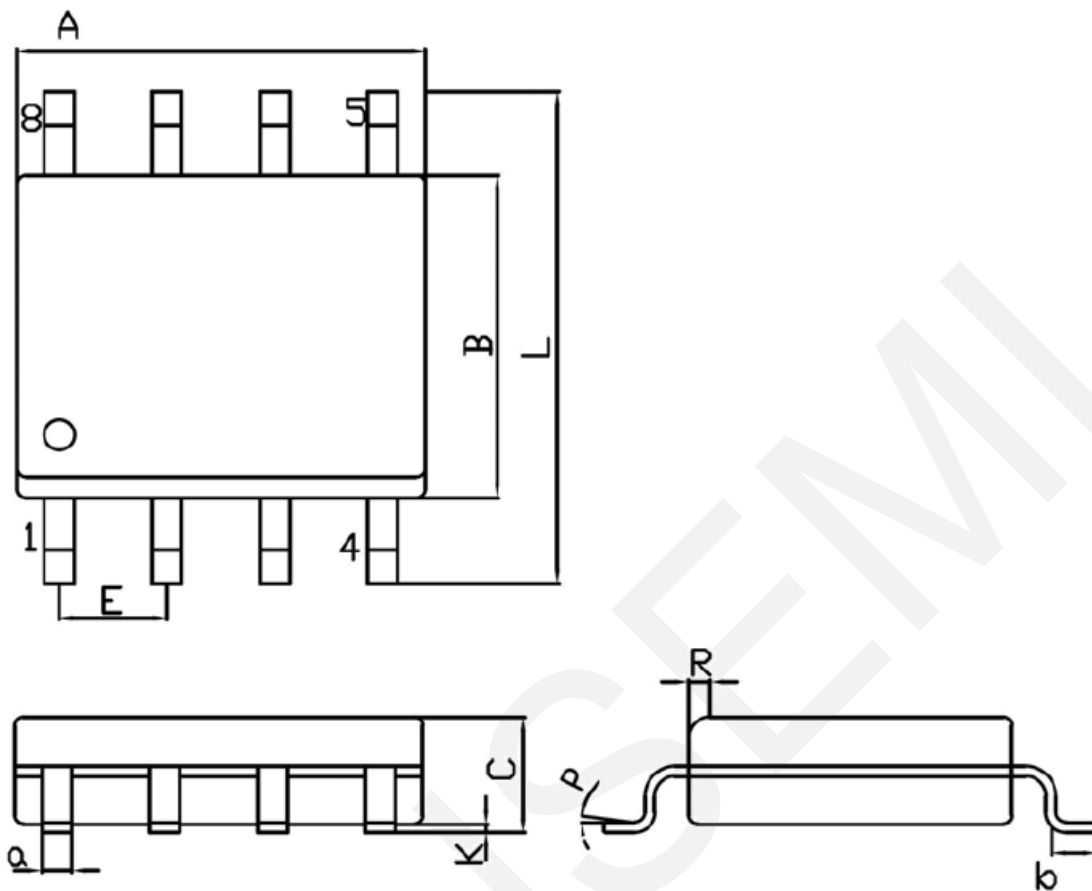
Safe Operation Area



Normalized Maximum Transient Thermal Impedance



**8.Package Dimensions**



Symbol	Dimensions In Millimeters		Symbol	Dimensions In Millimeters	
	Min	Max		Min	Max
A	4.70	5.10	C	1.35	1.75
B	3.70	4.10	a	0.35	0.49
L	5.80	6.20	R	0.30	0.60
E	1.27BSC		P	0°	7°
K	0.12	0.22	b	0.40	1.25

## 9. Important Notice

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