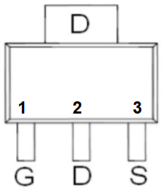
DESCRIPTION

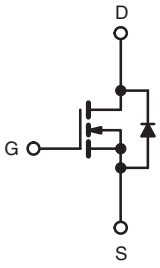
The SOT-223 package is designed for surface-mounting using vapor phase, infrared, or wave soldering techniques. Its unique package design allows for easy automatic pick-and-place as with other SOT or SOIC packages but has the added advantage of improved thermal performance due to an enlarged tab for heatsinking. Power dissipation of greater than 1.25 W is possible in a typical surface mount application.



SOT223

FEATURES

- V_{DS}(V) = 100V
- $R_{DS(ON)}$ < 54mΩ (V_{GS} = 5V)
- $R_{DS(ON)}$ < 76mΩ (V_{GS} = 4V)
- Surface mount
- Available in tape and reel
- Dynamic dV/dt rating
- Repetitive avalanche rated
- Logic-level gate drive
- $R_{DS(on)}$ specified at V_{GS} = 4 V and 5 V
- Fast switching
- Material categorization: for definitions of compliance



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T_C = 25 °C, unless otherwise noted)

PARAMETER			SYMBOL	LIMIT	UNIT
Drain-Source Voltage			V_{DS}	100	V
Gate-Source Voltage			V_{GS}	± 10	
Continuous Drain Current	V_{GS} at 5.0 V	T_C = 25 °C	I_D	1.5	A
		T_C = 100 °C		0.93	
Pulsed Drain Current [a]			I_{DM}	12	
Linear Derating Factor				0.025	W/°C
Linear Derating Factor (PCB Mount) [e]				0.017	
Single Pulse Avalanche Energy [b]			E_{AS}	50	mJ
Repetitive Avalanche Current [a]			I_{AR}	1.5	A
Repetitive Avalanche Energy [a]			E_{AR}	0.31	mJ
Maximum Power Dissipation	T_C = 25 °C		P_D	3.1	W
Maximum Power Dissipation (PCB Mount) [e]	T_A = 25 °C			2.0	
Peak Diode Recovery dV/dt [c]			dV/dt	5.5	V/ns
Operating Junction and Storage Temperature Range			T_J, T_{stg}	-55 to +150	°C
Soldering Recommendations (Peak Temperature) [d]	for 10 s			300	

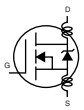
Notes

a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
b. V_{DD} = 25 V, starting T_J = 25 °C, L = 25 mH, R_g = 25 Ω, I_{AS} = 1.5 A (see fig. 12).
c. I_{SD} ≤ 5.6 A, dI/dt ≤ 75 A/μs, V_{DD} ≤ V_{DS}, T_J ≤ 150 °C.
d. 1.6 mm from case.
e. When mounted on 1" square PCB (FR-4 or G-10 material).

THERMAL RESISTANCE RATINGS				
PARAMETER	**SYMBOL**	**TYP.**	**MAX.**	**UNIT**
Maximum Junction-to-Ambient (PCB Mount) [a]	R_{thJA}	-	60	°C/W
Maximum Junction-to-Case (Drain)	R_{thJC}	-	40	

Note

a. When mounted on 1" square PCB (FR-4 or G-10 material).

SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)							
PARAMETER	**SYMBOL**	**TEST CONDITIONS**		**MIN.**	**TYP.**	**MAX.**	**UNIT**
Static							
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0 V, I_D = 250 µA		100	-	-	V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to 25 °C, I_D = 1 mA		-	0.12	-	V/°C
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA		1.0	-	2.0	V
Gate-Source Leakage	I_{GSS}	V_{GS} = ± 10 V		-	-	± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 100 V, V_{GS} = 0 V		-	-	25	µA
		V_{DS} = 80 V, V_{GS} = 0 V, T_J = 125 °C		-	-	250	
Drain-Source On-State Resistance	$R_{DS(on)}$	V_{GS} = 5.0 V	I_D = 0.90 A[b]			54	mΩ
		V_{GS} = 4.0 V	I_D = 0.75 A			76	
Forward Transconductance	g_{fs}	V_{DS} = 25 V, I_D = 0.90 A		0.57	-	-	S
Dynamic							
Input Capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 25 V, f = 1.0 MHz, see fig. 5		-	250	-	pF
Output Capacitance	C_{oss}			-	80	-	
Reverse Transfer Capacitance	C_{rss}			-	15	-	
Total Gate Charge	Q_g	V_{GS} = 5.0 V	I_D = 5.6 A, V_{DS} = 80 V, see fig. 6 and 13[b]	-	-	6.1	nC
Gate-Source Charge	Q_{gs}			-	-	2.6	
Gate-Drain Charge	Q_{gd}			-	-	3.3	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 50 V, I_D = 5.6 A, R_g = 12 Ω, R_D = 8.4 Ω		-	9.3	-	ns
Rise Time	t_r			-	47	-	
Turn-Off Delay Time	$t_{d(off)}$			-	16	-	
Fall Time	t_f			-	18	-	
Internal Drain Inductance	L_D	Between lead, 6 mm (0.25") from package and center of die contact 		-	4.0	-	nH
Internal Source Inductance	L_S			-	6.0	-	
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p - n junction diode 		-	-	1.5	A
Pulsed Diode Forward Current [a]	I_{SM}			-	-	12	
Body Diode Voltage	V_{SD}	T_J = 25 °C, I_S = 1.5 A, V_{GS} = 0 V[b]		-	-	2.5	V
Body Diode Reverse Recovery Time	t_{rr}	T_J = 25 °C, I_F = 5.6 A, dI/dt = 100 A/µs[b]		-	110	130	ns
Body Diode Reverse Recovery Charge	Q_{rr}			-	0.50	0.65	µC
Forward Turn-On Time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by L_S and L_D)					

Notes

a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).

b. Pulse width ≤ 300 µs; duty cycle ≤ 2 %.

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

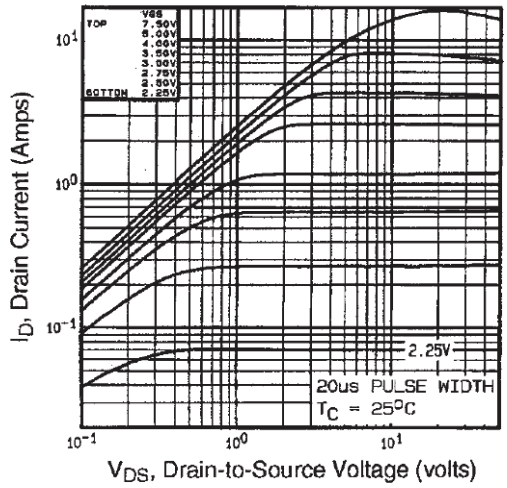


Fig. 1 - Typical Output Characteristics

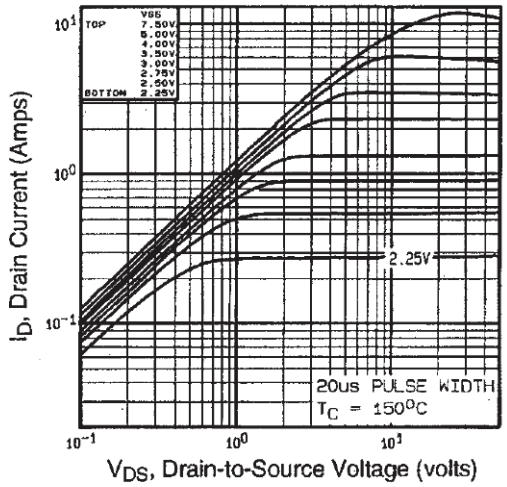


Fig. 2 - Typical Output Characteristics

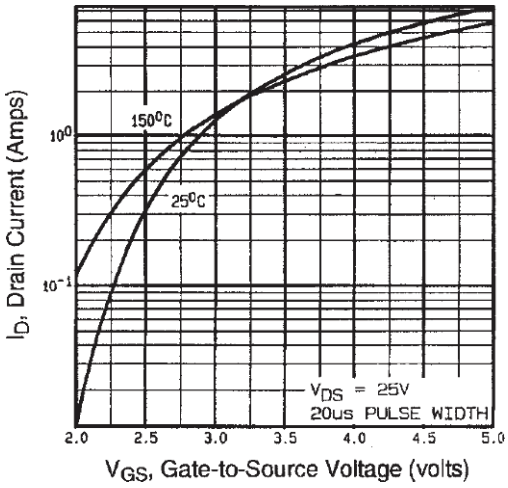


Fig. 3 - Typical Transfer Characteristics

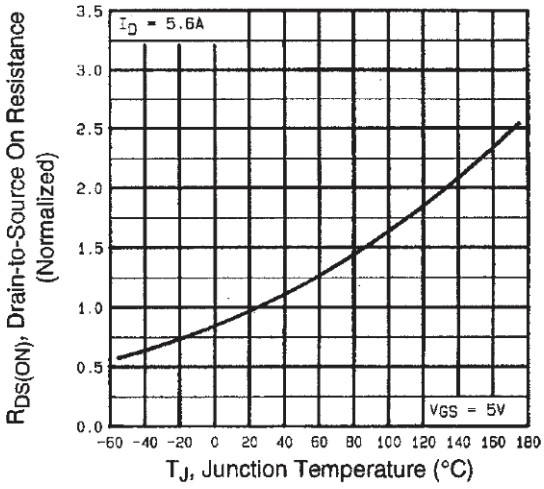


Fig. 4 - Normalized On-Resistance vs. Temperature

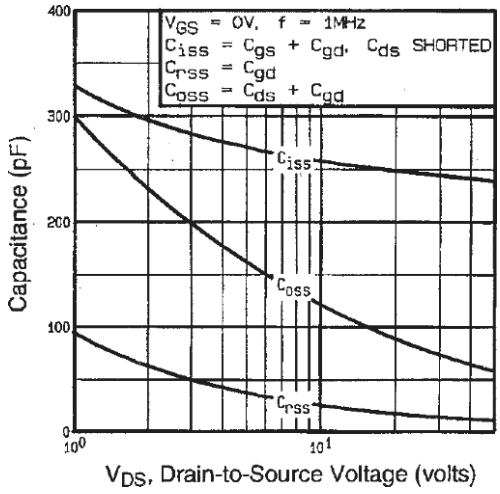


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

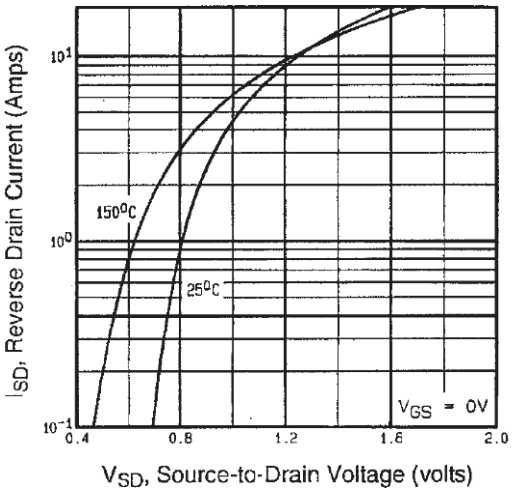


Fig. 7 - Typical Source-Drain Diode Forward Voltage

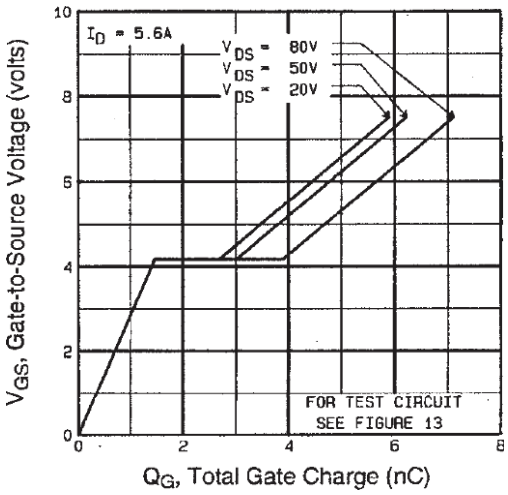


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

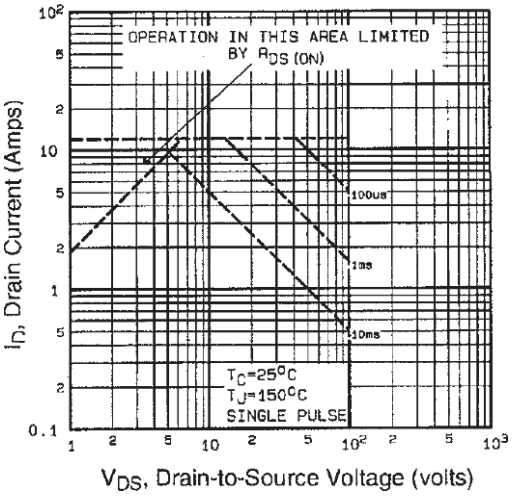


Fig. 8 - Maximum Safe Operating Area

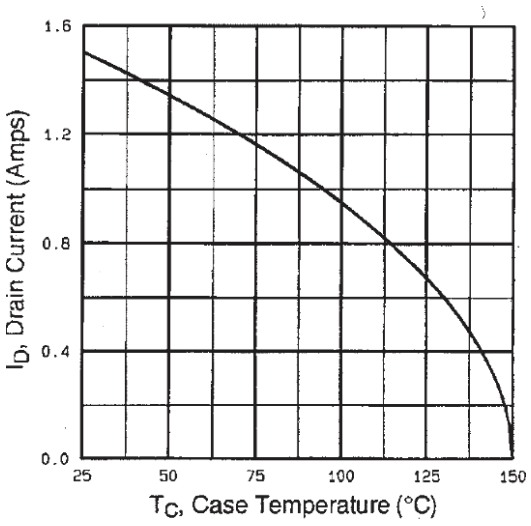


Fig. 9 - Maximum Drain Current vs. Case Temperature

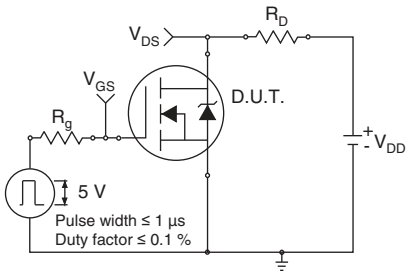


Fig. 10a - Switching Time Test Circuit

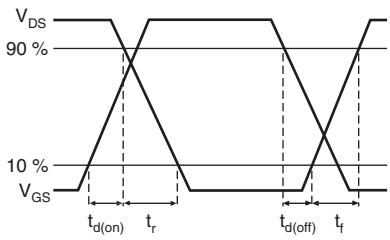


Fig. 10b - Switching Time Waveforms

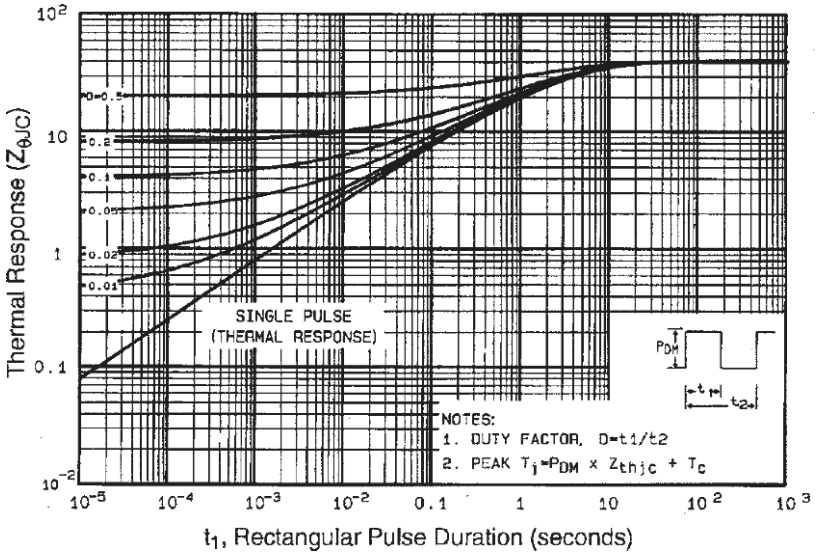


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

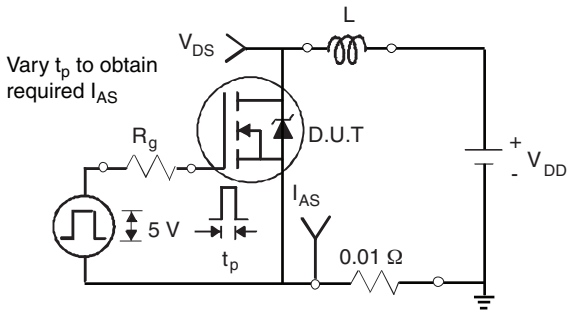


Fig. 12a - Unclamped Inductive Test Circuit

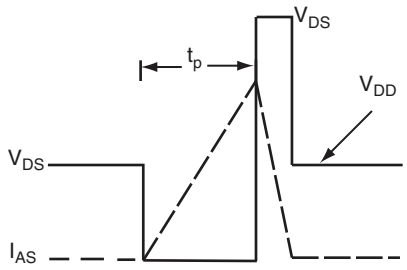


Fig. 12b - Unclamped Inductive Waveforms

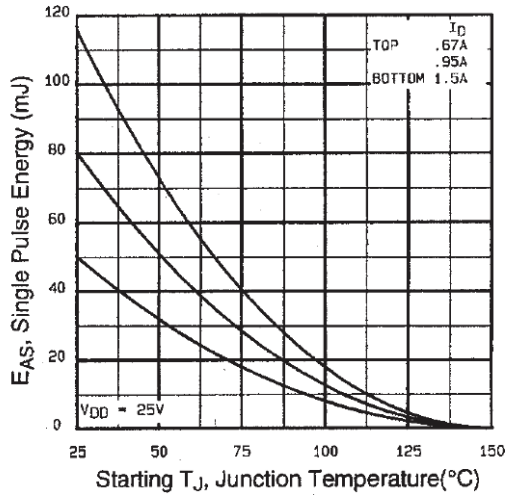


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

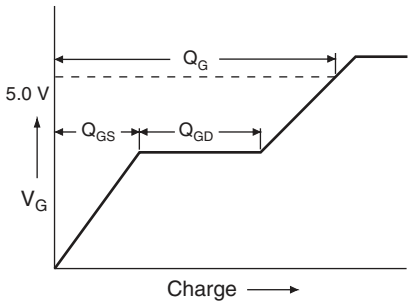


Fig. 13a - Basic Gate Charge Waveform

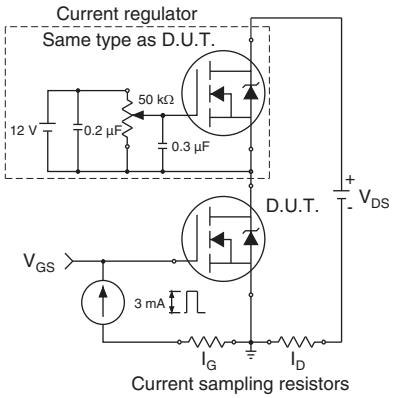
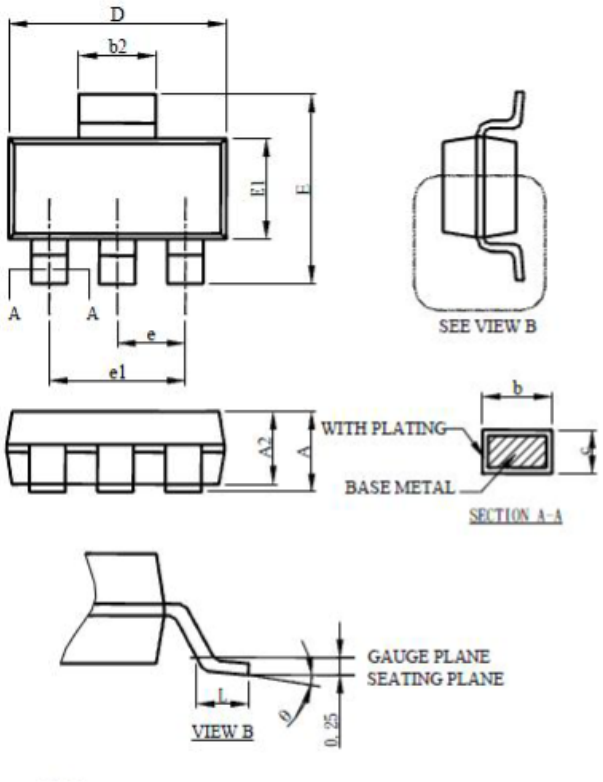


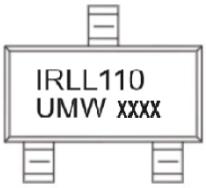
Fig. 13b - Gate Charge Test Circuit

PACKAGE OUTLINE DIMENSIONS



SYMBOL	SOT-223	
	MILLIMETERS	
	MIN.	MAX.
A		1.80
A1	0.02	0.10
A2	1.55	1.65
b	0.66	0.84
b2	2.90	3.10
c	0.23	0.33
D	6.30	6.70
E	6.70	7.30
E1	3.30	3.70
e	2.30 BSC	
e1	4.60 BSC	
L	0.90	
θ	0°	8°

Marking



Ordering information

Order code	Package	Baseqty	Deliverymode
UMW IRLL110TR	SOT-223	2500	Tape and reel