

±40V, 29A&-21A, 15mΩ&40mΩ N And P-channel Power Trench MOSFET

JMTKF0410AGD

Features

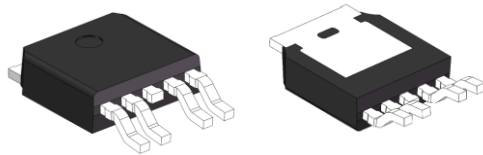
- Excellent $R_{DS(ON)}$ and Low Gate Charge
- 100% UIS Tested
- 100% ΔV_{DS} Tested
- Halogen-free; RoHS-compliant

Applications

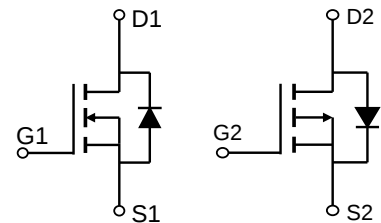
- Load Switch
- PWM Application
- Power Management

Product Summary

Parameters	N	P	Unit
V_{DSS}	40	-40	V
$V_{GS(th_Typ)}$	1.3	-1.7	V
$I_D(@V_{GS}=10V)$	29	-21	A
$R_{DS(ON_Typ)}(@V_{GS}=10V)$	14	29	mΩ
$R_{DS(ON_Typ)}(@V_{GS}=4.5V)$	15	40	mΩ



TO-252-4L



Schematic Diagram

Ordering Information

Device	Marking	MSL	Form	Package	Reel(pcs)	Per Carton (pcs)
JMTKF0410AGD	JMTKF0410AGD	3	Tape&Reel	TO-252-4L	2500	25000

Absolute Maximum Ratings (@ $T_C = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Value-N	Value-P	Unit
V_{DS}	Drain-to-Source Voltage	40	-40	V
V_{GS}	Gate-to-Source Voltage	± 20		V
I_D	Continuous Drain Current	$T_C = 25^\circ\text{C}$	-21	A
		$T_C = 100^\circ\text{C}$	-14	
I_{DM}	Pulsed Drain Current ⁽¹⁾	Refer to Fig.4		A
E_{AS}	Single Pulsed Avalanche Energy ⁽²⁾	24	28	mJ
P_D	Power Dissipation	$T_C = 25^\circ\text{C}$	29	W
		$T_C = 100^\circ\text{C}$	12	
T_J, T_{STG}	Junction & Storage Temperature Range	-55 to 150		$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	Max		Unit
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient ⁽³⁾	41	44	$^\circ\text{C/W}$
$R_{\theta JC}$	Thermal Resistance, Junction to Case	4.3	4.3	

Electrical Characteristics-N($T_J = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
V _{(BR)DSS}	Drain-Source Breakdown Voltage	I _D = 250μA, V _{GS} = 0V	40	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 40V, V _{GS} = 0V	-	-	1.0	μA
I _{GSS}	Gate-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	0.9	1.3	1.7	V
R _{DS(ON)}	Static Drain-Source ON-Resistance ⁽⁴⁾	V _{GS} = 10V, I _D = 15A	-	14	18	mΩ
		V _{GS} = 4.5V, I _D = 10A	-	15	20	mΩ
Dynamic Characteristics						
R _g	Gate Resistance	f = 1MHz	-	2.8	-	Ω
C _{iSS}	Input Capacitance	V _{GS} = 0V, V _{DS} = 20V, f = 1MHz	-	1200	1620	pF
C _{oss}	Output Capacitance		-	69	93	pF
C _{rSS}	Reverse Transfer Capacitance		-	58	78	pF
Q _g	Total Gate Charge	V _{GS} = 0 to 10V V _{DS} = 20V, I _D = 15A	-	26	-	nC
Q _{gs}	Gate Source Charge		-	3.8	-	nC
Q _{gd}	Gate Drain("Miller") Charge		-	4.2	-	nC
Switching Characteristics						
t _{d(on)}	Turn-On DelayTime	V _{GS} = 10V, V _{DD} = 20V I _D = 15A, R _{GEN} = 3Ω	-	6	-	ns
t _r	Turn-On Rise Time		-	19	-	ns
t _{d(off)}	Turn-Off DelayTime		-	30	-	ns
t _f	Turn-Off Fall Time		-	3	-	ns
Body Diode Characteristics						
I _S	Maximum Continuous Body Diode Forward Current		-	-	29	A
I _{SM}	Maximum Pulsed Body Diode Forward Current		-	-	115	A
V _{SD}	Body Diode Forward Voltage	V _{GS} = 0V, I _S = 15A	-		1.2	V
trr	Body Diode Reverse Recovery Time	I _F = 15A, di/dt = 100A/us	-	10	-	ns
Qrr	Body Diode Reverse Recovery Charge		-	4.9	-	nC

- Notes:
1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
 2. E_{AS} condition: Starting $T_J = 25^\circ\text{C}$, $V_{DD} = 20\text{V}$, $V_{GS} = 10\text{V}$, $R_G = 25\text{ohm}$, $L = 0.5\text{mH}$, $I_{AS} = 9.8\text{A}$, $V_{DD} = 0\text{V}$ during time in avalanche.
 3. $R_{\theta JA}$ is measured with the device mounted on a 1inch^2 pad of 2oz copper FR4 PCB.
 4. Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 0.5\%$.

**Electrical Characteristics-P** ($T_J = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
V _{(BR)DSS}	Drain-Source Breakdown Voltage	I _D = -250μA, V _{GS} = 0V	-40	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = -40V, V _{GS} = 0V	-	-	-1.0	μA
I _{GSS}	Gate-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	-1.2	-1.7	-2.2	V
R _{DS(ON)}	Static Drain-Source ON-Resistance ⁽⁵⁾	V _{GS} = -10V, I _D = -5A	-	29	37	mΩ
		V _{GS} = -4.5V, I _D = -3A	-	40	52	mΩ
Dynamic Characteristics						
R _g	Gate Resistance	f = 1MHz	-	7.2	-	Ω
C _{iSS}	Input Capacitance	V _{GS} = 0V, V _{DS} = -20V, f = 1MHz	-	1173	1760	pF
C _{oss}	Output Capacitance		-	88	132	pF
C _{rSS}	Reverse Transfer Capacitance		-	77	115	pF
Q _g	Total Gate Charge	V _{GS} = 0 to -10V V _{DS} = -20V, I _D = -5A	-	23	-	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 DelayTime	V _{GS} = -10V, V _{DD} = -20V I _D = -5A, R _{GEN} = 3Ω	-	6.6	-	ns
t _r	Turn-On Rise Time		-	1.6	-	ns
t _{d(off)}	Turn-Off DelayTime		-	33	-	ns
t _f	Turn-Off Fall Time		-	5.9	-	ns
Body Diode Characteristics						
I _S	Maximum Continuous Body Diode Forward Current		-	-	-21	A
I _{SM}	Maximum Pulsed Body Diode Forward Current		-	-	-86	A
V _{SD}	Body Diode Forward Voltage	V _{GS} = 0V, I _S = -5A	-		-1.2	V
trr	Body Diode Reverse Recovery Time	I _F = -5A, di/dt = -100A/us	-	13	-	ns
Qrr	Body Diode Reverse Recovery Charge		-	7.6	-	nC

Notes:

1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
2. E_{AS} condition: Starting $T_J = 25^\circ\text{C}$, $V_{DD} = -20\text{V}$, $V_{GS} = -10\text{V}$, $R_G = 25\Omega$, $L = 0.5\text{mH}$, $I_{AS} = -10.5\text{A}$, $V_{DD} = 0\text{V}$ during time in avalanche.
3. $R_{\theta JA}$ is measured with the device mounted on a minimum recommended pad of 2oz copper FR4 PCB.
4. Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 0.5\%$.



Typical Performance Characteristics-N

Figure 1: Power De-rating

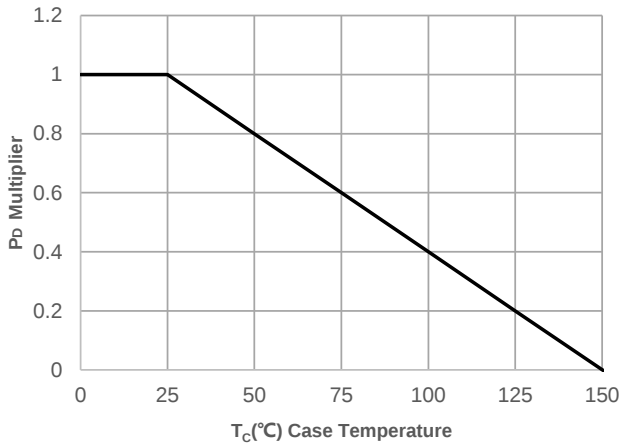


Figure 2: Current De-rating

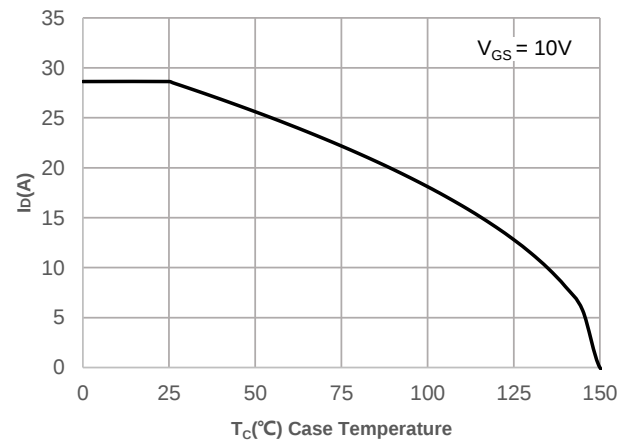


Figure 3: Normalized Maximum Transient Thermal Impedance

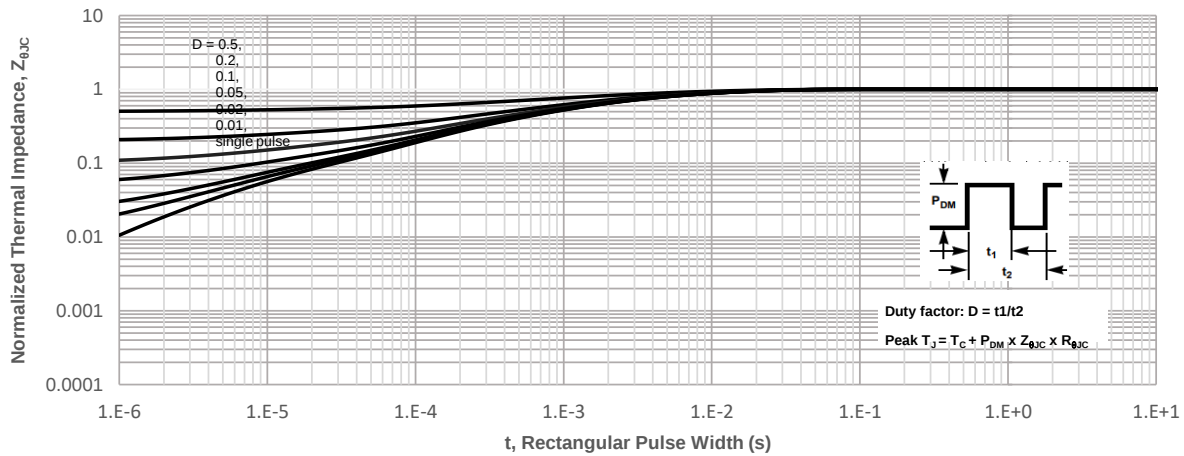
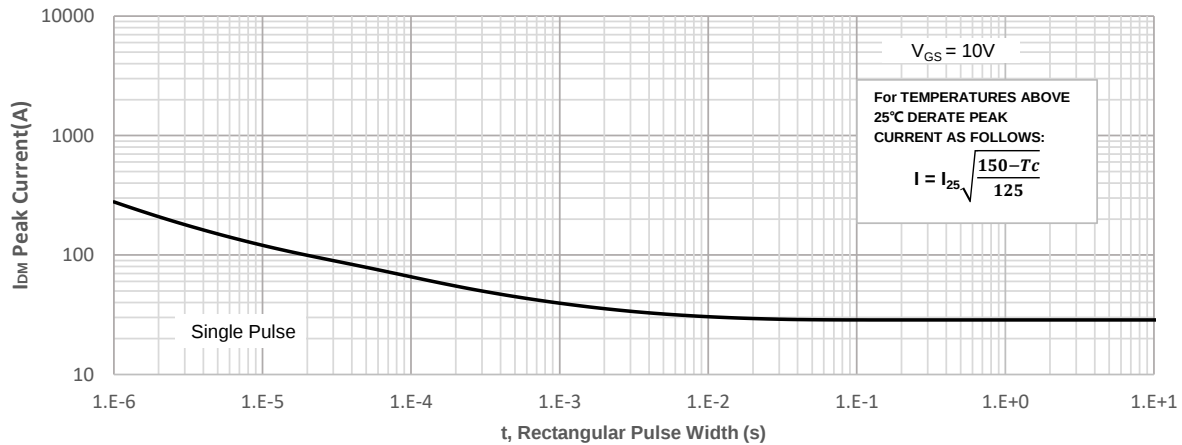
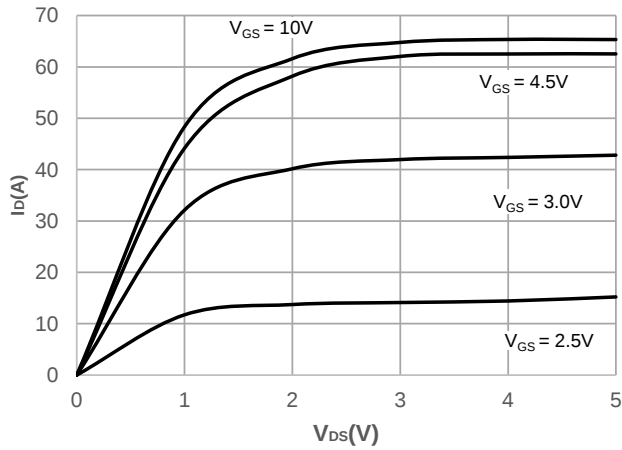
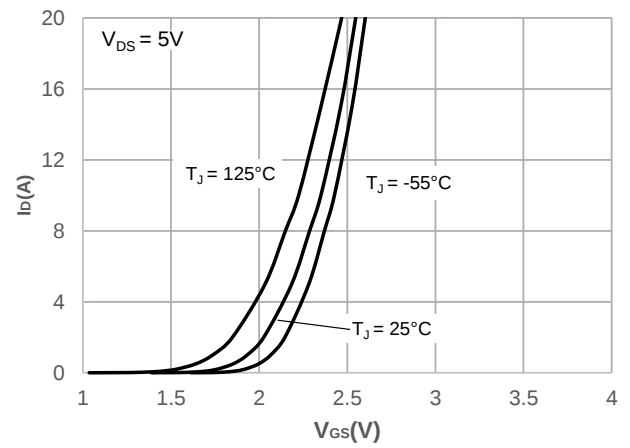
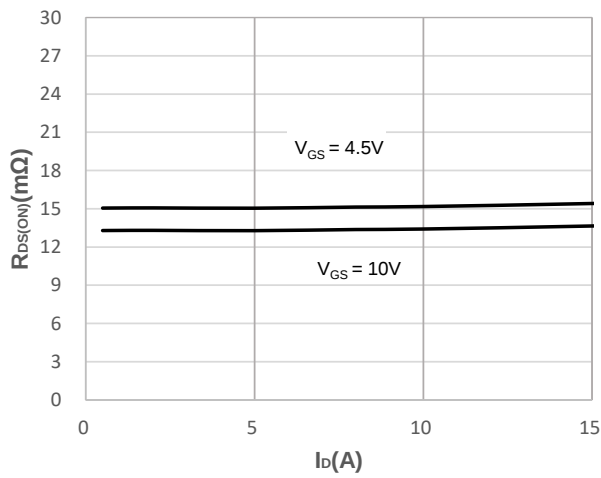
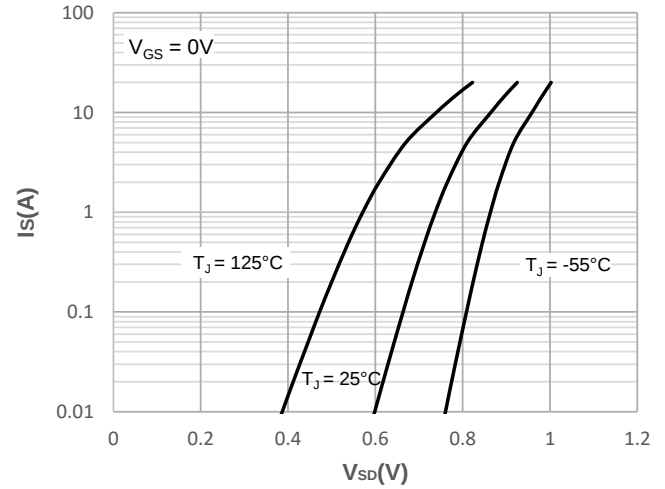
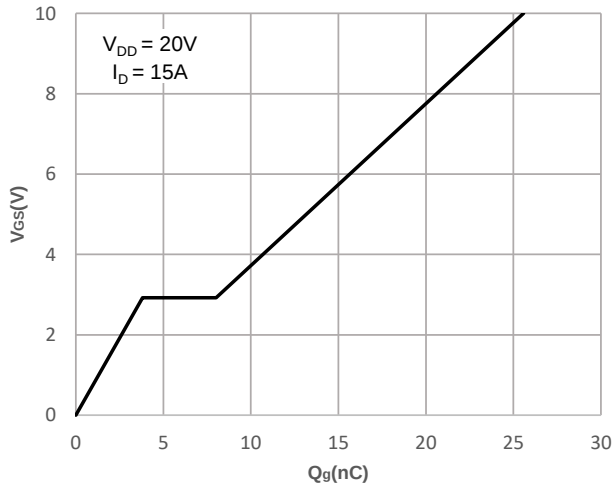
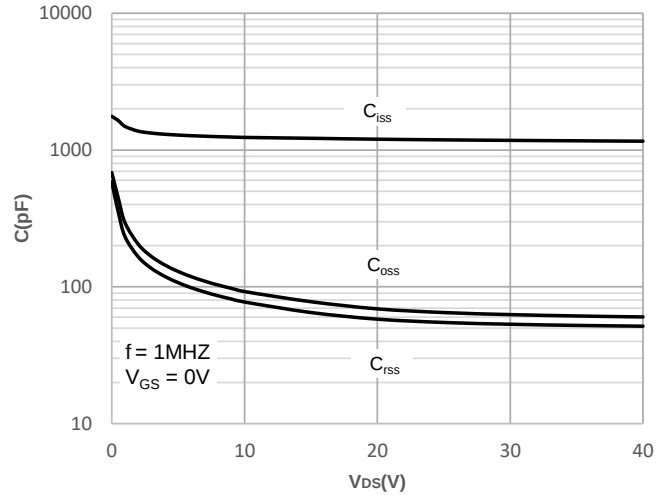


Figure 4: Peak Current Capacity



Typical Performance Characteristics-N

Figure 5: Output Characteristics

Figure 6: Typical Transfer Characteristics

Figure 7: On-resistance vs. Drain Current

Figure 8: Body Diode Characteristics

Figure 9: Gate Charge Characteristics

Figure 10: Capacitance Characteristics


Typical Performance Characteristics-N

Figure 11: Normalized Breakdown voltage vs. Junction Temperature

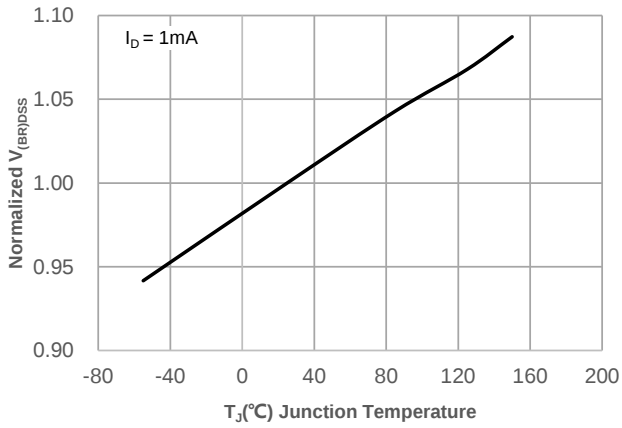


Figure 12: Normalized on Resistance vs. Junction Temperature

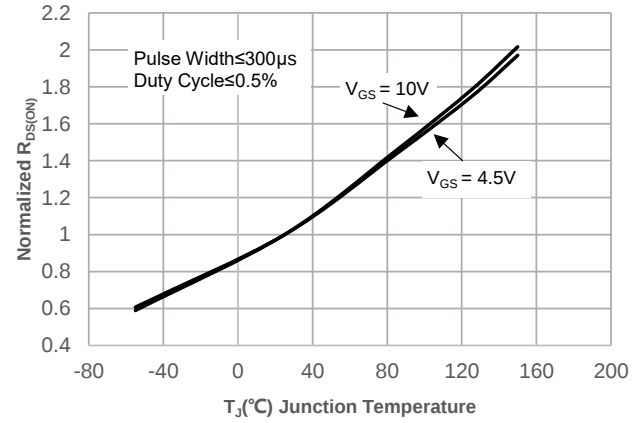


Figure 13: Normalized Threshold Voltage vs. Junction Temperature

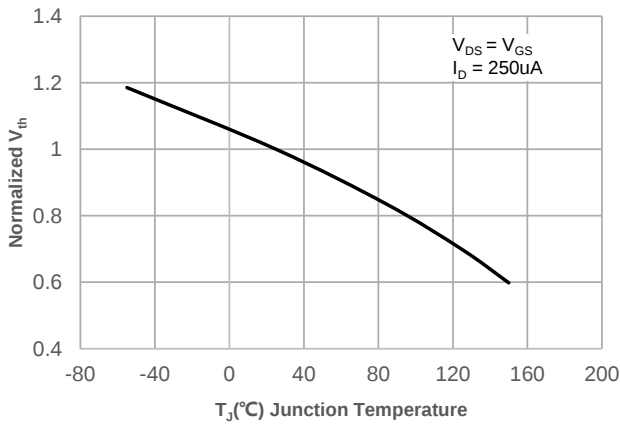


Figure 14: $R_{DS(ON)}$ vs. V_{GS}

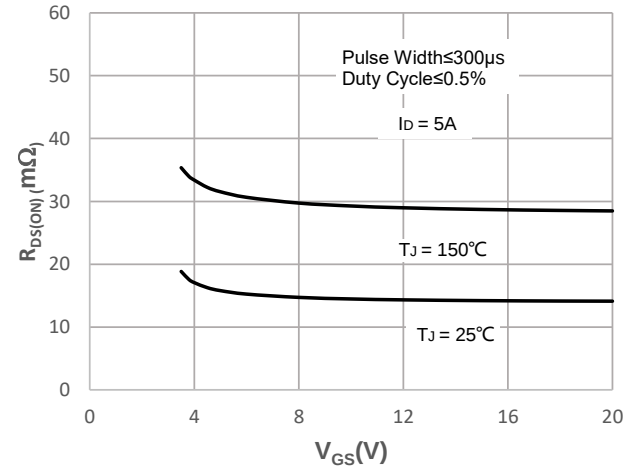
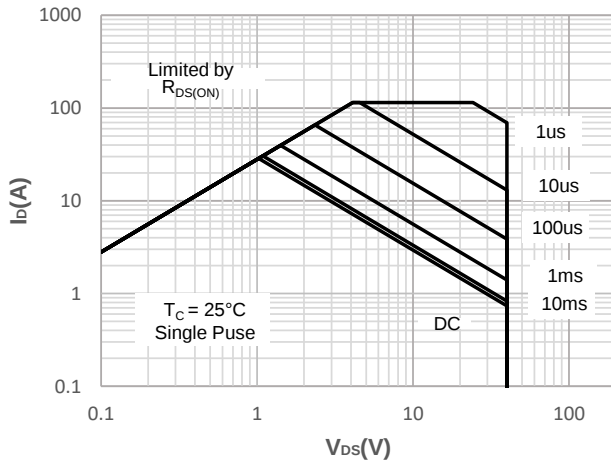


Figure 15: Maximum Safe Operating Area



Typical Performance Characteristics-P

Figure 1: Power De-rating

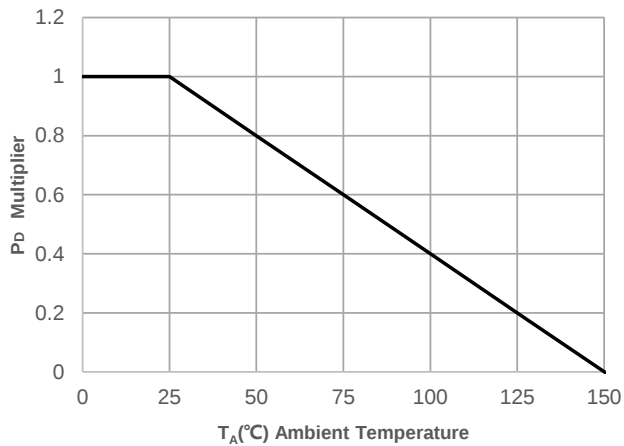


Figure 2: Current De-rating

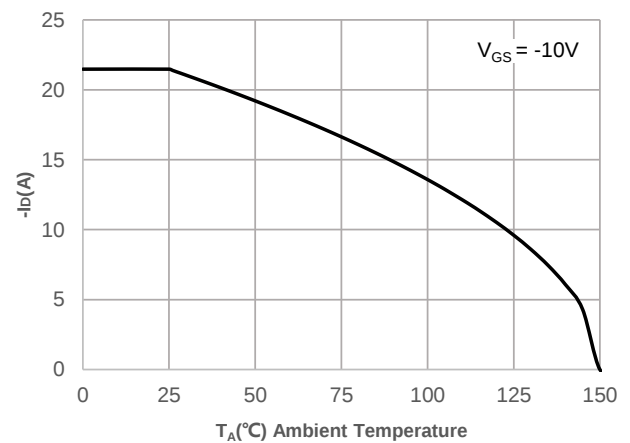


Figure 3: Normalized Maximum Transient Thermal Impedance

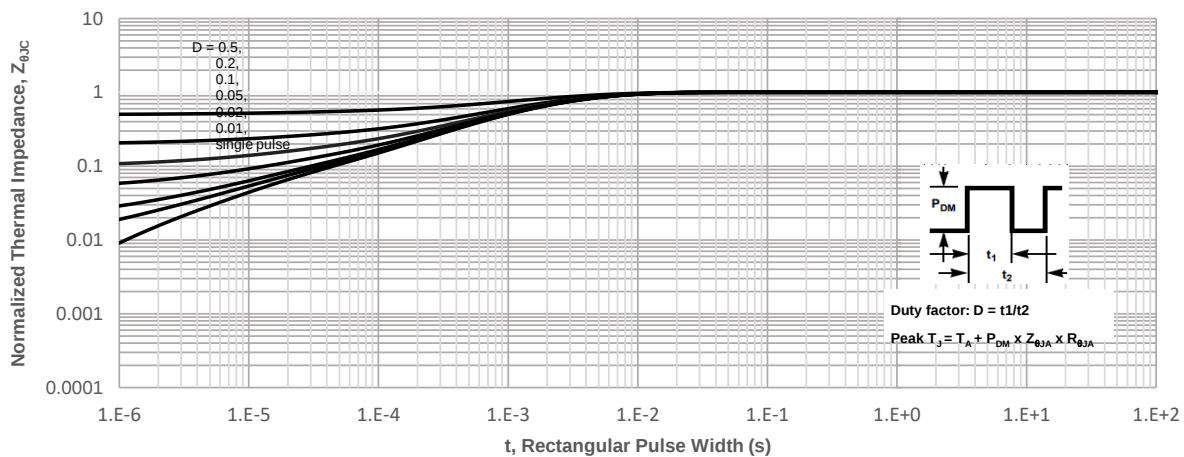
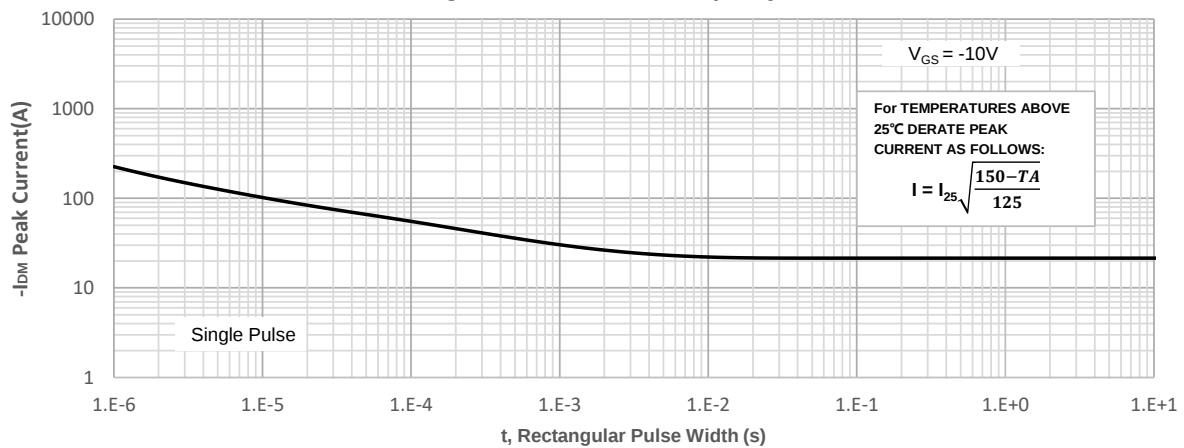


Figure 4: Peak Current Capacity



Typical Performance Characteristics-P

Figure 5: Output Characteristics

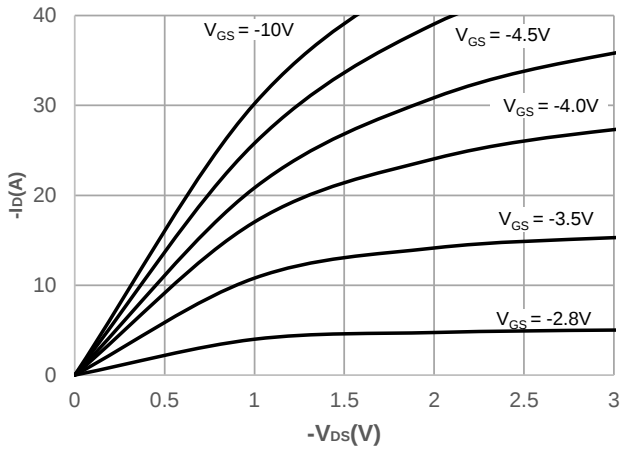


Figure 6: Typical Transfer Characteristics

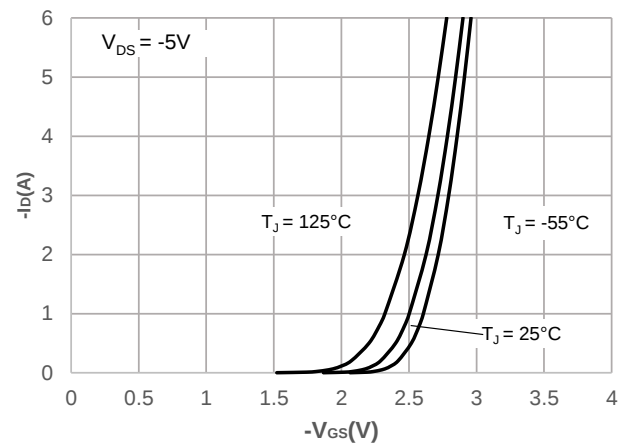


Figure 7: On-resistance vs. Drain Current

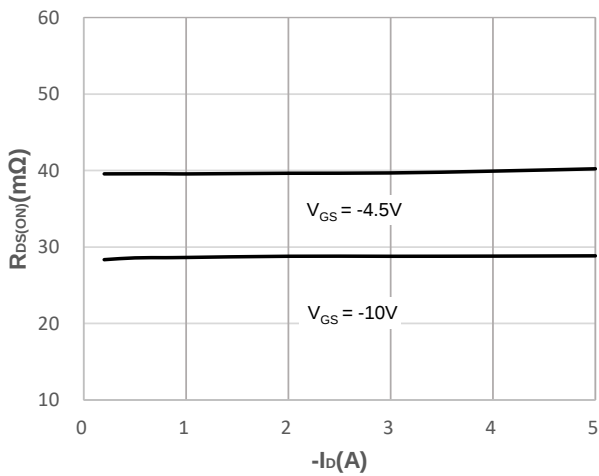


Figure 8: Body Diode Characteristics

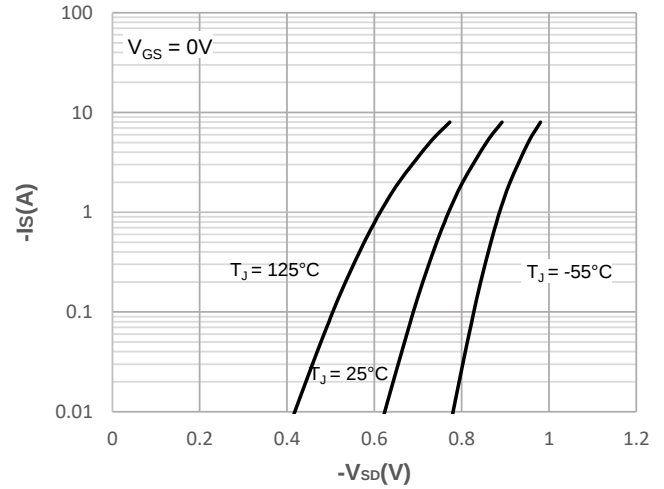


Figure 9: Gate Charge Characteristics

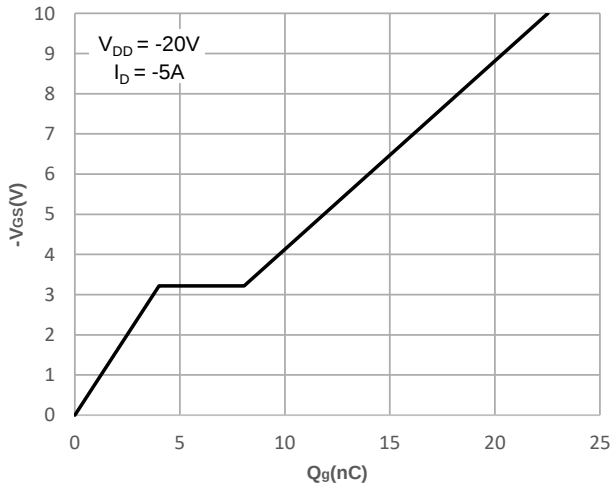
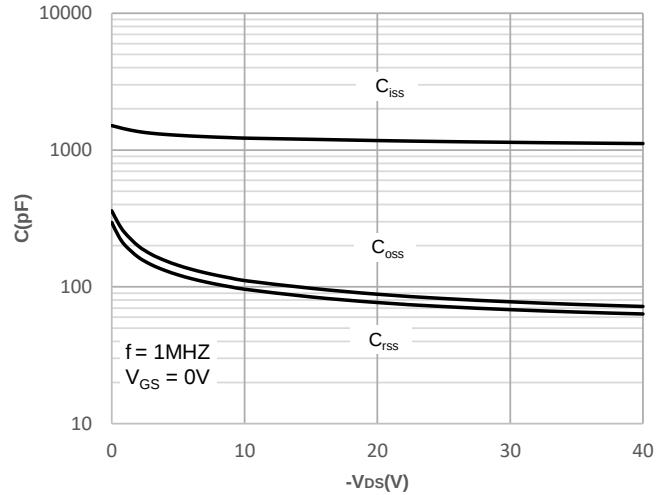


Figure 10: Capacitance Characteristics



Typical Performance Characteristics-P

Figure 11: Normalized Breakdown voltage vs. Junction Temperature

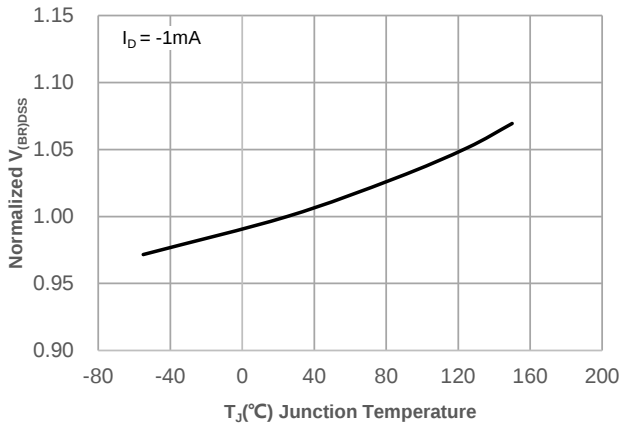


Figure 12: Normalized on Resistance vs. Junction Temperature

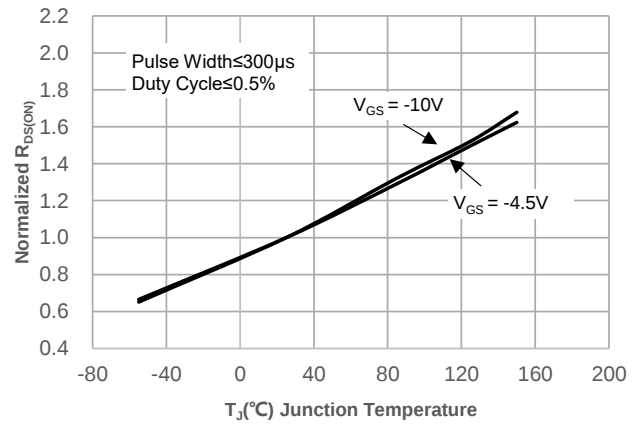


Figure 13: Normalized Threshold Voltage vs. Junction Temperature

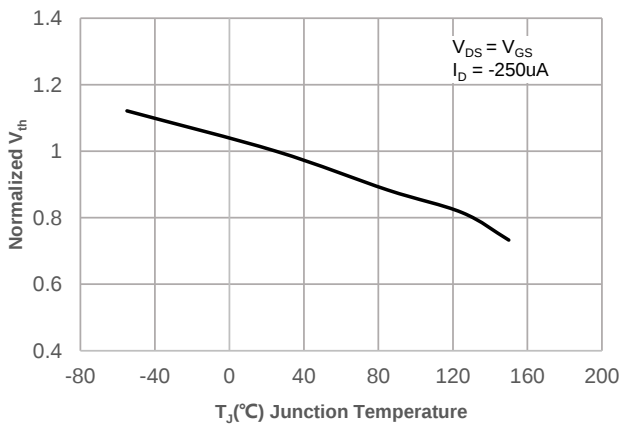


Figure 14: $R_{DS(ON)}$ vs. V_{GS}

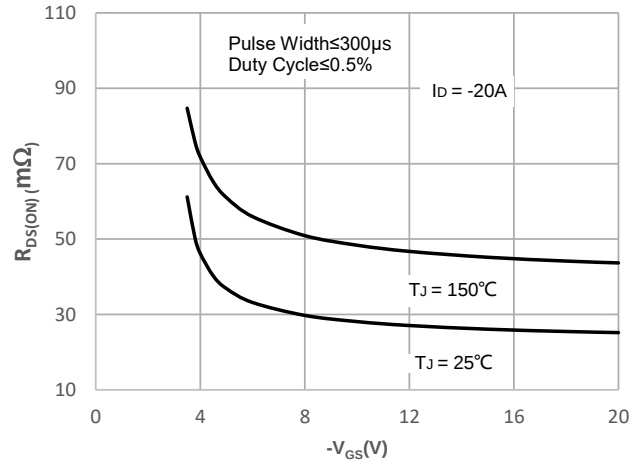
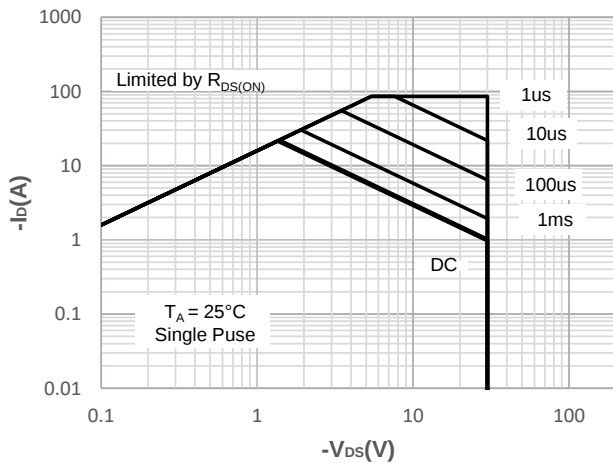


Figure 15: Maximum Safe Operating Area



Test Circuit

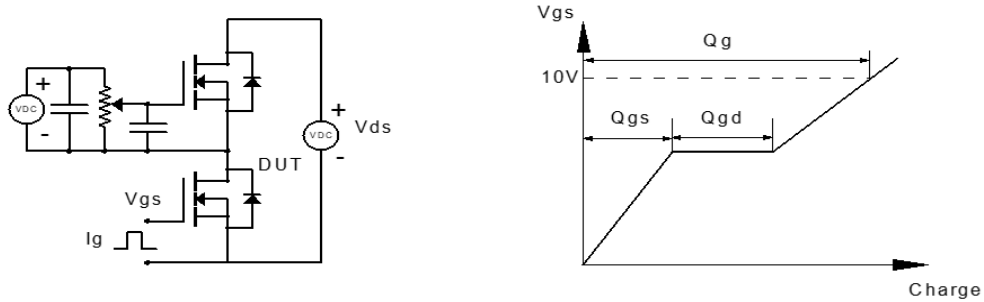


Figure 1: Gate Charge Test Circuit & Waveform

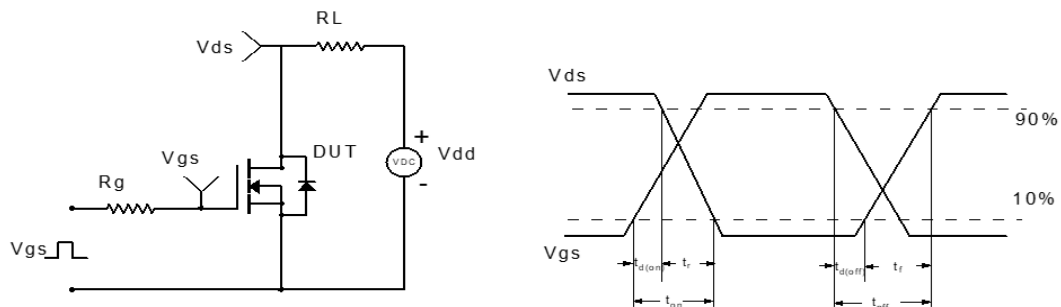


Figure 2: Resistive Switching Test Circuit & Waveform

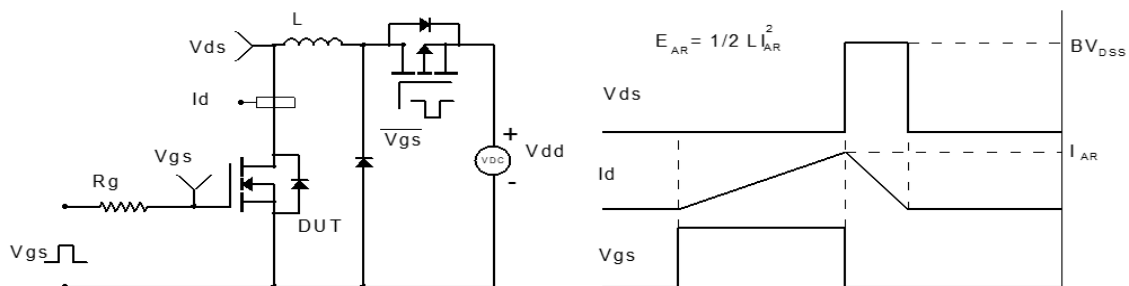


Figure 3: Unclamped Inductive Switching Test Circuit & Waveform

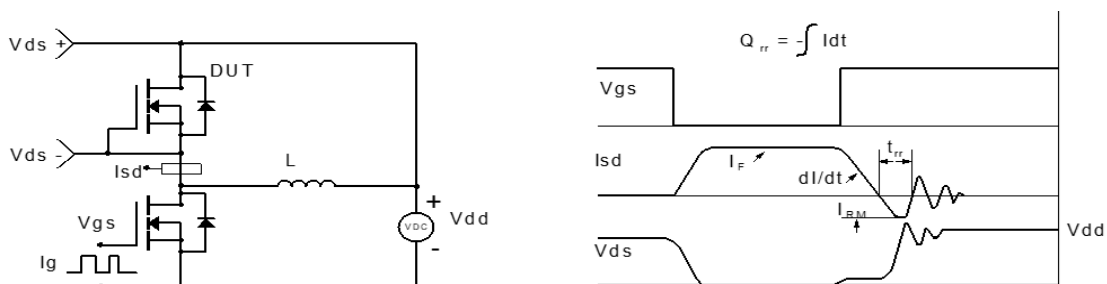


Figure 4: Diode Recovery Test Circuit & Waveform

Test Circuit

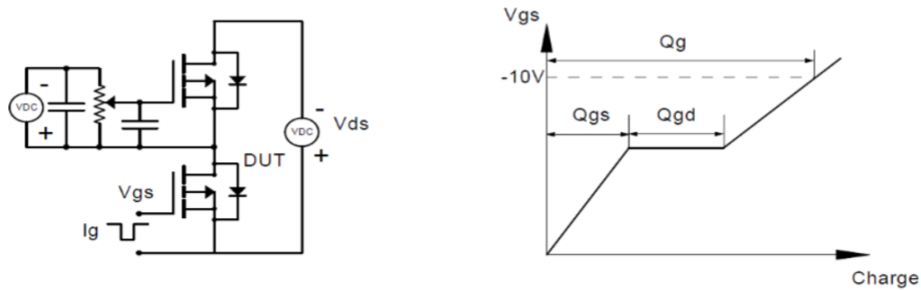


Figure 1: Gate Charge Test Circuit & Waveform

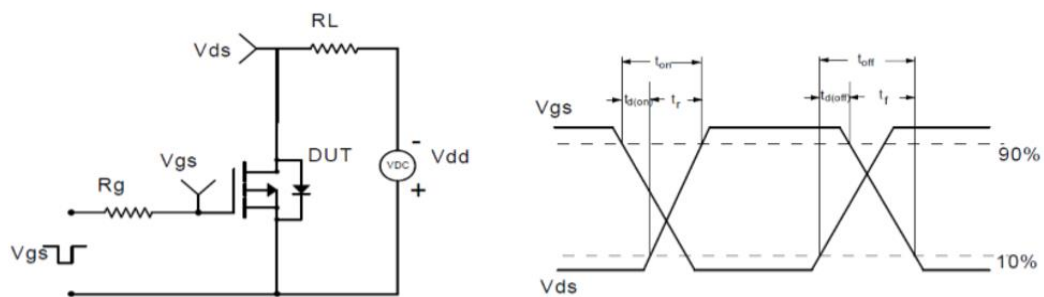


Figure 2: Resistive Switching Test Circuit & Waveform

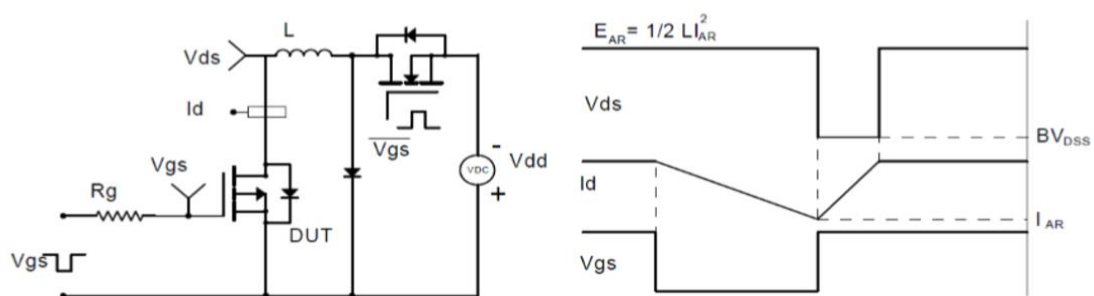


Figure 3: Unclamped Inductive Switching Test Circuit & Waveform

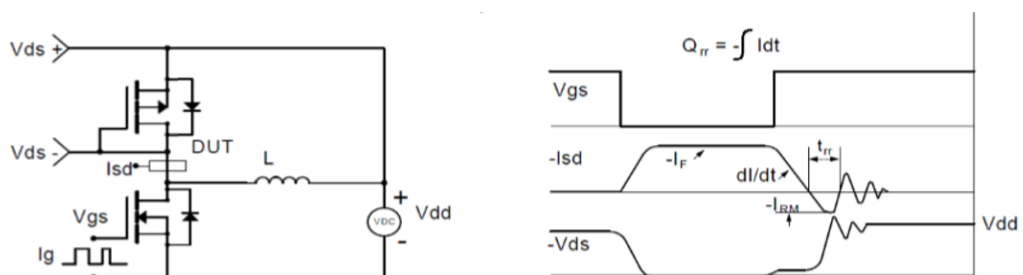
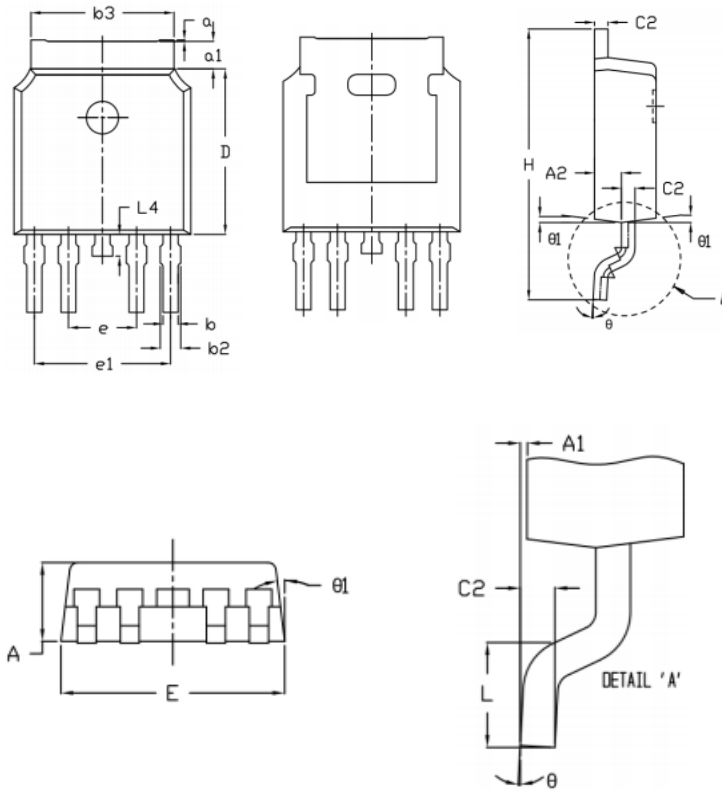


Figure 4: Diode Recovery Test Circuit & Waveform

Package Mechanical Data(TO-252-4L)



COMMON DIMENSIONS(UNITS OF MEASURE IS mm)			
SYMBOLS	MIN	NORMAL	MAX
A	2.250	2.300	2.350
E	6.550	6.600	6.650
b_3	5.240	5.340	5.440
D	6.050	6.100	6.150
b	0.56 BSC		
b_2	0.712 BSC		
e	2.54 BSC		
e_1	5.08 BSC		
L_4	0.700	0.800	0.900
C_2	0.508 BSC		
A_2	0.960	1.010	1.060
H	9.840	10.040	10.240
A_1	0.000	0.050	0.100
L	1.400	1.500	1.600
θ	7°		
θ_1	0°	3°	6°
a	0.05 BSC		
a_1	0.962	1.012	1.062

Information furnished in this document is believed to be accurate and reliable. However, Jiangsu JieJie Microelectronics Co.,Ltd assumes no responsibility for the consequences of use without consideration for such information nor use beyond it. Information mentioned in this document is subject to change without notice, apart from that when an agreement is signed, Jiangsu JieJie complies with the agreement. Products and information provided in this document have no infringement of patents. Jiangsu JieJie assumes no responsibility for any infringement of other rights of third parties which may result from the use of such products and information.

 is a registered trademark of Jiangsu JieJie Microelectronics Co.,Ltd.