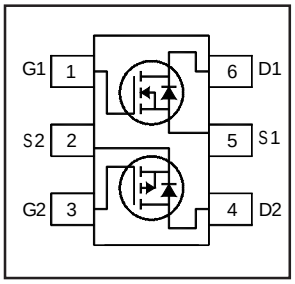
International
IOR Rectifier

PD-93998B

IRF5851

HEXFET® Power MOSFET

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

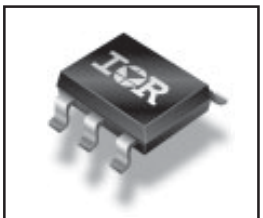


	N-Ch	P-Ch
V_{DSS}	20V	-20V
$R_{DS(on)}$	0.090Ω	0.135Ω

Description

These N and 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 IRF5851 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.



TSOP-6

Absolute Maximum Ratings

	Parameter	Max.		Units
		N-Channel	P-Channel	
V_{DS}	Drain-to-Source Voltage	20	-20	A
I_D @ T_A = 25°C	Continuous Drain Current, V_{GS} @ 10V	2.7	-2.2	
I_D @ T_A = 70°C	Continuous Drain Current, V_{GS} @ 10V	2.2	-1.7	
I_{DM}	Pulsed Drain Current ①	11	-9.0	
P_D @T_A = 25°C	Power Dissipation ③	0.96		W
P_D @T_A = 70°C	Power Dissipation ③	0.62		
	Linear Derating Factor	7.7		mW/°C
V_{GS}	Gate-to-Source Voltage	± 12		V
T_J, T_{STG}	Junction and Storage Temperature Range	-55 to + 150		°C

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JA}$	Maximum Junction-to-Ambient ③	——	130	°C/W

09/02/02

Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

	Parameter		Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	N-Ch	20	—	—	V	V_{GS} = 0V, I_D = 250μA
		P-Ch	-20	—	—		V_{GS} = 0V, I_D = -250μA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	N-Ch	—	0.016	—	V/°C	Reference to 25°C, I_D = 1mA
		P-Ch	—	-0.011	—		Reference to 25°C, I_D = -1mA
$R_{DS(ON)}$	Static Drain-to-Source On-Resistance	N-Ch	—	—	0.090	Ω	V_{GS} = 4.5V, I_D = 2.7A ②
			—	—	0.120		V_{GS} = 2.5V, I_D = 2.2A ②
		P-Ch	—	—	0.135		V_{GS} = -4.5V, I_D = -2.2A ②
			—	—	0.220		V_{GS} = -2.5V, I_D = -1.7A ②
$V_{GS(th)}$	Gate Threshold Voltage	N-Ch	0.60	—	1.25	V	V_{DS} = V_{GS}, I_D = 250μA
		P-Ch	-0.45	—	-1.2		V_{DS} = V_{GS}, I_D = -250μA
g_{fs}	Forward Transconductance	N-Ch	5.2	—	—	S	V_{DS} = 10V, I_D = 2.7A ②
		P-Ch	3.5	—	—		V_{DS} = -10V, I_D = -2.2A ②
I_{DSS}	Drain-to-Source Leakage Current	N-Ch	—	—	1.0	μA	V_{DS} = 16 V, V_{GS} = 0V
		P-Ch	—	—	-1.0		V_{DS} = -16V, V_{GS} = 0V
		N-Ch	—	—	25		V_{DS} = 16 V, V_{GS} = 0V, T_J = 70°C
		P-Ch	—	—	-25		V_{DS} = -16V, V_{GS} = 0V, T_J = 70°C
I_{GSS}	Gate-to-Source Forward Leakage	N-P	—	—	±100		V_{GS} = ± 12V
Q_g	Total Gate Charge	N-Ch	—	4.0	6.0	nC	N-Channel I_D = 2.7A, V_{DS} = 10V, V_{GS} = 4.5V ② P-Channel I_D = -2.2A, V_{DS} = -10V, V_{GS} = -4.5V
		P-Ch	—	3.6	5.4		
Q_{gs}	Gate-to-Source Charge	N-Ch	—	0.95	—		
		P-Ch	—	0.66	—		
Q_{gd}	Gate-to-Drain ("Miller") Charge	N-Ch	—	0.83	—		
		P-Ch	—	5.7	—		
$t_{d(on)}$	Turn-On Delay Time	N-Ch	—	6.6	—	ns	N-Channel V_{DD} = 10V, I_D = 1.0A, R_G = 6.2Ω, V_{GS} = 4.5V ② P-Channel V_{DD} = -10V, I_D = -1.0A, R_G = 6.0Ω, V_{GS} = -4.5V
		P-Ch	—	8.3	—		
t_r	Rise Time	N-Ch	—	1.2	—		
		P-Ch	—	14	—		
$t_{d(off)}$	Turn-Off Delay Time	N-Ch	—	15	—		
		P-Ch	—	31	—		
t_f	Fall Time	N-Ch	—	2.4	—		
		P-Ch	—	28	—		
C_{iss}	Input Capacitance	N-Ch	—	400	—	pF	N-Channel V_{GS} = 0V, V_{DS} = 15V, f = 1.0MHz P-Channel V_{GS} = 0V, V_{DS} = -15V, f = 1.0MHz
		P-Ch	—	320	—		
C_{oss}	Output Capacitance	N-Ch	—	48	—		
		P-Ch	—	56	—		
C_{rss}	Reverse Transfer Capacitance	N-Ch	—	32	—		
		P-Ch	—	40	—		

Source-Drain Ratings and Characteristics

	Parameter		Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	N-Ch	—	—	0.96	A	
		P-Ch	—	—	-0.96		
I_{SM}	Pulsed Source Current (Body Diode) ①	N-Ch	—	—	11		
		P-Ch	—	—	-9.0		
V_{SD}	Diode Forward Voltage	N-Ch	—	—	1.2	V	T_J = 25°C, I_S = 0.96A, V_{GS} = 0V ②
		P-Ch	—	—	-1.2		T_J = 25°C, I_S = -0.96A, V_{GS} = 0V ②
t_{rr}	Reverse Recovery Time	N-Ch	—	25	38	ns	N-Channel T_J = 25°C, I_F = 0.96A, di/dt = 100A/μs ② P-Channel T_J = 25°C, I_F = -0.96A, di/dt = -100A/μs
		P-Ch	—	23	35		
Q_{rr}	Reverse Recovery Charge	N-Ch	—	6.5	9.8	nC	
		P-Ch	—	7.7	12		

Notes:

① Repetitive rating; pulse width limited by max. junction temperature. (See fig. 10 & 26)

② Pulse width ≤ 400μs; duty cycle ≤ 2%.

③ Surface mounted on FR-4 board, t ≤ 10sec.

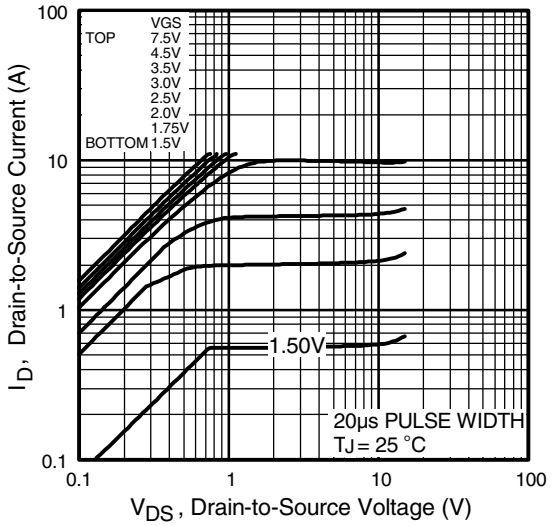


Fig 1. Typical Output Characteristics

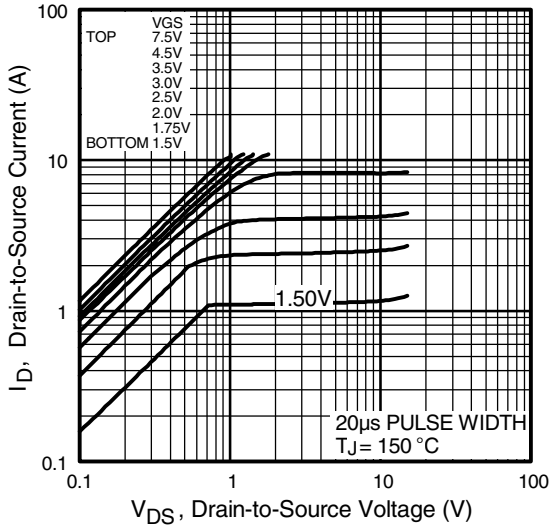


Fig 2. Typical Output Characteristics

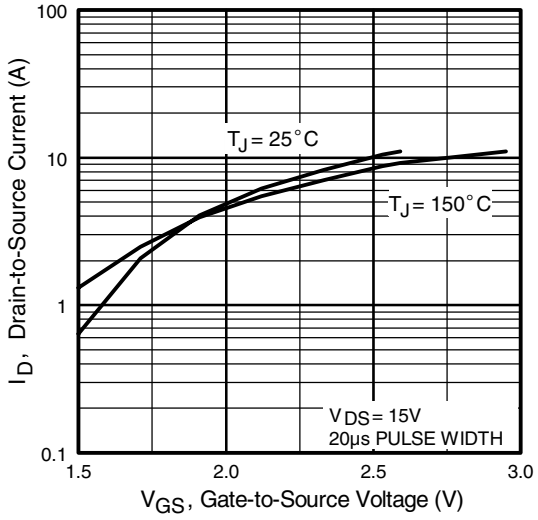


Fig 3. Typical Transfer Characteristics

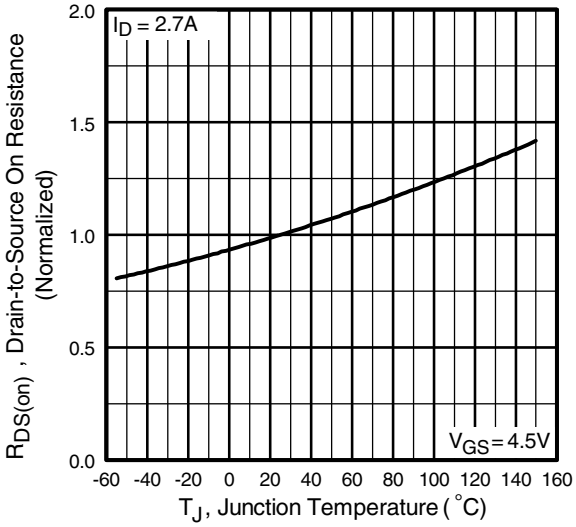


Fig 4. Normalized On-Resistance Vs. Temperature

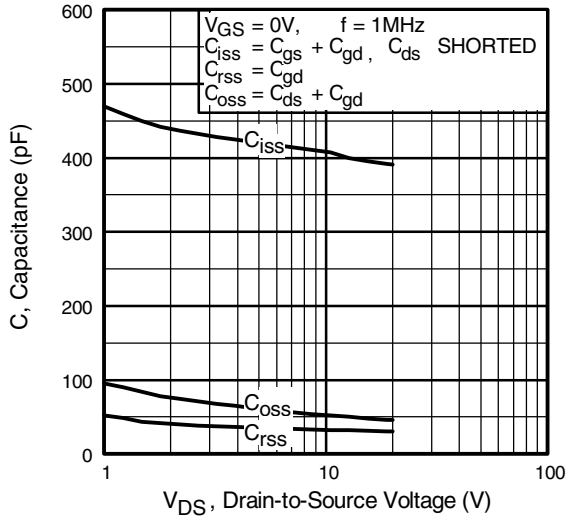


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

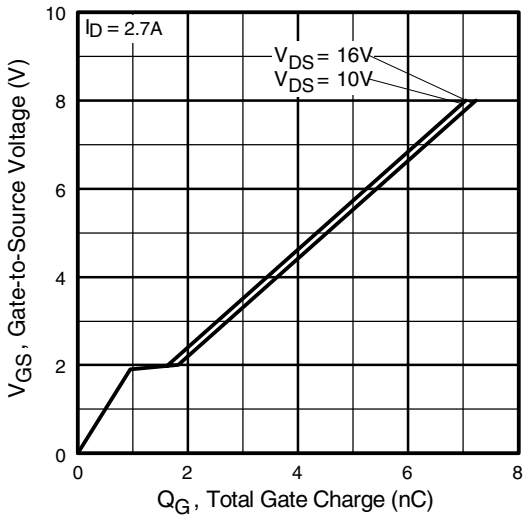


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

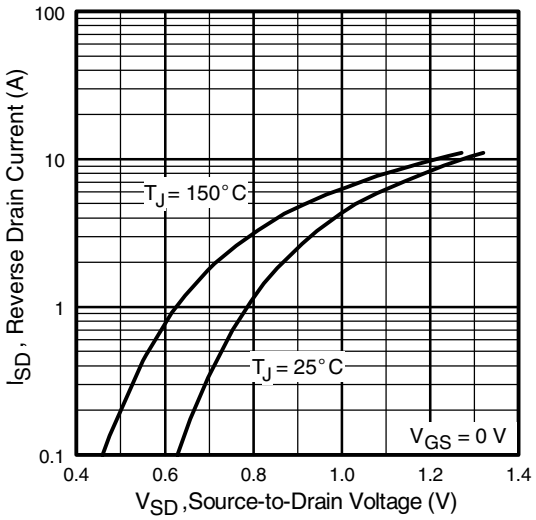


Fig 7. Typical Source-Drain Diode Forward Voltage

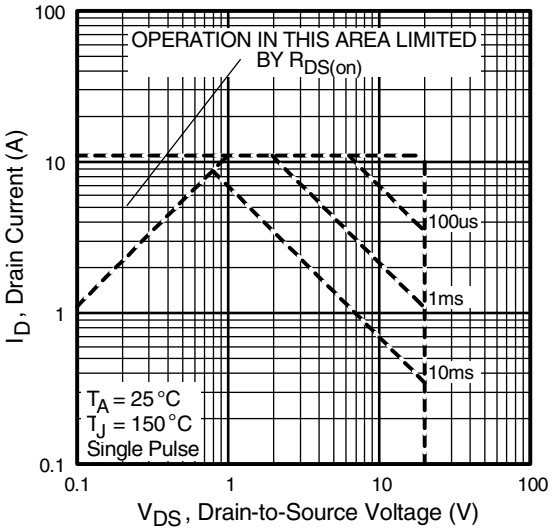


Fig 8. Maximum Safe Operating Area

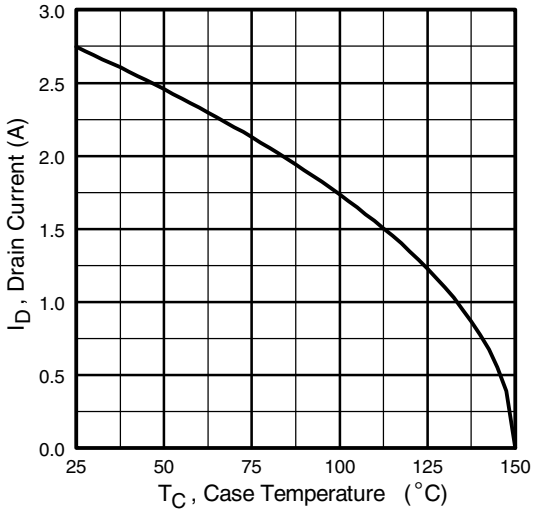


Fig 9. Maximum Drain Current Vs. Case Temperature

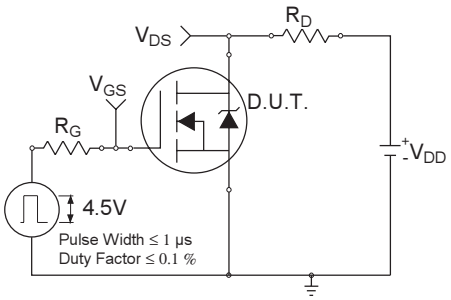


Fig 10a. Switching Time Test Circuit

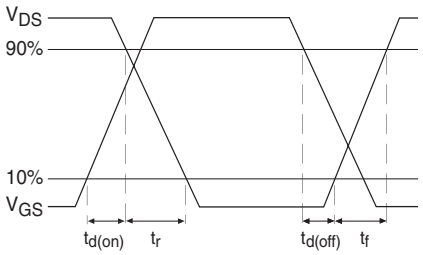


Fig 10b. Switching Time Waveforms

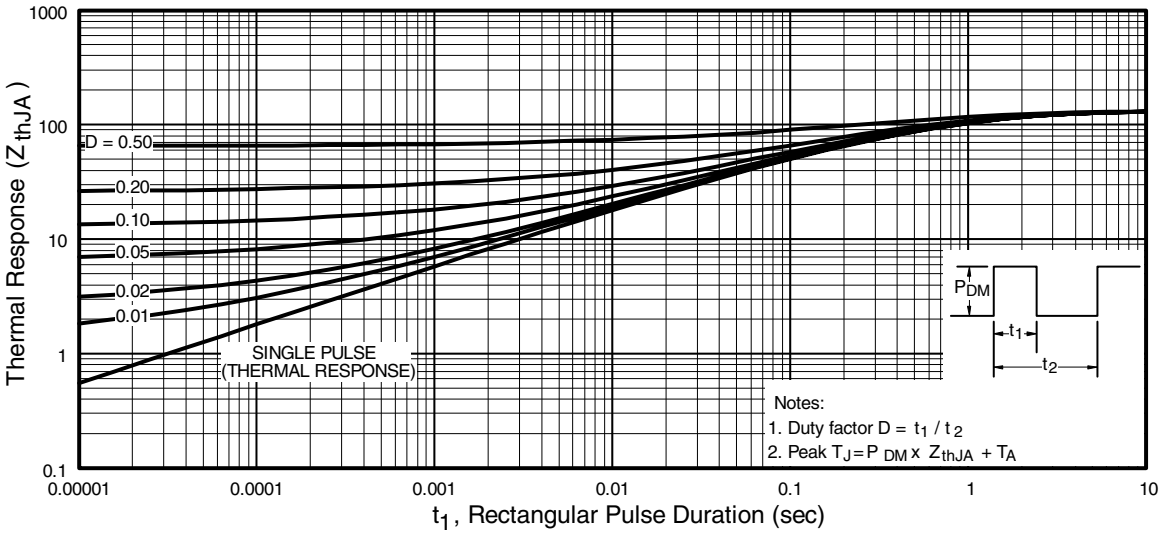


Fig 10. Typical Effective Transient Thermal Impedance, Junction-to-Ambient

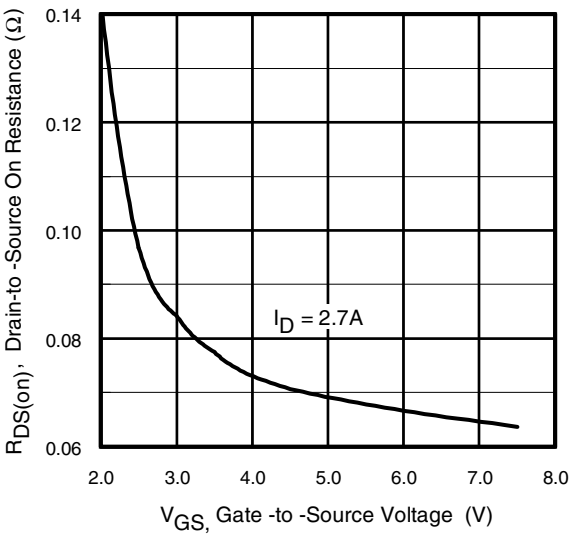


Fig 11. Typical On-Resistance Vs. Gate Voltage

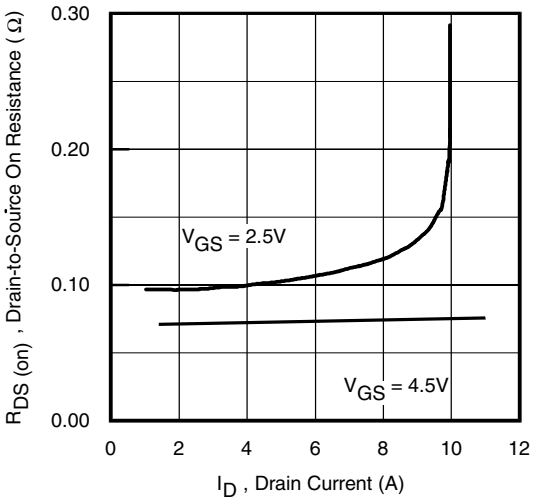


Fig 12. Typical On-Resistance Vs. Drain Current

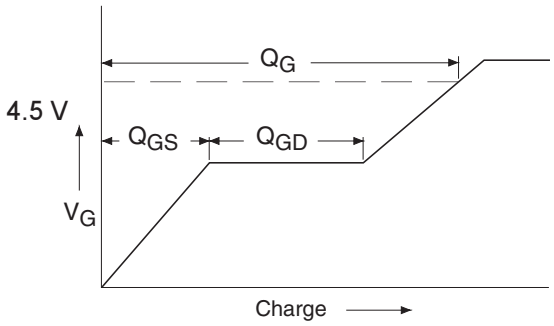


Fig 13a. Basic Gate Charge Waveform

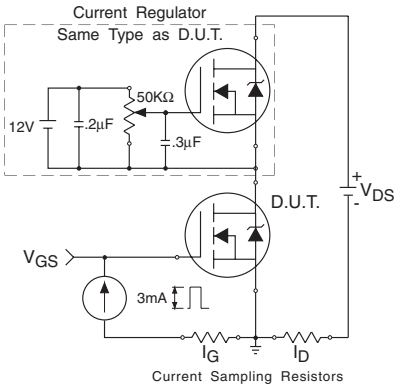


Fig 13b. Gate Charge Test Circuit

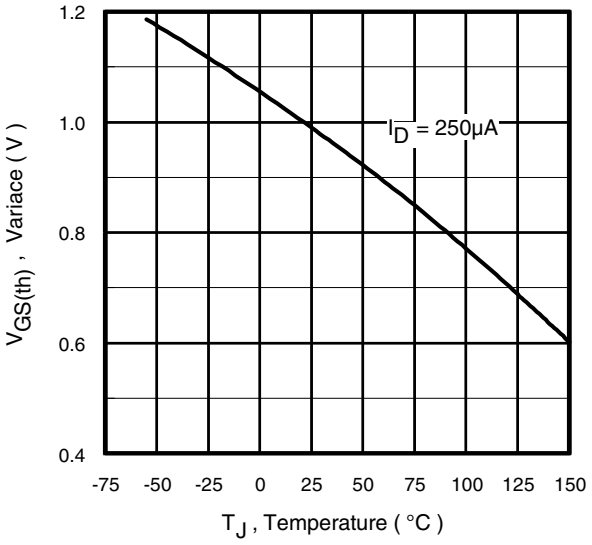


Fig 14. Threshold Voltage Vs. Temperature

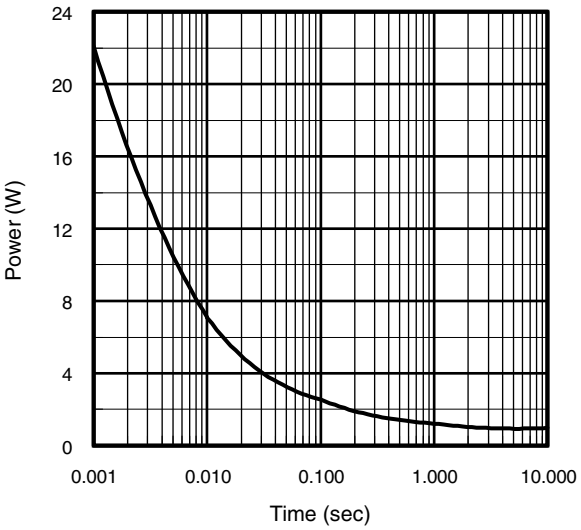


Fig 15. Typical Power Vs. Time

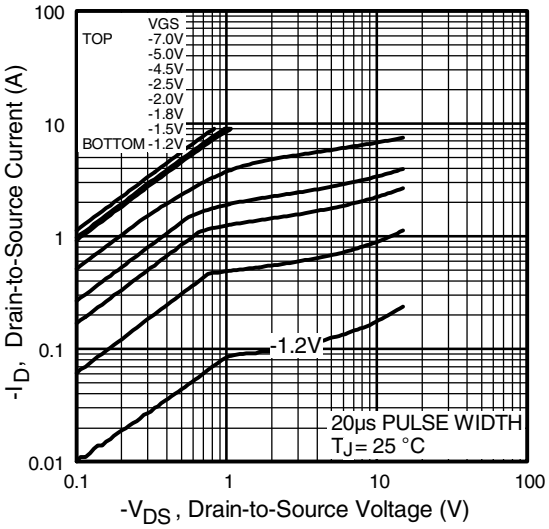


Fig 16. Typical Output Characteristics

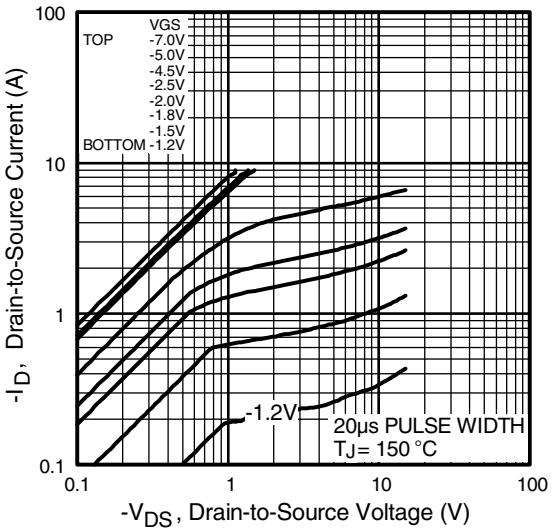


Fig 17. Typical Output Characteristics

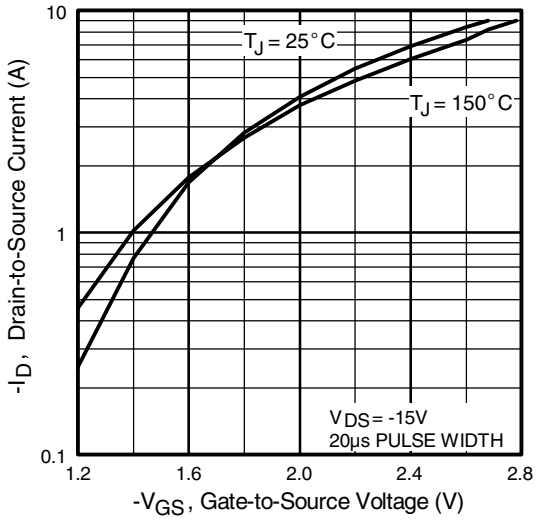


Fig 18. Typical Transfer Characteristics

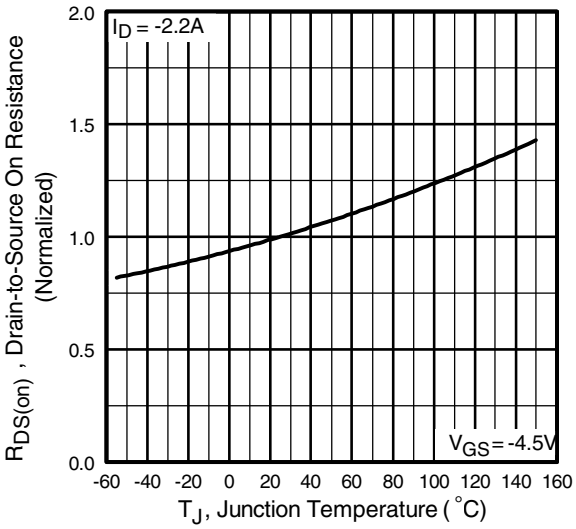


Fig 19. Normalized On-Resistance Vs. Temperature

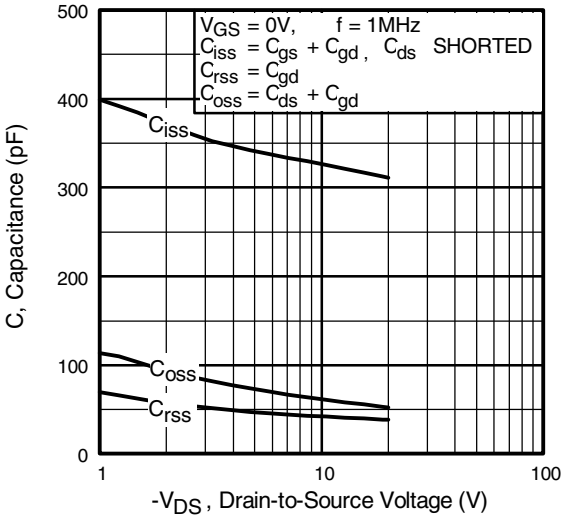


Fig 20. Typical Capacitance Vs. Drain-to-Source Voltage

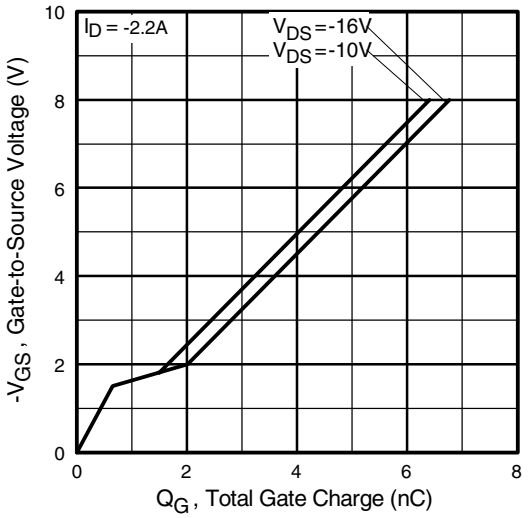


Fig 21. Typical Gate Charge Vs. Gate-to-Source Voltage

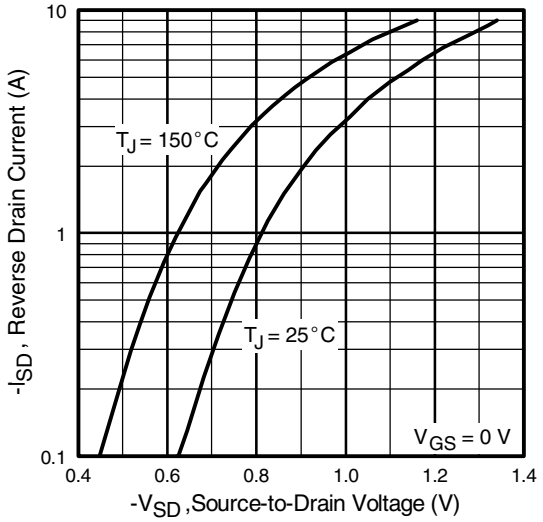


Fig 22. Typical Source-Drain Diode Forward Voltage

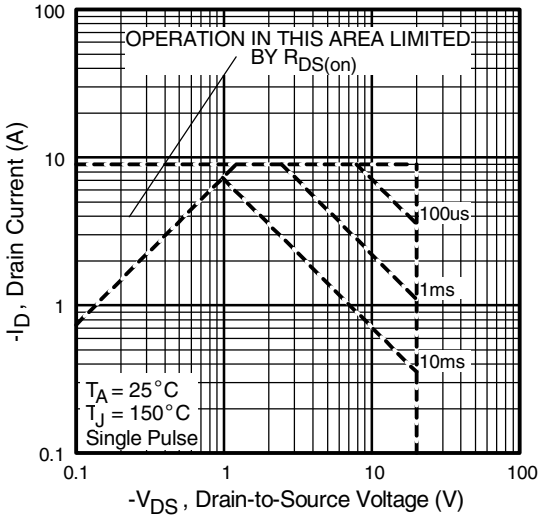


Fig 23. Maximum Safe Operating Area

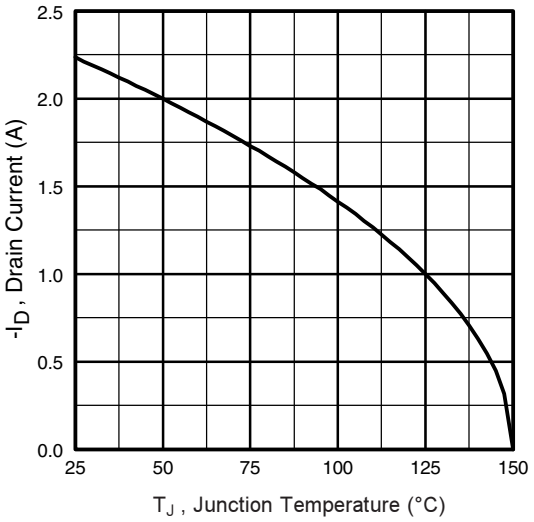


Fig 24. Maximum Drain Current Vs. Junction Temperature

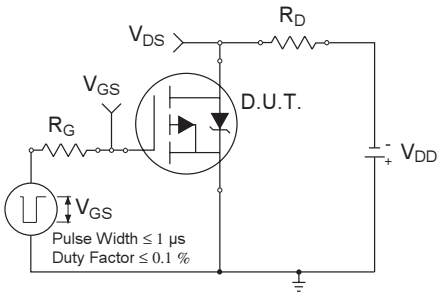


Fig 25a. Switching Time Test Circuit

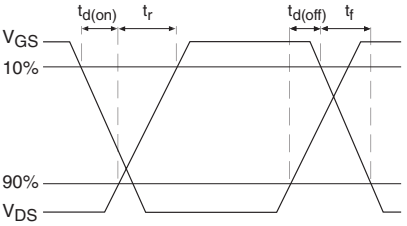


Fig 25b. Switching Time Waveforms

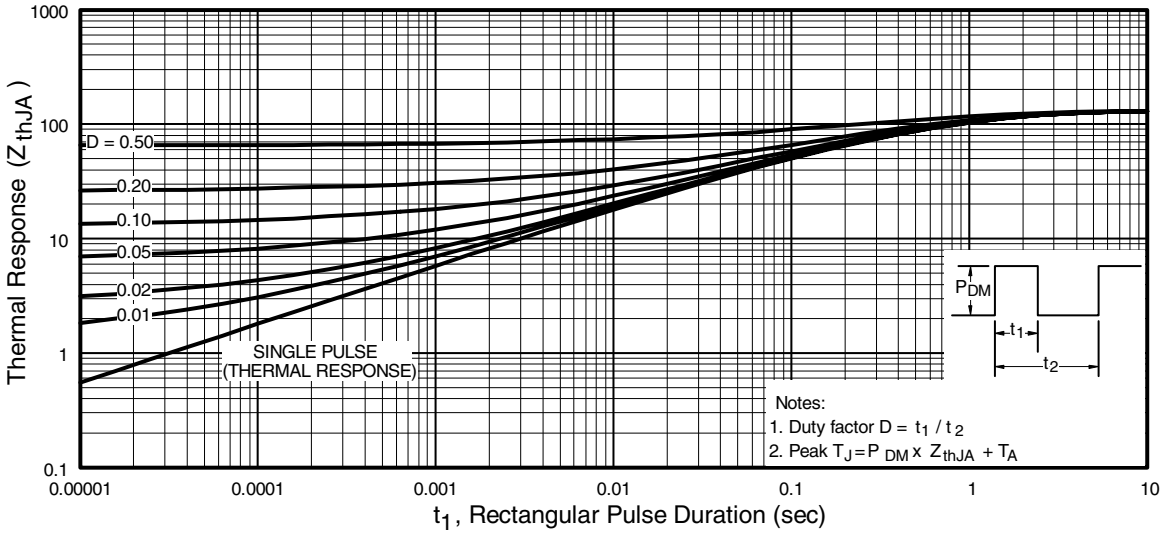


Fig 26. Typical Effective Transient Thermal Impedance, Junction-to-Ambient

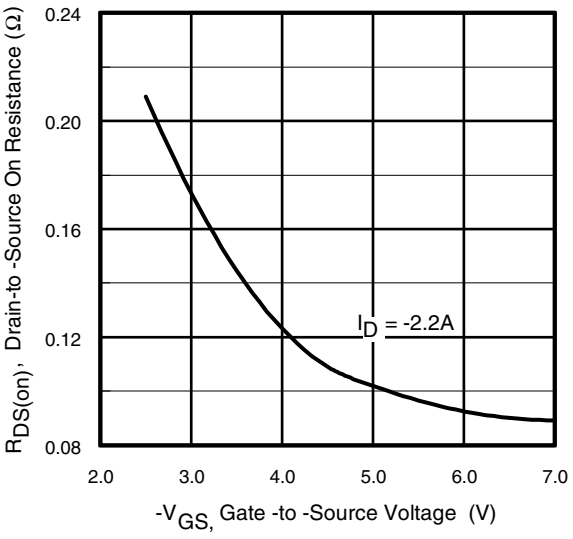


Fig 27. Typical On-Resistance Vs. Gate Voltage

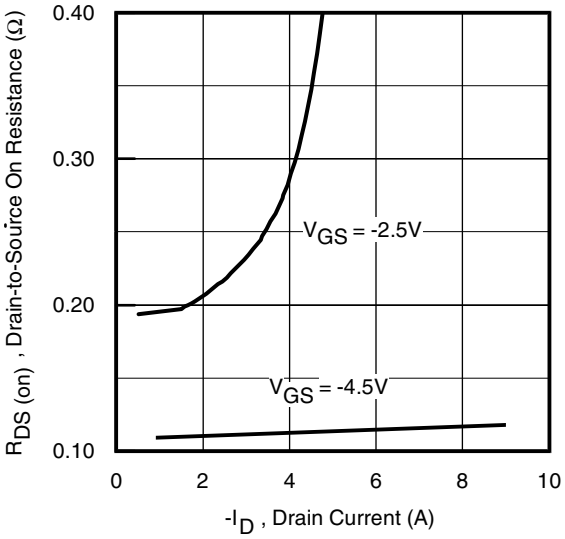


Fig 28. Typical On-Resistance Vs. Drain Current

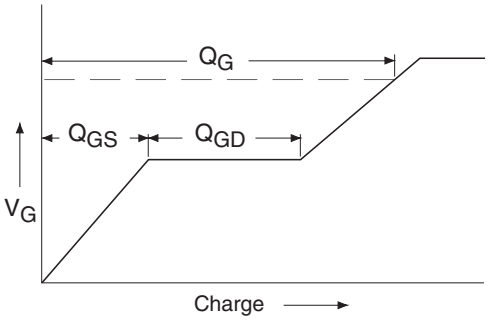


Fig 29a. Basic Gate Charge Waveform

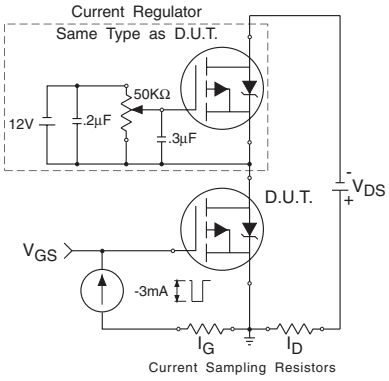


Fig 29b. Gate Charge Test Circuit

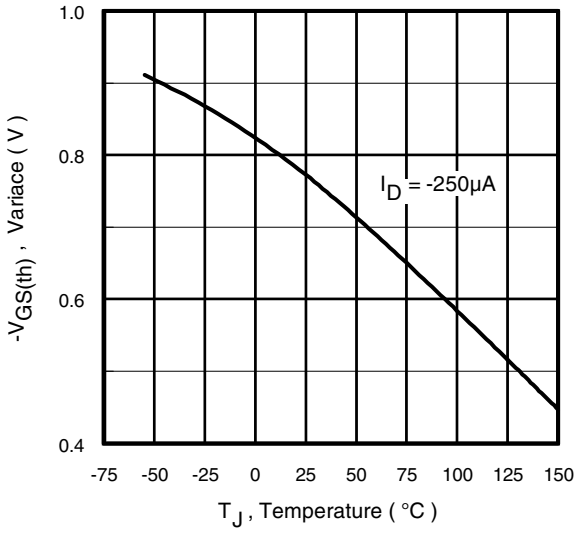


Fig 30. Threshold Voltage Vs. Temperature

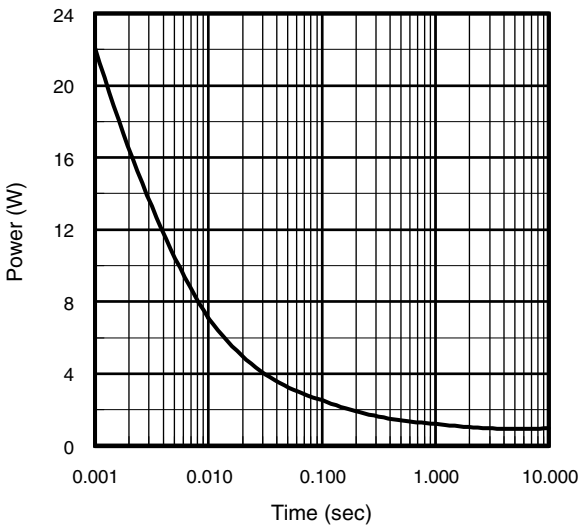
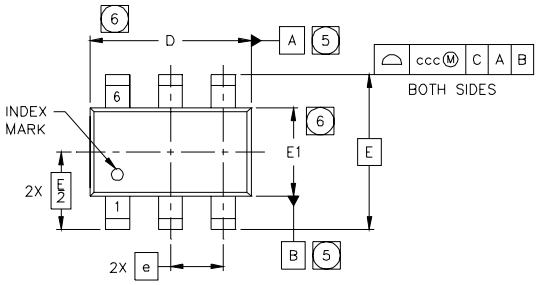
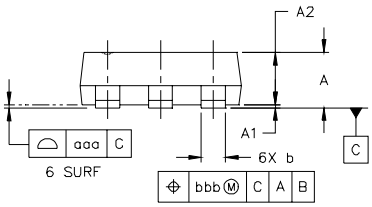


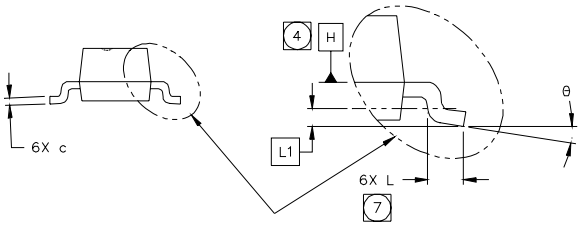
Fig 31. Typical Power Vs. Time

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		
θ	0°	---	8°	0°	---	8°
aaa	0.10			.004		
bbb	0.15			.006		
ccc	0.25			.010		

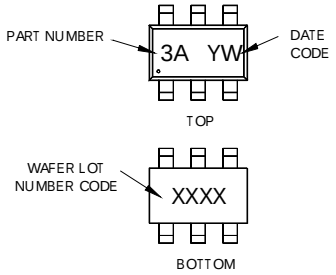




TSOP-6 Part Marking Information (Old)

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

EXAMPLE: THIS IS AN SI3443DV



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 = SI3443DV
3B = IRF5800
3C = IRF5850
3D = IRF5851
3E = IRF5852
3I = IRF5805
3J = IRF5806

DATE CODE EXAMPLES:

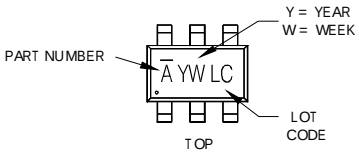
YWW = 9603 = 6C
YWW = 9632 = FF

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

TSOP-6 Part Marking Information (New)

Note: 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

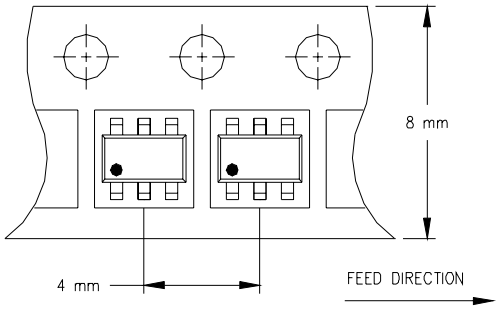
PART NUMBER CODE REFERENCE:

$\overline{A}$ = SI3443DV
$\overline{B}$ = IRF5800
$\overline{C}$ = IRF5850
$\overline{D}$ = IRF5851
$\overline{E}$ = IRF5852
$\overline{I}$ = IRF5805
$\overline{J}$ = IRF5806
$\overline{K}$ = IRF5810
$\overline{L}$ = IRF5804
$\overline{M}$ = IRF5803
$\overline{N}$ = IRF5820

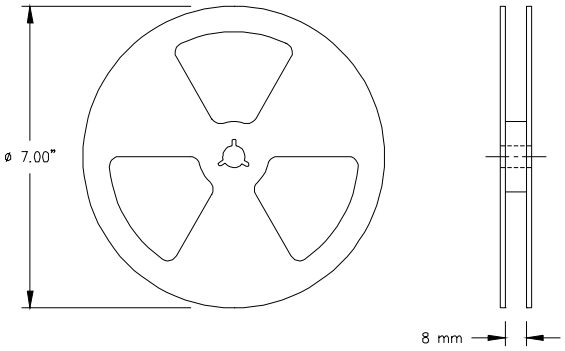
W = (27-52) IF PRECEDED BY A LETTER

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

TSOP-6 Tape & Reel Information



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



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

Data and specifications subject to change without notice.
This product has been designed and qualified for the Industrial market.
Qualification Standards can be found on IR's Web site.

International
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