

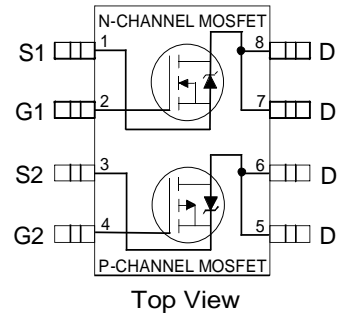
**Features**

**N-Ch:**

- $V_{DS} (V) = 30V$
- $R_{DS(ON)} < 50m\Omega$  ( $V_{GS} = 4.5V$ )
- $R_{DS(ON)} < 70m\Omega$  ( $V_{GS} = 2.7V$ )

**P-Ch:**

- $V_{DS} (V) = -30V$
- $R_{DS(ON)} < 100m\Omega$  ( $V_{GS} = 4.5V$ )
- $R_{DS(ON)} < 140m\Omega$  ( $V_{GS} = 2.7V$ )
- Industry-standard pinout SO-8 Package
- Compatible with Existing Surface Mount Techniques



**Benefits**

- Multi-Vendor Compatibility
- Easier Manufacturing
- Environmentally Friendlier
- Increased Reliability

**Absolute Maximum Ratings**

Parameter		Max.		Units
		N-Channel	P-Channel	
$I_D @ T_A = 25^\circ C$	10 Sec. Pulse Drain Current, $V_{GS} @ 10V$	4.7	-3.5	A
$I_D @ T_A = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	4.0	-3.0	A
$I_D @ T_A = 70^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	3.2	-2.4	A
$I_{DM}$	Pulsed Drain Current $\text{Ⓢ}$	16	-12	A
$P_D @ T_A = 25^\circ C$	Power Dissipation (PCB Mount)**	1.4		W
	Linear Derating Factor (PCB Mount)**	0.011		W/°C
$V_{GS}$	Gate-to-Source Voltage	$\pm 20$		V
$dv/dt$	Peak Diode Recovery $dv/dt$ $\text{Ⓢ}$	6.9	-6.0	V/ns
$T_J, T_{STG}$	Junction and Storage Temperature Range	-55 to + 150		°C

**Thermal Resistance**

	Parameter	Min.	Typ.	Max.	Units
$R_{\theta JA}$	Junction-to-Amb. (PCB Mount, steady state)**			90	°C/W

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

Parameter	Description		Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	N-Ch	30			V	$V_{GS} = 0V, I_D = 250\mu A$
		P-Ch	-30				$V_{GS} = 0V, I_D = -250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	N-Ch		0.032		V/°C	Reference to $25^\circ\text{C}, I_D = 1\text{mA}$
		P-Ch		0.037			Reference to $25^\circ\text{C}, I_D = -1\text{mA}$
$R_{DS(ON)}$	Static Drain-to-Source On-Resistance	N-Ch			50	mΩ	$V_{GS} = 10V, I_D = 2.4A$ ③
					70		$V_{GS} = 4.5V, I_D = 2.0A$ ③
		P-Ch			100		$V_{GS} = -10V, I_D = -1.8A$ ③
					140		$V_{GS} = -4.5V, I_D = -1.5A$ ③
$V_{GS(th)}$	Gate Threshold Voltage	N-Ch	1.0			V	$V_{DS} = V_{GS}, I_D = 250\mu A$
		P-Ch	-1.0				$V_{DS} = V_{GS}, I_D = -250\mu A$
$g_{fs}$	Forward Transconductance	N-Ch	5.2			S	$V_{DS} = 15V, I_D = 2.4A$ ③
		P-Ch	2.5				$V_{DS} = -24V, I_D = -1.8A$ ③
$I_{DSS}$	Drain-to-Source Leakage Current	N-Ch			1.0	μA	$V_{DS} = 24V, V_{GS} = 0V$
					-1.0		$V_{DS} = -24V, V_{GS} = 0V$
		P-Ch			25		$V_{DS} = 24V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
					-25		$V_{DS} = -24V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
$I_{GSS}$	Gate-to-Source Forward Leakage	N-P			±100		$V_{GS} = \pm 20V$
$Q_g$	Total Gate Charge	N-Ch			25	nC	N-Channel $I_D = 2.6A, V_{DS} = 16V, V_{GS} = 4.5V$ ③
		P-Ch			25		
$Q_{gs}$	Gate-to-Source Charge	N-Ch			2.9	nC	P-Channel $I_D = -2.2A, V_{DS} = -16V, V_{GS} = -4.5V$
		P-Ch			2.9		
$Q_{gd}$	Gate-to-Drain ("Miller") Charge	N-Ch			7.9	nC	
		P-Ch			9.0		
$t_{d(on)}$	Turn-On Delay Time	N-Ch		6.8		ns	N-Channel $V_{DD} = 10V, I_D = 2.6A, R_G = 6.0\Omega, R_D = 3.8\Omega$ ③
		P-Ch		11			
$t_r$	Rise Time	N-Ch		21		ns	P-Channel $V_{DD} = -10V, I_D = -2.2A, R_G = 6.0\Omega, R_D = 4.5\Omega$ ③
		P-Ch		17			
$t_{d(off)}$	Turn-Off Delay Time	N-Ch		22		ns	
		P-Ch		25			
$t_f$	Fall Time	N-Ch		7.7		ns	
		P-Ch		18			
$L_D$	Internal Drain Inductance	N-P		4.0		nH	Between lead tip and center of die contact
$L_S$	Internal Source Inductance	N-P		6.0			
$C_{iss}$	Input Capacitance	N-Ch		520		pF	N-Channel $V_{GS} = 0V, V_{DS} = 15V, f = 1.0\text{MHz}$ ③
		P-Ch		440			
$C_{oss}$	Output Capacitance	N-Ch		180		pF	P-Channel $V_{GS} = 0V, V_{DS} = -15V, f = 1.0\text{MHz}$ ③
		P-Ch		200			
$C_{rss}$	Reverse Transfer Capacitance	N-Ch		72		pF	
		P-Ch		93			

**Source-Drain Ratings and Characteristics**

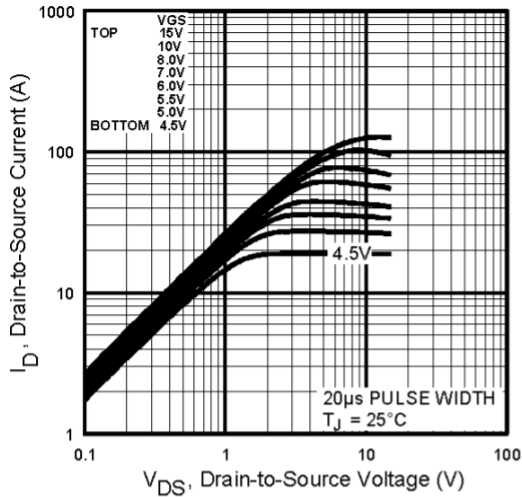
Parameter	Description		Min.	Typ.	Max.	Units	Conditions
$I_S$	Continuous Source Current (Body Diode)	N-Ch			1.8	A	
		P-Ch			-1.8		
$I_{SM}$	Pulsed Source Current (Body Diode) ①	N-Ch			16	A	
		P-Ch			-12		
$V_{SD}$	Diode Forward Voltage	N-Ch			1.0	V	$T_J = 25^\circ\text{C}, I_S = 1.8A, V_{GS} = 0V$ ③
		P-Ch			-1.0		$T_J = 25^\circ\text{C}, I_S = -1.8A, V_{GS} = 0V$ ③
$t_{rr}$	Reverse Recovery Time	N-Ch		47	71	ns	N-Channel $T_J = 25^\circ\text{C}, I_F = 2.6A, di/dt = 100A/\mu s$ ③
		P-Ch		53	80		
$Q_{rr}$	Reverse Recovery Charge	N-Ch		56	84	nC	P-Channel $T_J = 25^\circ\text{C}, I_F = -2.2A, di/dt = 100A/\mu s$ ③
		P-Ch		66	99		
$t_{on}$	Forward Turn-On Time	N-P	Intrinsic turn-on time is negligible (turn-on is dominated by $I_S + L_D$ )				

① Repetitive rating; pulse width limited by max. junction temperature. ( See fig. 23 )

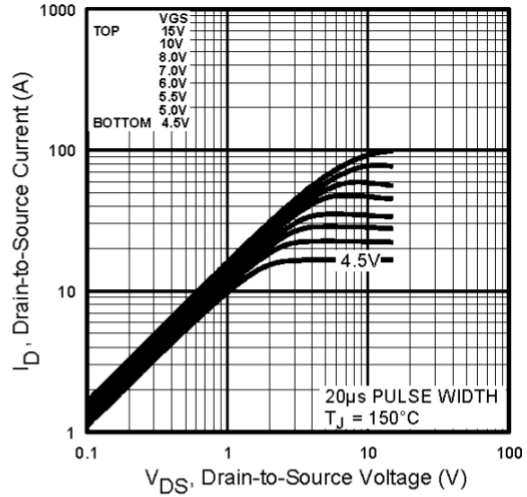
 ② N-Channel  $I_{SD} \leq 2.4A, di/dt \leq 73A/\mu s, V_{DD} \leq V_{(BR)DSS}, T_J \leq 150^\circ\text{C}$   
 P-Channel  $I_{SD} \leq -1.8A, di/dt \leq 90A/\mu s, V_{DD} \leq V_{(BR)DSS}, T_J \leq 150^\circ\text{C}$ 

 ③ Pulse width  $\leq 300\mu s$ ; duty cycle  $\leq 2\%$ .

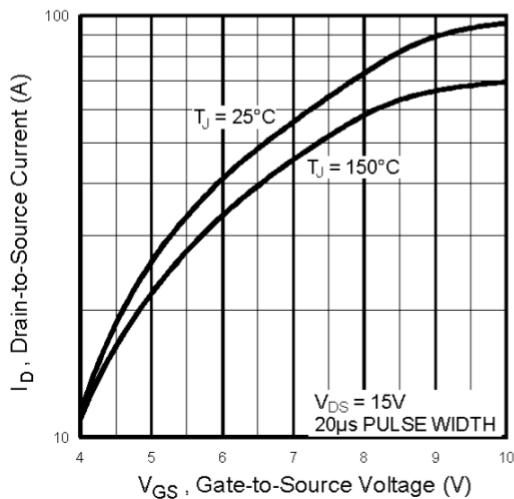
N-Channel



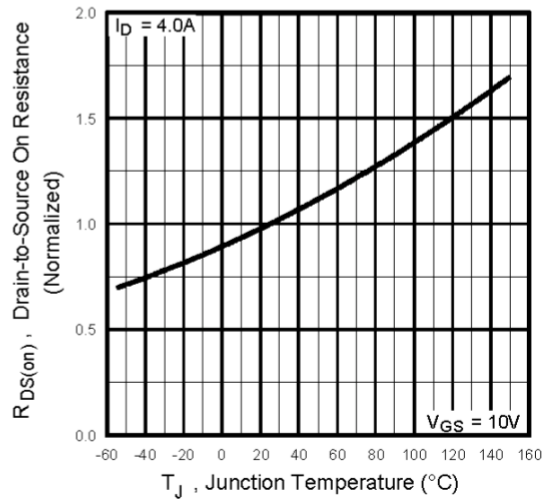
**Fig 1.** Typical Output Characteristics,  $T_J = 25^\circ\text{C}$



**Fig 2.** Typical Output Characteristics,  $T_J = 150^\circ\text{C}$



**Fig 3.** Typical Transfer Characteristics



**Fig 4.** Normalized On-Resistance Vs. Temperature

N-Channel

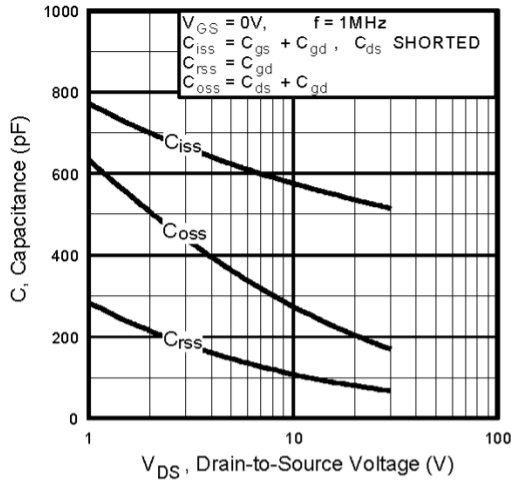


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

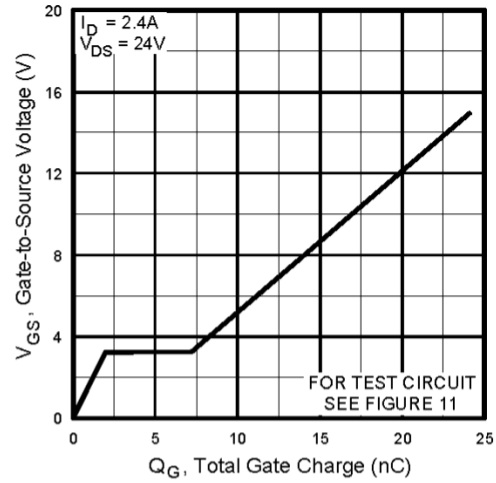


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

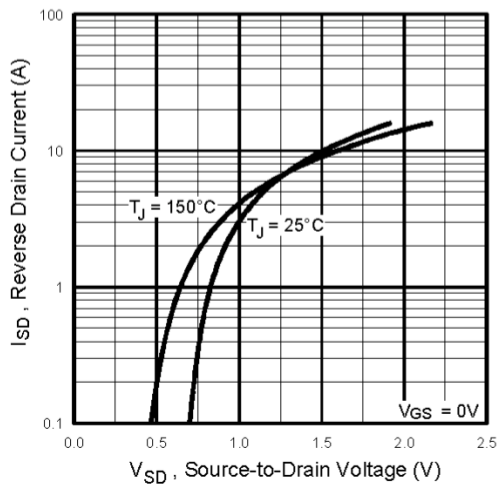


Fig 7. Typical Source-Drain Diode Forward Voltage

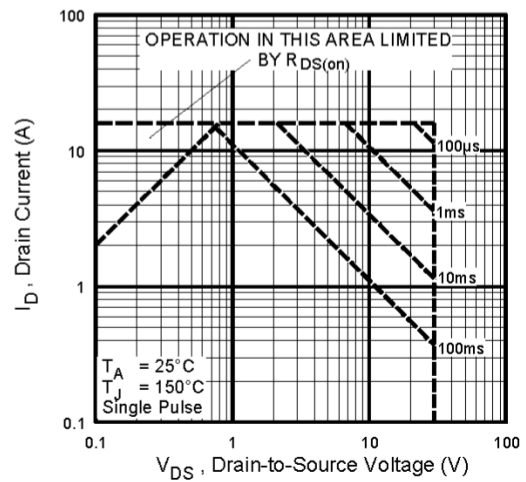


Fig 8. Maximum Safe Operating Area

N-Channel

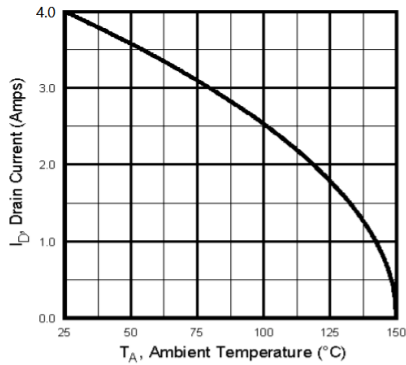


Fig 9. Max. Drain Current Vs. Ambient Temp.

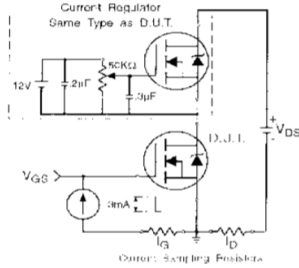


Fig 11a. Gate Charge Test Circuit

P-Channel

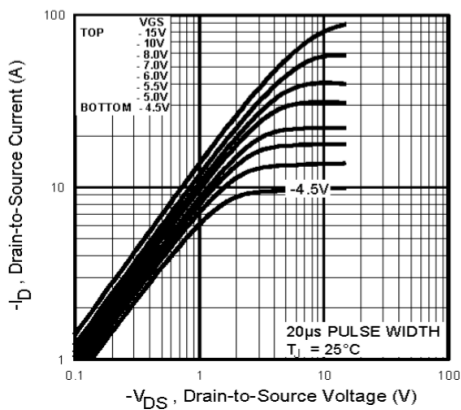


Fig 12. Typical Output Characteristics,  $T_j = 25^\circ\text{C}$

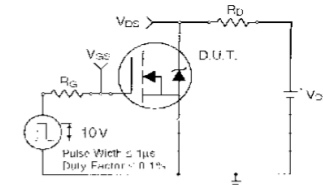


Fig 10a. Switching Time Test Circuit

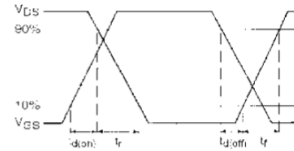


Fig 10b. Switching Time Waveforms

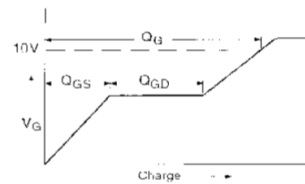


Fig 11b. Basic Gate Charge Waveform

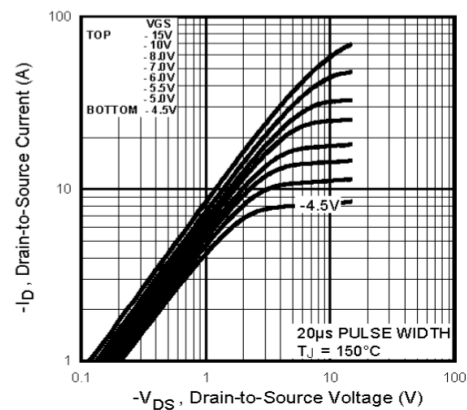


Fig 13. Typical Output Characteristics,  $T_j = 150^\circ\text{C}$

P-Channel

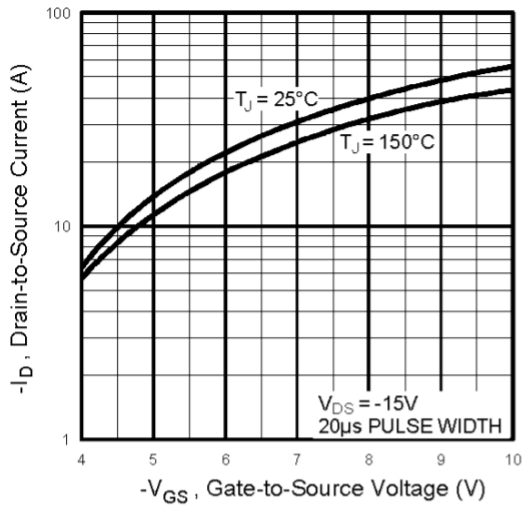


Fig 14. Typical Transfer Characteristics

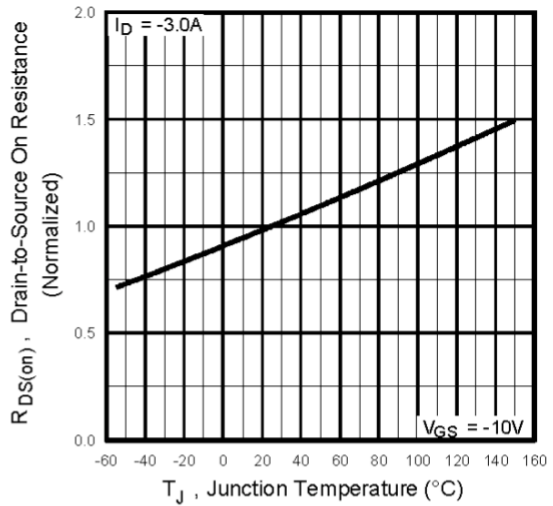


Fig 15. Normalized On-Resistance Vs. Temperature

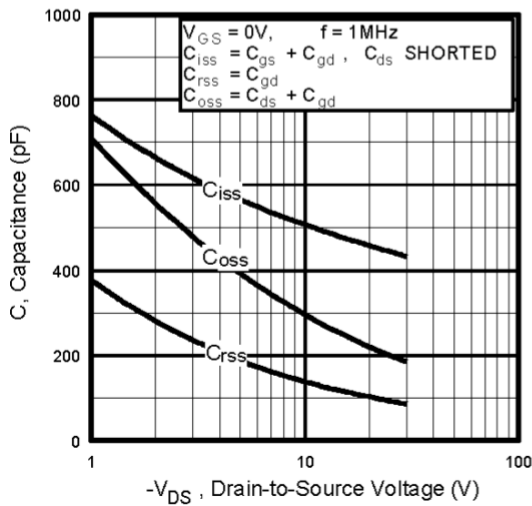


Fig 16. Typical Capacitance Vs. Drain-to-Source Voltage

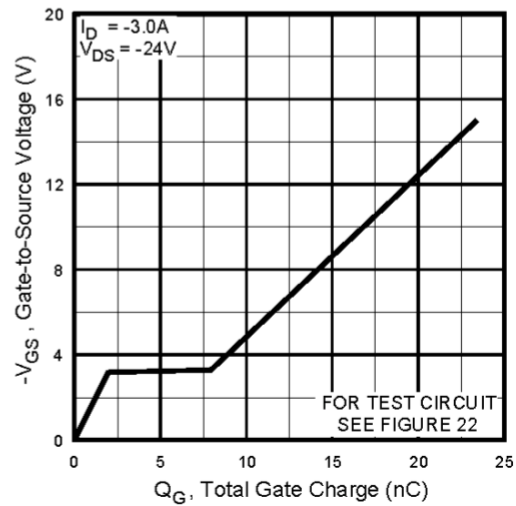


Fig 17. Typical Gate Charge Vs. Gate-to-Source Voltage

P-Channel

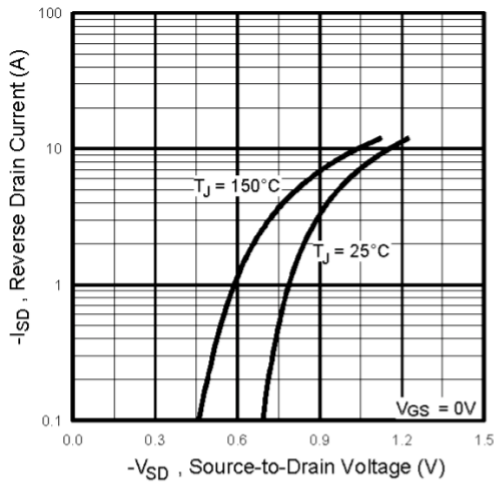


Fig 18. Typical Source-Drain Diode Forward Voltage

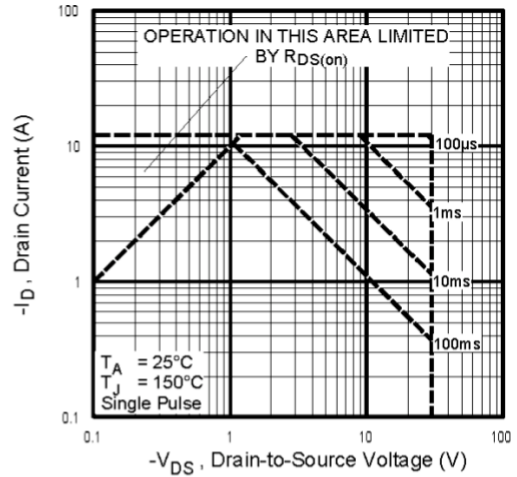


Fig 19. Maximum Safe Operating Area

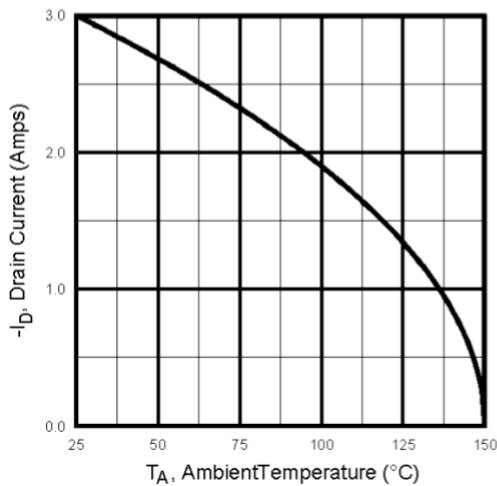


Fig 20. Max. Drain Current Vs. Ambient Temp.

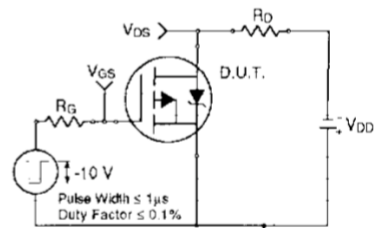


Fig 21a. Switching Time Test Circuit

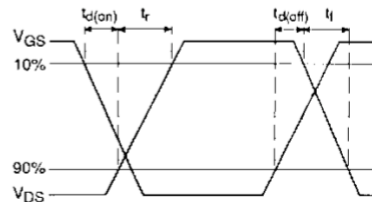


Fig 21b. Switching Time Waveforms

P-Channel

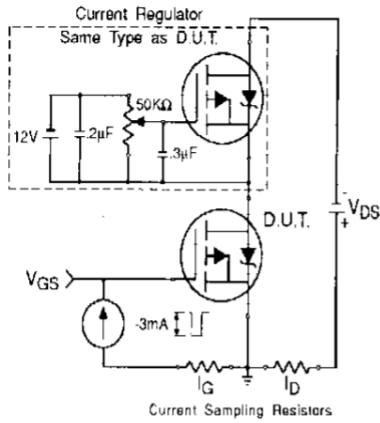


Fig 22b. Gate Charge Test Circuit

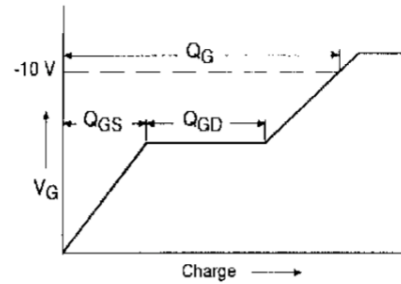


Fig 22b. Basic Gate Charge Waveform

N- and P-Channel

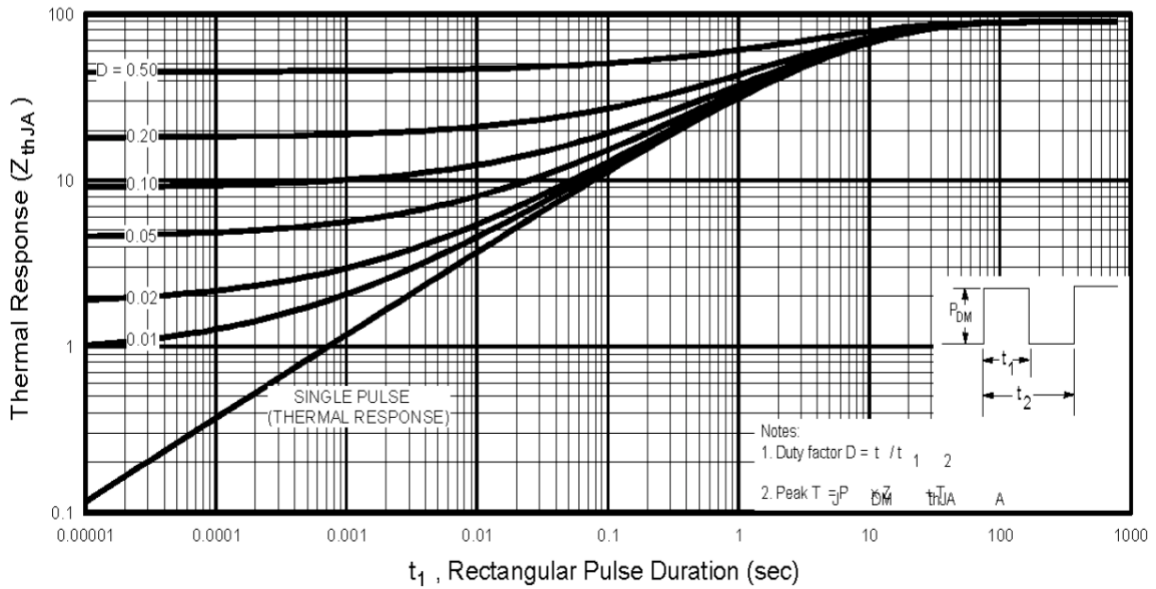
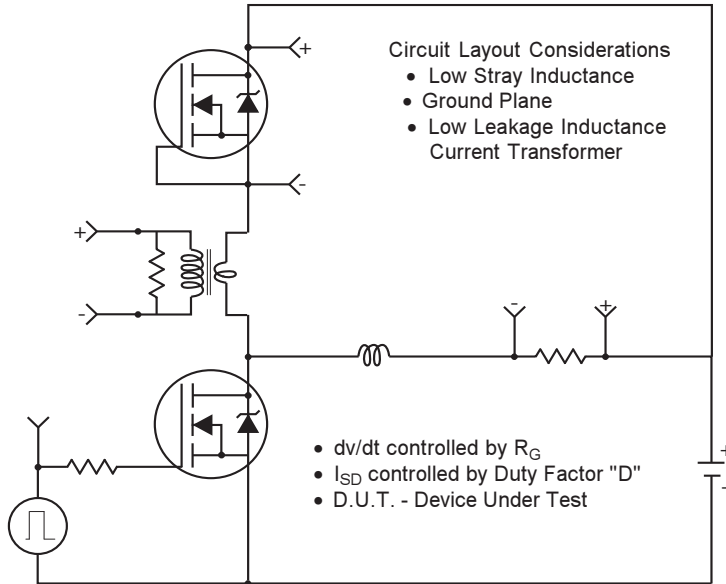


Fig 23. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

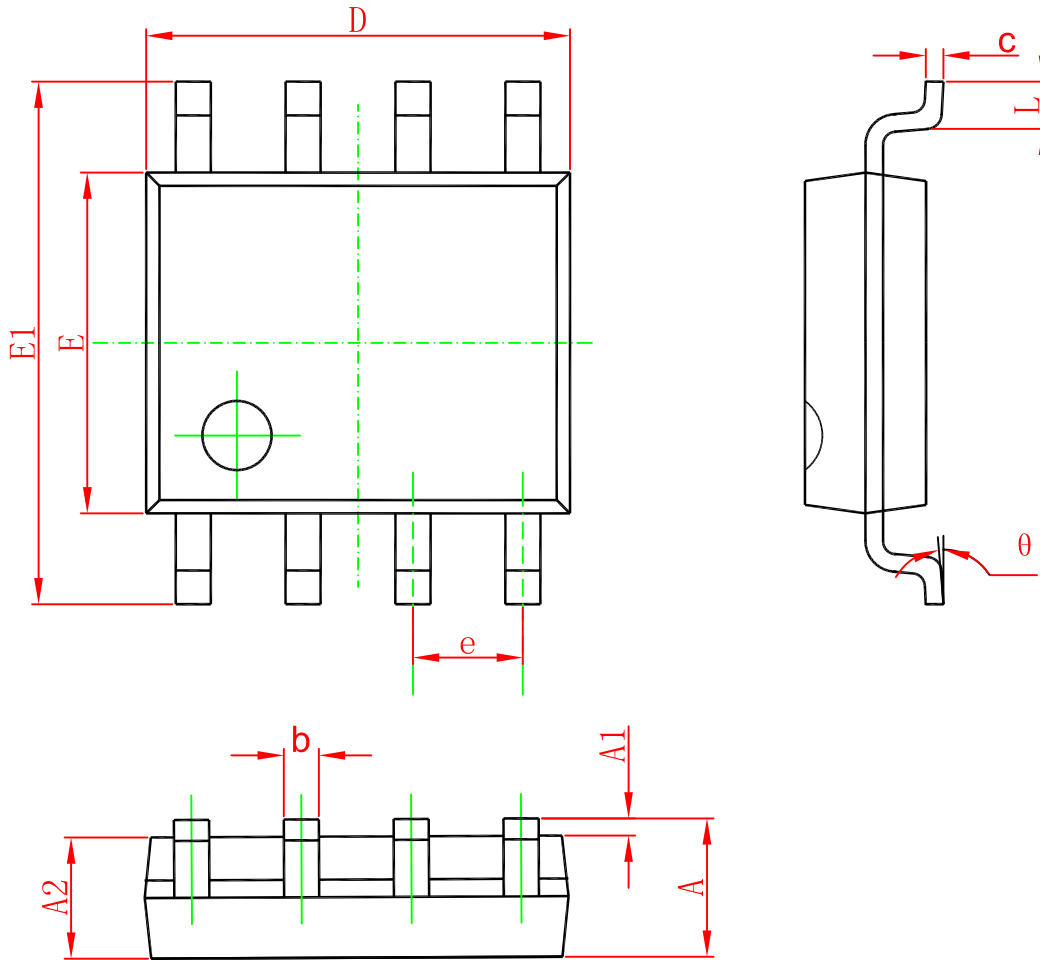


**Peak Diode Recovery dv/dt Test Circuit**



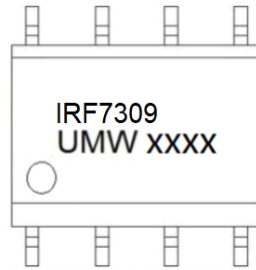
\* Reverse Polarity for P-Channel  
\*\* Use P-Channel Driver for P-Channel Measurements

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 IRF7309TR	SOP-8	3000	Tape and reel