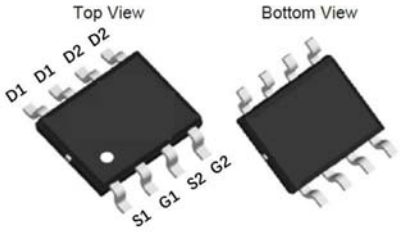
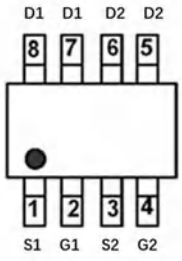
Features

- N-Channel: 40V, 13A
  $R_{DS(ON)}$ *TYP.*= 18mΩ @ V_{GS} = 10V
  $R_{DS(ON)}$ *TYP.*= 21mΩ @ V_{GS} = 4.5V
- P-Channel: -40V, -12A
  $R_{DS(ON)}$ *TYP.*= 31mΩ @ V_{GS} = -10V
  $R_{DS(ON)}$ *TYP.*= 44mΩ @ V_{GS} = -4.5V
- Excellent Gate Charge x $R_{DS(ON)}$ Product(FOM)
- Very Low On-resistance $R_{DS(ON)}$
- Fast Switching Speed

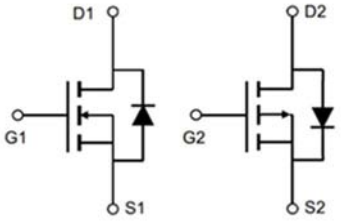


SOP-8(Dual)



Application

- Battery Protection
- Load Switch
- Power Management



n-channel **p-channel**

Absolute Maximum Ratings (T_A=25℃ unless otherwise specified)

Symbol	Parameter		Max. N-Channel	Max. P-Channel	Units
V_{DSS}	Drain-Source Voltage		40	-40	V
V_{GSS}	Gate-Source Voltage		±20	±20	V
I_D	Continuous Drain Current	T_A= 25℃	13	-12	A
		T_A= 100℃	7.8	-7.2	A
I_{DM}	Pulsed Drain Current note1		50	-48	A
E_{AS}	Single Pulsed Avalanche Energy note2		13	17.6	mJ
P_D	Power Dissipation	T_A= 25℃	2	3.2	W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient		62.5	39	℃/W
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +150		℃

N-Channel Electrical Characteristics (T_J=25℃ unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
Off Characteristic						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	V_{GS}=0V, I_D=250μA	40	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=40V, V_{GS}=0V	-	-	1.0	μA
I_{GSS}	Gate to Body Leakage Current	V_{DS}=0V, V_{GS}=±20V	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_D=250μA	1.0	1.5	2.2	V
$R_{DS(on)}$	Static Drain-Source on-Resistance note3	V_{GS}=10V, I_D=8A	-	18	25	mΩ
		V_{GS}=4.5V, I_D=5A	-	21	31	mΩ
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS}=20V, V_{GS}=0V, f=1.0MHz	-	779	-	pF
C_{oss}	Output Capacitance		-	57	-	pF
C_{rss}	Reverse Transfer Capacitance		-	48	-	pF
Q_g	Total Gate Charge	V_{DS}=20V, I_D=8A, V_{GS}=10V	-	22	-	nC
Q_{gs}	Gate-Source Charge		-	4.0	-	nC
Q_{gd}	Gate-Drain(“Miller”) Charge		-	4.0	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-on Delay Time	V_{DD}= 20V, R_L =2.5Ω V_{GS}=10V,R_{REN} =3Ω	-	7	-	ns
t_r	Turn-on Rise Time		-	9	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	25	-	ns
t_f	Turn-off Fall Time		-	3	-	ns
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	13	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	50	A
V_{SD}	Drain to Source Diode Forward Voltage	V_{GS}=0V, I_S= 8A	-	-	1.2	V

P-Channel Electrical Characteristics (T_J=25℃ unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
Off Characteristic						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	V_{GS}=0V, I_D= -250μA	-40	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}= -40V, V_{GS}=0V	-	-	-1	μA
I_{GSS}	Gate to Body Leakage Current	V_{DS}=0V, V_{GS}=±20V	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_D= -250μA	-1.1	-1.6	-2.2	V
$R_{DS(on)}$	Static Drain-Source on-Resistance note3	V_{GS}= -10V, I_D= -6A	-	31	44	mΩ
		V_{GS}= -4.5V, I_D= -4A	-	44	58	
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS}= -20V, V_{GS}=0V, f=1.0MHz	-	621	-	pF
C_{oss}	Output Capacitance		-	75	-	pF
C_{rss}	Reverse Transfer Capacitance		-	65	-	pF
Q_g	Total Gate Charge	V_{DS}= -20V, I_D= -6A, V_{GS}= -10V	-	15	-	nC
Q_{gs}	Gate-Source Charge		-	3.0	-	nC
Q_{gd}	Gate-Drain(“Miller”) Charge		-	3.3	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-on Delay Time	V_{DD}= -20V, R_L =2.3Ω V_{GS}=-10V,R_{REN} =6Ω	-	7	-	ns
t_r	Turn-on Rise Time		-	9	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	21	-	ns
t_f	Turn-off Fall Time		-	10	-	ns
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	-12	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	-48A	
V_{SD}	Drain to Source Diode Forward Voltage	V_{GS}=0V, I_S= -6A	-	-	-1.2	V

Notes:1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

2. EAS condition : T_J=25℃,V_{DD}=20V,V_G=10V,L=0.5mH,Rg=25Ω,I_{AS}=7.2A

T_J=25℃,V_{DD}=-20V,V_G= -10V,L=0.5mH,Rg=25Ω,I_{AS}=-8.4A

3. Pulse Test: Pulse Width≤300μs, Duty Cycle≤2%

Typical Performance Characteristics-N

Figure1: Output Characteristics

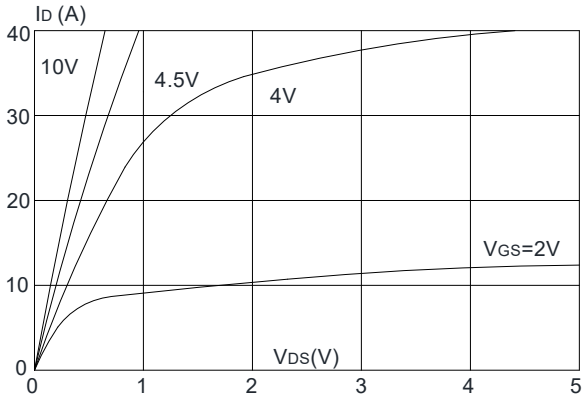


Figure 2: Typical Transfer Characteristics

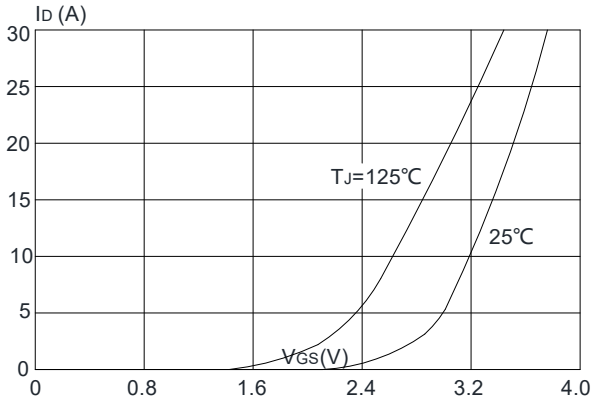


Figure 3: On-resistance vs. Drain Current

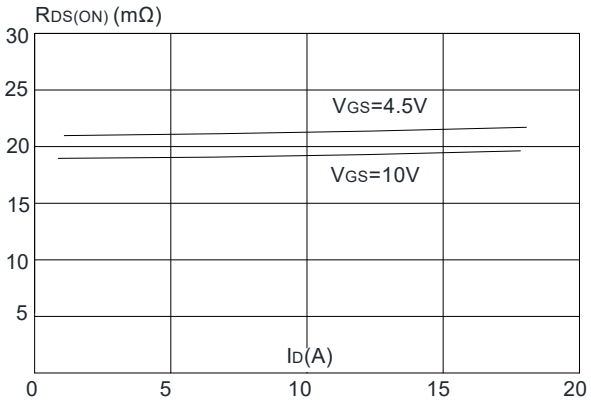


Figure 4: Body Diode Characteristics

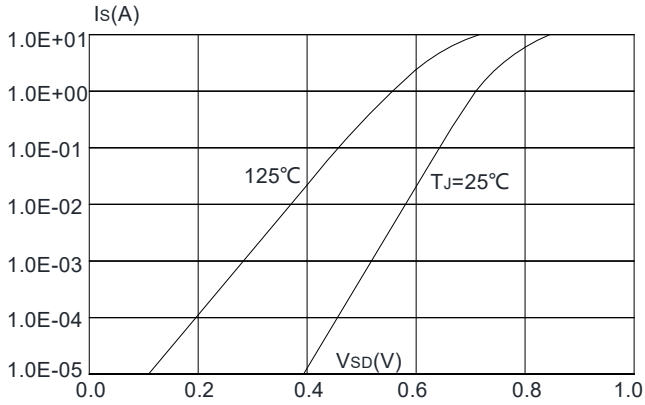


Figure 5: Gate Charge Characteristics

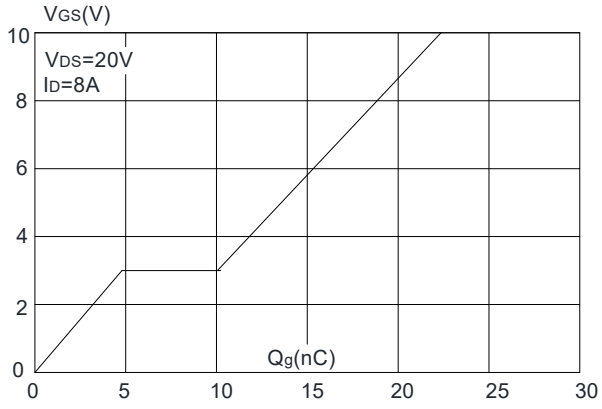


Figure 6: Capacitance Characteristics

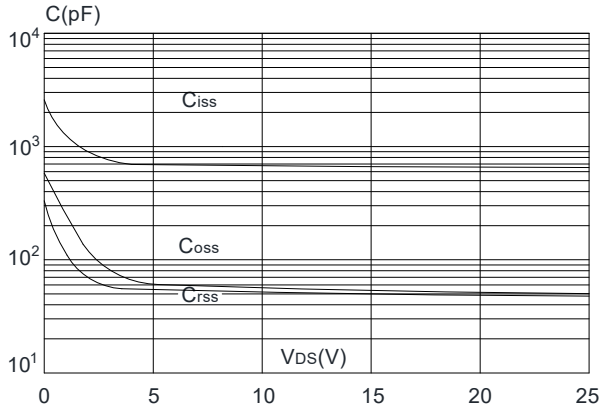


Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

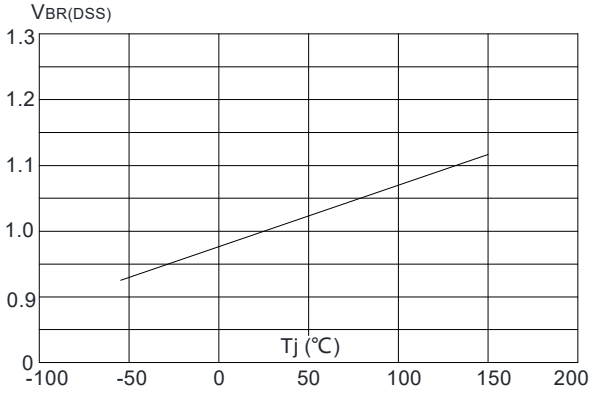


Figure 8: Normalized on Resistance vs. Junction Temperature

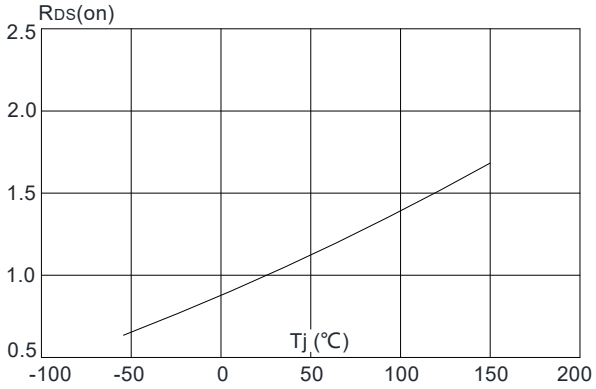


Figure 9: Maximum Safe Operating Area

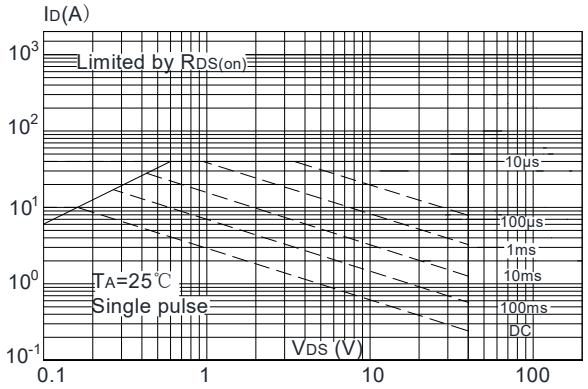


Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature

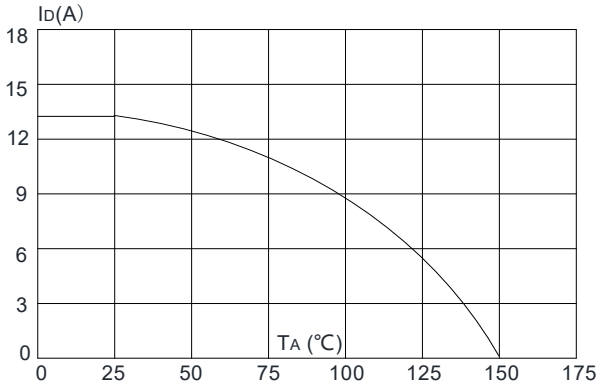
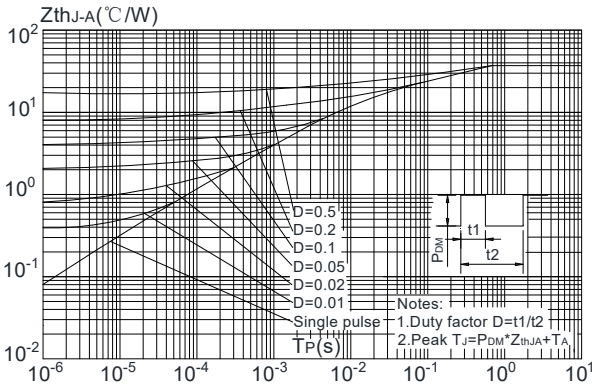


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Ambient



Test Circuit-N

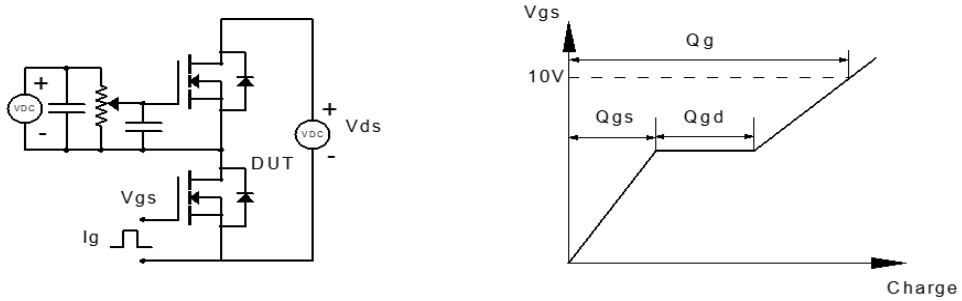


Figure 1: Gate Charge Test Circuit & Waveform

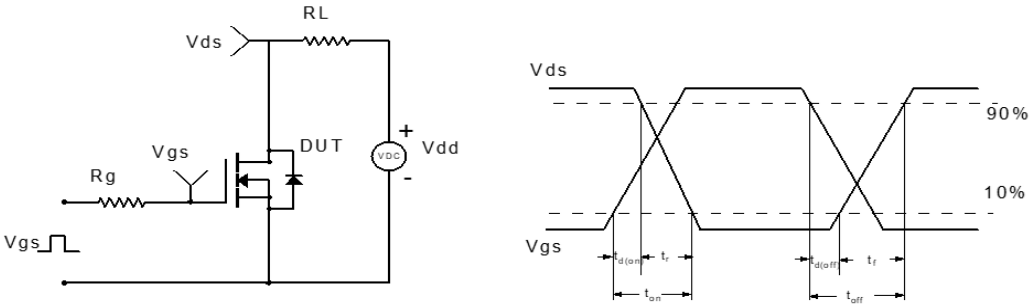


Figure 2: Resistive Switching Test Circuit & Waveform

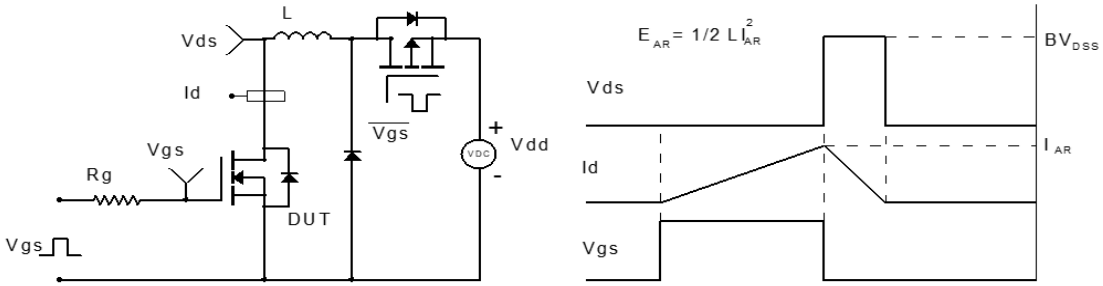


Figure 3: Unclamped Inductive Switching Test Circuit& Waveform

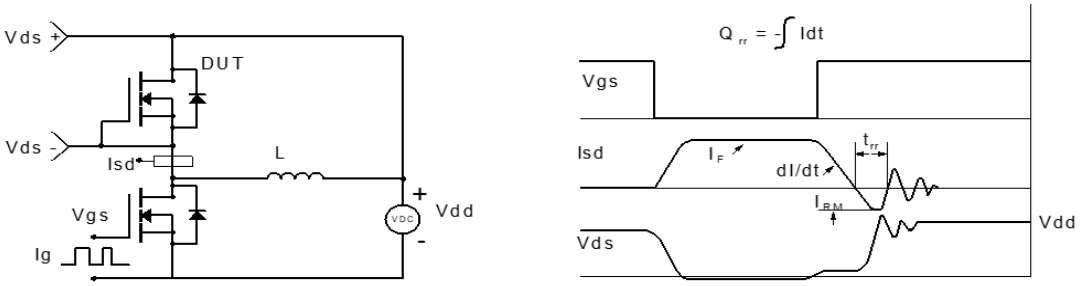


Figure 4: Diode Recovery Test Circuit & Waveform

Typical Performance Characteristics-P

Figure1: Output Characteristics

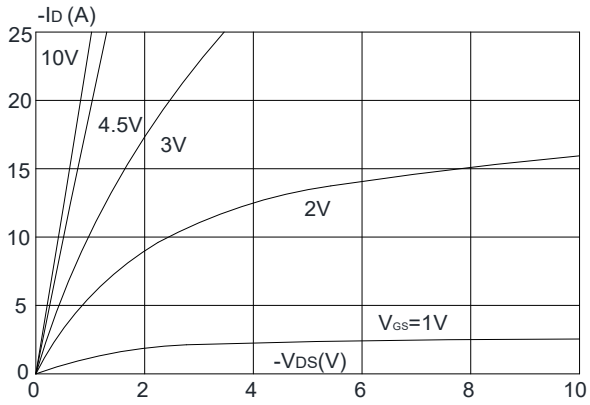


Figure 2: Typical Transfer Characteristics

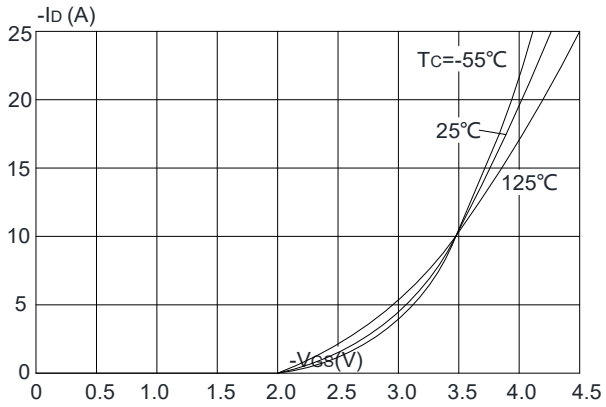


Figure 3: On-resistance vs. Drain Current

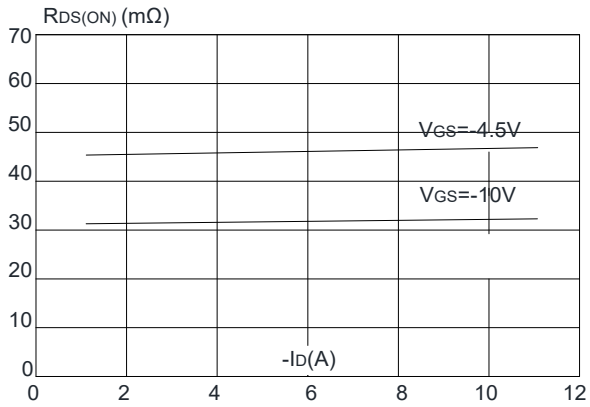


Figure 4: Body Diode Characteristics

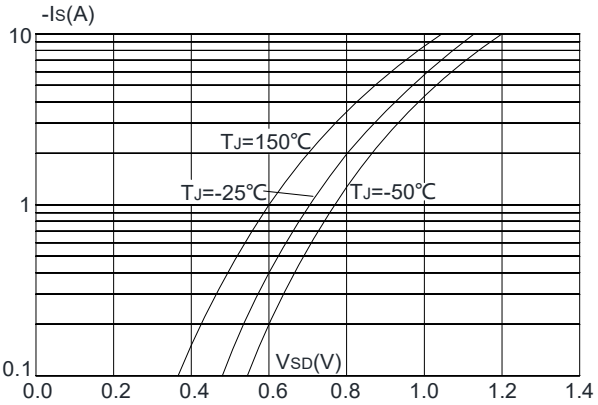


Figure 5: Gate Charge Characteristics

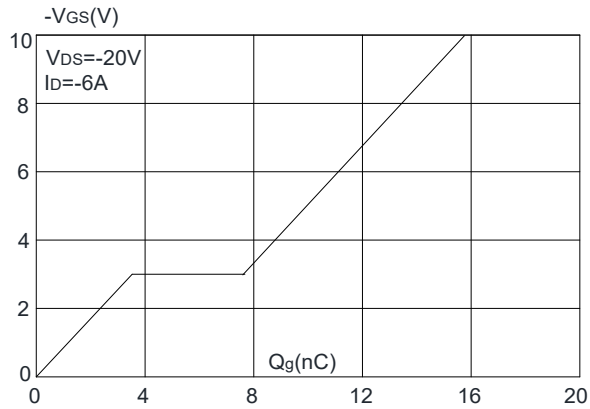


Figure 6: Capacitance Characteristics

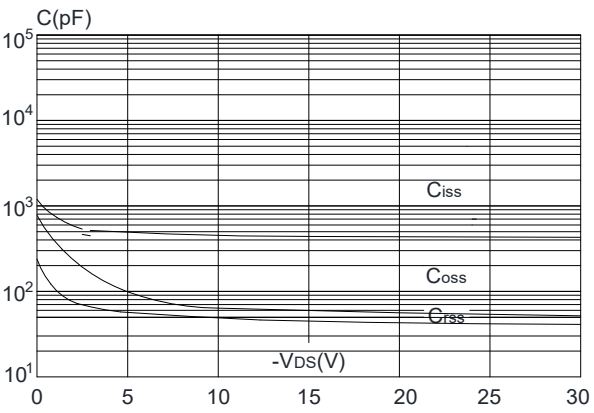


Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

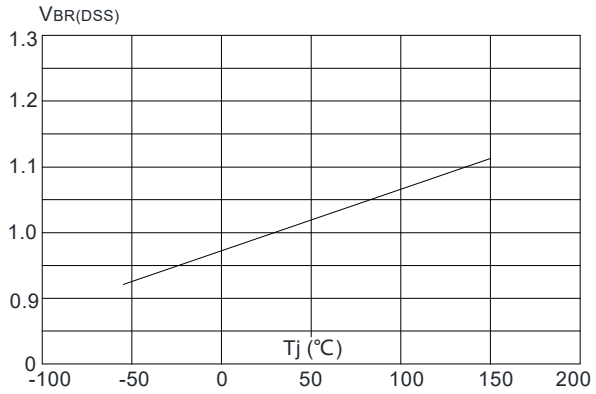


Figure 8: Normalized on Resistance vs. Junction Temperature

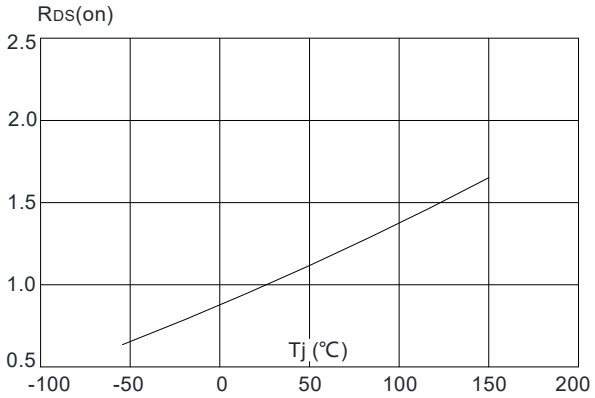


Figure 9: Maximum Safe Operating Area

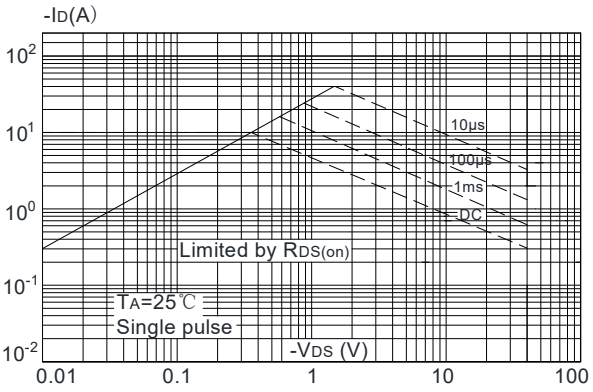


Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature

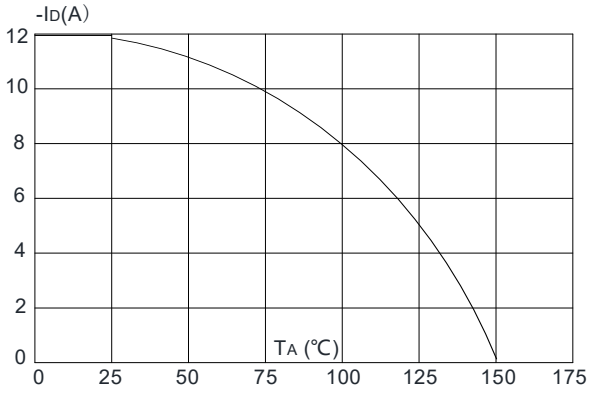
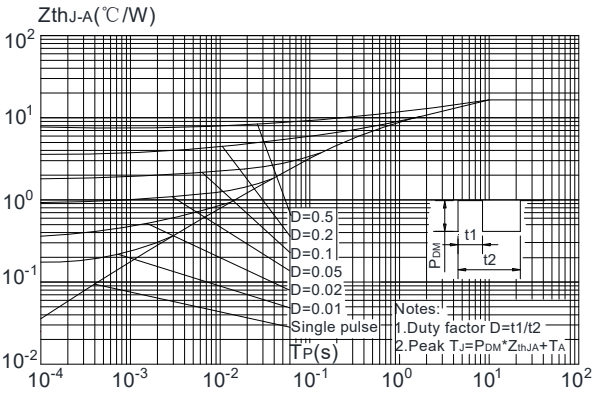
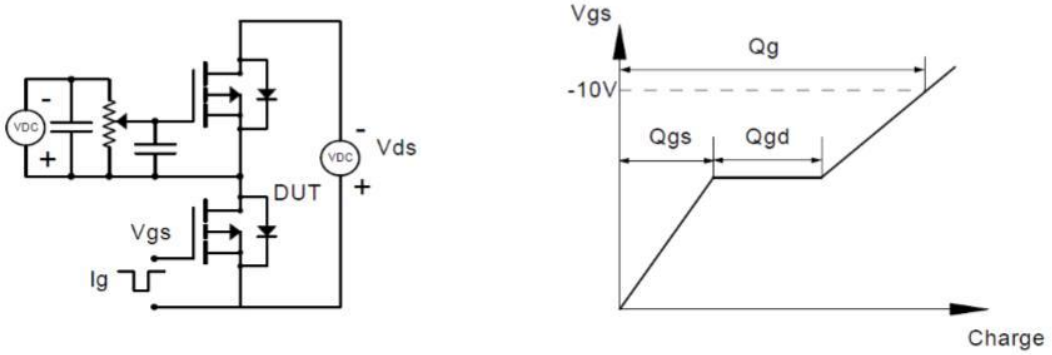


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

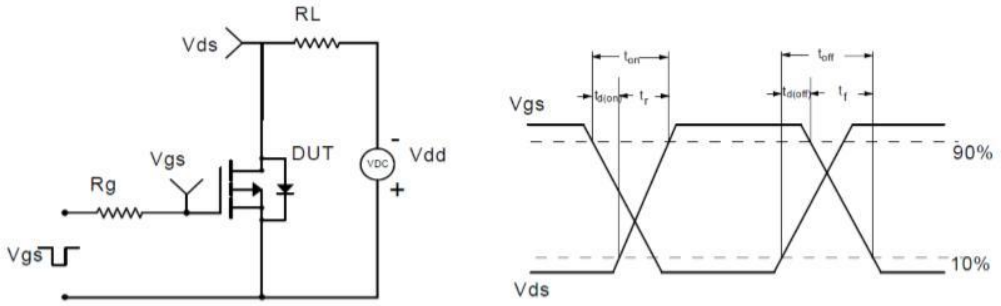


Test Circuit-P

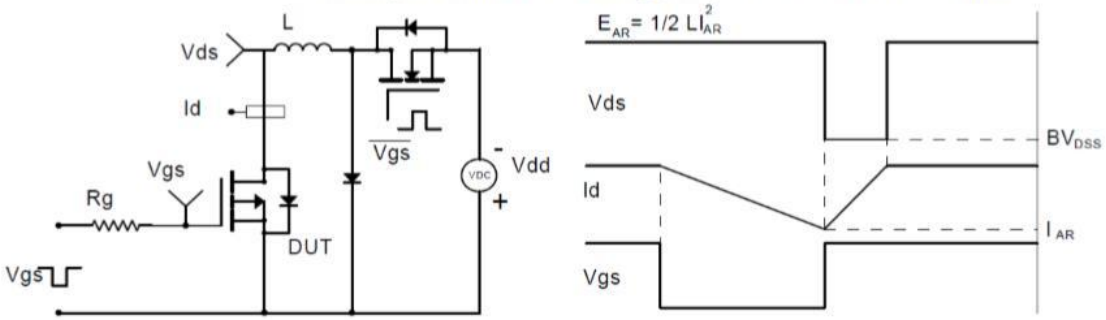
Gate Charge Test Circuit & Waveform



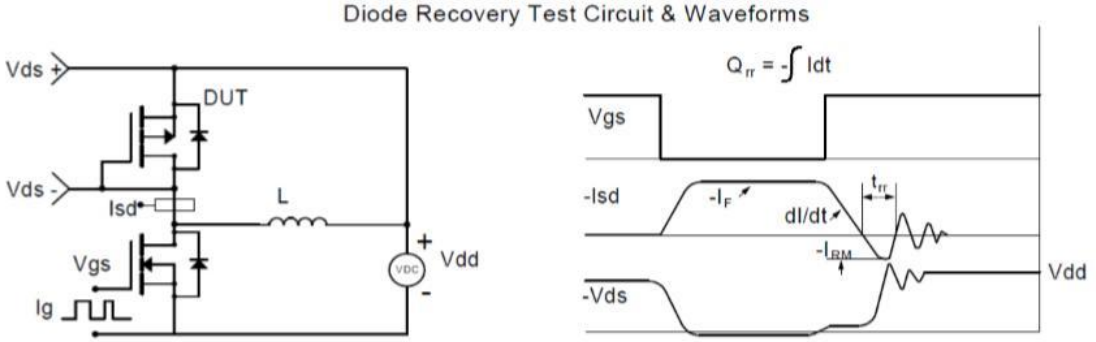
Resistive Switching Test Circuit & Waveforms



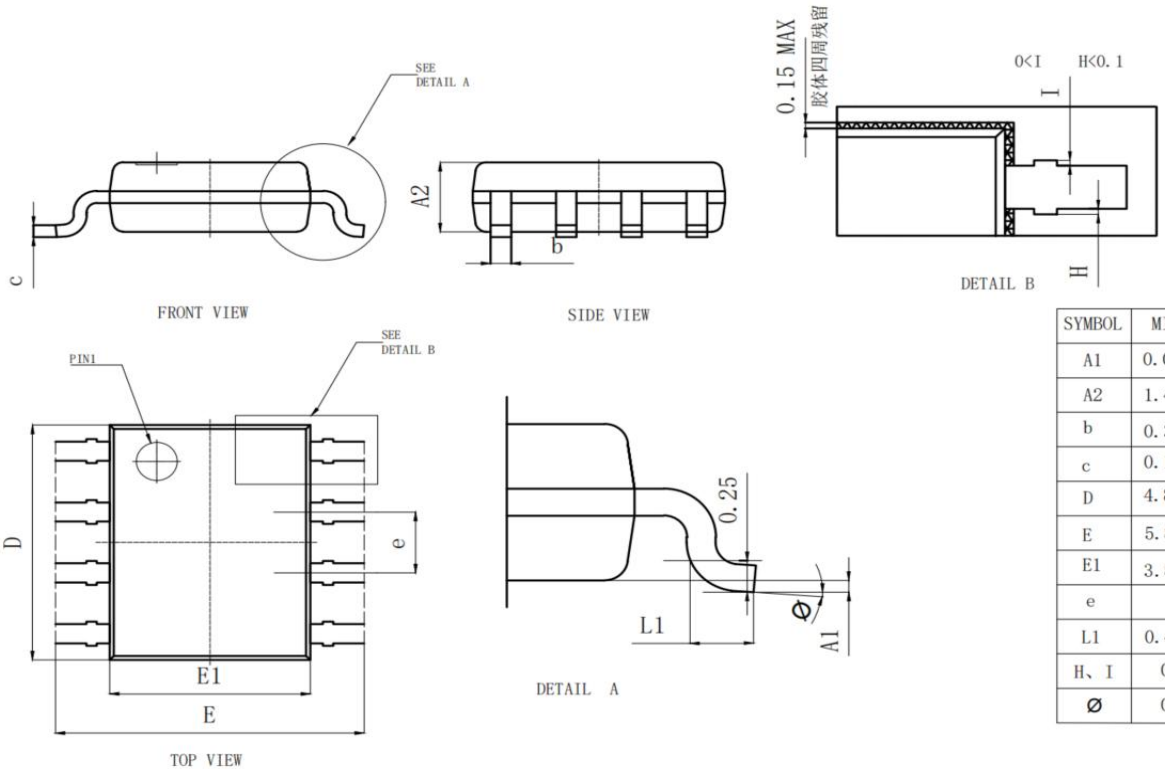
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



Package Mechanical Data(SOP-8)



SYMBOL	MIN	NOM	MAX
A1	0.030	0.090	0.150
A2	1.425	1.450	1.475
b	0.300	0.400	0.500
c	0.150	0.200	0.250
D	4.800	5.000	5.200
E	5.800	6.000	6.200
E1	3.800	4.000	4.200
e	1.270BSC		
L1	0.400	0.600	0.800
H、I	0	NA	0.100
Ø	0°	NA	8°