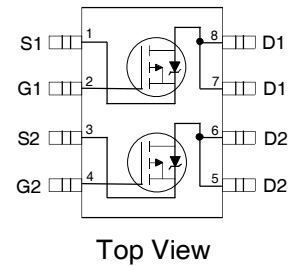


**Features**

- $V_{DS} (V) = -20V$
- $R_{DS(ON)} < 90m\Omega$  ( $V_{GS} = -4.5V$ )
- $R_{DS(ON)} < 140 m \Omega$  ( $V_{GS} = -2.7V$ )
- Generation V Technology
- Ultra Low On-Resistance
- Surface Mount
- Available in Tape & Reel
- Dynamic dv/dt Rating
- Fast Switching
- Lead-Free



**Description**

The SOP-8 has been modified through a customized leadframe for enhanced thermacharacteristics and multiple diode 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 infrared, 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, $V_{GS} @ -4.5V$	-4.7	A
$I_D @ T_A = 25^\circ C$	Continuous Drain Current, $V_{GS} @ -4.5V$	-4.3	
$I_D @ T_A = 70^\circ C$	Continuous Drain Current, $V_{GS} @ -4.5V$	-3.4	
$I_{DM}$	Pulsed Drain Current ①	-17	
$P_D @ T_A = 25^\circ C$	Power Dissipation	2.0	W
	Linear Derating Factor	0.016	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 ④		62.5	°C/W

**Electrical Characteristics @ T<sub>J</sub> = 25°C (unless otherwise specified)**

	Parameter	Min.	Typ.	Max.	Units	Conditions
V <sub>(BR)DSS</sub>	Drain-to-Source Breakdown Voltage	-20			V	V <sub>GS</sub> = 0V, I <sub>D</sub> = -250μA
ΔV <sub>(BR)DSS/ΔT<sub>J</sub></sub>	Breakdown Voltage Temp. Coefficient		-0.012		V/°C	Reference to 25°C, I <sub>D</sub> = -1mA
R <sub>DS(ON)</sub>	Static Drain-to-Source On-Resistance			90 140	mΩ	V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -2.2A ③ V <sub>GS</sub> = -2.7V, I <sub>D</sub> = -1.8A ③
V <sub>GS(th)</sub>	Gate Threshold Voltage	-0.70			V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA
g <sub>fs</sub>	Forward Transconductance	4.0			S	V <sub>DS</sub> = -16V, I <sub>D</sub> = -2.2A
I <sub>DSS</sub>	Drain-to-Source Leakage Current			-1.0 -25	μA	V <sub>DS</sub> = -16V, V <sub>GS</sub> = 0V V <sub>DS</sub> = -16V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 125°C
I <sub>GSS</sub>	Gate-to-Source Forward Leakage			-100	nA	V <sub>GS</sub> = -12V
	Gate-to-Source Reverse Leakage			100	nA	V <sub>GS</sub> = 12V
Q <sub>g</sub>	Total Gate Charge			22	nC	I <sub>D</sub> = -2.2A
Q <sub>gs</sub>	Gate-to-Source Charge			3.3	nC	V <sub>DS</sub> = -16V
Q <sub>gd</sub>	Gate-to-Drain ("Miller") Charge			9.0	nC	V <sub>GS</sub> = -4.5V, See Fig. 6 and 12 ③
t <sub>d(on)</sub>	Turn-On Delay Time		8.4		ns	V <sub>DD</sub> = -10V
t <sub>r</sub>	Rise Time		26		ns	I <sub>D</sub> = -2.2A
t <sub>d(off)</sub>	Turn-Off Delay Time		51		ns	R <sub>G</sub> = 6.0Ω
t <sub>f</sub>	Fall Time		33		ns	R <sub>G</sub> = 4.5Ω, See Fig. 10 ③
L <sub>D</sub>	Internal Drain Inductance		4.0		nH	Between lead tip and center of die contact
L <sub>S</sub>	Internal Source Inductance		6.0		nH	
C <sub>iss</sub>	Input Capacitance		610		pF	V <sub>GS</sub> = 0V
C <sub>oss</sub>	Output Capacitance		310		pF	V <sub>DS</sub> = -15V
C <sub>rss</sub>	Reverse Transfer Capacitance		170		pF	f = 1.0MHz, See Fig. 5

**Source-Drain Ratings and Characteristics**

	Parameter	Min.	Typ.	Max.	Units	Conditions
I <sub>S</sub>	Continuous Source Current (Body Diode)			-2.5	A	MOSFET symbol showing the integral reverse p-n junction diode.
I <sub>SM</sub>	Pulsed Source Current (Body Diode) ①			-17	A	
V <sub>SD</sub>	Diode Forward Voltage			-1.0	V	T <sub>J</sub> = 25°C, I <sub>S</sub> = -1.8A, V <sub>GS</sub> = 0V ②
t <sub>rr</sub>	Reverse Recovery Time		56	84	ns	T <sub>J</sub> = 25°C, I <sub>F</sub> = -2.2A
Q <sub>rr</sub>	Reverse Recovery Charge		71	110	nC	di/dt = 100A/μs ③
t <sub>on</sub>	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by L <sub>S</sub> +L <sub>D</sub> )				

**Notes:**

- ① Repetitive rating; pulse width limited by max. junction temperature. ( See fig. 11 )
- ② I<sub>SD</sub> ≤ -2.2A, di/dt ≤ -50A/μs, V<sub>DD</sub> ≤ V<sub>(BR)DSS</sub>, T<sub>J</sub> ≤ 150°C
- ③ Pulse width ≤ 300μs; duty cycle ≤ 2%.

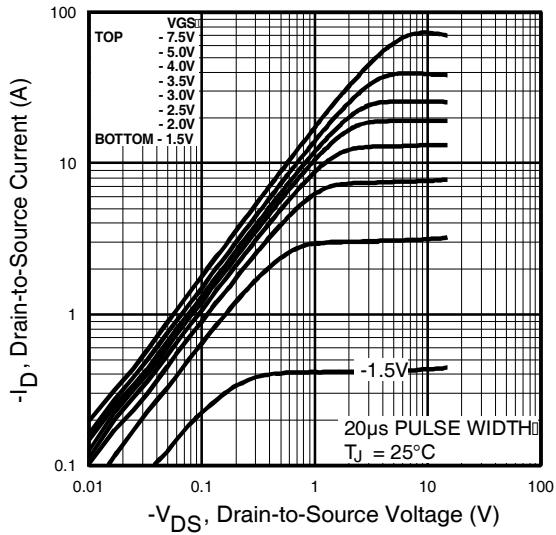


Fig 1. Typical Output Characteristics

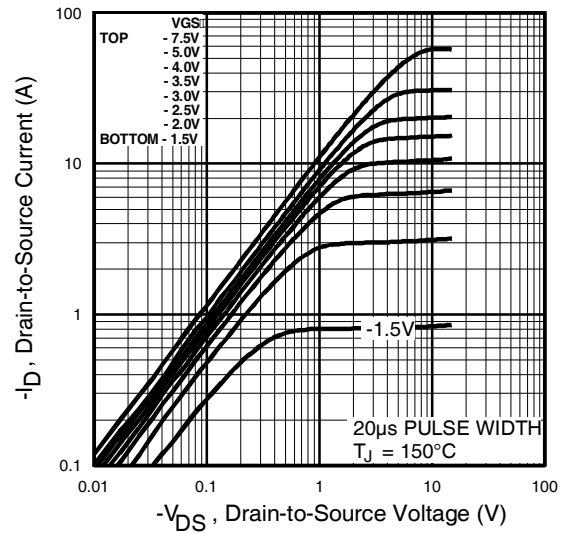


Fig 2. Typical Output Characteristics

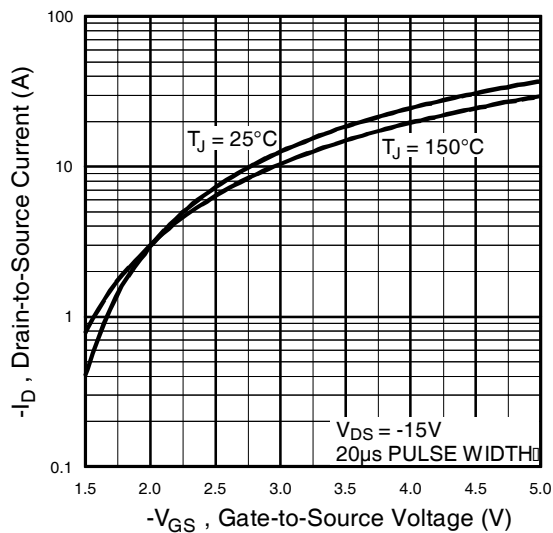


Fig 3. Typical Transfer Characteristics

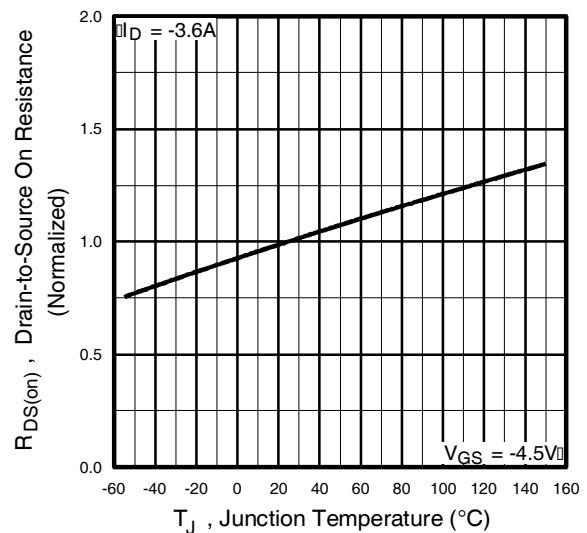
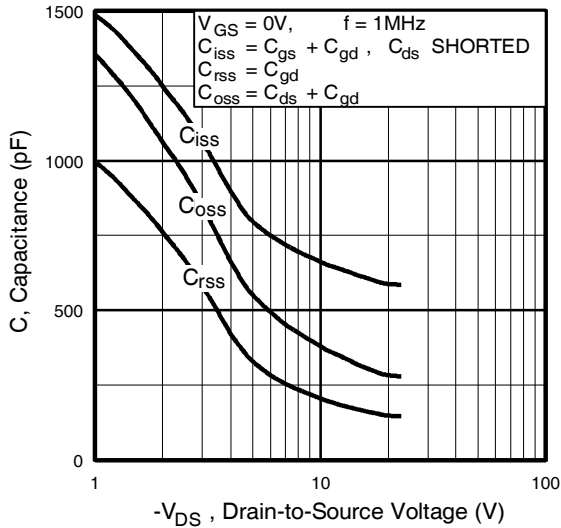
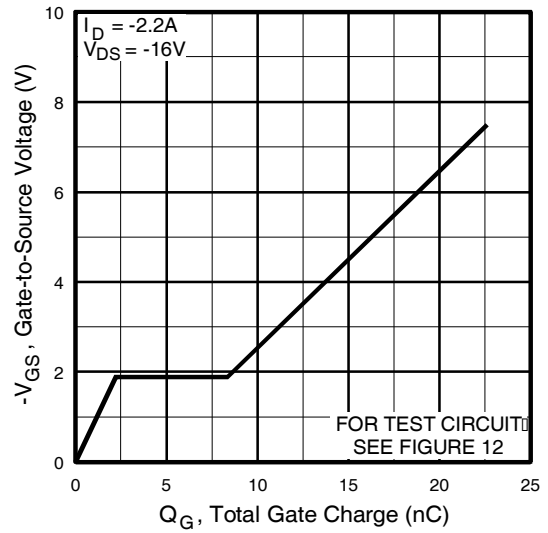


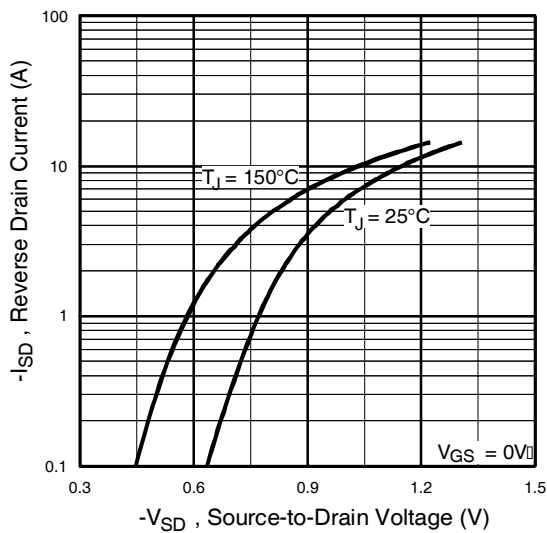
Fig 4. Normalized On-Resistance Vs. Temperature



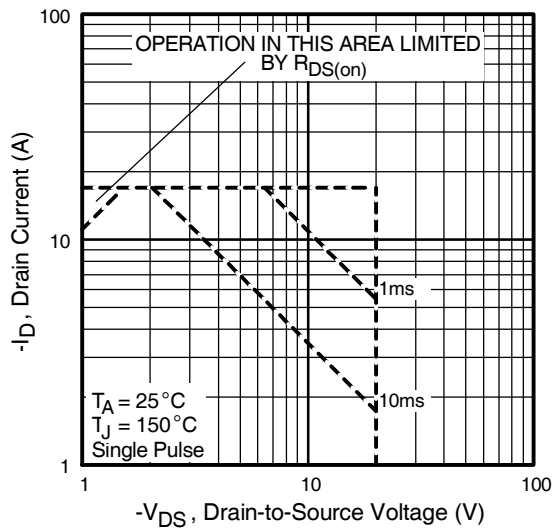
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



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



**Fig 7.** Typical Source-Drain Diode Forward Voltage



**Fig 8.** Maximum Safe Operating Area

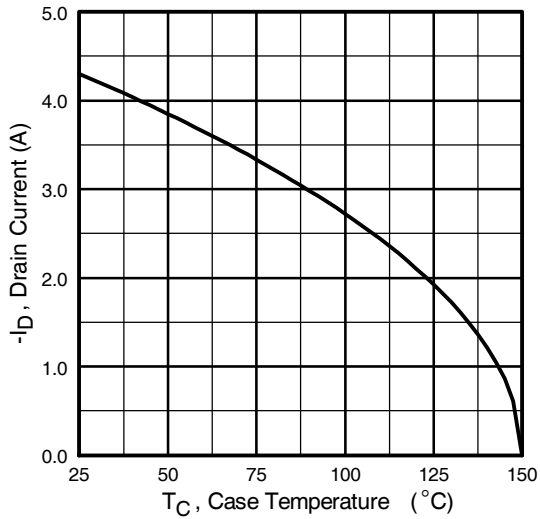


Fig 9. Maximum Drain Current Vs. Ambient Temperature

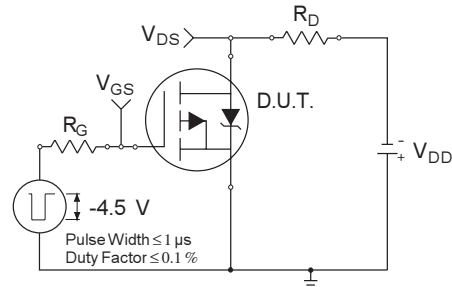


Fig 10a. Switching Time Test Circuit

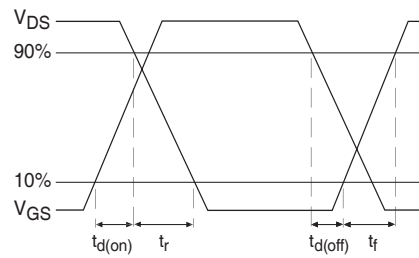


Fig 10b. Switching Time Waveforms

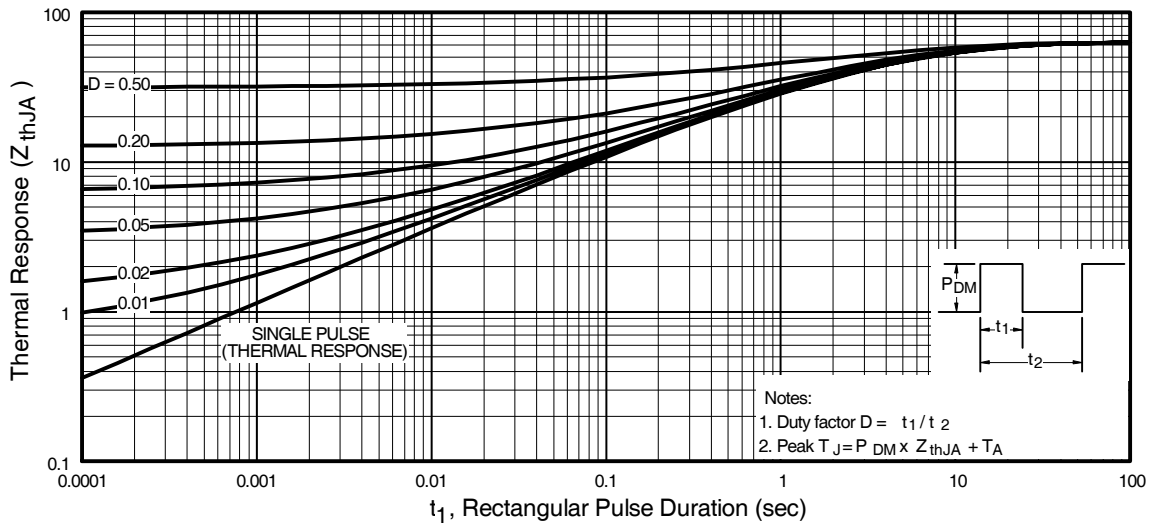


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

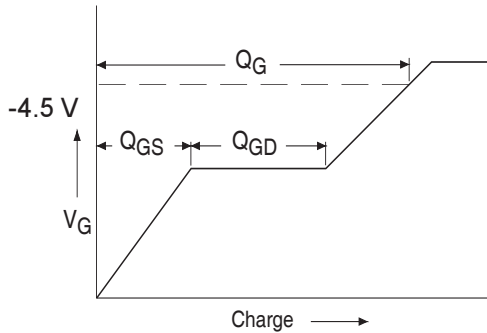


Fig 12a. Basic Gate Charge Waveform

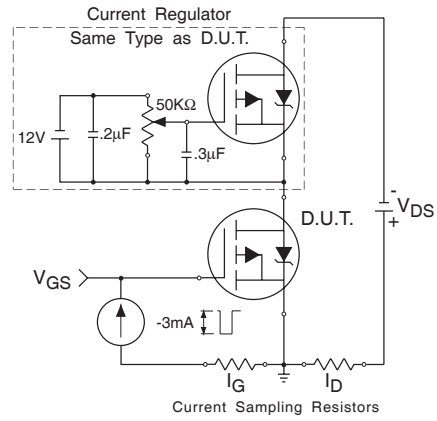
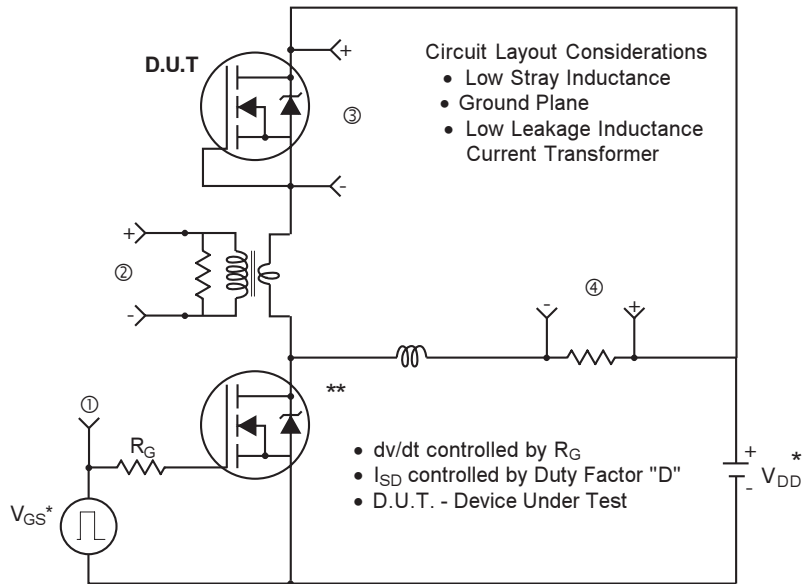


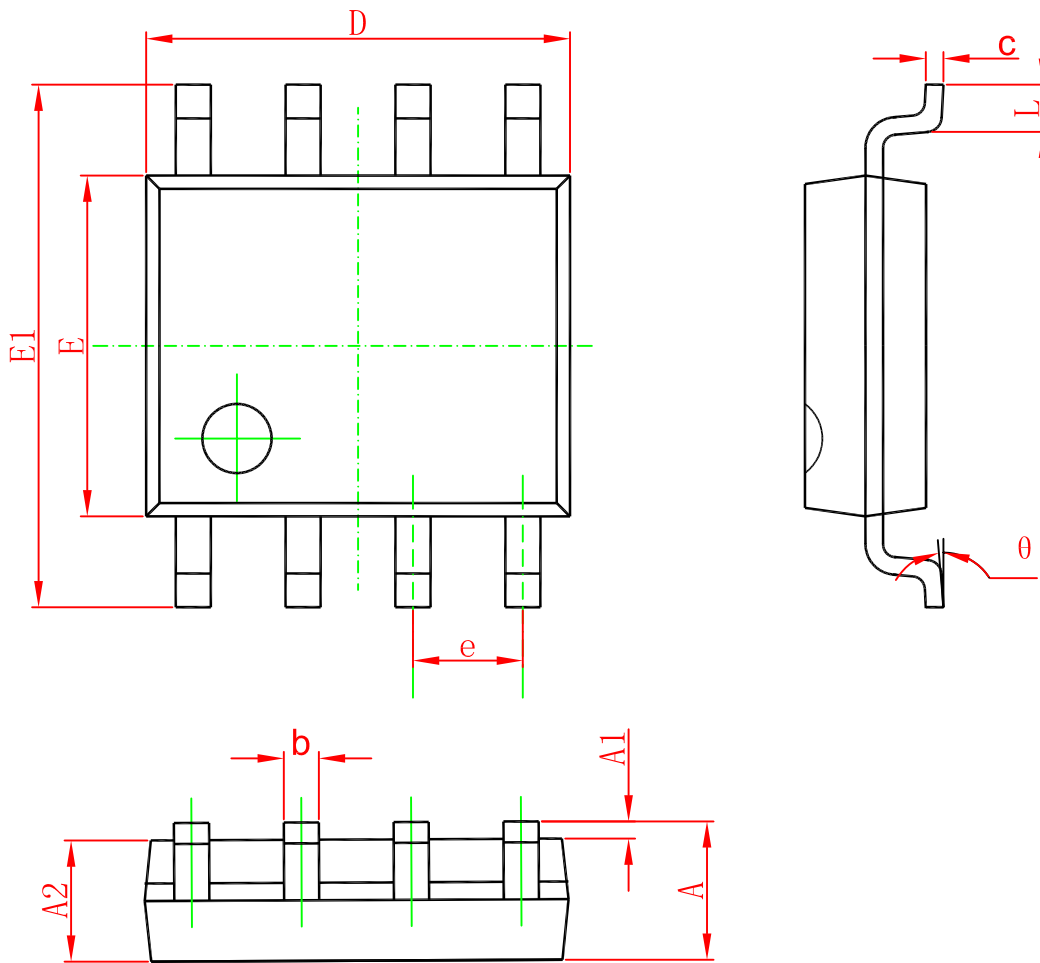
Fig 12b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit



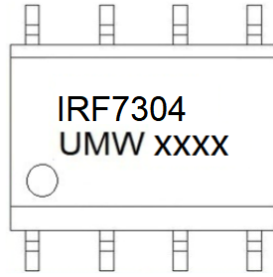
\* Reverse Polarity for P-Channel  
\*\* Use P-Channel Driver for P-Channel Measurements

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 IRF7304TR	SOP-8	3000	Tape and reel