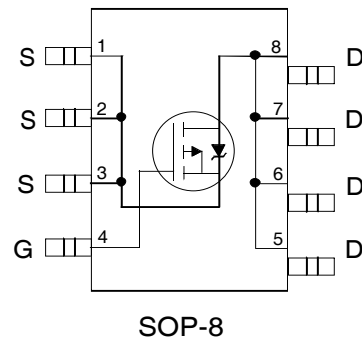


Features

- $V_{DS} (V) = -20V$
- $R_{DS(ON)} < 40\ m\ \Omega$ ($V_{GS} = -4.5V$)
- $R_{DS(ON)} < 60\ m\ \Omega$ ($V_{GS} = -2.7V$)
- Generation V Technology
- Ultra Low On-Resistance
- Surface Mount
- Dynamic dv/dt Rating
- Fast Switching
- Lead-Free



Description

The SOP-8 has been modified through a customized eadframe for enhanced thermal characteristics and multiple-die capability making it ideal in a variety of power applications. With these improvements, multiple devices can be used in an application with dramatically reduced board space. The package is designed for vapor phase, infra red, or wave soldering techniques. Power dissipation of greater than 0.8W is possible in a typical PCB mount application.

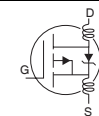
Absolute Maximum Ratings

	Parameter	Max.	Units
$I_D @ T_A = 25^\circ C$	10 Sec. Pulsed Drain Current, $V_{GS} @ -4.5V$	-7.7	A
$I_D @ T_A = 25^\circ C$	Continuous Drain Current, $V_{GS} @ -4.5V$	-6.7	
$I_D @ T_A = 70^\circ C$	Continuous Drain Current, $V_{GS} @ -4.5V$	-5.4	
I_{DM}	Pulsed Drain Current ①	-27	
$P_D @ T_A = 25^\circ C$	Power Dissipation	2.5	W
	Linear Derating Factor	0.02	W/°C
V_{GS}	Gate-to-Source Voltage	± 12	V
dv/dt	Peak Diode Recovery dv/dt ②	-5.0	V/ns
T_J, T_{STG}	Junction and Storage Temperature Range	-55 to + 150	°C

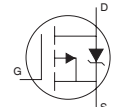
Thermal Resistance Ratings

	Parameter	Typ.	Max.	Units
$R_{\theta JA}$	Maximum Junction-to-Ambient ③		50	°C/W

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	-20			V	$V_{GS} = 0V, I_D = -250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient		-0.012		V/ $^\circ\text{C}$	Reference to 25°C , $I_D = -1\text{mA}$
$R_{DS(ON)}$	Static Drain-to-Source On-Resistance			40	m Ω	$V_{GS} = -4.5V, I_D = -3.2A$ ③
				60		$V_{GS} = -2.7V, I_D = -2.7A$ ③
$V_{GS(th)}$	Gate Threshold Voltage	-0.70			V	$V_{DS} = V_{GS}, I_D = -250\mu A$
g_{fs}	Forward Transconductance	6.8			S	$V_{DS} = -15V, I_D = -3.2A$
I_{DSS}	Drain-to-Source Leakage Current			-1.0	μA	$V_{DS} = -16V, V_{GS} = 0V$
				-25		$V_{DS} = -16V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage			-100	nA	$V_{GS} = -12V$
	Gate-to-Source Reverse Leakage			100		$V_{GS} = 12V$
Q_g	Total Gate Charge			50	nC	$I_D = -3.2A$
Q_{gs}	Gate-to-Source Charge			5.5		$V_{DS} = -16V$
Q_{gd}	Gate-to-Drain ("Miller") Charge			21		$V_{GS} = -4.5V$, See Fig. 6 and 12 ③
$t_{d(on)}$	Turn-On Delay Time		14		ns	$V_{DD} = -10V$ $I_D = -3.2A$ $R_G = 6.0\Omega$ $R_D = 3.1\Omega$, See Fig. 10 ③
t_r	Rise Time		32			
$t_{d(off)}$	Turn-Off Delay Time		100			
t_f	Fall Time		65			
L_D	Internal Drain Inductance		2.5		nH	Between lead tip and center of die contact 
L_S	Internal Source Inductance		4.0			
C_{iss}	Input Capacitance		1500		pF	$V_{GS} = 0V$
C_{oss}	Output Capacitance		730			$V_{DS} = -15V$
C_{rss}	Reverse Transfer Capacitance		340			$f = 1.0\text{MHz}$, See Fig. 5

Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)			-3.1	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①			-27		
V_{SD}	Diode Forward Voltage			-1.0	V	$T_J = 25^\circ\text{C}, I_S = -2.0A, V_{GS} = 0V$ ③
t_{rr}	Reverse Recovery Time		69	100	ns	$T_J = 25^\circ\text{C}, I_F = -3.2A$
Q_{rr}	Reverse Recovery Charge		71	110	μC	$di/dt = 100A/\mu s$ ③
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by L_S+L_D)				

Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature. (See fig. 11)
- ② $I_{SD} \leq -3.2A, di/dt \leq -65A/\mu s, V_{DD} \leq V_{(BR)DSS}, T_J \leq 150^\circ\text{C}$
- ③ Pulse width $\leq 300\mu s$; duty cycle $\leq 2\%$.
- ④ Surface mounted on FR-4 board, $t \leq 10\text{sec}$.

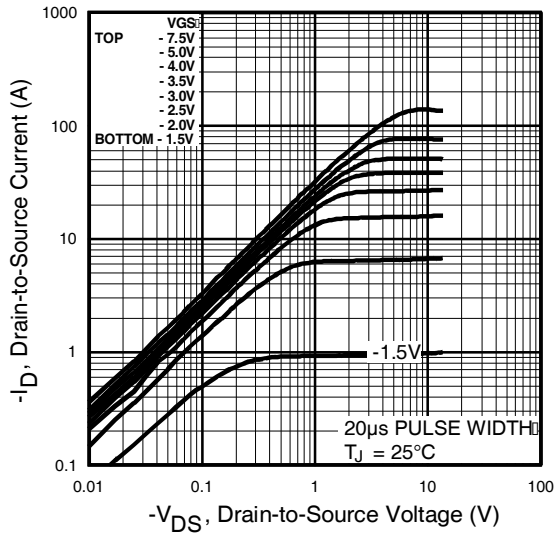


Fig 1. Typical Output Characteristics

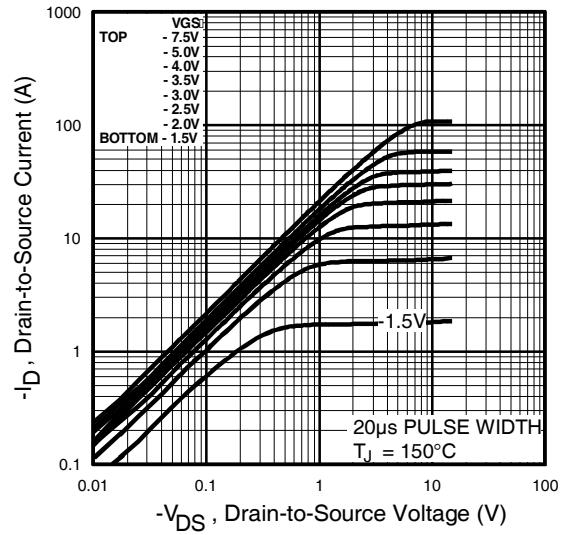


Fig 2. Typical Output Characteristics

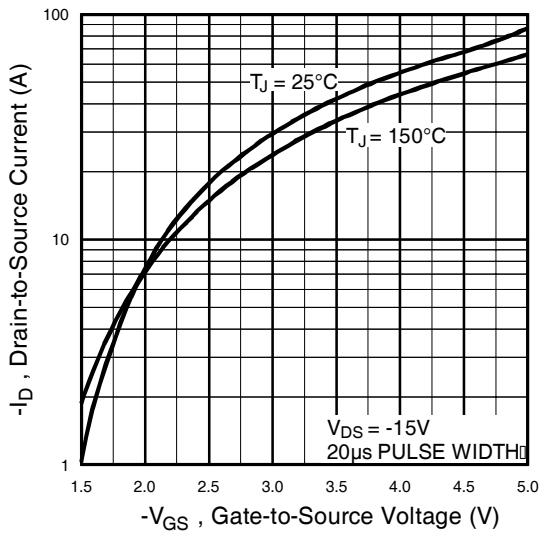


Fig 3. Typical Transfer Characteristics

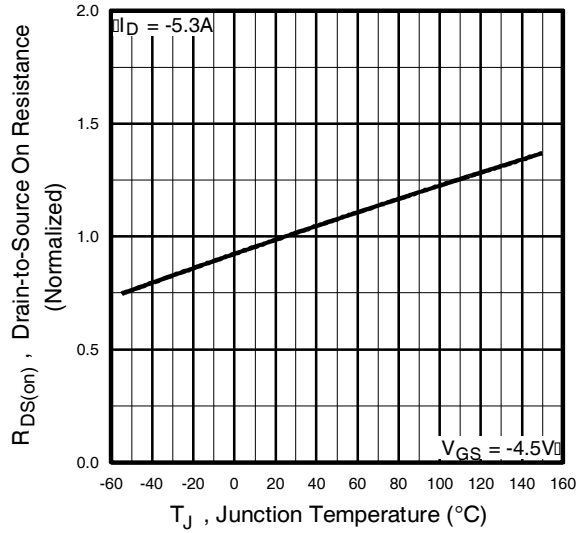


Fig 4. Normalized On-Resistance Vs. Temperature

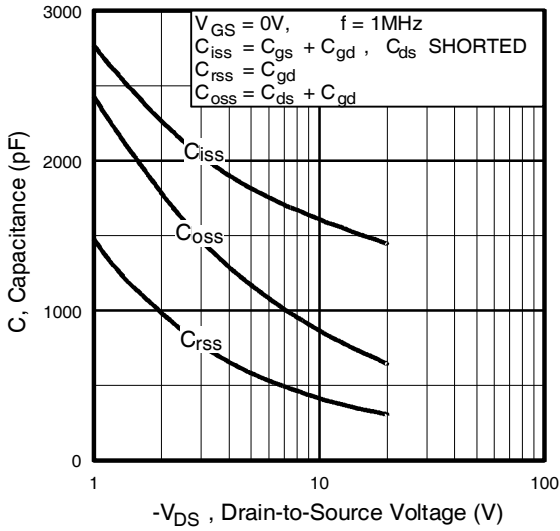


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

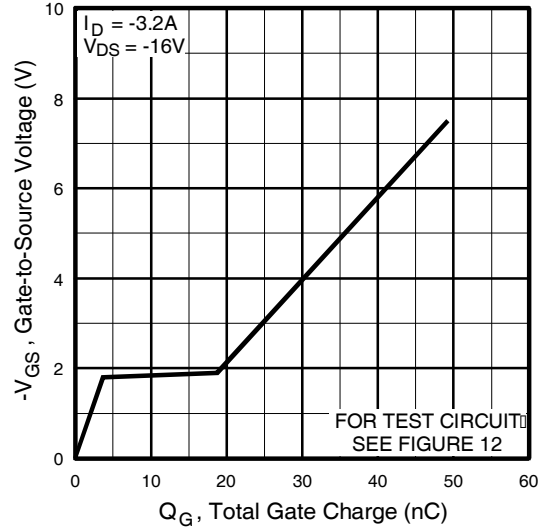


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

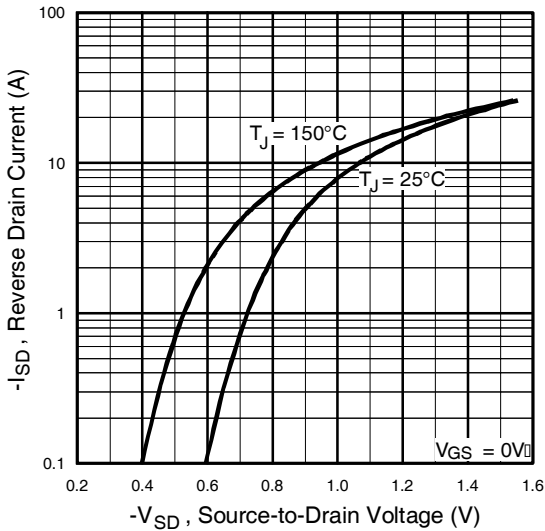


Fig 7. Typical Source-Drain Diode Forward Voltage

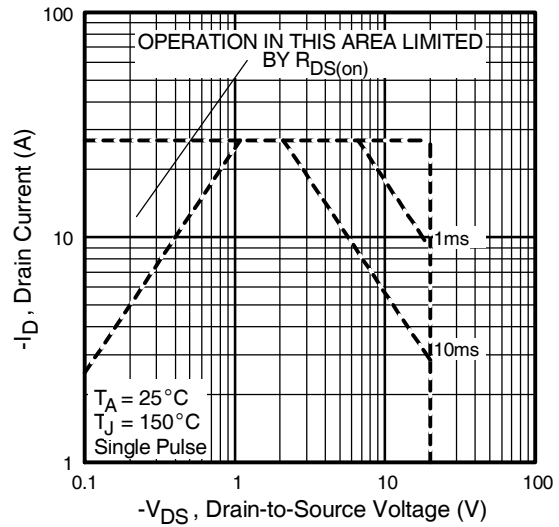


Fig 8. Maximum Safe Operating Area

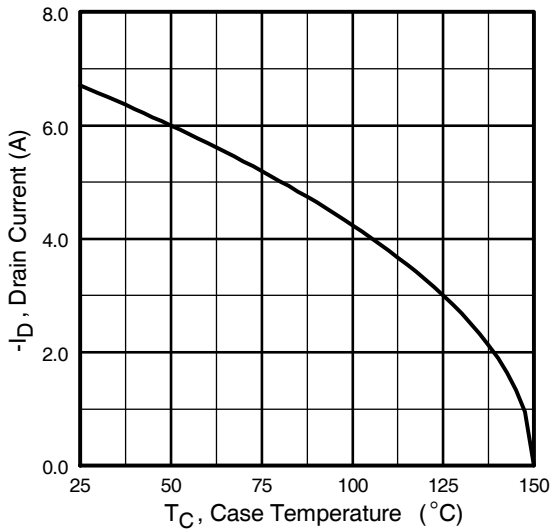


Fig 9. Maximum Drain Current Vs. Ambient Temperature

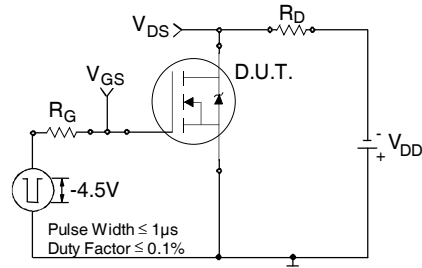


Fig 10a. Switching Time Test Circuit

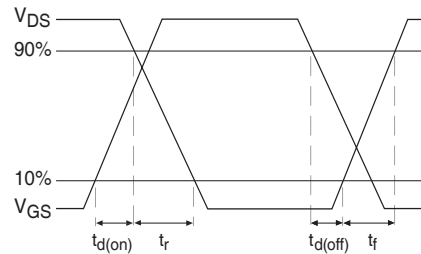


Fig 10b. Switching Time Waveforms

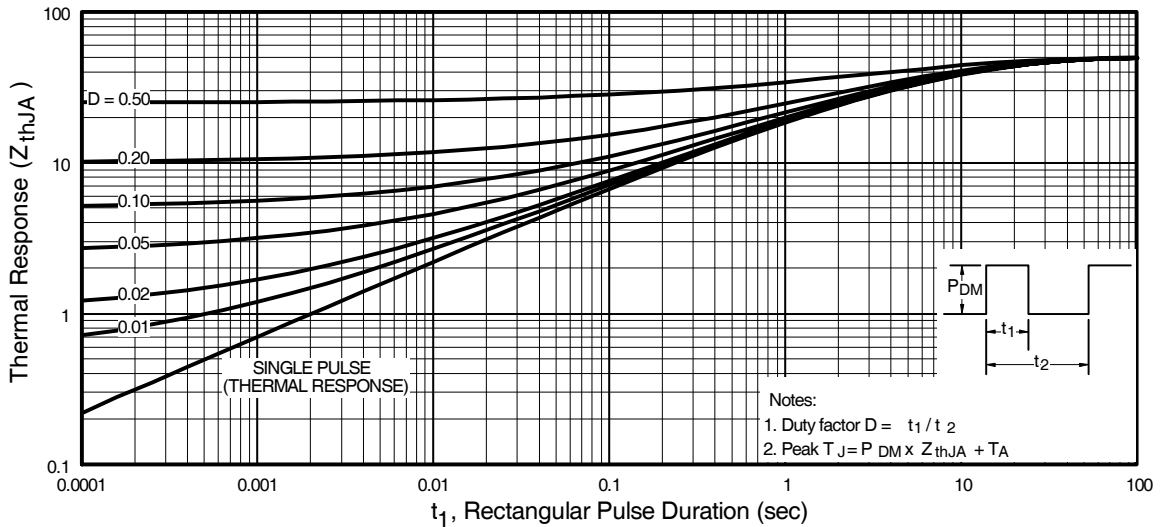


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

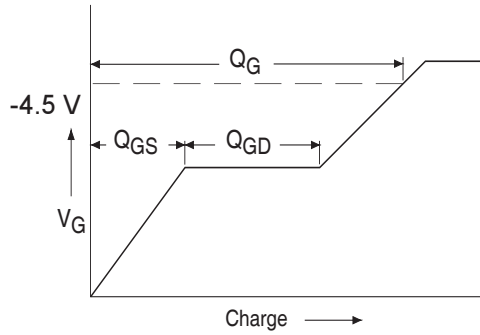


Fig 12a. Basic Gate Charge Waveform

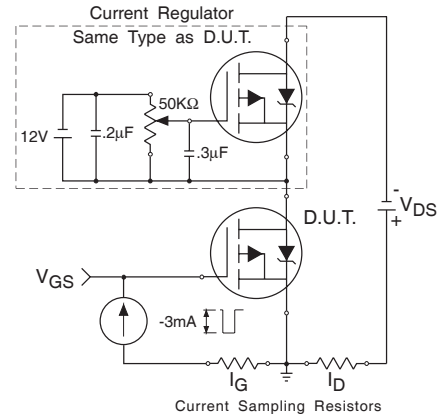
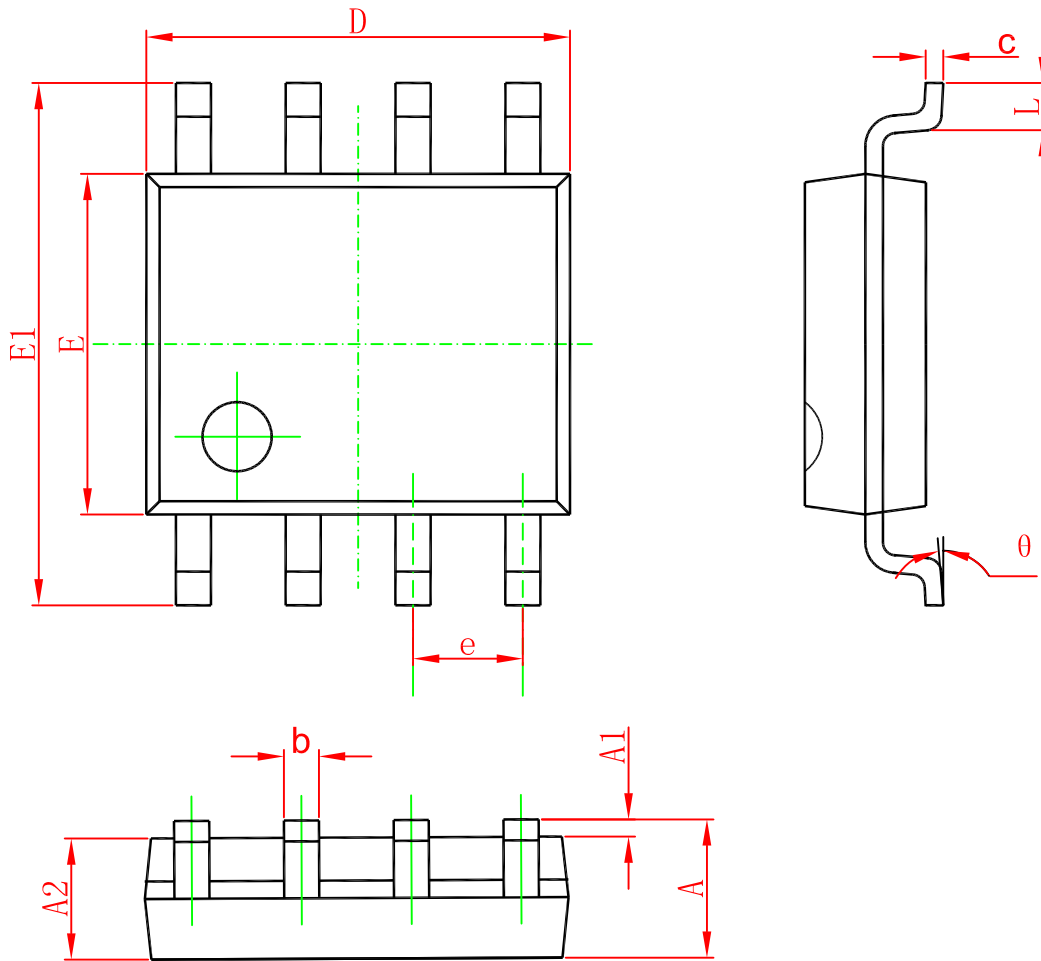


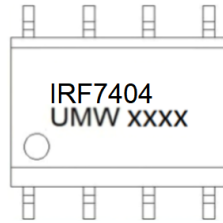
Fig 12b. Gate Charge Test Circuit

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 IRF7404TR	SOP-8	3000	Tape and reel