



**WANSEMI**  
万芯半导体

**WP4025**

# **Enhancement Mode N+P-Channel Power MOSFET**

**TO-252-4L/N+PMOS/40V/ $\pm$ 20V/1.8V/50A/5.4m $\Omega$**

**-40V/ $\pm$ 20V/-1.5V/-20A/16m $\Omega$**

**Rev0.2**

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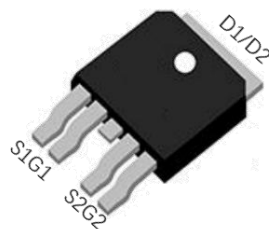
## 40V N+P-Channel MOSFET

### 1.Features

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

### 2.Applications

- ◆ BLDC Motor driver
- ◆ PWM applications



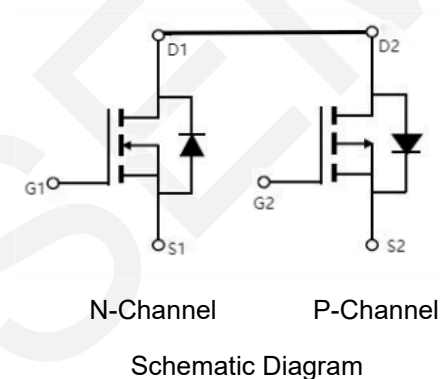
TO-252-4L  
Pin Description

#### ◆ N-Channel

$V_{DS}$	$R_{DS(on)}$ Typ.	$I_D$
40V	5.4m $\Omega$ @10V	50A
	6.5m $\Omega$ @ 4.5V	

#### ◆ P-Channel

$V_{DS}$	$R_{DS(on)}$ Typ.	$I_D$
-40V	16m $\Omega$ @ -10V	-20A
	20m $\Omega$ @ -4.5V	



### 3.Package Marking and Ordering Information

Part no.	Marking	Package	PCS/Reel	PCS/CTN.
WP4025	4025	TO-252-4L	2,500	25,000

### 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)	$I_D$	50	-20	A
Drain Current (Pulse), $PW \leq 300\mu s$	$I_{DM}$	200	-80	A
Total Dissipation	$P_D$	41.6		W
Junction Temperature	$T_j$	-55 to +175		$^{\circ}C$
Storage Temperature	$T_{stg}$			

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	N-channel	P-channel	Unit
Junction to case	$R_{\theta JC}$	1.1	3.6	$^{\circ}\text{C}/\text{W}$

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

**6. Electrical Characteristics at  $T_a=25^{\circ}\text{C}$  (Note 3)**
**N-Channel**

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	-	-	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	1.8	2.5	V
Static Drain to Source On-State Resistance	$R_{DS(on)}$	$I_D = 20\text{A}$ , $V_{GS} = 10\text{V}$	-	5.4	7.0	$\text{m}\Omega$
		$I_D = 10\text{A}$ , $V_{GS} = 4.5\text{V}$	-	6.5	9.0	$\text{m}\Omega$
Input Capacitance	$C_{iss}$	$V_{GS}=0\text{V}$ , $V_{DS}=20\text{V}$ , Frequency=1.0MHz	-	2443	-	pF
Output Capacitance	$C_{oss}$		-	167	-	pF
Reverse Transfer Capacitance	$C_{rss}$		-	138	-	pF
Turn-ON Delay Time	$t_{d(on)}$	$V_{DD} = 20\text{V}$ $V_{GS} = 10\text{V}$ $R_G = 3\Omega$ $I_D = 20\text{A}$	-	10	-	ns
Rise Time	$t_r$		-	28	-	ns
Turn-OFF Delay Time	$t_{d(off)}$		-	40	-	ns
Fall Time	$t_f$		-	7	-	ns
Total Gate Charge	$Q_g$	$V_{DS} = 20\text{V}$ , $V_{GS} = 0$ to $10\text{V}$ , $I_D = 20\text{A}$	-	48	-	nC
	$Q_{gs}$		-	10	-	nC
	$Q_{gd}$		-	10	-	nC
Diode Forward Voltage	$V_{FSD}$	$I_S = 20\text{A}$ , $V_{GS} = 0\text{V}$	-	-	1.2	V

**P-Channel**

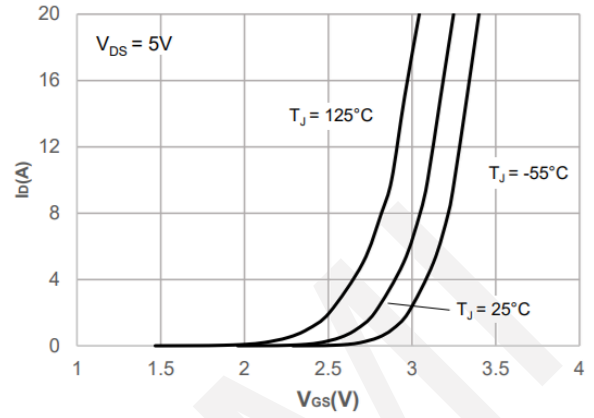
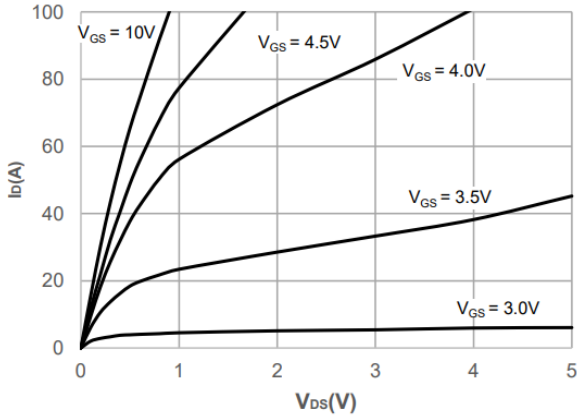
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Drain to Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D = -250\mu A, V_{GS} = 0V$	-40	-	-	V
Zero-Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = -40V, V_{GS} = 0V$	-	-	-1	$\mu A$
Gate to Source Leakage Current	$I_{GSS}$	$V_{GS} = \pm 20V, V_{DS} = 0V$	-	-	$\pm 100$	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	$R_{DS(on)}$	$I_D = -12A, V_{GS} = -10V$	-	16	21	m $\Omega$
		$I_D = -8A, V_{GS} = -4.5V$	-	20	28	m $\Omega$
Input Capacitance	$C_{iss}$	$V_{GS}=0V,$ $V_{DS}=-20V,$ Frequency=1.0MHz	-	3800	-	pF
Output Capacitance	$C_{oss}$		-	329	-	pF
Reverse Transfer Capacitance	$C_{rss}$		-	289	-	pF
Turn-ON Delay Time	$t_{d(on)}$		-	10	-	ns
Rise Time	$t_r$	$V_{DD} = -20V, I_D = -20A,$ $V_{GS} = -10V,$ $R_{GEN} = 2.4\Omega$	-	82	-	ns
Turn-OFF Delay Time	$t_{d(off)}$		-	93	-	ns
Fall Time	$t_f$		-	74	-	ns
Total Gate Charge	$Q_g$		$V_{DS} = -20V,$	-	68	-
	$Q_{gs}$	$V_{GS} = -10V,$	-	10	-	nC
	$Q_{gd}$	$I_D = -20A$	-	14	-	nC
Diode Forward Voltage	$V_{FSD}$	$I_S = -12A, V_{GS} = 0$	-0.5	-	-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.



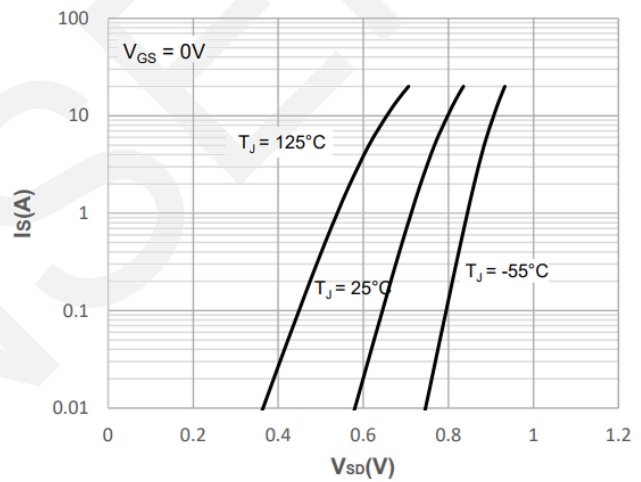
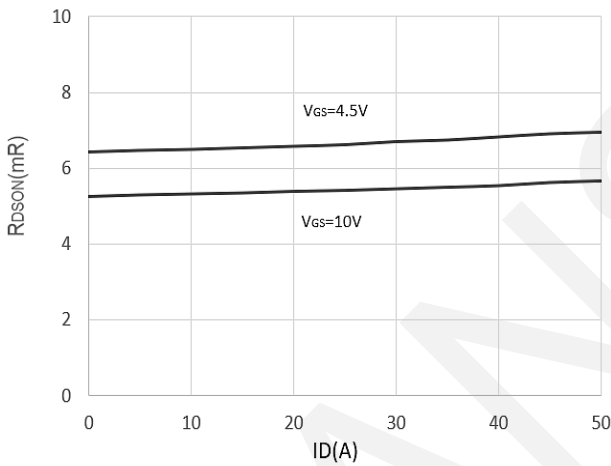
## 7. Typical electrical and thermal characteristics

### N-Channel



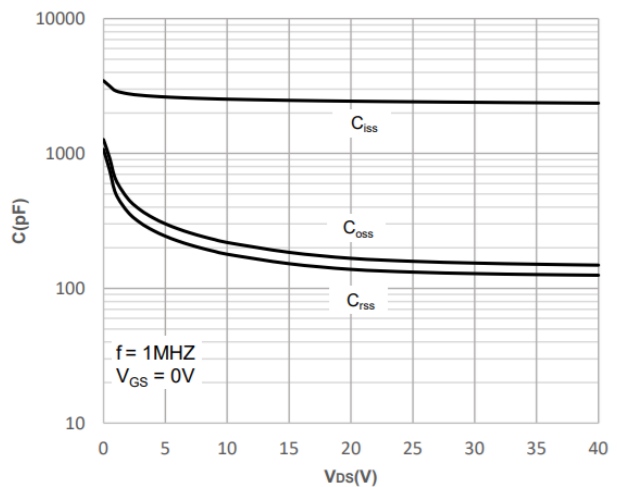
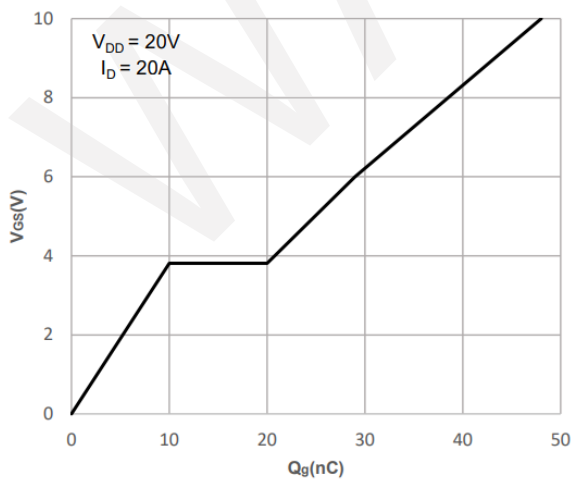
Output Characteristics

Transfer Characteristics



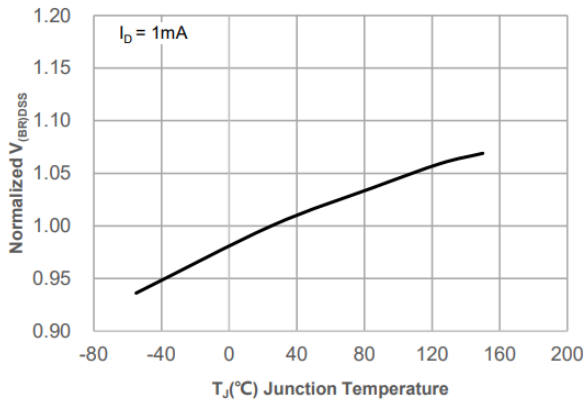
On-resistance vs. Drain Current

Body Diode Characteristics

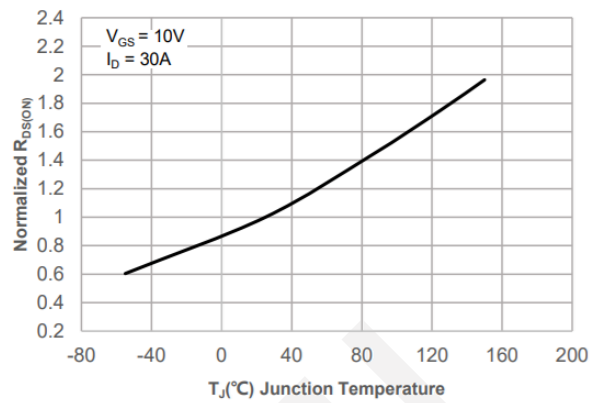


Gate Charge Characteristics

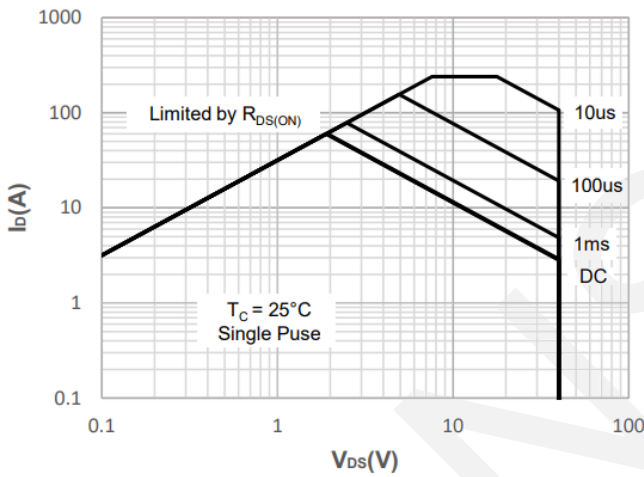
Capacitance Characteristics



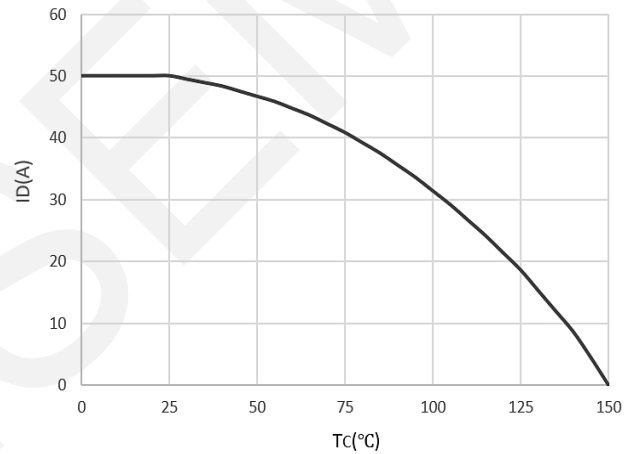
Normalized Breakdown Voltage vs. Junction Temperature



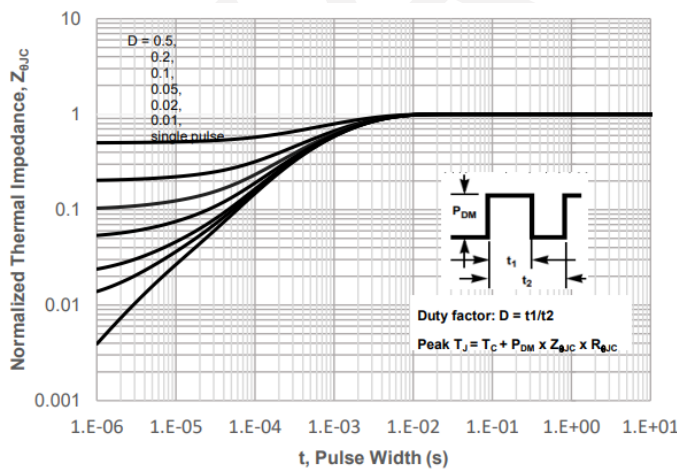
Normalized on Resistance vs. Junction Temperature



Maximum Safe Operating Area



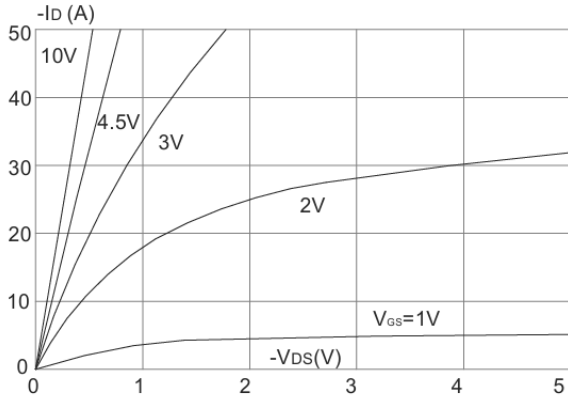
Maximum Continuous Drain Current vs. Case Temperature



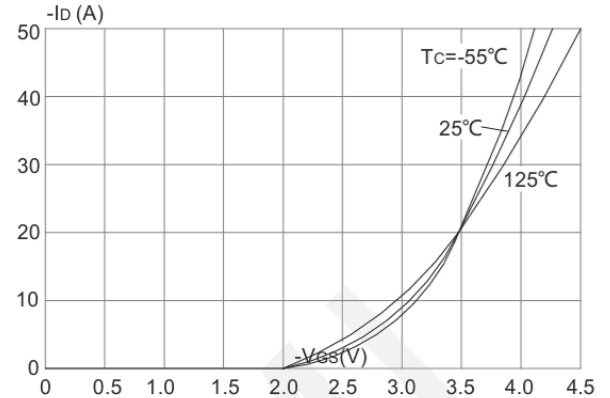
Normalized Maximum Transient Thermal Impedance



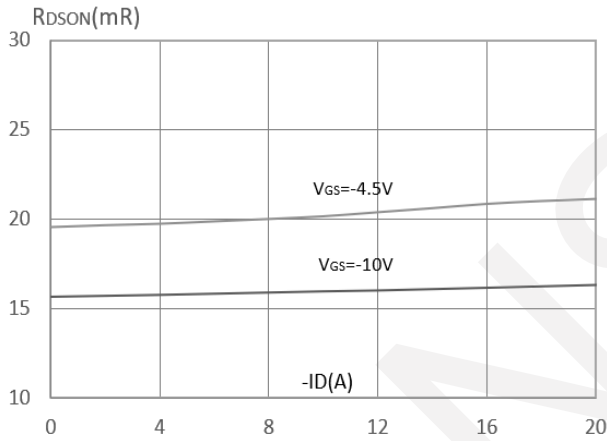
**P-Channel**



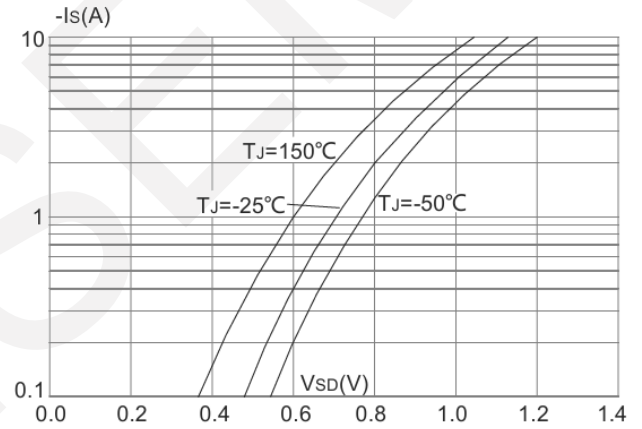
**Output Characteristics**



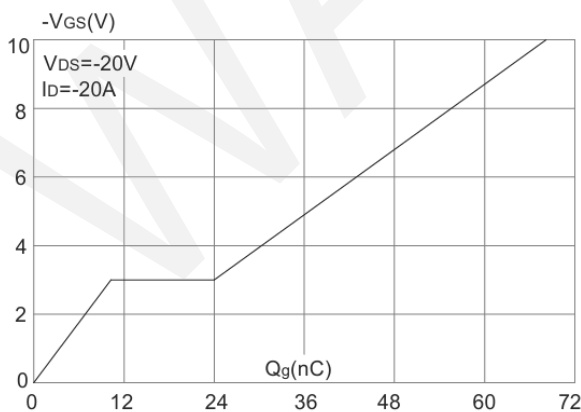
**Transfer Characteristics**



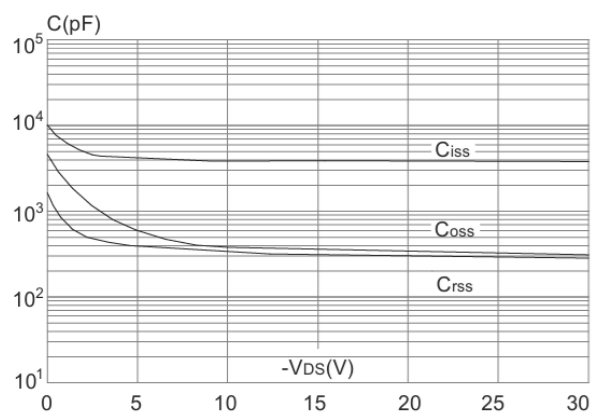
**Rdson- Drain Current**



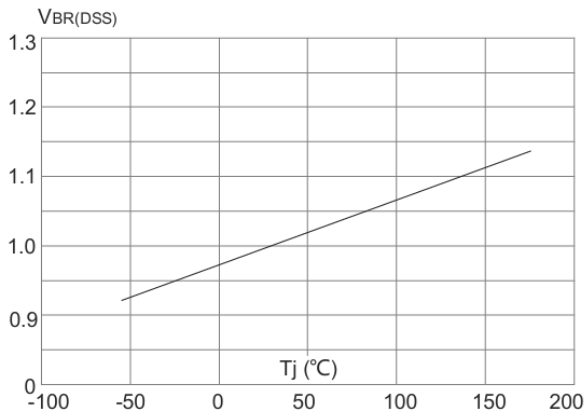
**Body Diode Characteristics**



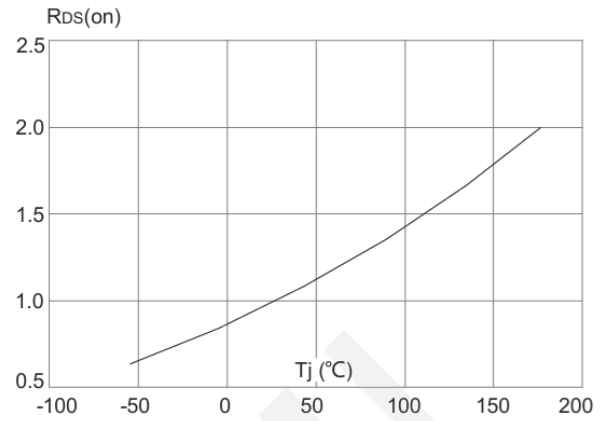
**Gate Charge**



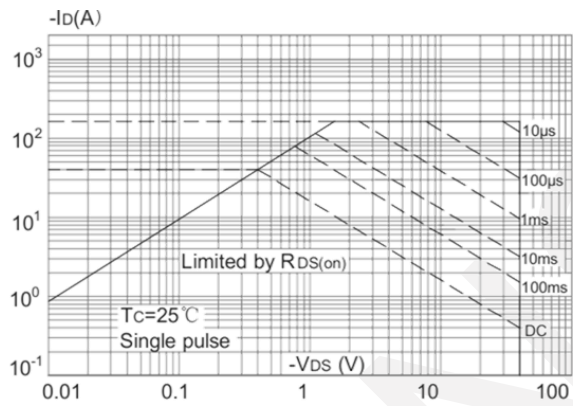
**Capacitance Characteristics**



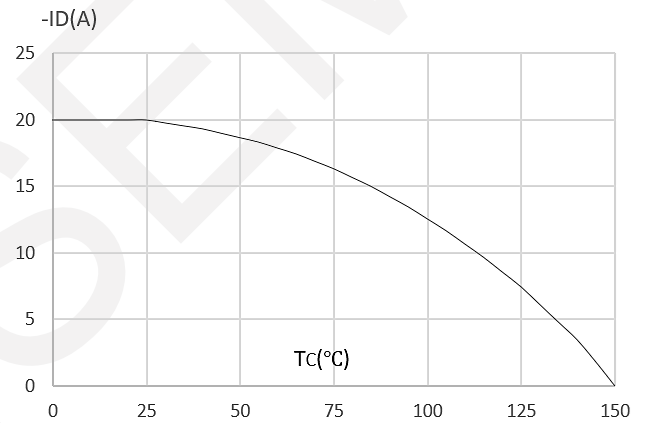
**Normalized Breakdown Voltage vs. Junction Temperature**



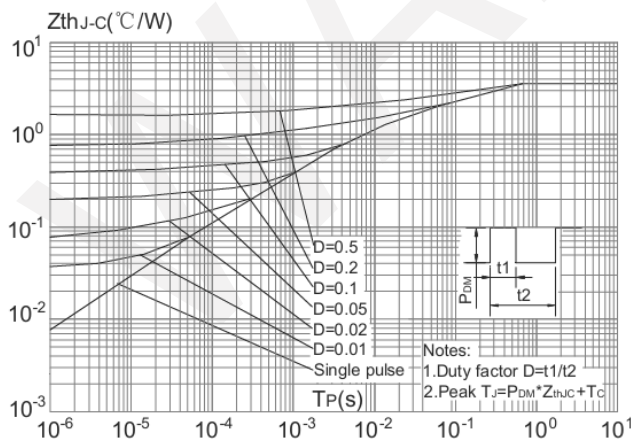
**Normalized on Resistance vs. Junction Temperature**



**Maximum Safe Operating Area**



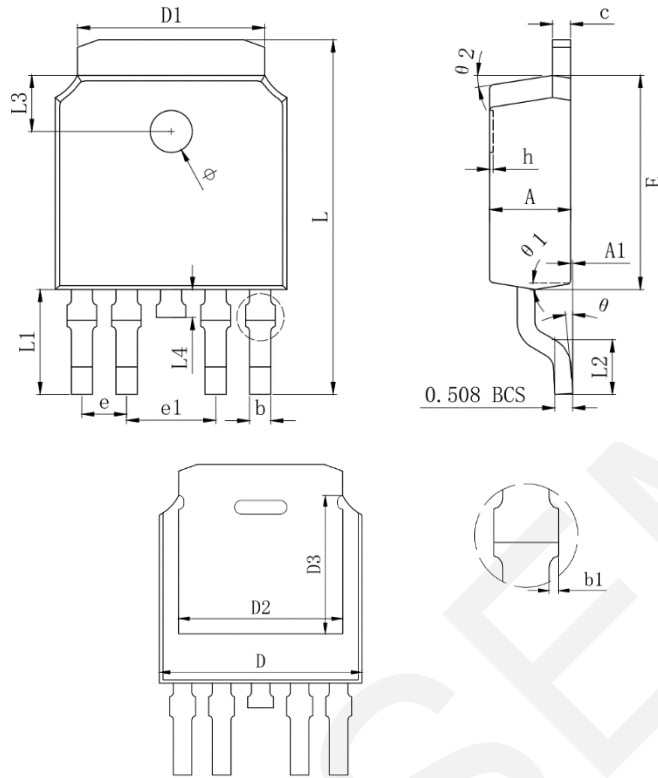
**Maximum Continuous Drain Current vs. Ambient Temperature**



**Normalized Maximum Transient Thermal Impedance**



**8.Package Dimensions**



SYMBOL	MILLIMETER		
	MIN	Typ.	MAX
A	2.200	2.300	2.400
A1	0.000		0.127
b	0.550	0.600	0.650
b1	0.000		0.120
c(电镀后)	0.460	0.520	0.580
D	6.500	6.600	6.700
D1	5.334 REF		
D2	5.346 REF		
D3	4.490 REF		
E	6.000	6.100	6.200
e	1.270 TYP		
e1	2.540 TYP		
h	0.000	0.100	0.200
L	9.900	10.100	10.300
L1	2.988 REF		
L2	1.400	1.550	1.700
L3	1.600 REF		
L4	0.700	0.800	0.900
φ	1.100	1.200	1.300
θ	0°		8°
θ 1	9° TYP		
θ 2	9° TYP		

## 9. Important Notice

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