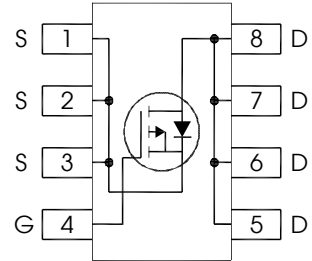


**Product Summary**

V <sub>DS</sub> (V)	R <sub>DS(on)</sub> (mΩ)	I <sub>D</sub> (A) <sup>d</sup>	Q <sub>g</sub> (Typ.)
- 30	4.6 at V <sub>GS</sub> = - 10 V	-20	58 nC
	6.8 at V <sub>GS</sub> = - 4.5 V		



**Features**

- Industry-standard pinout SOP-8 Package
- Compatible with Existing Surface Mount Techniques
- RoHS Compliant, Halogen-Free
- MSL1, Industrial qualification

**Absolute Maximum Ratings**

	Parameter	Max.	Units
V <sub>DS</sub>	Drain-to-Source Voltage	-30	V
V <sub>GS</sub>	Gate-to-Source Voltage	± 20	
I <sub>D</sub> @ T <sub>A</sub> = 25°C	Continuous Drain Current, V <sub>GS</sub> @ 10V	-20	A
I <sub>D</sub> @ T <sub>A</sub> = 70°C	Continuous Drain Current, V <sub>GS</sub> @ 10V	-16	
I <sub>DM</sub>	Pulsed Drain Current ①	-160	
P <sub>D</sub> @ T <sub>A</sub> = 25°C	Power Dissipation ②	2.5	W
P <sub>D</sub> @ T <sub>A</sub> = 70°C	Power Dissipation ②	1.6	
	Linear Derating Factor	0.02	W/°C
T <sub>J</sub>	Operating Junction and	-55 to + 150	°C
T <sub>STG</sub>	Storage Temperature Range		

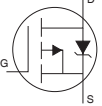
**Static @  $T_J = 25^\circ\text{C}$  (unless otherwise specified)**

	Parameter	Min.	Typ.	Max.	Units	Conditions
$BV_{DSS}$	Drain-to-Source Breakdown Voltage	-30	—	—	V	$V_{GS} = 0V, I_D = -250\mu A$
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.020	—	V/ $^\circ\text{C}$	Reference to $25^\circ\text{C}, I_D = -1mA$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	3.9	4.6	m $\Omega$	$V_{GS} = -10V, I_D = -20A$ ③
		—	5.8	6.8		$V_{GS} = -4.5V, I_D = -16A$ ③
$V_{GS(th)}$	Gate Threshold Voltage	-1.3	-1.8	-2.4	V	$V_{DS} = V_{GS}, I_D = -100\mu A$
$\Delta V_{GS(th)}$	Gate Threshold Voltage Coefficient	—	-5.8	—	mV/ $^\circ\text{C}$	
$I_{DSS}$	Drain-to-Source Leakage Current	—	—	-1.0	$\mu A$	$V_{DS} = -24V, V_{GS} = 0V$
		—	—	-150		$V_{DS} = -24V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
$I_{GSS}$	Gate-to-Source Forward Leakage	—	—	-100	nA	$V_{GS} = -20V$
	Gate-to-Source Reverse Leakage	—	—	100		$V_{GS} = 20V$
gfs	Forward Transconductance	39	—	—	S	$V_{DS} = -10V, I_D = -16A$
$Q_g$	Total Gate Charge	—	58	—	nC	$V_{DS} = -15V, V_{GS} = -4.5V, I_D = -16A$
$Q_{gs}$	Gate-to-Source Charge	—	17	—	nC	$V_{GS} = -10V$
$Q_{gd}$	Gate-to-Drain Charge	—	28	—		$V_{DS} = -15V$
						$I_D = -16A$
$R_G$	Gate Resistance	—	2.8	—	$\Omega$	
$t_{d(on)}$	Turn-On Delay Time	—	25	—	ns	$V_{DD} = -15V, V_{GS} = -4.5V$ ③
$t_r$	Rise Time	—	47	—		$I_D = -1.0A$
$t_{d(off)}$	Turn-Off Delay Time	—	65	—		$R_G = 1.8\Omega$
$t_f$	Fall Time	—	70	—		See Figs. 20a & 20b
$C_{iss}$	Input Capacitance	—	5250	—	pF	$V_{GS} = 0V$
$C_{oss}$	Output Capacitance	—	1300	—		$V_{DS} = -15V$
$C_{riss}$	Reverse Transfer Capacitance	—	880	—		$f = 1.0MHz$

**Avalanche Characteristics**

	Parameter	Typ.	Max.	Units
$E_{AS}$	Single Pulse Avalanche Energy ②	—	630	mJ
$I_{AR}$	Avalanche Current ①	—	-16	A

**Diode Characteristics**

	Parameter	Min.	Typ.	Max.	Units	Conditions
$I_S$	Continuous Source Current (Body Diode)	—	—	-2.5	A	MOSFET symbol showing the integral reverse p-n junction diode. 
$I_{SM}$	Pulsed Source Current (Body Diode) ①	—	—	-160		
$V_{SD}$	Diode Forward Voltage	—	—	-1.2	V	$T_J = 25^\circ\text{C}, I_S = -2.5A, V_{GS} = 0V$ ③
$t_{rr}$	Reverse Recovery Time	—	71	107	ns	$T_J = 25^\circ\text{C}, I_F = -2.5A, V_{DD} = -24V$
$Q_{rr}$	Reverse Recovery Charge	—	12	18	nC	$di/dt = 100A/\mu s$ ③

**Thermal Resistance**

	Parameter	Typ.	Max.	Units
$R_{\theta JL}$	Junction-to-Drain Lead ⑤	—	20	$^\circ\text{C/W}$
$R_{\theta JA}$	Junction-to-Ambient ④	—	50	

**Notes:**

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Starting  $T_J = 25^\circ\text{C}, L = 4.9mH, R_G = 25\Omega, I_{AS} = -16A$ .
- ③ Pulse width  $\leq 400\mu s$ ; duty cycle  $\leq 2\%$ .
- ④ When mounted on 1 inch square copper board.
- ⑤  $R_\theta$  is measured at  $T_J$  of approximately  $90^\circ\text{C}$ .

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

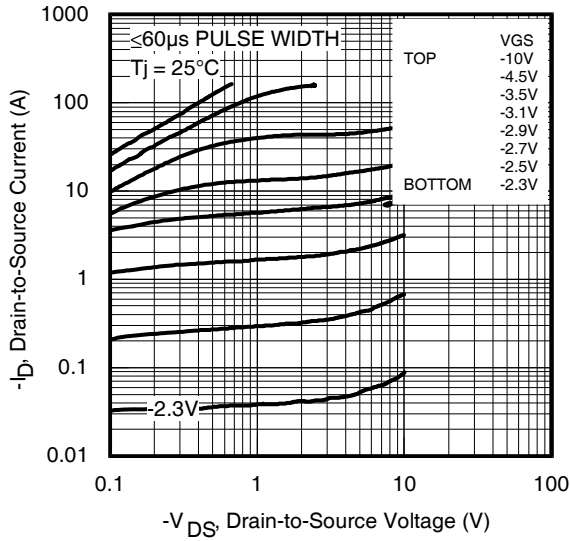


Fig 1. Typical Output Characteristics

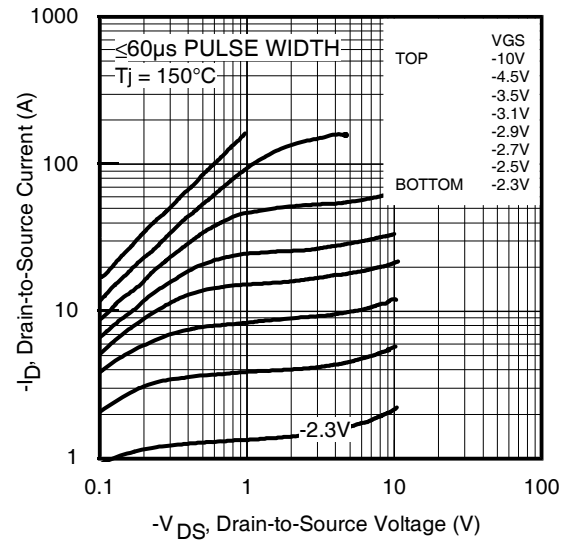


Fig 2. Typical Output Characteristics

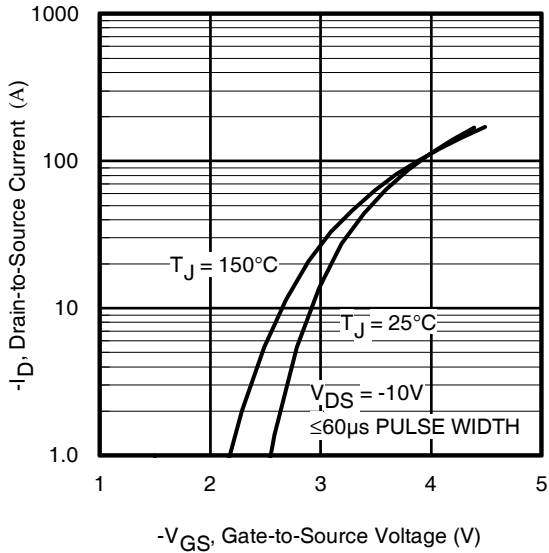


Fig 3. Typical Transfer Characteristics

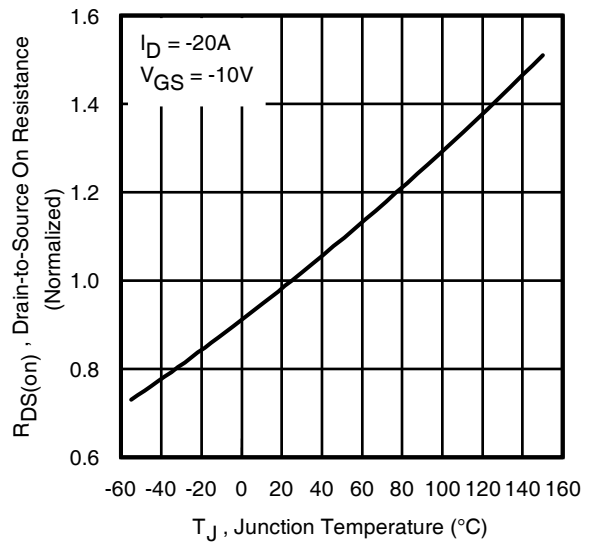


Fig 4. Normalized On-Resistance vs. Temperature

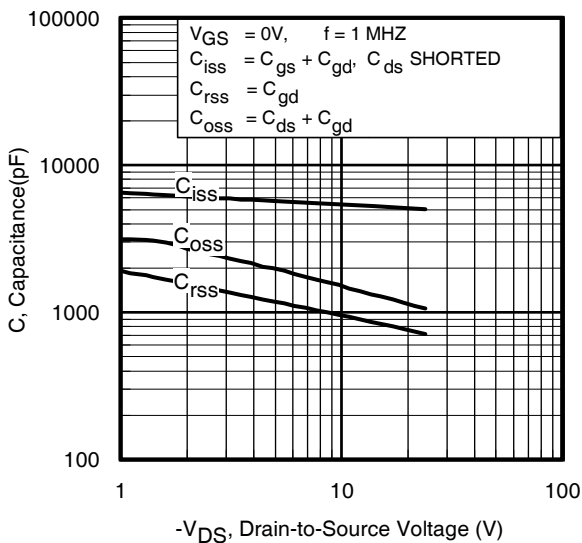


Fig 5. Typical Capacitance vs. Drain-to-Source Voltage

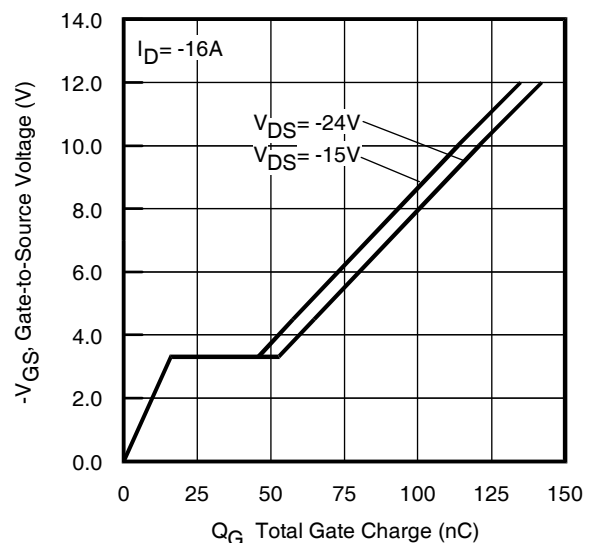


Fig 6. Typical Gate Charge vs. Gate-to-Source Voltage

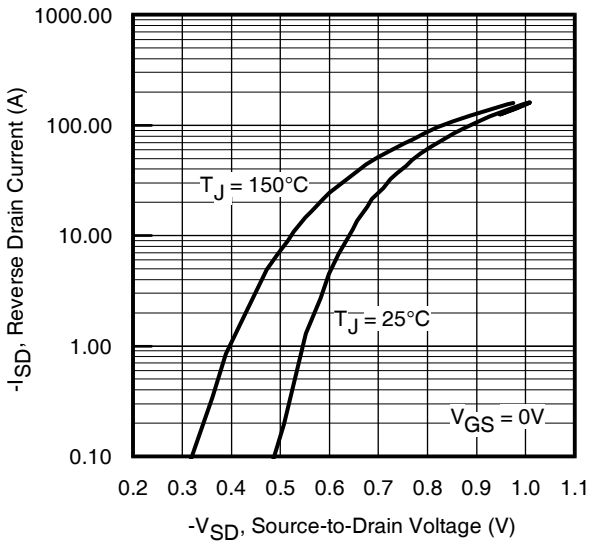


Fig 7. Typical Source-Drain Diode Forward Voltage

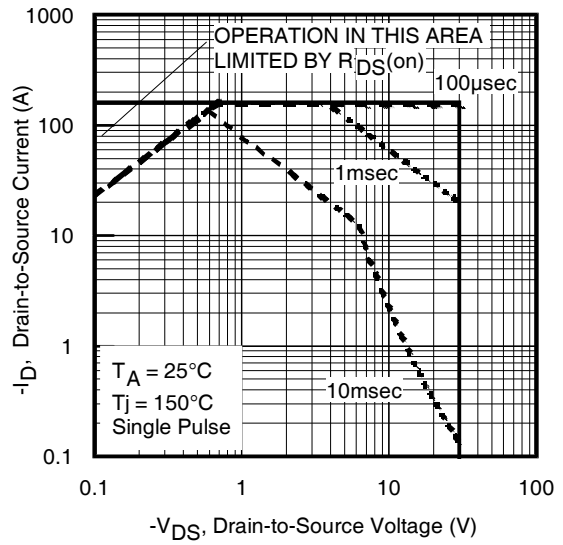


Fig 8. Maximum Safe Operating Area

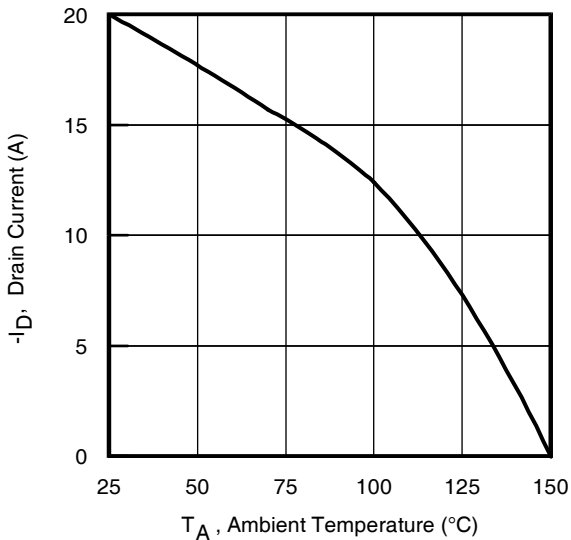


Fig 9. Maximum Drain Current vs. Ambient Temperature

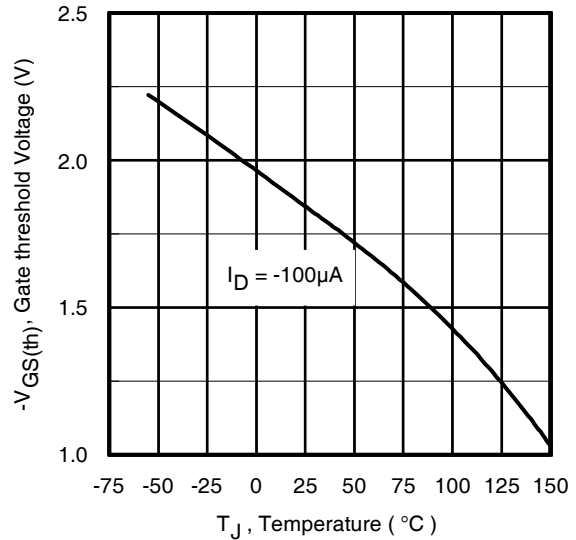


Fig 10. Threshold Voltage vs. Temperature

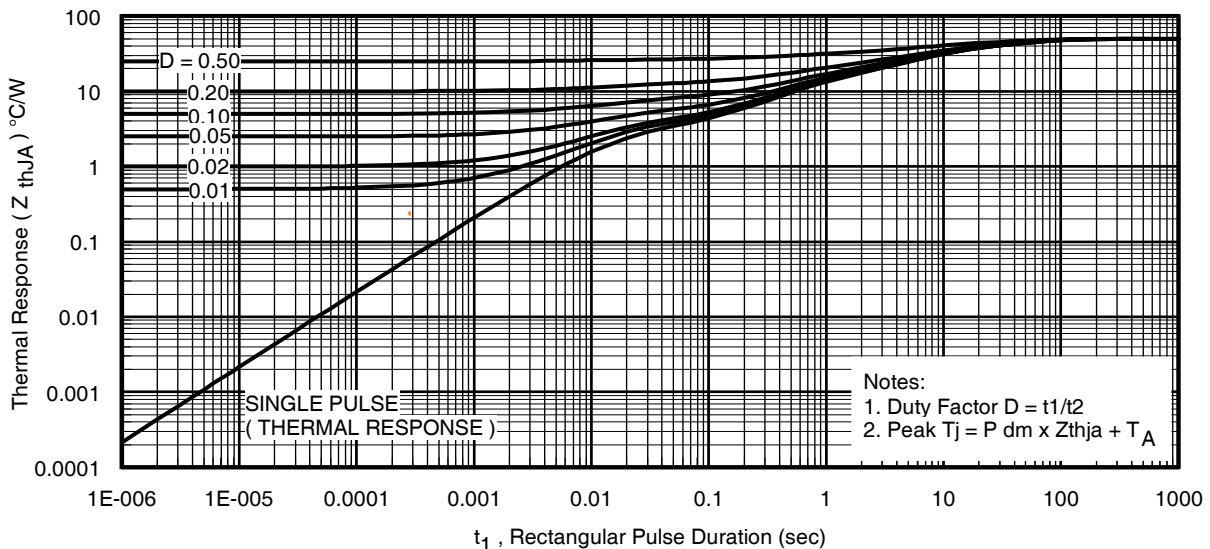


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

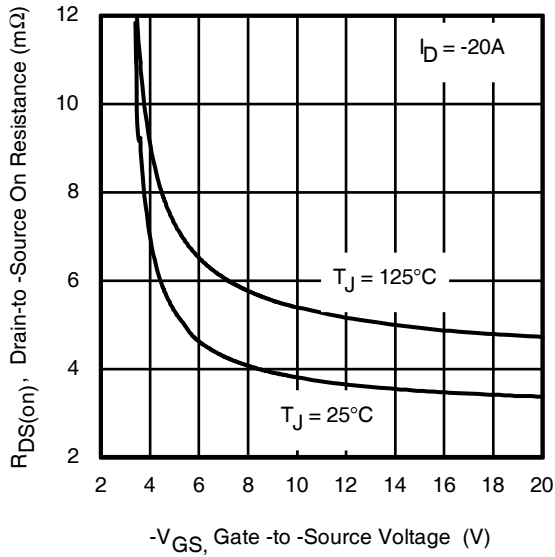


Fig 12. On-Resistance vs. Gate Voltage

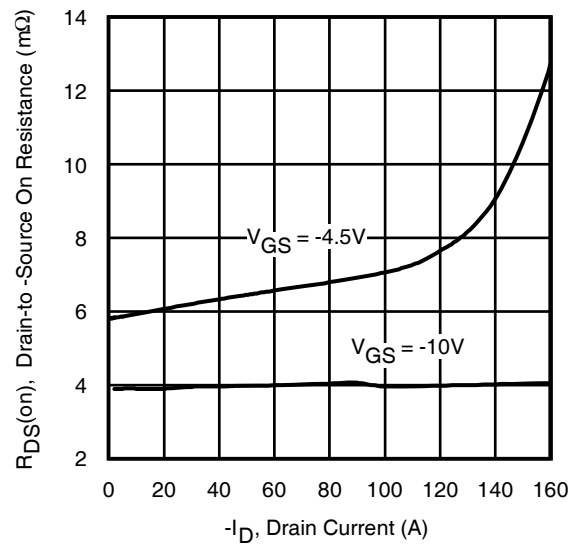


Fig 13. Typical On-Resistance vs. Drain Current

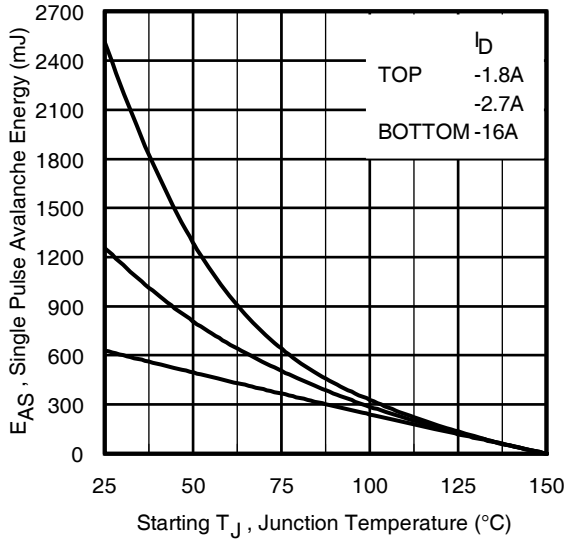


Fig 14. Maximum Avalanche Energy vs. Drain Current

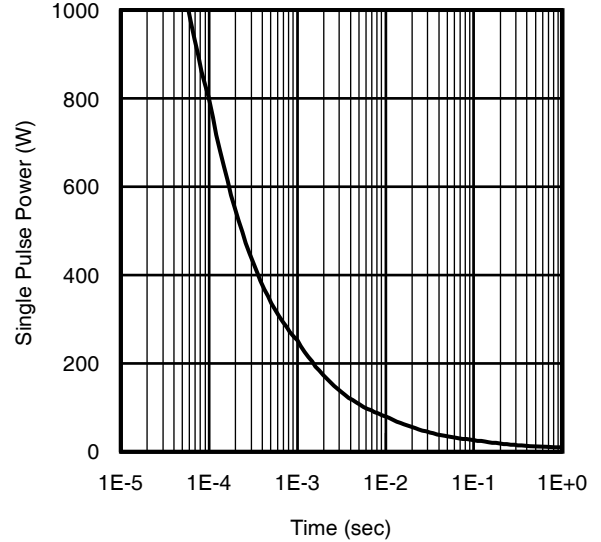


Fig 16. Typical Power vs. Time

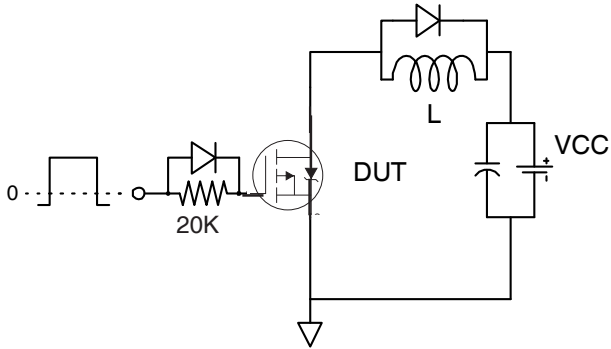


Fig 18a. Gate Charge Test Circuit

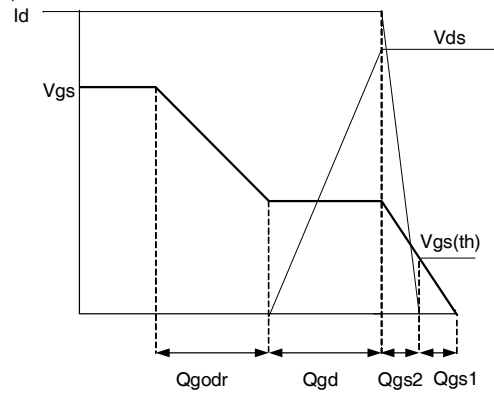


Fig 18b. Gate Charge Waveform

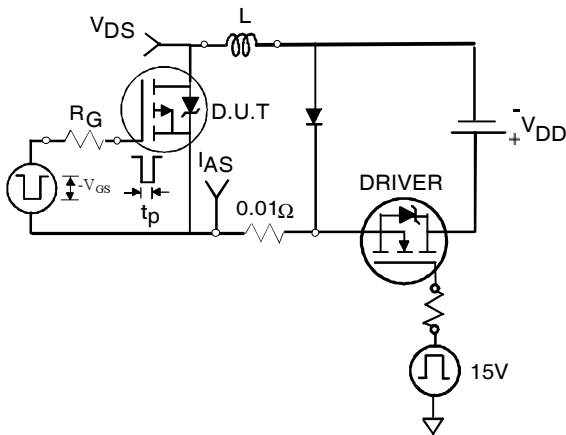


Fig 19a. Unclamped Inductive Test Circuit

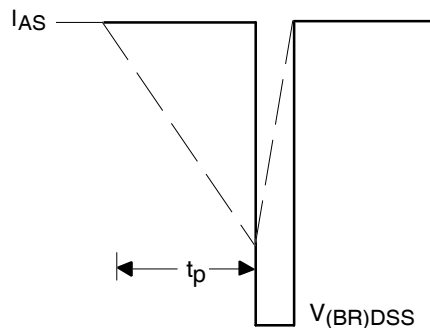


Fig 19b. Unclamped Inductive Waveforms

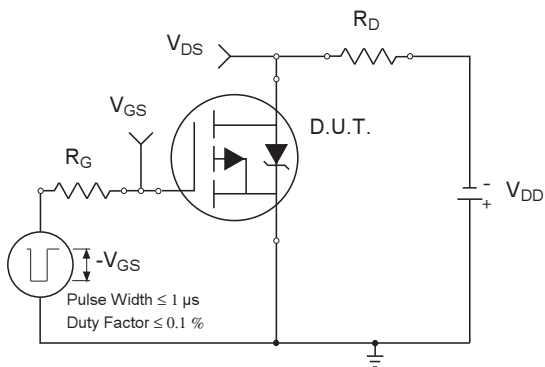


Fig 20a. Switching Time Test Circuit

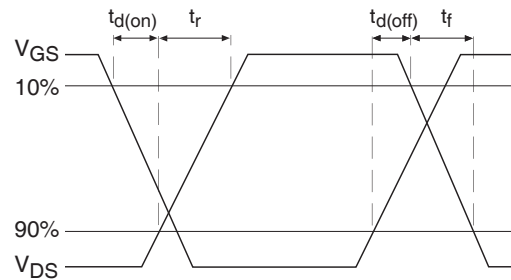
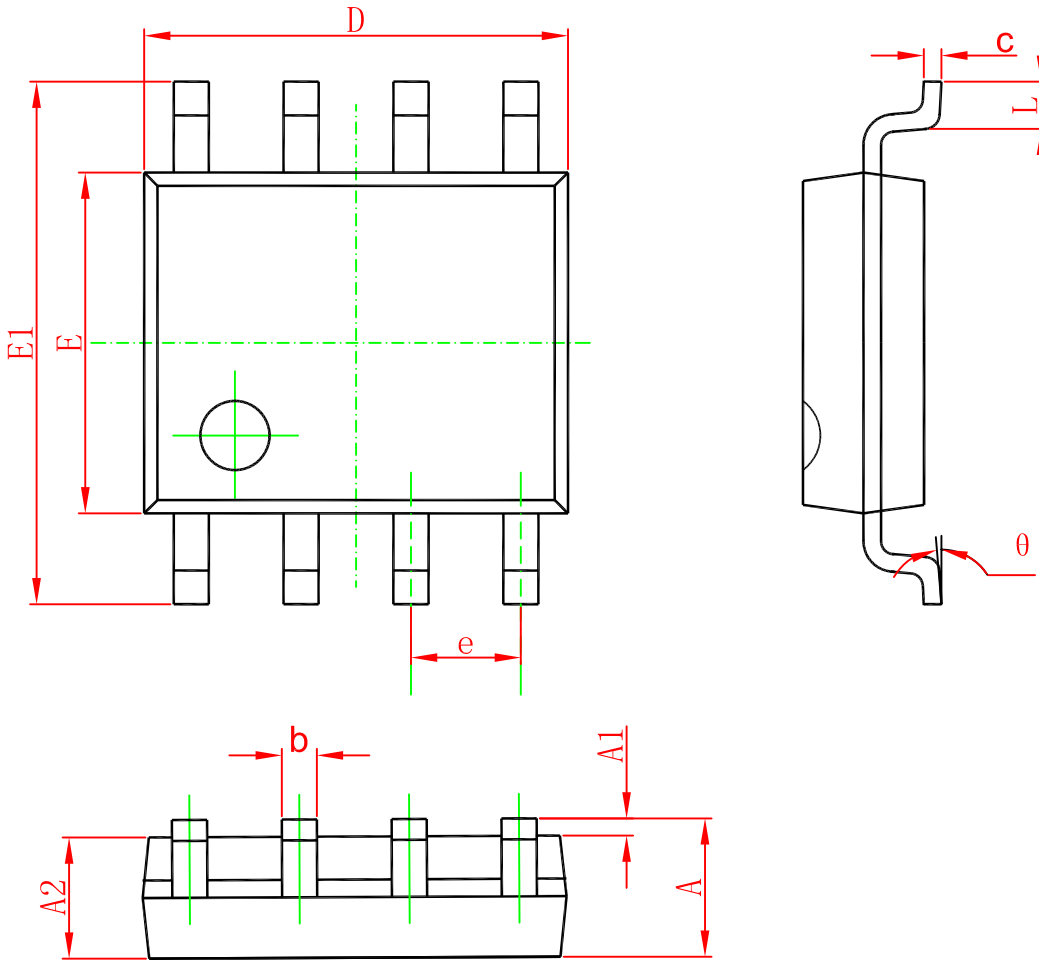


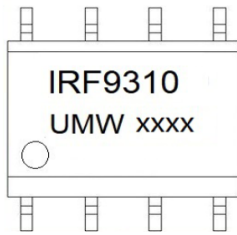
Fig 20b. Switching Time Waveforms

SOP-8



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°

**Marking**



**Ordering information**

Order code	Package	Baseqty	Deliverymode
UMW IRF9310TR	SOP-8	3000	Tape and reel