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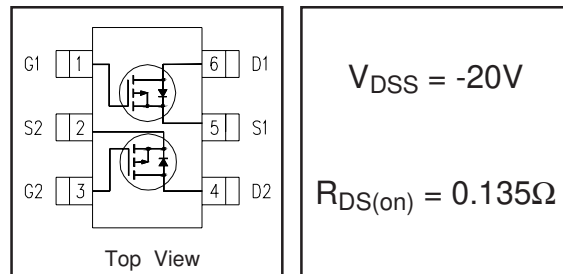
Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



# IRF5850

HEXFET® Power MOSFET

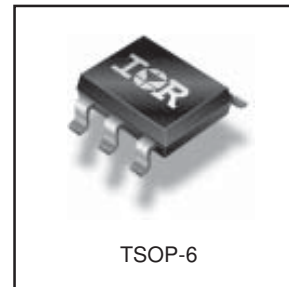
- Ultra Low On-Resistance
- Dual P-Channel MOSFET
- Surface Mount
- Available in Tape & Reel
- Low Gate Charge



## Description

These P-channel MOSFETs from International Rectifier utilize advanced processing techniques to achieve the extremely low on-resistance per silicon area. This benefit provides the designer with an extremely efficient device for use in battery and load management applications.

This Dual TSOP-6 package is ideal for applications where printed circuit board space is at a premium and where maximum functionality is required. With two die per package, the IRF5850 can provide the functionality of two SOT-23 packages in a smaller footprint. Its unique thermal design and  $R_{DS(on)}$  reduction enables an increase in current-handling capability.



## Absolute Maximum Ratings

	Parameter	Max.	Units
$V_{DS}$	Drain- Source Voltage	-20	V
$I_D @ T_A = 25^\circ C$	Continuous Drain Current, $V_{GS} @ -4.5V$	-2.2	A
$I_D @ T_A = 70^\circ C$	Continuous Drain Current, $V_{GS} @ -4.5V$	-1.8	
$I_{DM}$	Pulsed Drain Current ①	-9.0	
$P_D @ T_A = 25^\circ C$	Power Dissipation	0.96	W
$P_D @ T_A = 70^\circ C$	Power Dissipation	0.62	
	Linear Derating Factor	7.7	mW/°C
$V_{GS}$	Gate-to-Source Voltage	$\pm 12$	V
$T_J, T_{STG}$	Junction and Storage Temperature Range	-55 to + 150	°C

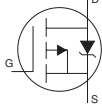
## Thermal Resistance

	Parameter	Max.	Units
$R_{\theta JA}$	Maximum Junction-to-Ambient③	130	°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	—	0.011	—	V/°C	Reference to $25^\circ\text{C}$ , $I_D = -1\text{mA}$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	0.135	$\Omega$	$V_{GS} = -4.5V, I_D = -2.2A$ ②
		—	—	0.220		$V_{GS} = -2.5V, I_D = -1.9A$ ②
$V_{GS(th)}$	Gate Threshold Voltage	-0.45	—	-1.2	V	$V_{DS} = V_{GS}, I_D = -250\mu A$
$g_{fs}$	Forward Transconductance	3.5	—	—	S	$V_{DS} = -10V, I_D = -2.2A$
$I_{DSS}$	Drain-to-Source Leakage Current	—	—	-1.0	$\mu A$	$V_{DS} = -16V, V_{GS} = 0V$
		—	—	-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	—	3.6	5.4	nC	$I_D = -2.2A$
$Q_{gs}$	Gate-to-Source Charge	—	0.66	—		$V_{DS} = -10V$
$Q_{gd}$	Gate-to-Drain ("Miller") Charge	—	0.83	—		$V_{GS} = -4.5V$ ②
$t_{d(on)}$	Turn-On Delay Time	—	8.3	—	ns	$V_{DD} = -10V$ ②
$t_r$	Rise Time	—	14	—		$I_D = -1.0A$
$t_{d(off)}$	Turn-Off Delay Time	—	31	—		$R_G = 6.0\Omega$
$t_f$	Fall Time	—	28	—		$V_{GS} = -4.5V$
$C_{iss}$	Input Capacitance	—	320	—	pF	$V_{GS} = 0V$
$C_{oss}$	Output Capacitance	—	56	—		$V_{DS} = -15V$
$C_{rss}$	Reverse Transfer Capacitance	—	40	—		$f = 1.0\text{kHz}$

## Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
$I_S$	Continuous Source Current (Body Diode)	—	—	-0.96	A	MOSFET symbol showing the integral reverse p-n junction diode. 
$I_{SM}$	Pulsed Source Current (Body Diode) ①	—	—	-9.0		
$V_{SD}$	Diode Forward Voltage	—	—	-1.2	V	$T_J = 25^\circ\text{C}, I_S = -0.96A, V_{GS} = 0V$ ②
$t_{rr}$	Reverse Recovery Time	—	23	35	ns	$T_J = 25^\circ\text{C}, I_F = -0.96A$
$Q_{rr}$	Reverse Recovery Charge	—	7.7	12	nC	$di/dt = -100A/\mu s$ ②

### Notes:

① Repetitive rating; pulse width limited by max. junction temperature.

③ Surface mounted on FR-4 board,  $t \leq 5\text{sec}$ .

② Pulse width  $\leq 400\mu s$ ; duty cycle  $\leq 2\%$ .

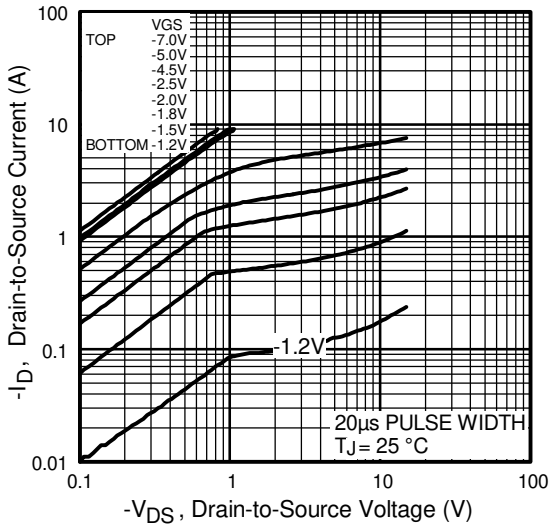


Fig 1. Typical Output Characteristics

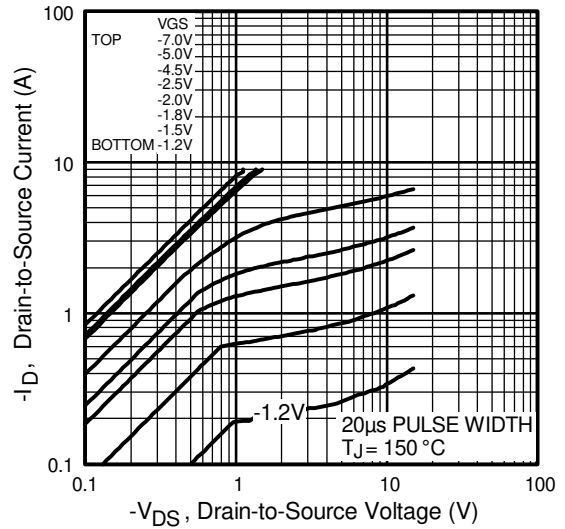


Fig 2. Typical Output Characteristics

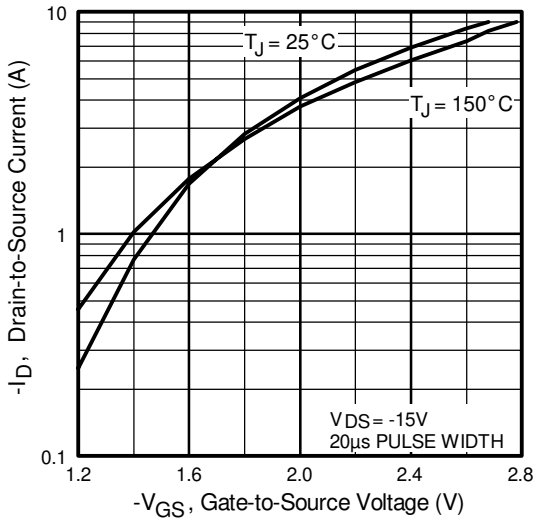


Fig 3. Typical Transfer Characteristics

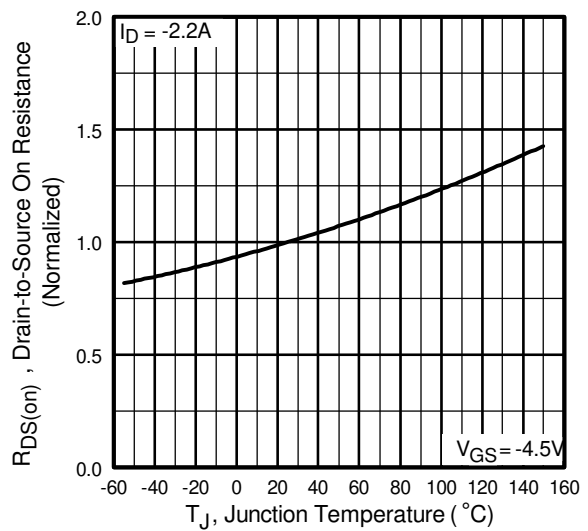
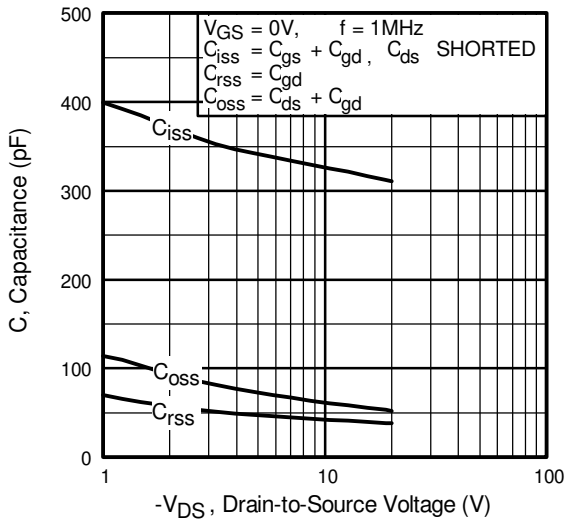
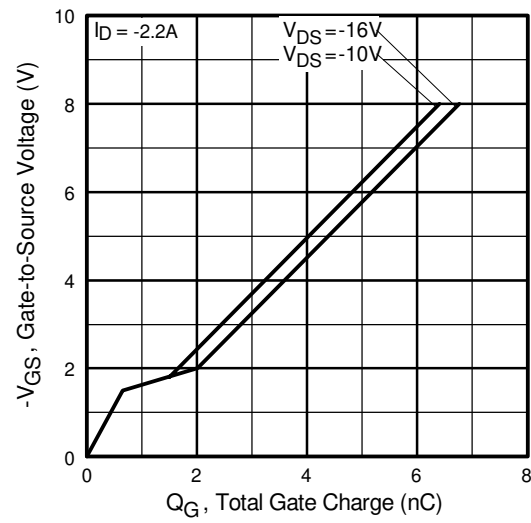


Fig 4. Normalized On-Resistance Vs. Temperature

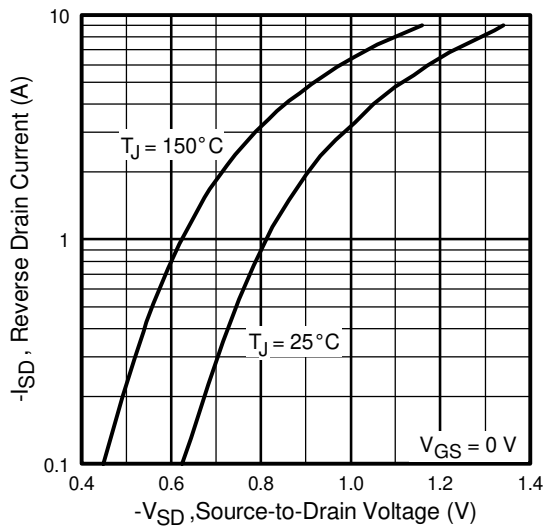




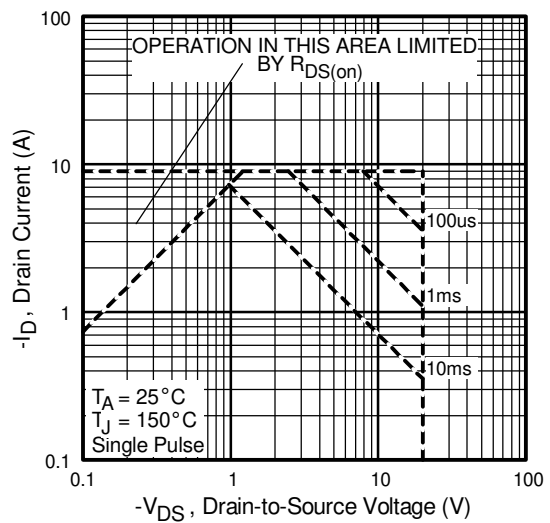
**Fig 5.** Typical Capacitance Vs. Drain-to-Source Voltage



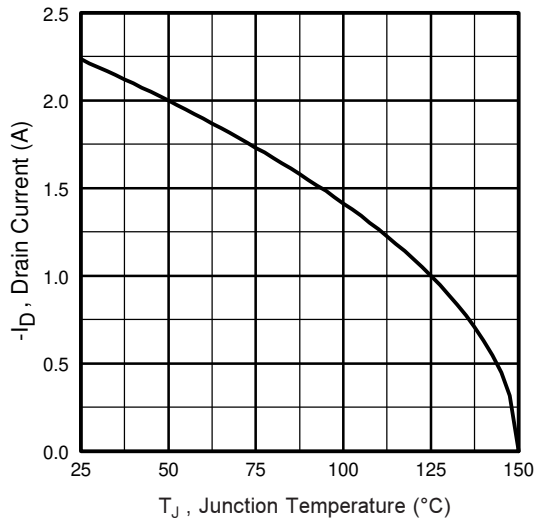
**Fig 6.** Typical Gate Charge Vs. Gate-to-Source Voltage



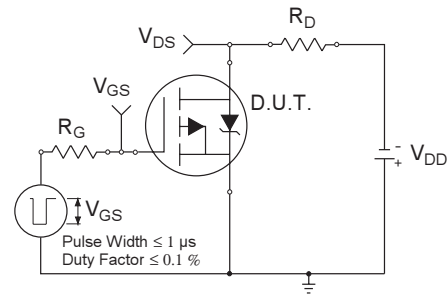
**Fig 7.** Typical Source-Drain Diode Forward Voltage



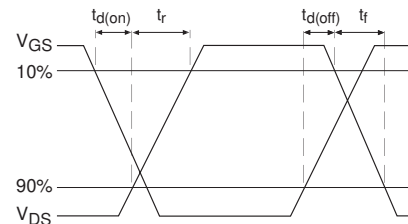
**Fig 8.** Maximum Safe Operating Area



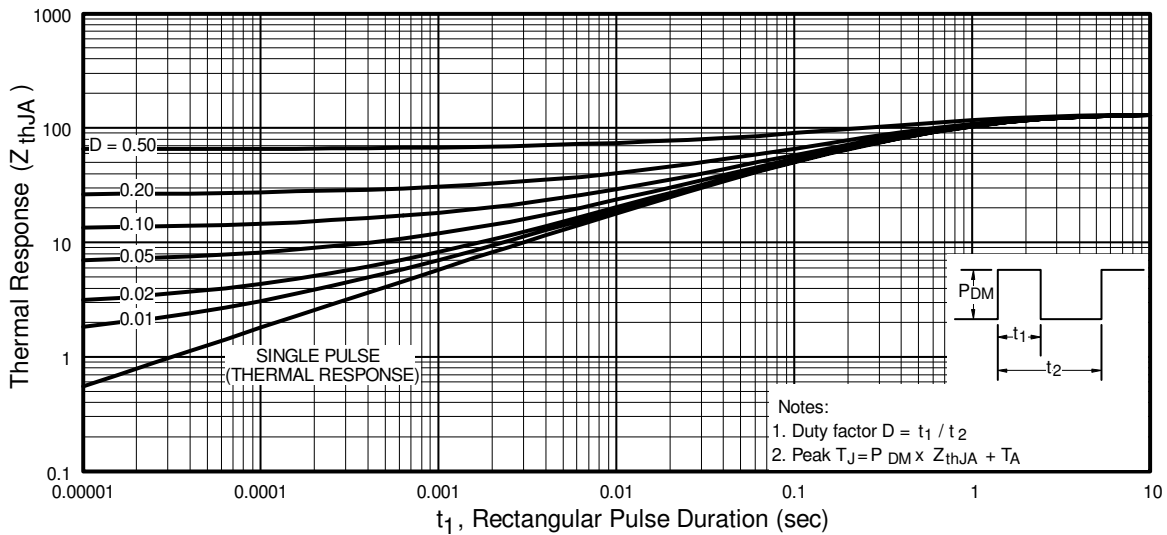
**Fig 9.** Maximum Drain Current Vs. Junction Temperature



**Fig 10a.** Switching Time Test Circuit



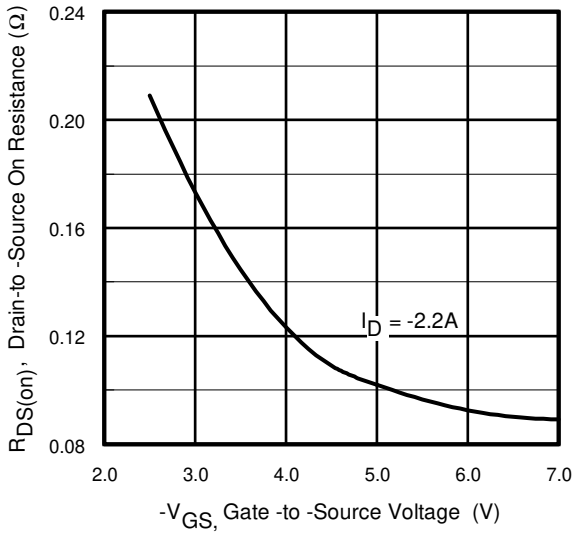
**Fig 10b.** Switching Time Waveforms



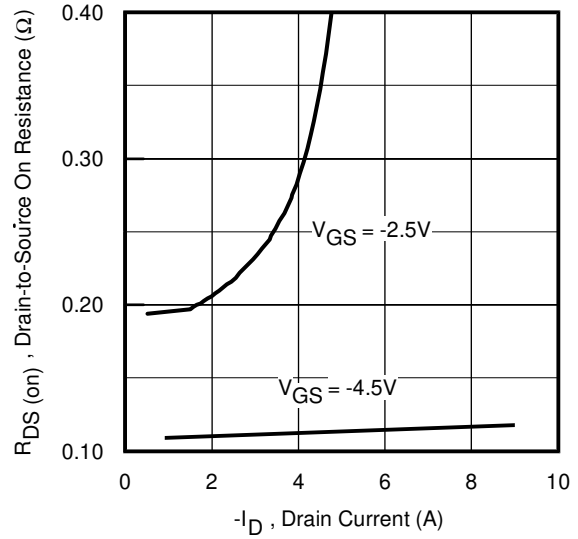
**Fig 10.** Typical Effective Transient Thermal Impedance, Junction-to-Ambient

# IRF5850

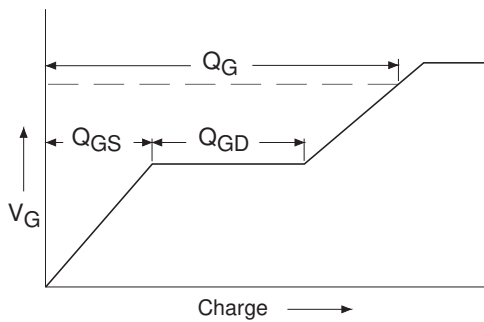
International  
**IR** Rectifier



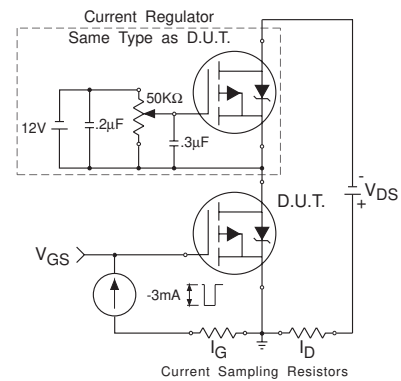
**Fig 11.** Typical On-Resistance Vs. Gate Voltage



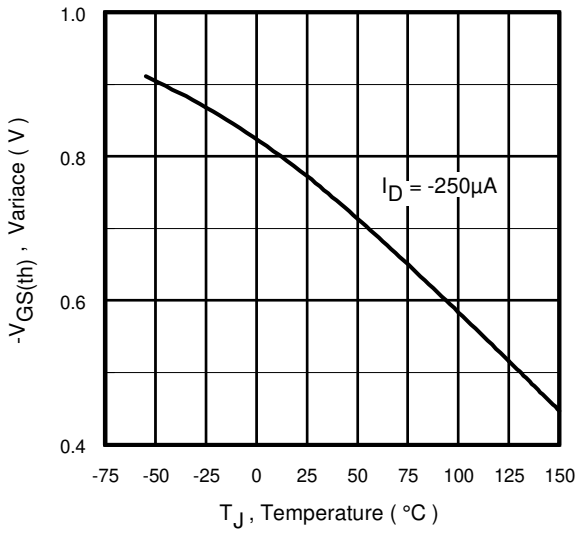
**Fig 12.** Typical On-Resistance Vs. Drain Current



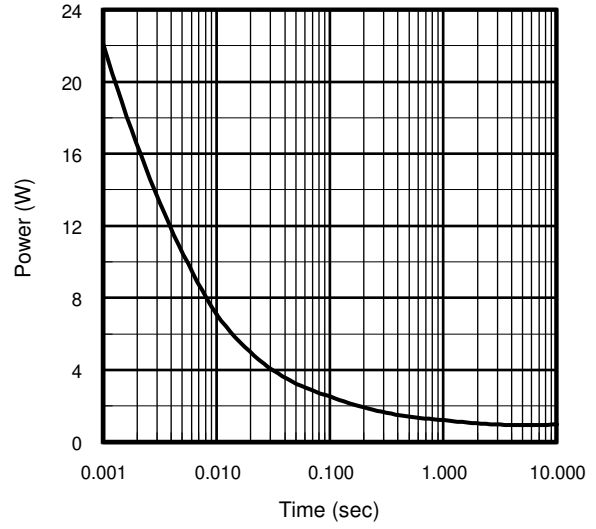
**Fig 13a.** Basic Gate Charge Waveform



**Fig 13b.** Gate Charge Test Circuit



**Fig 14.** Threshold Voltage Vs. Temperature

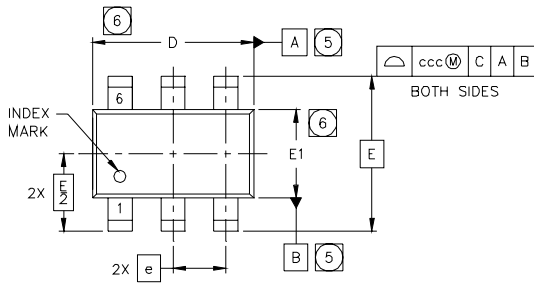


**Fig 15.** Typical Power Vs. Time

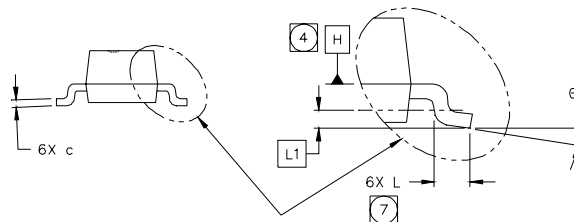
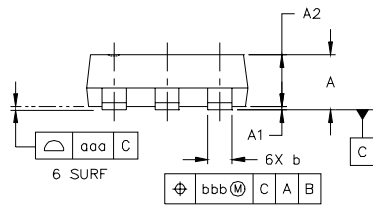


# IRF5850

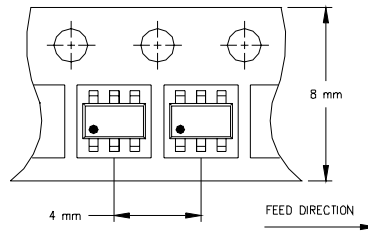
## TSOP-6 Package Outline



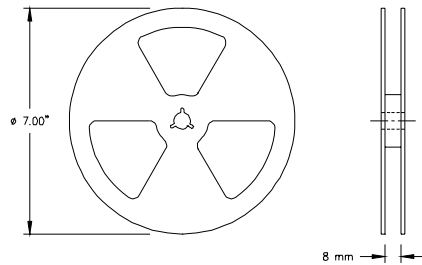
SYMBOL	MO-193AA DIMENSIONS					
	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	---	---	1.10	---	---	.0433
A1	0.01	---	0.10	.0004	---	.0039
A2	0.80	0.90	1.00	.0315	.0354	.0393
b	0.25	---	0.50	.0099	---	.0196
c	0.10	---	0.26	.004	---	.010
D	2.90	3.00	3.10	.115	.118	.122
E	2.75 BSC			.108 BSC		
E1	1.30	1.50	1.70	.052	.059	.066
e	1.00 BSC			.039 BSC		
L	0.20	0.40	0.60	.0079	.0157	.0236
L1	0.30 BSC			.0118 BSC		
Ø	0"	---	8"	0"	---	8"
aaa	0.10			.004		
bbb	0.15			.006		
ccc	0.25			.010		



## TSOP-6 Tape & Reel Information



NOTES:  
1. OUTLINE CONFORMS TO EIA-481 & EIA-541.



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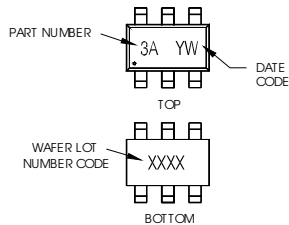
International  
**IR** Rectifier  
**TSOP-6 Part Marking Information**

# IRF5850

Notes: This part marking information applies to devices produced before 02/26/2001

EXAMPLE: THIS IS AN S13443DV

WW = (1-26) IF PRECEDED BY LAST DIGIT OF CALENDAR YEAR



YEAR	Y	WORK WEEK	W
2001	1	01	A
2002	2	02	B
2003	3	03	C
2004	4	04	D
2005	5		
1996	6		
1997	7		
1998	8		
1999	9		
2000	0	24	X
		25	Y
		26	Z

PART NUMBER CODE REFERENCE:

- 3A = S13443DV
- 3B = IRF5800
- 3C = IRF5850
- 3D = IRF5851
- 3E = IRF5852
- 3I = IRF5805
- 3J = IRF5806

DATE CODE EXAMPLES:

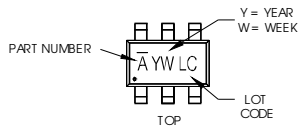
- YWW = 9603 = 6C
- YWW = 9632 = FF

WW = (27-52) IF PRECEDED BY A LETTER

YEAR	Y	WORK WEEK	W
2001	A	27	A
2002	B	28	B
2003	C	29	C
2004	D	30	D
2005	E		
1996	F		
1997	G		
1998	H		
1999	J		
2000	K	50	X
		51	Y
		52	Z

Notes: This part marking information applies to devices produced after 02/26/2001

W = (1-26) IF PRECEDED BY LAST DIGIT OF CALENDAR YEAR



YEAR	Y	WORK WEEK	W
2001	1	01	A
2002	2	02	B
2003	3	03	C
2004	4	04	D
2005	5		
1996	6		
1997	7		
1998	8		
1999	9		
2000	0	24	X
		25	Y
		26	Z

PART NUMBER CODE REFERENCE:

- A = S13443DV
- B = IRF5800
- C = IRF5850
- D = IRF5851
- E = IRF5852
- T = IRF5805
- J = IRF5806
- K = IRF5810
- L = IRF5804
- M = IRF5803
- N = IRF5820

W = (27-52) IF PRECEDED BY A LETTER

YEAR	Y	WORK WEEK	W
2001	A	27	A
2002	B	28	B
2003	C	29	C
2004	D	30	D
2005	E		
1996	F		
1997	G		
1998	H		
1999	J		
2000	K	50	X
		51	Y
		52	Z

International  
**IR** Rectifier

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*Data and specifications subject to change without notice. 1/03*