

AP4606B

N and P-Channel Enhancement Mosfet

Feature

- **N-Channel**

$V_{DD}=30V, I_D=7A$

$R_{DS(ON)} < 25m\Omega @ V_{GS}=10V$ TYP:18 mΩ

$R_{DS(ON)} < 38m\Omega @ V_{GS}=4.5V$ TYP:25 mΩ

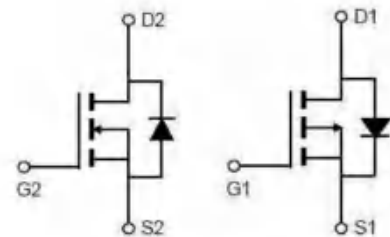
- **P-Channel**

$V_{DD}=-30V, I_D=-5.1A$

$R_{DS(ON)} < 50m\Omega @ V_{GS}=-10V$ TYP:38 mΩ

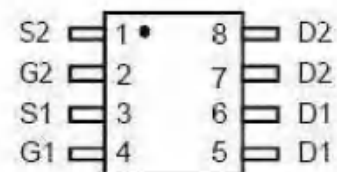
$R_{DS(ON)} < 70m\Omega @ V_{GS}=-4.5V$ TYP:53 mΩ

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



N-channel P-channel

Schematic diagram



Marking and pin assignment

Application

- PWM applications
- Load Switch
- Power management



SOP-8

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity (PCS)
4606B	AP4606B	SOP-8	13 inch	-	4000

ABSOLUTE MAXIMUM RATINGS ($T_a=25^{\circ}C$ unless otherwise noted)

Parameter	Symbol	N-Channel	P-Channel	Unit
Drain-Source Voltage	V_{DS}	30	-30	V
Gate-Source Voltage	V_{GS}	± 20	± 20	V
Continuous Drain Current ($T_a = 25^{\circ}C$)	I_D	7	-5.1	A
Continuous Drain Current ($T_a = 100^{\circ}C$)	I_D	4.5	-3.3	A
Pulsed Drain Current ⁽¹⁾	I_{DM}	28	-20.4	A
Power Dissipation	P_D	2.15	2.15	W
Thermal Resistance from Junction to Ambient	$R_{\theta JA}$	58	58	$^{\circ}C/W$
Junction Temperature	T_J	150	150	$^{\circ}C$
Storage Temperature	T_{STG}	-55~ +150	-55~ +150	$^{\circ}C$

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N-CH ELECTRICAL CHARACTERISTICS($T_a=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Type	Max	Unit
Static Characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = -250\mu A$	30			V
Zero gate voltage drain current	I_{DSS}	$V_{DS} = 30V, V_{GS} = 0V$			1	μA
Gate-body leakage current	I_{GSS}	$V_{GS} = \pm 20V, V_{DS} = 0V$			± 100	nA
Gate threshold voltage ⁽²⁾	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	1	1.5	2.5	V
Drain-source on-resistance ⁽²⁾	$R_{DS(on)}$	$V_{GS} = 10V, I_D = 5A$		18	25	m Ω
		$V_{GS} = 4.5V, I_D = 3A$		25	38	
Dynamic characteristics						
Input Capacitance	C_{iss}	$V_{DS} = 15V, V_{GS} = 0V, f = 1MHz$		490		pF
Output Capacitance	C_{oss}			79		
Reverse Transfer Capacitance	C_{rss}			61		
Switching characteristics						
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 15V, I_D = 3A, R_L = 6\Omega$ $V_{GS} = 10V, R_G = 3\Omega$		4.5		ns
Turn-on rise time	t_r			2.5		
Turn-off delay time	$t_{d(off)}$			14.5		
Turn-off fall time	t_f			3.5		
Total Gate Charge	Q_g	$V_{DS} = 15V, I_D = 5A,$ $V_{GS} = 10V$		5.2		nC
Gate-Source Charge	Q_{gs}			0.9		
Gate-Drain Charge	Q_{gd}			1.3		
Source-Drain Diode characteristics						
Diode Forward voltage ⁽²⁾	V_{DS}	$V_{GS} = 0V, I_S = 7A$			1.2	V
Diode Forward current ⁽³⁾	I_S		-	-	7	A

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P-CH ELECTRICAL CHARACTERISTICS($T_a=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Type	Max	Unit
Static Characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = -250\mu A$	-30			V
Zero gate voltage drain current	I_{DSS}	$V_{DS} = -30V, V_{GS} = 0V$			1	μA
Gate-body leakage current	I_{GSS}	$V_{GS} = \pm 20V, V_{DS} = 0V$			± 100	nA
Gate threshold voltage ⁽²⁾	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\mu A$	-1	-1.5	-2.5	V
Drain-source on-resistance ⁽²⁾	$R_{DS(on)}$	$V_{GS} = -10V, I_D = -4A$		38	50	m Ω
		$V_{GS} = -4.5V, I_D = -3A$		53	70	
Dynamic characteristics						
Input Capacitance	C_{iss}	$V_{DS} = -15V, V_{GS} = 0V, f = 1MHz$		580		pF
Output Capacitance	C_{oss}			98		
Reverse Transfer Capacitance	C_{rss}			74		
Switching characteristics						
Turn-on delay time	$t_{d(on)}$	$V_{DD} = -15V, I_D = -1A, R_L = 6\Omega$ $V_{GS} = -10V, R_G = 1\Omega$		14		ns
Turn-on rise time	t_r			61		
Turn-off delay time	$t_{d(off)}$			19		
Turn-off fall time	t_f			10		
Total Gate Charge	Q_g	$V_{DS} = -15V, I_D = -4.1A,$ $V_{GS} = -10V$		6.8		nC
Gate-Source Charge	Q_{gs}			1		
Gate-Drain Charge	Q_{gd}			1.4		
Source-Drain Diode characteristics						
Diode Forward voltage ⁽²⁾	V_{DS}	$V_{GS} = 0V, I_S = -4A$			1.2	V
Diode Forward current ⁽³⁾	I_S		-	-	-5.1	A

Notes:

1. Repetitive Rating: pulse width limited by maximum junction temperature
2. Pulse Test: pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$
3. Surface Mounted on FR4 Board, $t \leq 10$ sec

N Test Circuit

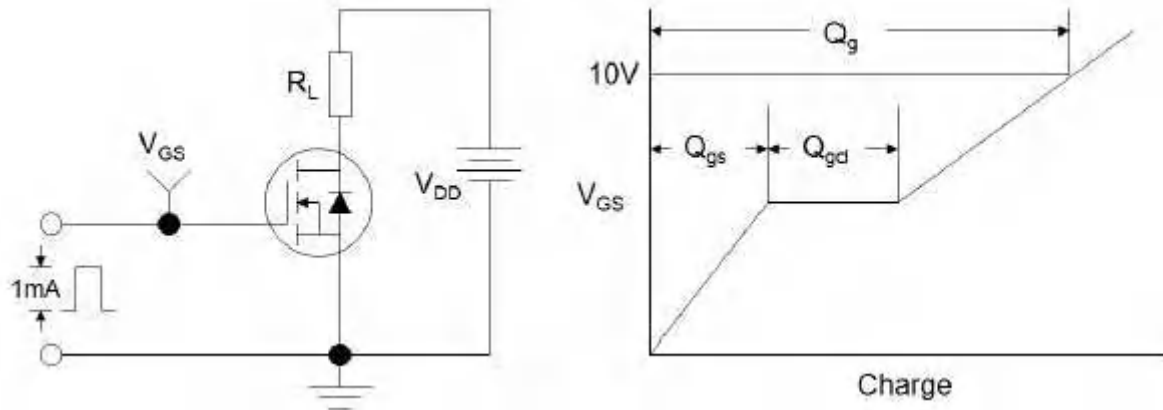


Figure1:Gate Charge Test Circuit & Waveform

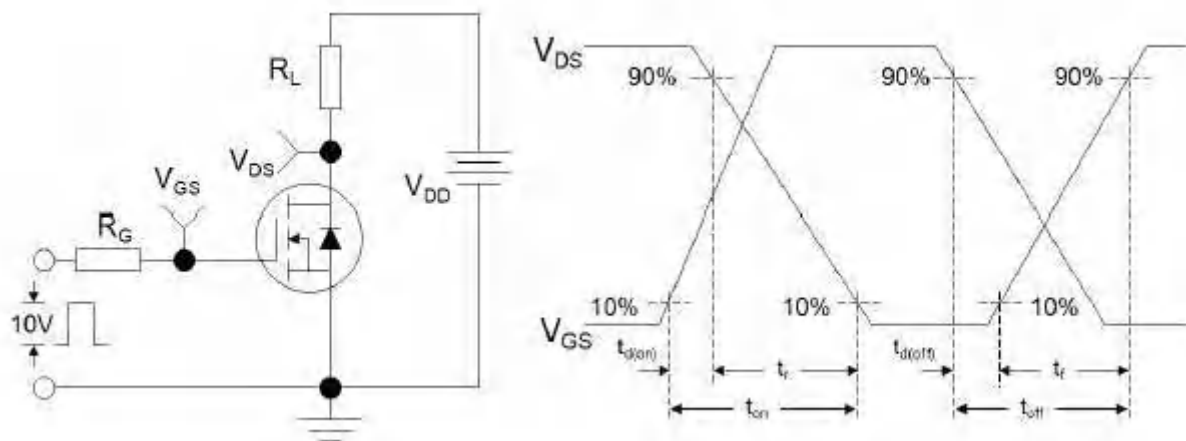


Figure 2: Resistive Switching Test Circuit & Waveforms

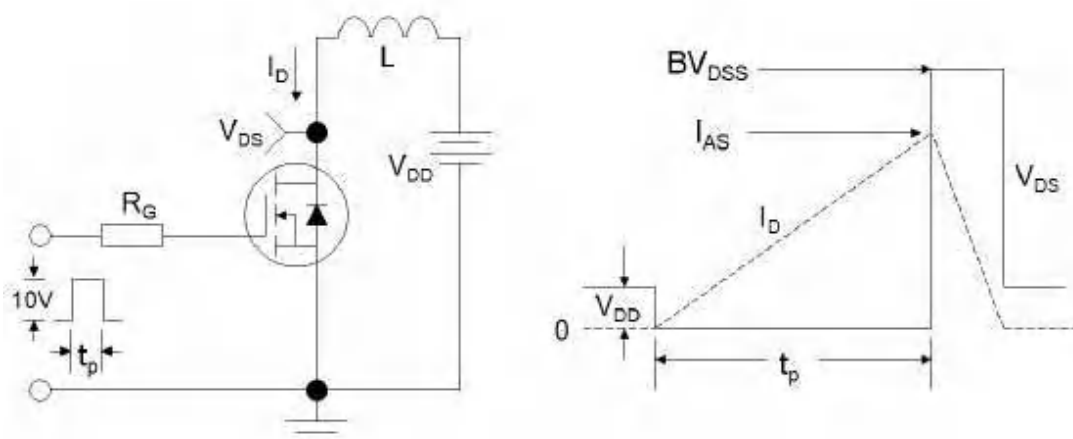


Figure 3:Unclamped Inductive Switching Test Circuit & Waveforms

Figure 1: Output Characteristics

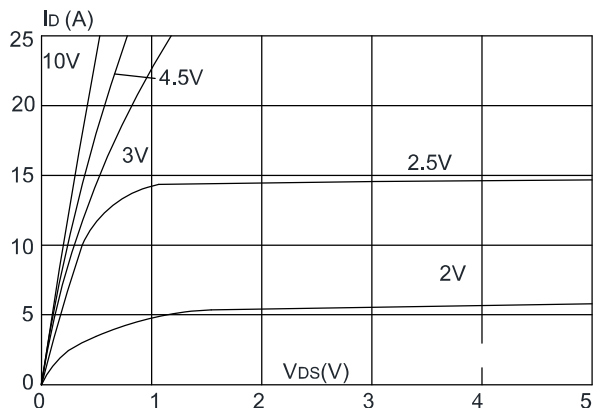


Figure 2: Typical Transfer Characteristics

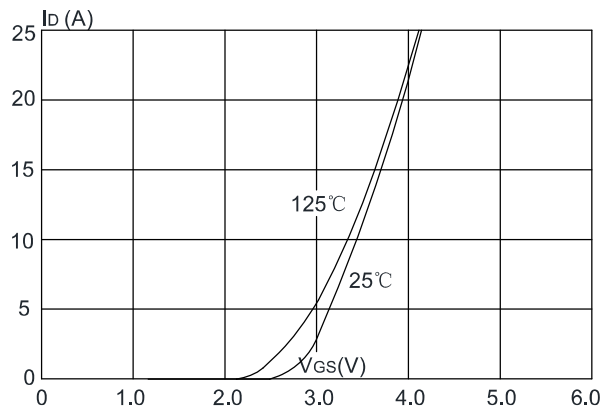


Figure 3: On-resistance vs. Drain Current

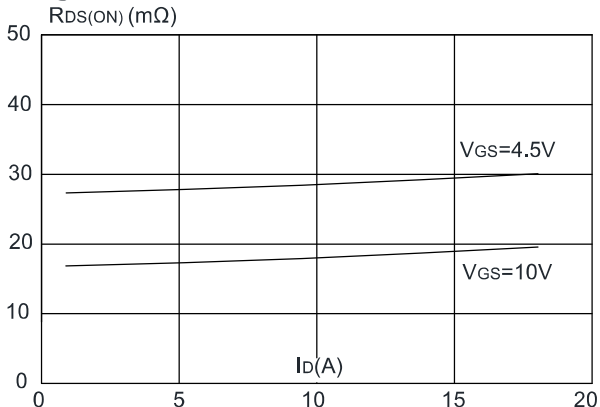


Figure 4: Body Diode Characteristics

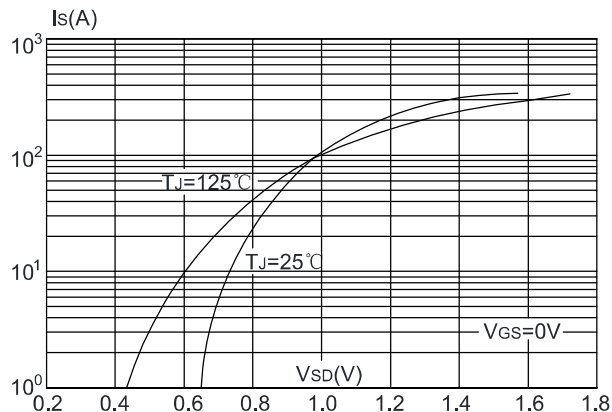


Figure 5: Gate Charge Characteristics

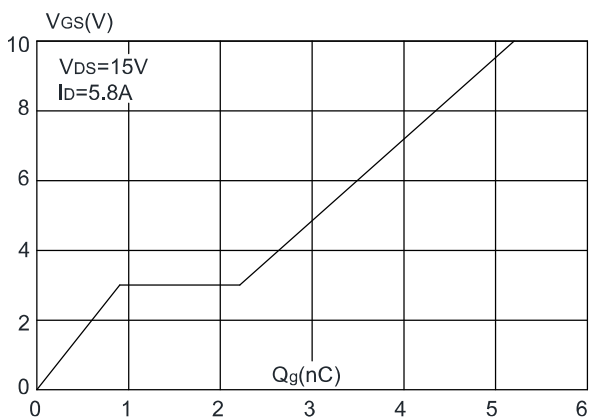
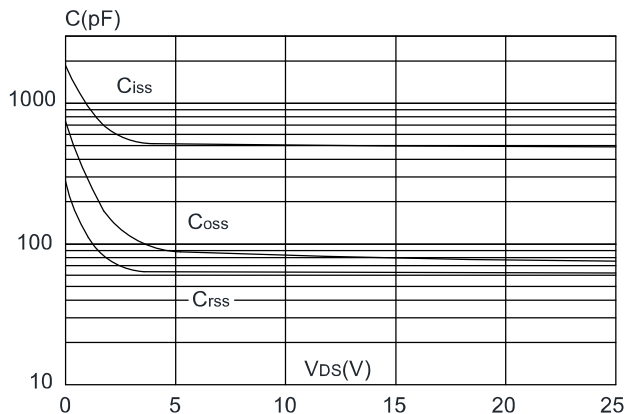


Figure 6: Capacitance Characteristics



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Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

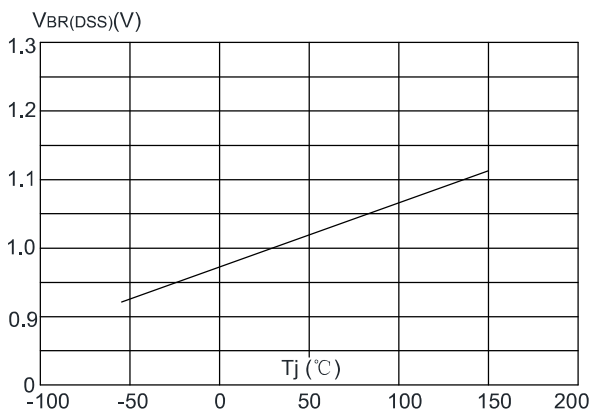


Figure 8: Normalized on Resistance vs. Junction Temperature

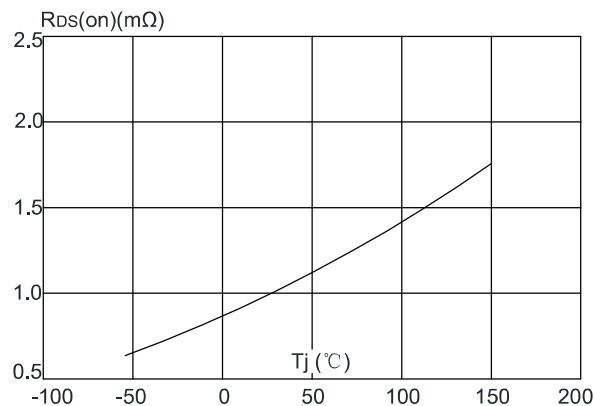


Figure 9: Maximum Safe Operating Area

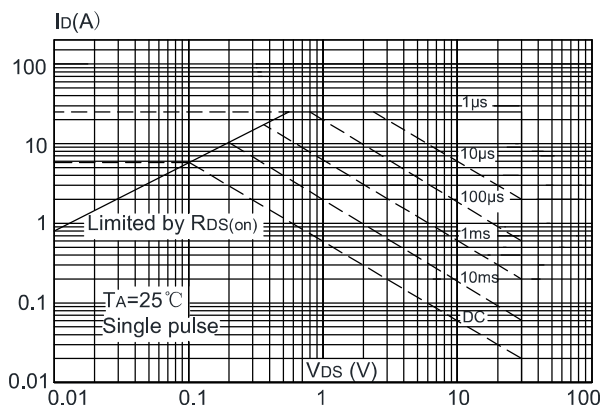


Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature

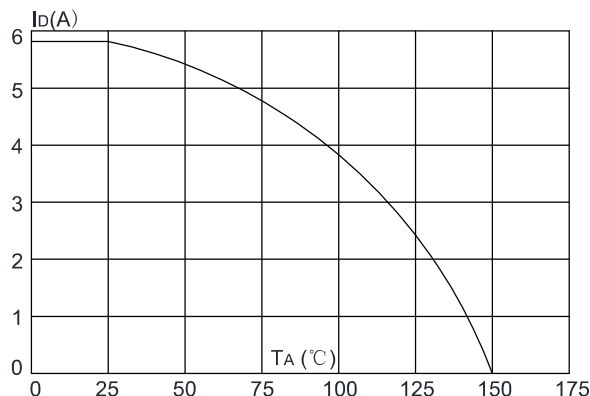
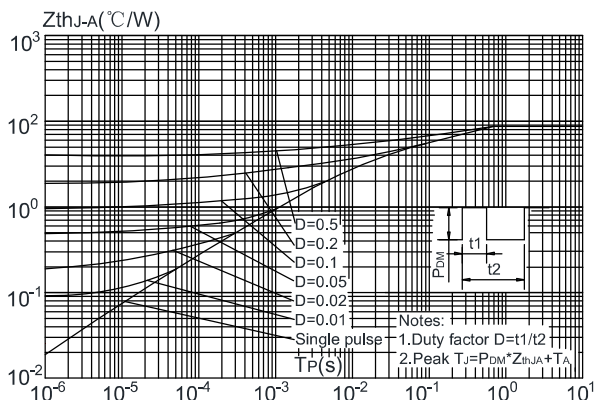
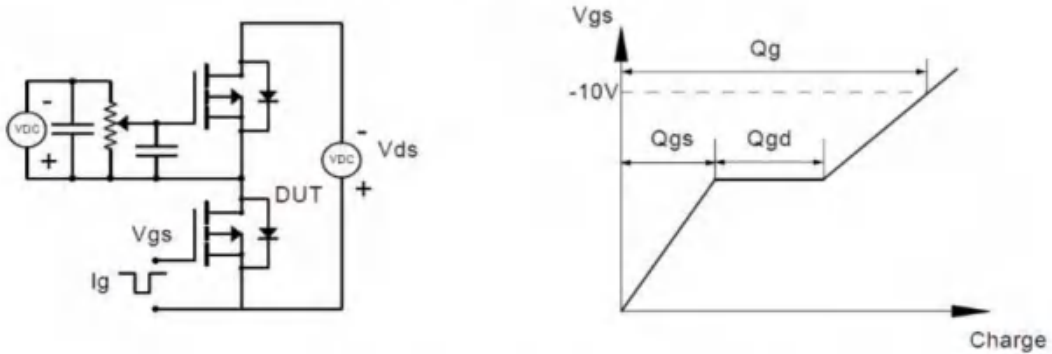


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

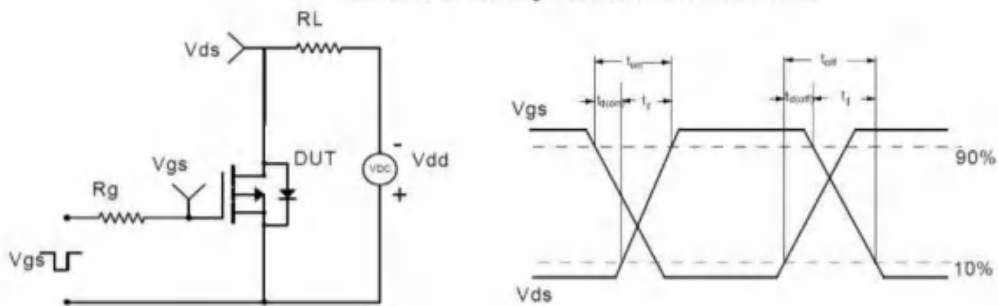


P Typical Performance Characteristics

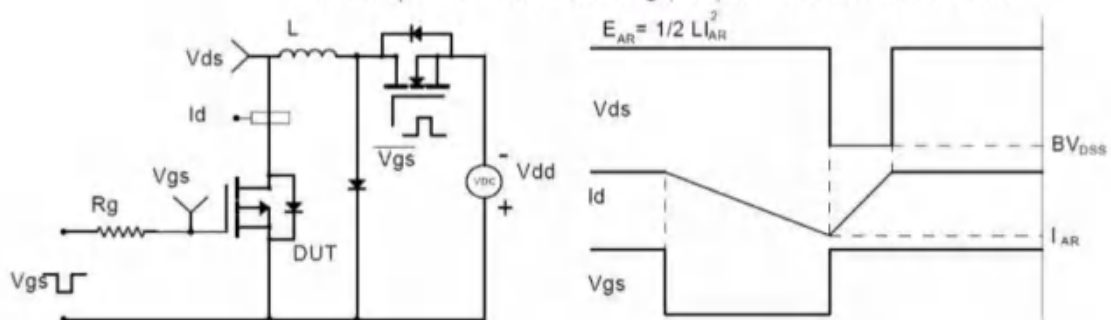
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

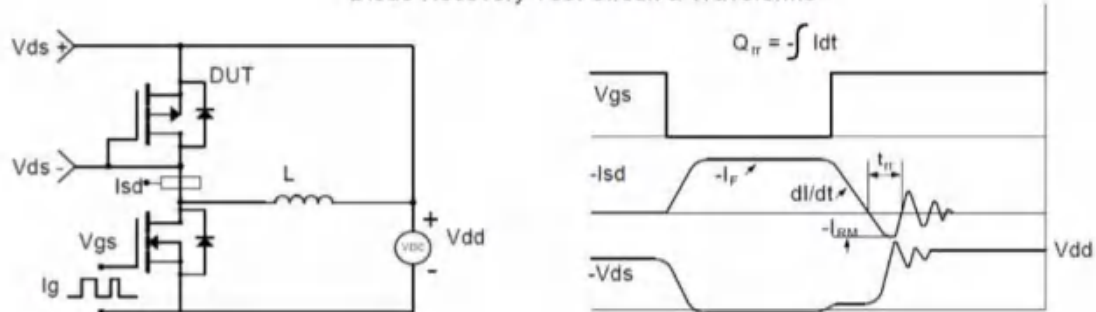


Figure 1: Output Characteristics

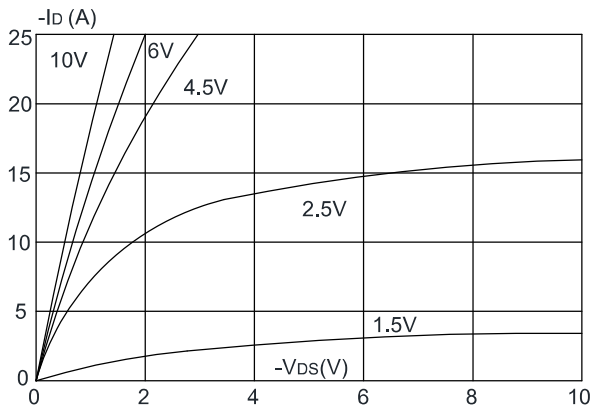


Figure 2: Typical Transfer Characteristics

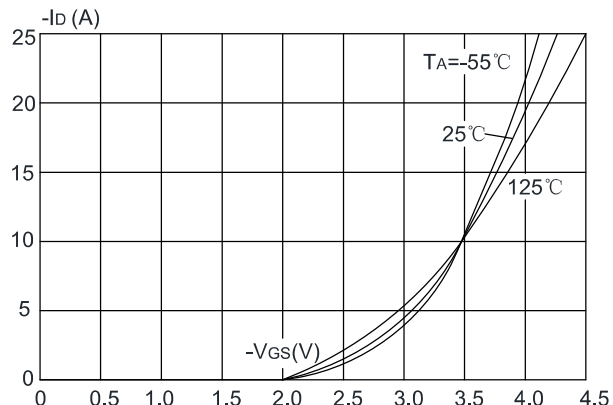


Figure 3: On-resistance vs. Drain Current

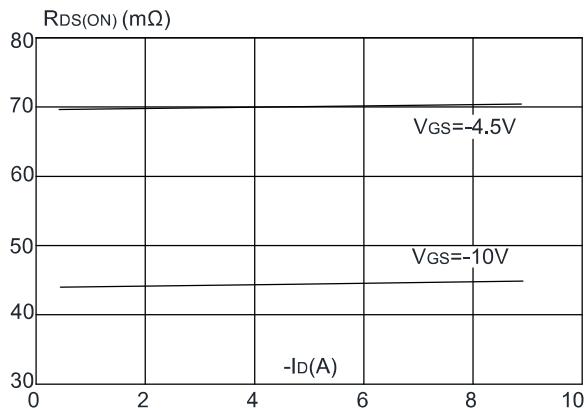


Figure 4: Body Diode Characteristics

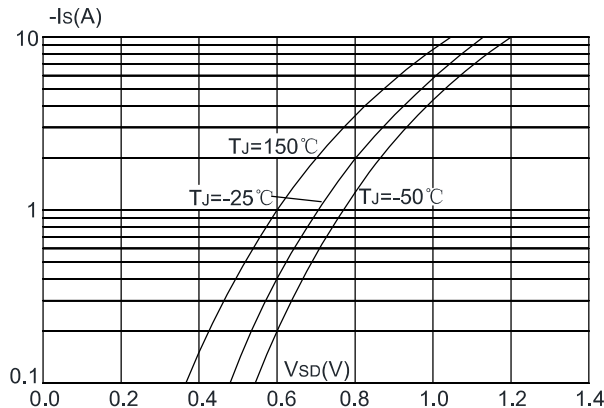


Figure 5: Gate Charge Characteristics

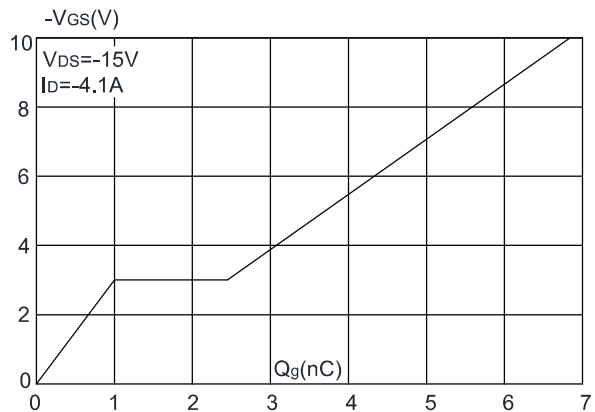
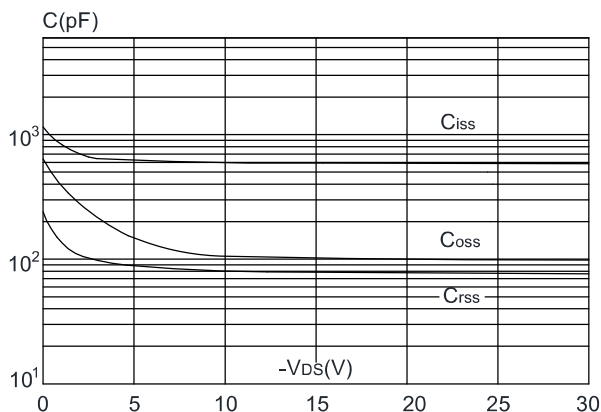


Figure 6: Capacitance Characteristics



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Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

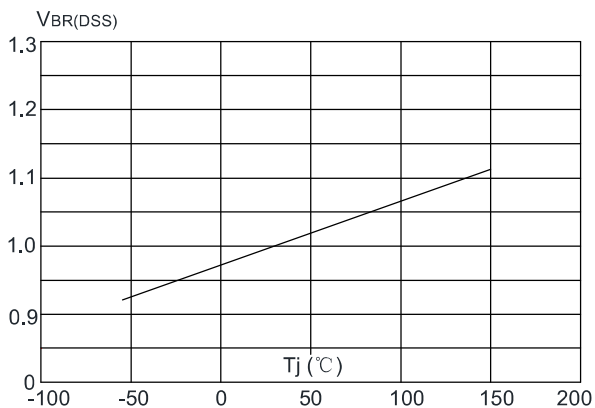


Figure 8: Normalized on Resistance vs. Junction Temperature

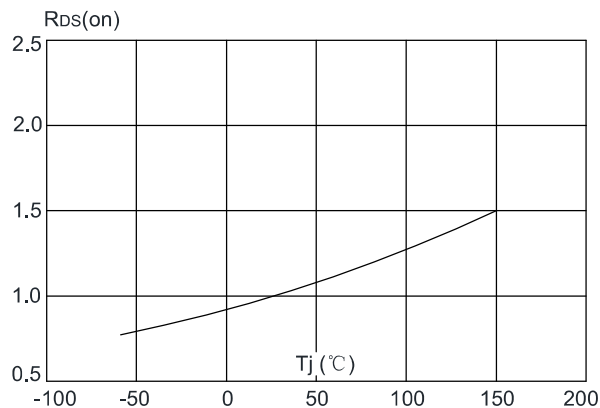


Figure 9: Maximum Safe Operating Area

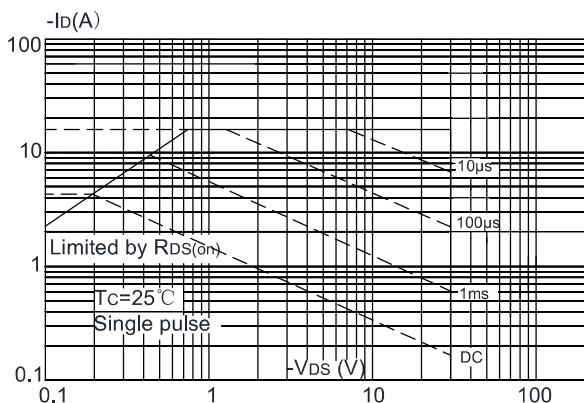


Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature

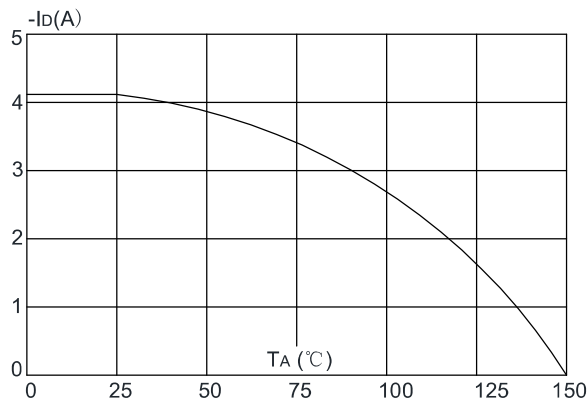
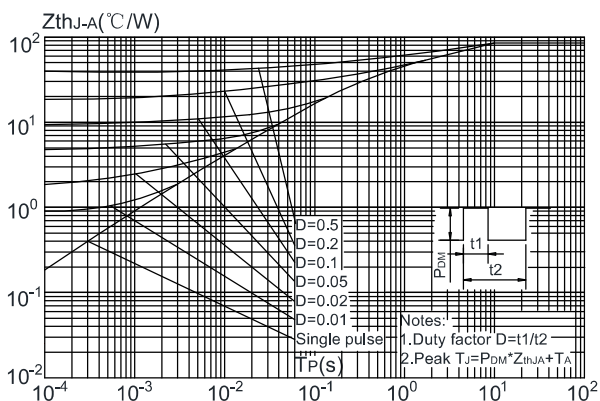


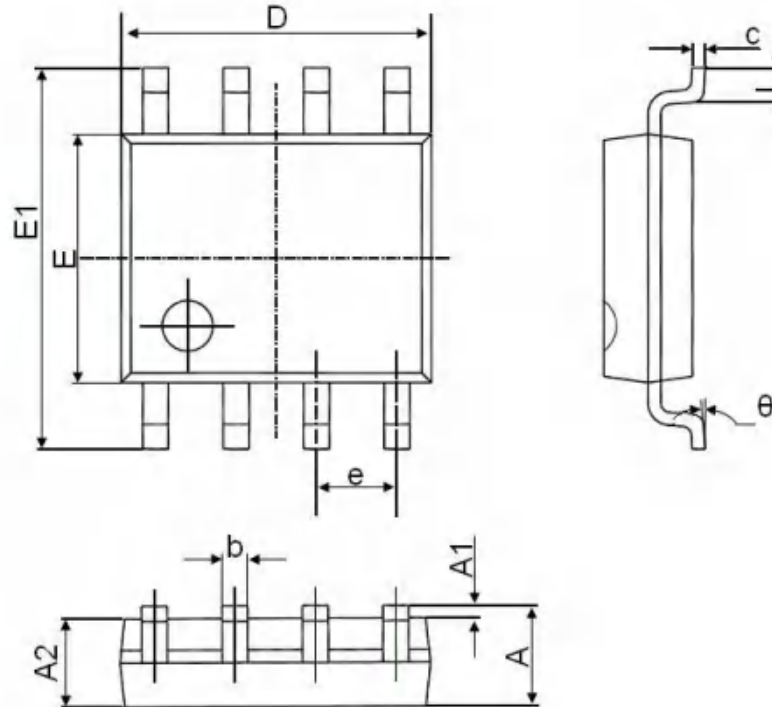
Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Ambient



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SOP-8 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°