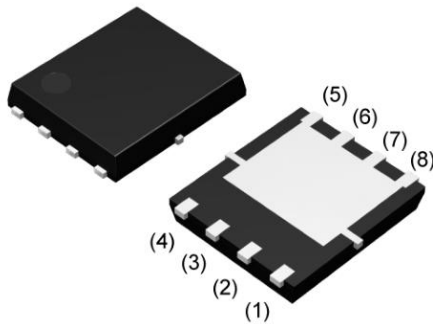


**Description**
**40V N-CHANNEL ENHANCEMENT MODE POWER MOSFET**
**Features**

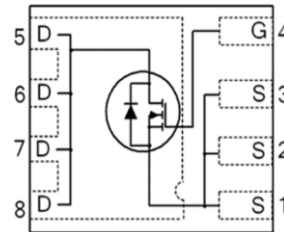
- Device Rating  $V_{DS} = 40V$ ,  $I_D = 238A$
- $R_{DS(ON)} = 1.9m\Omega$  (typ.) @  $V_{GS} = 10V$ ,  $I_D = 50A$
- Proprietary High Density Trench Technology
- RoHS Compliant & Halogen-Free

**Application**

- High performance DC/DC
- SR
- Motor Driving

**Package**


**DFN 5\*6-8L**  
**JFG238N40L**


**Absolute Maximum Ratings**  $T_C = 25^\circ C$  unless otherwise specified

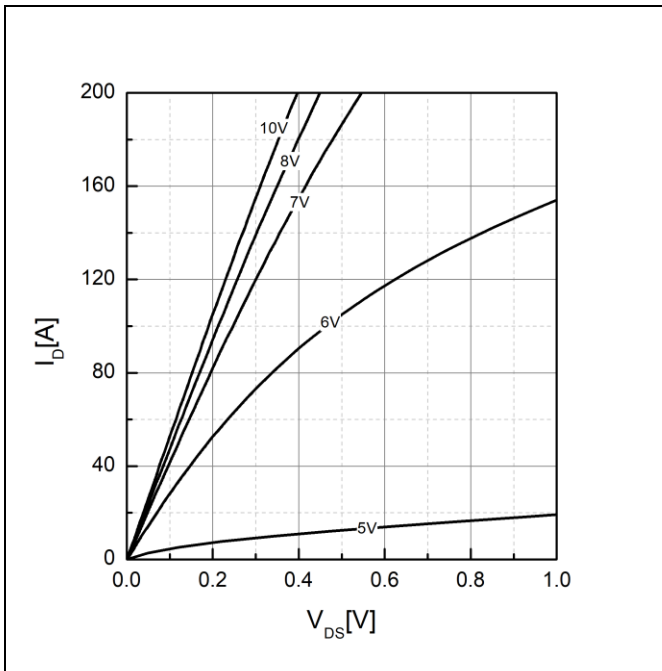
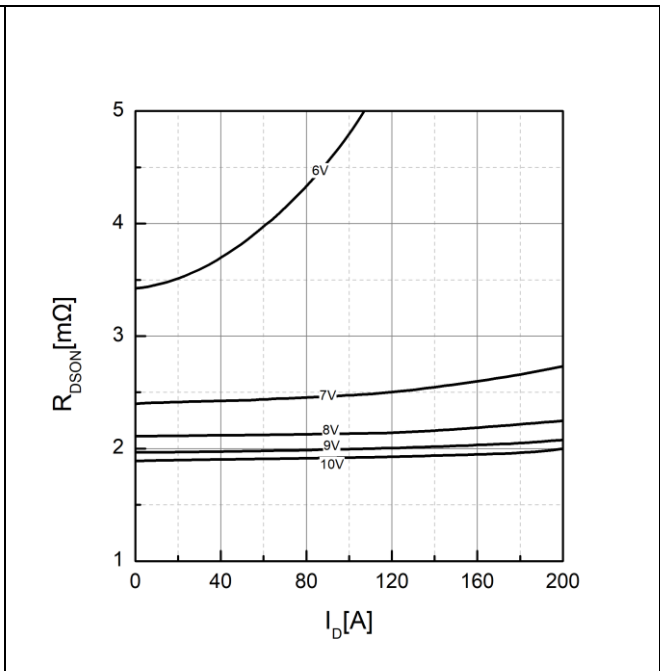
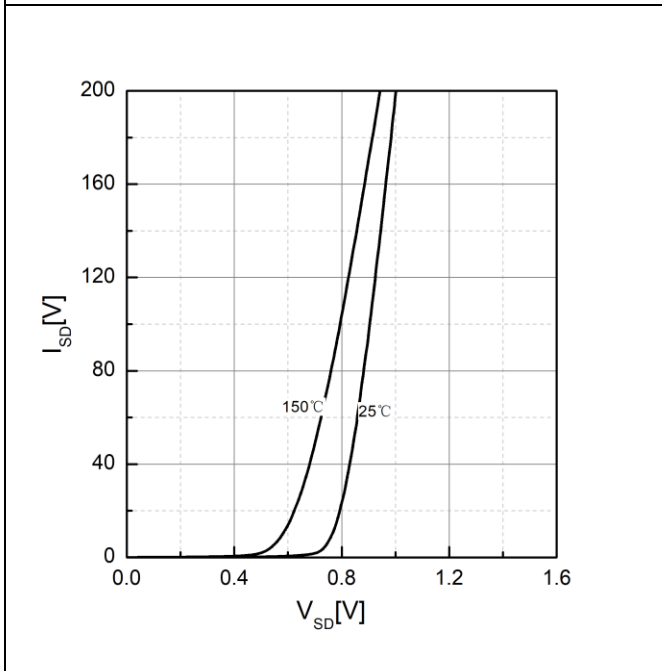
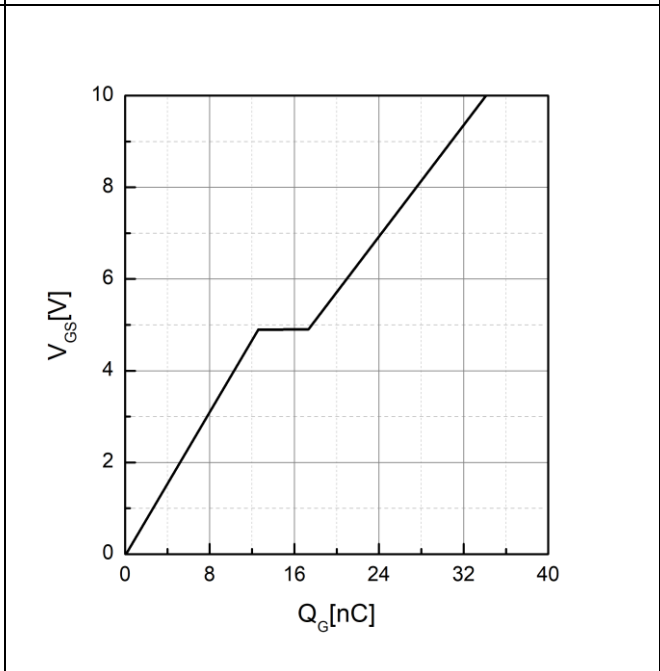
Symbol	Parameter	Max.	Units	
$V_{DS}$	Drain-Source Voltage	40	V	
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V	
$I_D$	Continuous Drain Current, $V_{GS} @ 10V$ <sup>note1</sup>	$T_C = 25^\circ C$	238	A
		$T_C = 100^\circ C$	151	A
$I_{DM}$	Pulsed Drain Current <sup>note2</sup>	486	A	
$P_D$	Power Dissipation <sup>note4</sup>	$T_C = 25^\circ C$	208	W
	Power Dissipation	$T_A = 25^\circ C$	2.5	W
$E_{AS}$	Single Pulsed Avalanche Energy <sup>note3</sup>	245	mJ	
$R_{\theta JC}$	Thermal Resistance, Junction to Case <sup>note1</sup>	0.6	$^\circ C/W$	
$R_{\theta JA}$	Junction to Ambient (mounted on 1 inch square PCB)	50	$^\circ C/W$	
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +150	$^\circ C$	

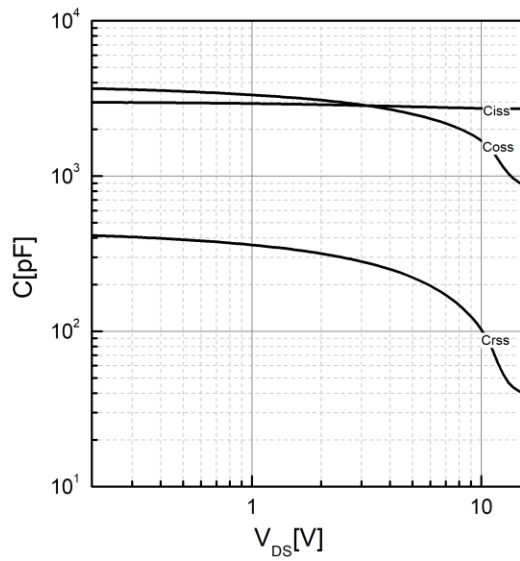
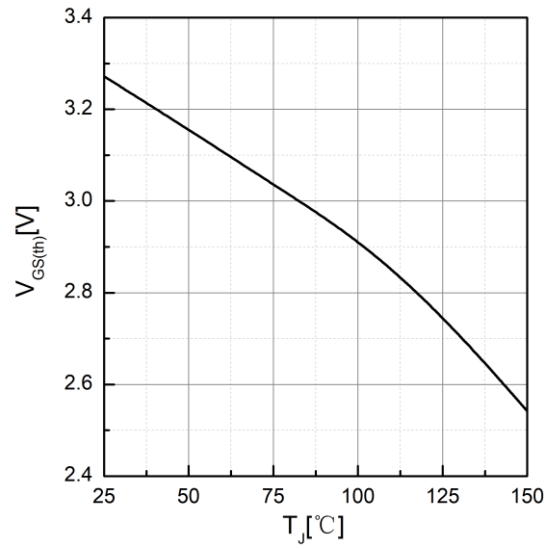
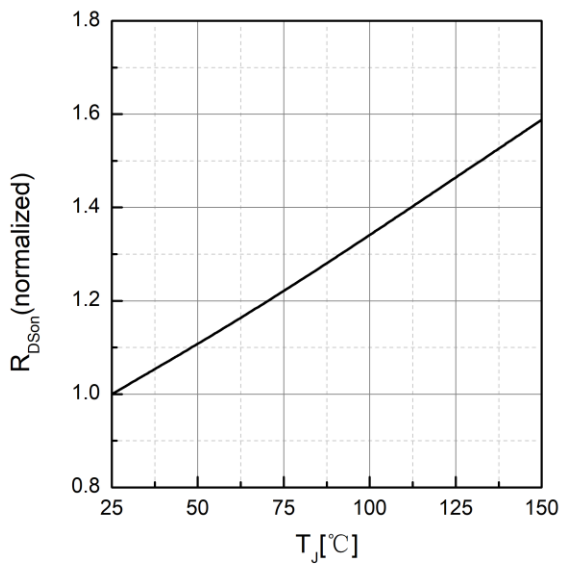
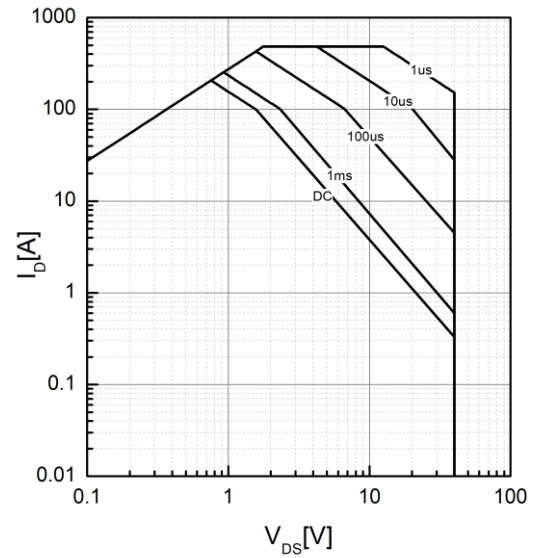
**Electrical Characteristics**  $T_C=25^{\circ}\text{C}$  unless otherwise specified

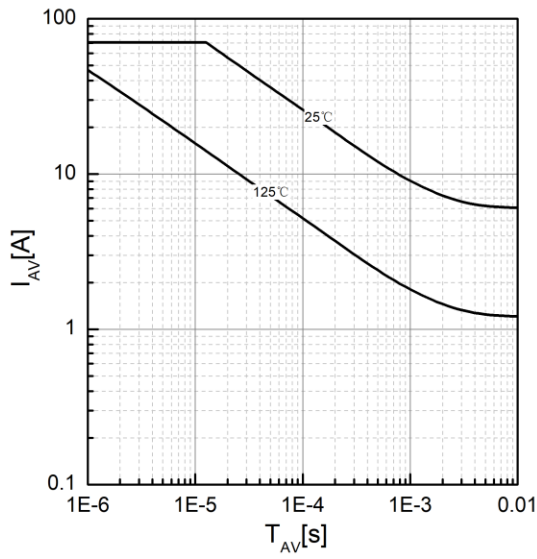
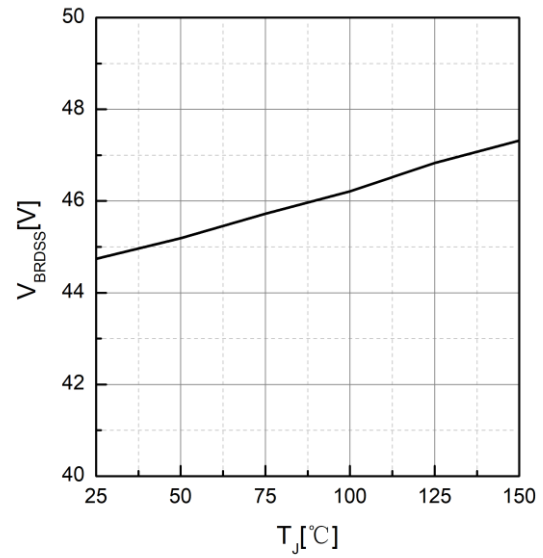
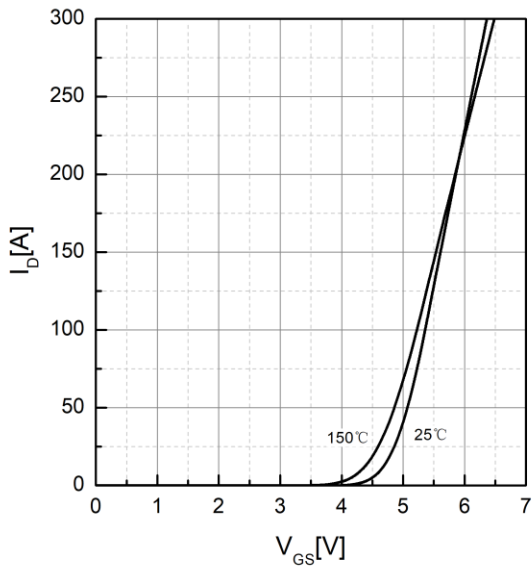
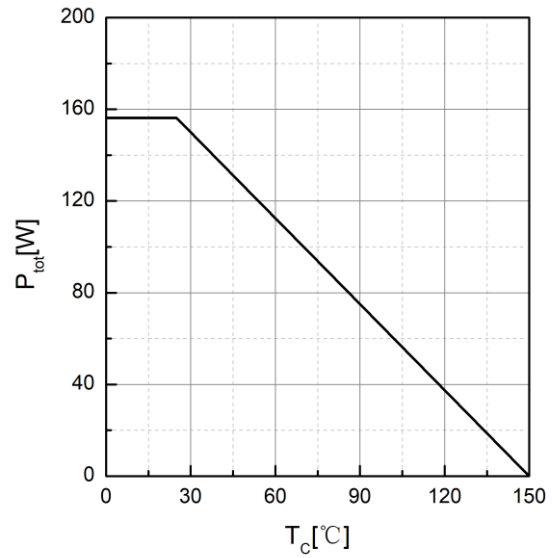
Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
<b>Off Characteristic</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	40	-	-	V
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS}=40V, V_{GS}= 0V, T_C = 25^{\circ}\text{C}$	-	-	1	$\mu A$
		$V_{DS}=40V, V_{GS}= 0V, T_C = 55^{\circ}\text{C}$	-	-	10	$\mu A$
$I_{GSS}$	Gate-Source Leakage Current	$V_{DS} = 0V, V_{GS} = \pm 20V$	-100	-	100	nA
<b>On Characteristics</b>						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	2	-	4	V
$R_{DS(on)}$	Static Drain-Source On-Resistance <small>note2</small>	$V_{GS} = 10V, I_D = 50A$	-	1.9	2.3	m $\Omega$
$R_{DS(on)}$	Static Drain-Source On-Resistance <small>note2</small>	$V_{GS} = 7V, I_D = 50A$	-	2.4	2.9	m $\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 1V, I_D = 50A$	-	150	-	S
<b>Dynamic Characteristics</b>						
$R_g$	Gate Resistance		-	1.1	-	$\Omega$
$C_{iss}$	Input Capacitance	$V_{DS} = 20V, V_{GS} = 0V,$ $f = 1\text{MHz}$	-	2710	-	pF
$C_{oss}$	Output Capacitance		-	724	-	pF
$C_{rss}$	Reverse Transfer Capacitance		-	35	-	pF
$Q_g$	Total Gate Charge	$V_{DS} = 20V, I_D = 50A,$ $V_{GS} = 10V$	-	34	-	nC
$Q_{gs}$	Gate-Source Charge		-	12.5	-	nC
$Q_{gd}$	Gate-Drain("Miller") Charge		-	4.8	-	nC
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 20V, I_D = 50A,$ $R_G = 0.1\Omega, V_{GS} = 10V$	-	12	-	ns
$t_r$	Turn-On Rise Time		-	19	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	18	-	ns
$t_f$	Turn-Off Fall Time		-	5	-	ns
<b>Source-Drain Diode Characteristics and Maximum Ratings</b>						
$I_S$	Maximum Continuous Diode Forward Current <small>note1,5</small>		-	-	173	A
$I_{SM}$	Maximum Pulsed Diode Forward Current <small>note2,5</small>		-	-	486	A
$t_{rr}$	Reverse Recovery Time	$T_J = 25^{\circ}\text{C}, I_S = 50A, V_{GS} = 0V$ $di/dt = 150A/\mu s$	-	72	-	ns
$Q_{rr}$	Reverse Recovery Charge		-	43	-	nC
$V_{SD}$ <small>note2</small>	Source to Drain Diode Forward Voltage	$T_J = 25^{\circ}\text{C}, I_S = 50A, V_{GS} = 0V$	-	0.84	-	V

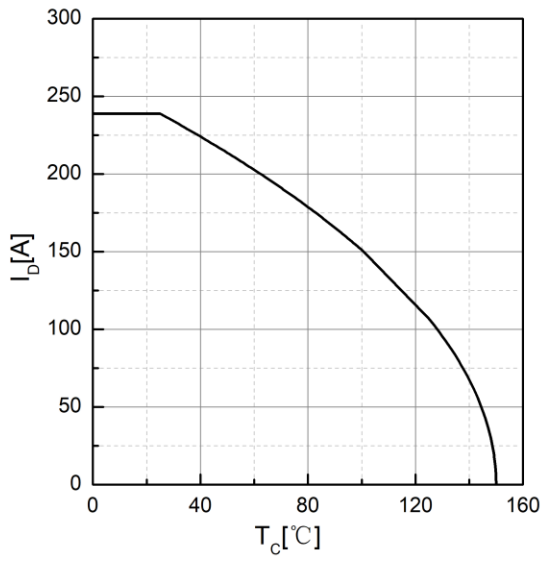
Note :

- 1.The data tested by surface mounted on one inch<sup>2</sup> FR-4 board with 20Z copper.
- 2.The data tested by pulsed, pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ .
- 3.The EAS data shows Max. rating. The test condition is  $L=0.1\text{mH}$ ,  $I_{AS}= 70A$ .
- 4.The power dissipation is limited by  $150^{\circ}\text{C}$  junction temperature.
- 5.The data is theoretically the same as  $I_D$  and  $I_{DM}$ , in real applications, should be limited by total power dissipation.

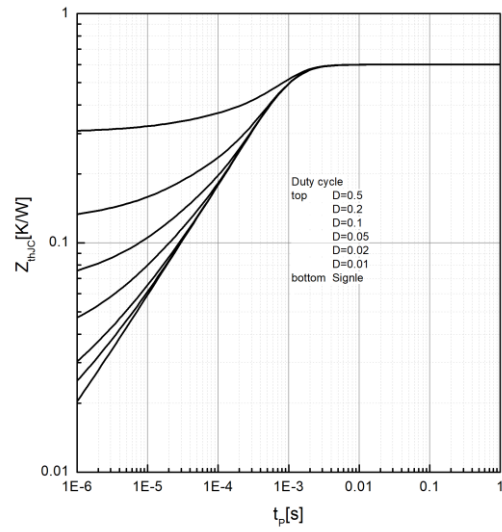
**Typical Performance Characteristics**

**Figure 1. Output Characteristics,  $T_J=25^\circ\text{C}$** 

**Figure 2. Drain-source on resistance ,  $T_J=25^\circ\text{C}$** 

**Figure 3. Forward characteristics of body diode**

**Figure 4. Gate Charge Characteristics**


**Figure 5. Capacitance Characteristics**

**Figure 6. Threshold Voltage Vs. Temperature**

**Figure 7. Drain-source on-state resistance**

**Figure 8. Maximum Safe Operating Area**

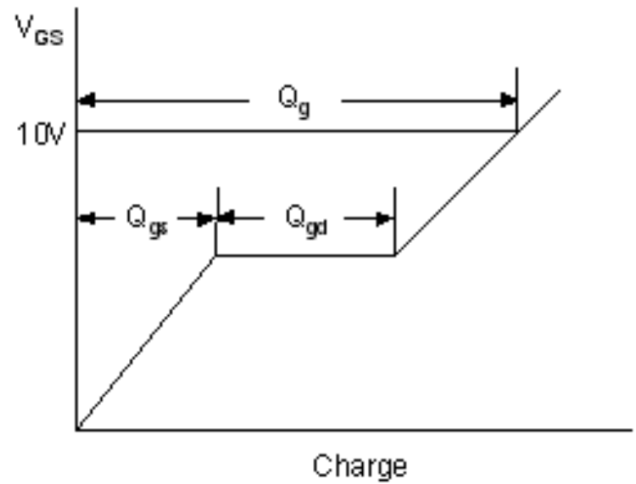
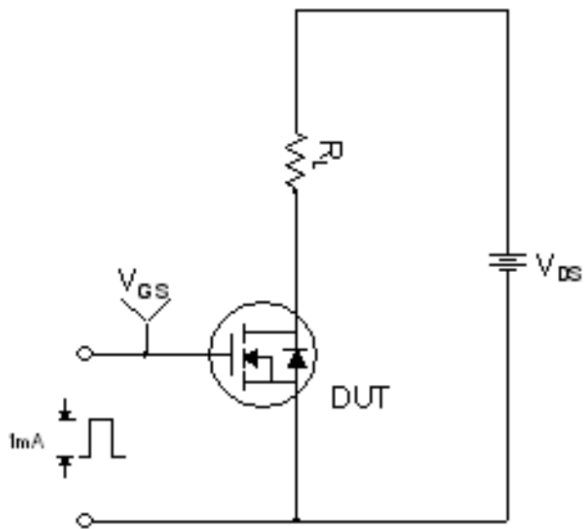

**Figure 9. Avalanche characteristics**

**Figure 10. Drain-source breakdown voltage**

**Figure 11. Transfer characteristics**

**Figure 12. Power dissipation**



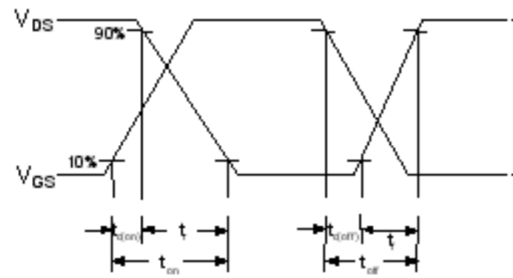
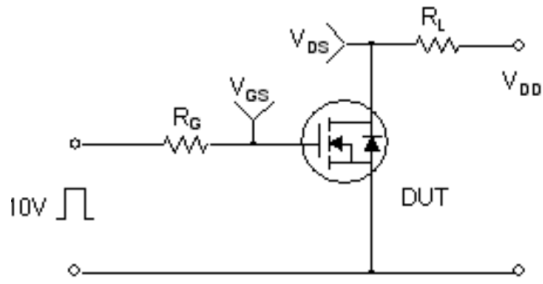
**Figure 13. Drain current**



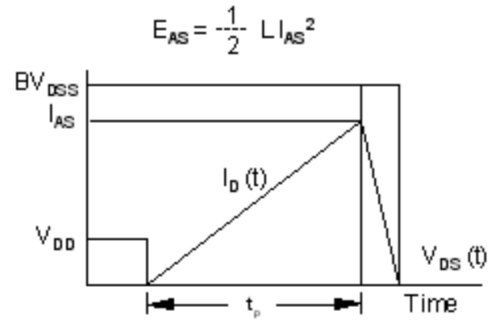
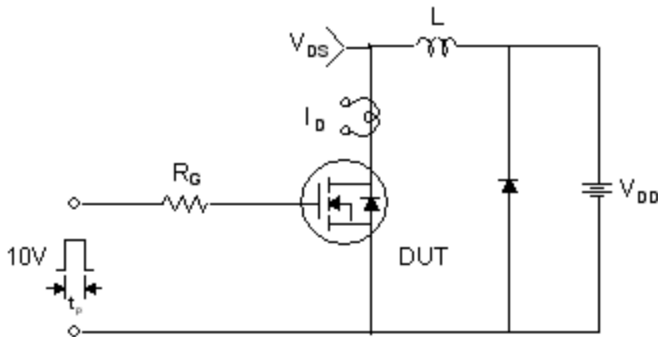
**Figure 14. Effective Transient Thermal Impedance**



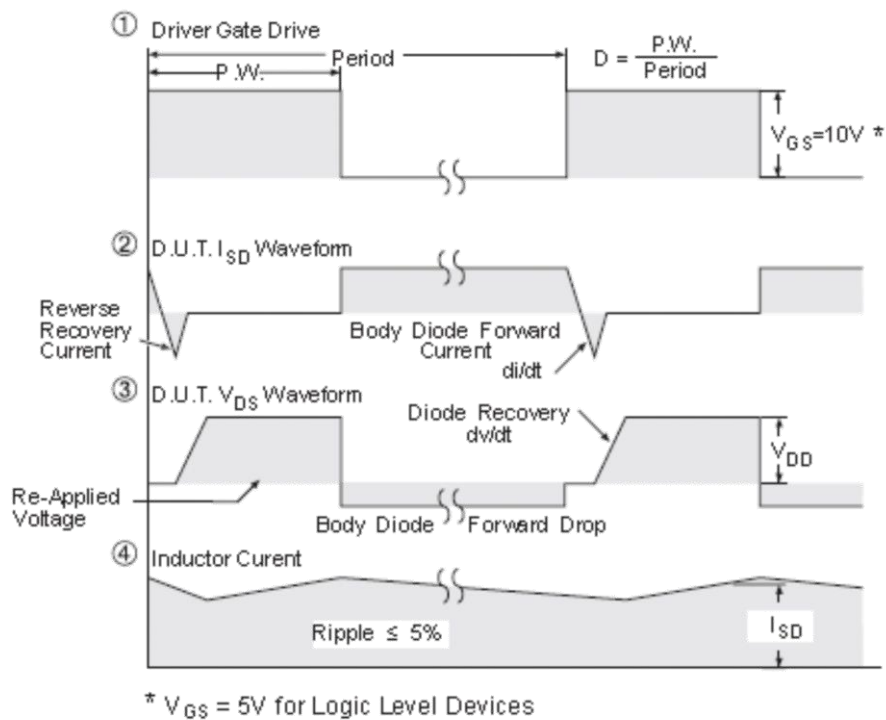
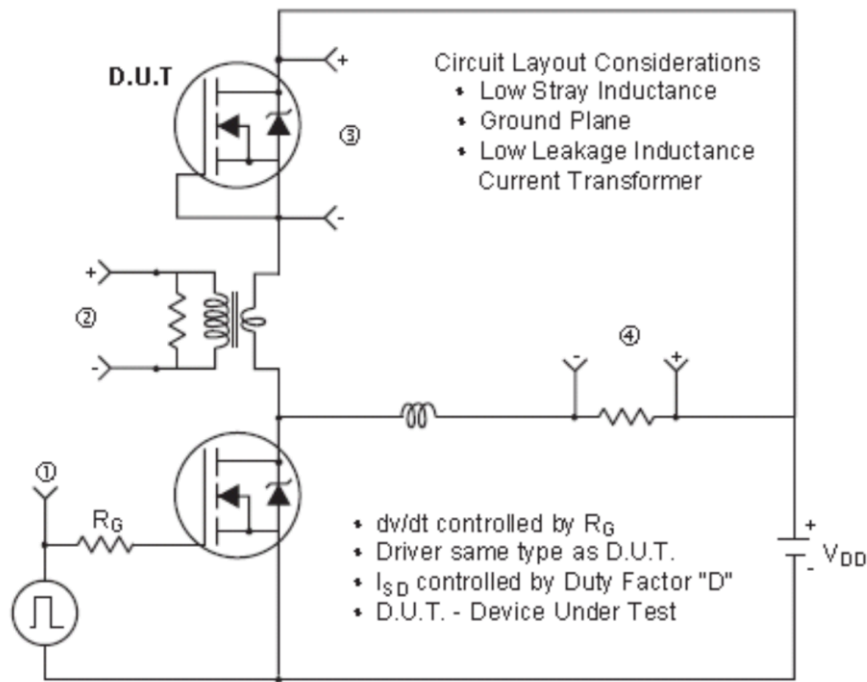
**Figure 15. Gate Charge Test Circuit & Waveform**



**Figure 16. Resistive Switching Test Circuit & Waveforms**

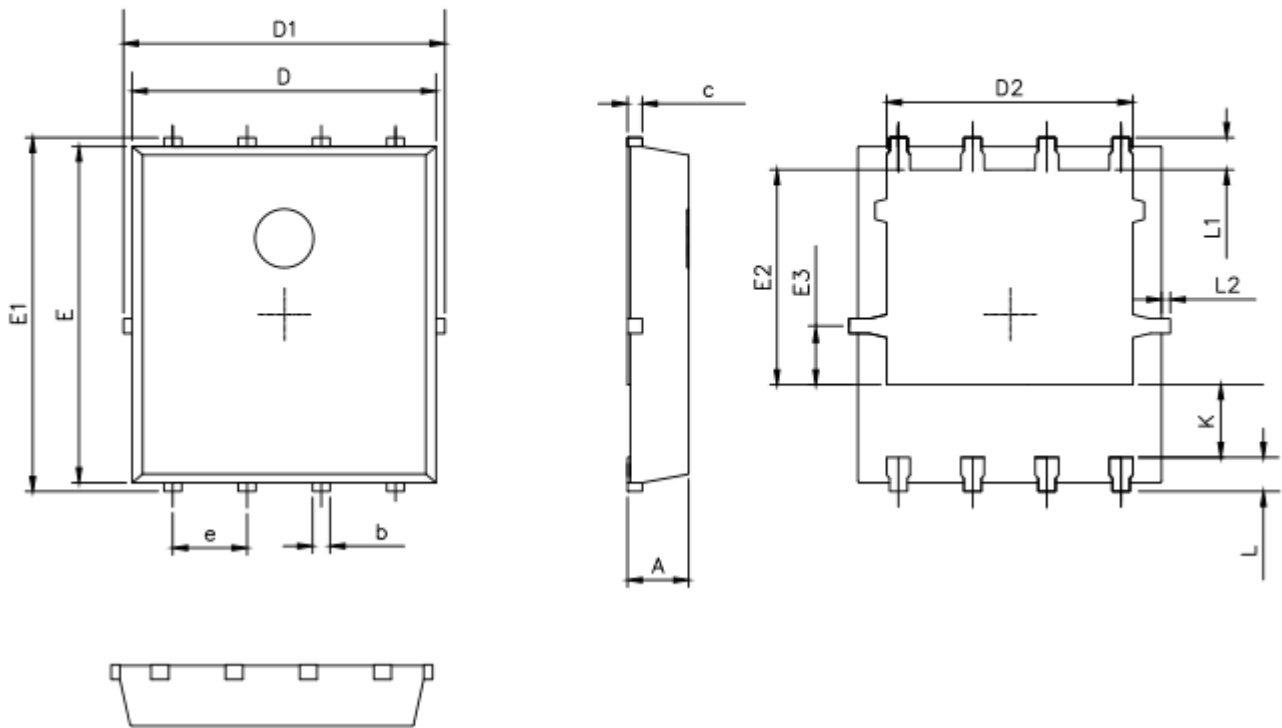
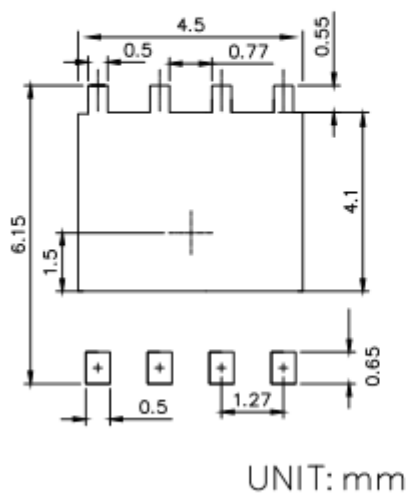


**Figure 17. Unclamped Inductive Switching Test Circuit & Waveforms**



**Figure 18. Peak Diode Recovery  $dv/dt$  Test Circuit & Waveforms (For N-channel)**



**Package outline**
**DFN5x6 PACKAGE OUTLINE**

**RECOMMENDED LAND PATTERN**


UNIT: mm

	MIN	NOM	MAX
A	0.90	1.00	1.10
b	0.25	0.35	0.50
c	0.10	0.20	0.30
D	4.80	5.00	5.30
D1	4.90	5.10	5.50
D2	3.92	4.02	4.20
E	5.65	5.75	5.85
E1	5.90	6.05	6.20
E2	3.325	3.525	3.775
E3	0.80	0.90	1.00
e		1.27	
L	0.40	0.55	0.70
L1		0.65	
L2	0.00		0.15
K	1.00	1.30	1.50

**Figure 19. DFN 5x6 Package outline**

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