Bulletin I27235 07/06

International
IOR Rectifier

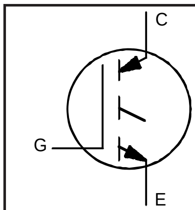
GA200SA60SP

INSULATED GATE BIPOLAR TRANSISTOR

Standard Speed IGBT

Features

- Standard : Optimized for minimum saturation voltage and low operating frequencies up to 1kHz
- Lowest conduction losses available
- Fully isolated package (2,500 volt AC)
- Very low internal inductance (5 nH typ.)
- Industry standard outline
- UL pending
- Totally Lead-Free



n-channel

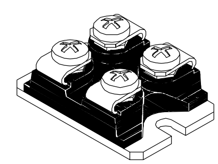
V_{CES} = 600V

$V_{CE(on)\,typ.}$ = 1.10V

@V_{GE} = 15V, I_C = 100A

Benefits

- Designed for increased operating efficiency in power conversion: UPS, SMPS, Welding, Induction heating
- Easy to assemble and parallel
- Direct mounting to heatsink
- Plug-in compatible with other SOT-227 packages



SOT-227

Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Breakdown Voltage	600	V
I_C @ T_C = 25°C	Continuous Collector Current	200	A
I_C @ T_C = 100°C	Continuous Collector Current	100	
I_{CM}	Pulsed Collector Current ①	400	
I_{LM}	Clamped Inductive Load Current ②	400	
V_{GE}	Gate-to-Emitter Voltage	± 20	V
E_{ARV}	Reverse Voltage Avalanche Energy ③	155	mJ
V_{ISOL}	RMS Isolation Voltage, Any Terminal to Case, t=1 min	2500	V
P_D @ T_C = 25°C	Maximum Power Dissipation	630	W
P_D @ T_C = 100°C	Maximum Power Dissipation	250	
T_J	Operating Junction	-55 to + 150	°C
T_{STG}	Storage Temperature Range	-55 to + 150	
	Mounting Torque, 6-32 or M3 Screw	12 lbf •in(1.3N•m)	

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	0.20	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	0.05	—	
Wt	Weight of Module	30	—	gm

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)CES}$	Collector-to-Emitter Breakdown Voltage	600	—	—	V	V_{GE} = 0V, I_C = 250µA
$V_{(BR)ECS}$	Emitter-to-Collector Breakdown Voltage ④	18	—	—	V	V_{GE} = 0V, I_C = 1.0A
$\Delta V_{(BR)CES}/\Delta T_J$	Temperature Coeff. of Breakdown Voltage	—	0.62	—	V/°C	V_{GE} = 0V, I_C = 1.0mA
$V_{CE(ON)}$	Collector-to-Emitter Saturation Voltage	—	1.10	1.3	V	I_C = 100A, V_{GE} = 15V
		—	1.33	—		I_C = 200A, See Fig.2, 5
		—	1.02	—		I_C = 100A , T_J = 150°C
$V_{GE(th)}$	Gate Threshold Voltage	3.0	—	6.0		V_{CE} = V_{GE}, I_C = 250µA
$\Delta V_{GE(th)}/\Delta T_J$	Temperature Coeff. of Threshold Voltage	—	-10	—	mV/°C	V_{CE} = V_{GE}, I_C = 2 mA
g_{fe}	Forward Transconductance ⑤	90	150	—	S	V_{CE} = 100V, I_C = 100A
I_{CES}	Zero Gate Voltage Collector Current	—	—	1.0	mA	V_{GE} = 0V, V_{CE} = 600V
		—	—	10		V_{GE} = 0V, V_{CE} = 10V, T_J = 150°C
I_{GES}	Gate-to-Emitter Leakage Current	—	—	±250	nA	V_{GE} = ±20V

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
Q_g	Total Gate Charge (turn-on)	—	770	1200	nC	I_C = 100A
Q_{ge}	Gate - Emitter Charge (turn-on)	—	100	150		V_{CC} = 400V See Fig. 8
Q_{gc}	Gate - Collector Charge (turn-on)	—	260	380		V_{GE} = 15V
$t_{d(on)}$	Turn-On Delay Time	—	78	—	ns	
t_r	Rise Time	—	56	—		T_J = 25°C
$t_{d(off)}$	Turn-Off Delay Time	—	890	1300		I_C = 100A, V_{CC} = 480V
t_f	Fall Time	—	390	580		V_{GE} = 15V, R_G = 2.0Ω
E_{on}	Turn-On Switching Loss	—	0.98	—	mJ	Energy losses include "tail"
E_{off}	Turn-Off Switching Loss	—	17.4	—		See Fig. 9, 10, 13
E_{ts}	Total Switching Loss	—	18.4	25.5		
$t_{d(on)}$	Turn-On Delay Time	—	72	—	ns	T_J = 150°C,
t_r	Rise Time	—	60	—		I_C = 100A, V_{CC} = 480V
$t_{d(off)}$	Turn-Off Delay Time	—	1500	—		V_{GE} = 15V, R_G = 2.0Ω
t_f	Fall Time	—	660	—		Energy losses include "tail"
E_{ts}	Total Switching Loss	—	35.7	—	mJ	See Fig. 10,11, 13
L_E	Internal Emitter Inductance	—	5.0	—	nH	Between lead, and center of the die contact
C_{ies}	Input Capacitance	—	16250	—	pF	V_{GE} = 0V
C_{oes}	Output Capacitance	—	1040	—		V_{CC} = 30V See Fig. 7
C_{res}	Reverse Transfer Capacitance	—	190	—		f = 1.0MHz

Notes:

① Repetitive rating; V_{GE} = 20V, pulse width limited by max. junction temperature. (See fig. 15)

② V_{CC} = 80%(V_{CES}), V_{GE} = 20V, L = 10µH, R_G = 2.0Ω, (See fig. 14)

③ Repetitive rating; pulse width limited by maximum junction temperature.

④ Pulse width ≤ 80µs; duty factor ≤ 0.1%.

⑤ Pulse width 5.0µs, single shot.

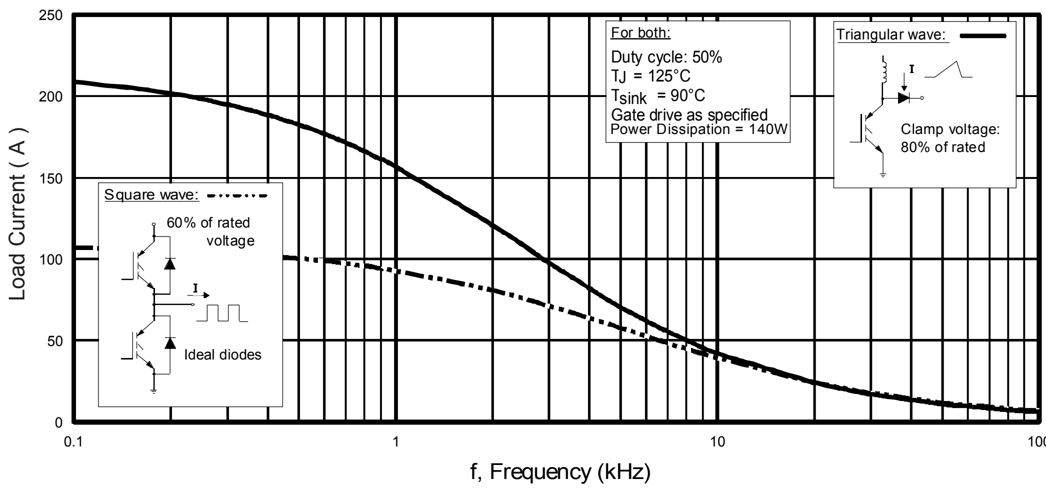


Fig. 1 - Typical Load Current vs. Frequency
(Load Current = I_{RMS} of fundamental)

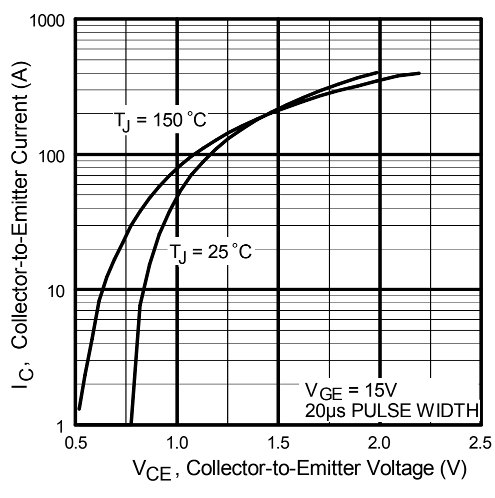


Fig. 2 - Typical Output Characteristics

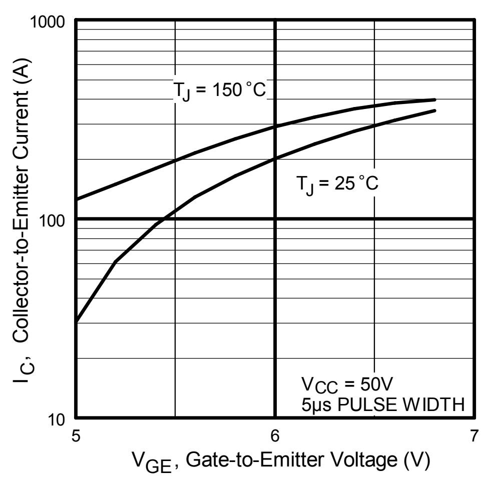


Fig. 3 - Typical Transfer Characteristics

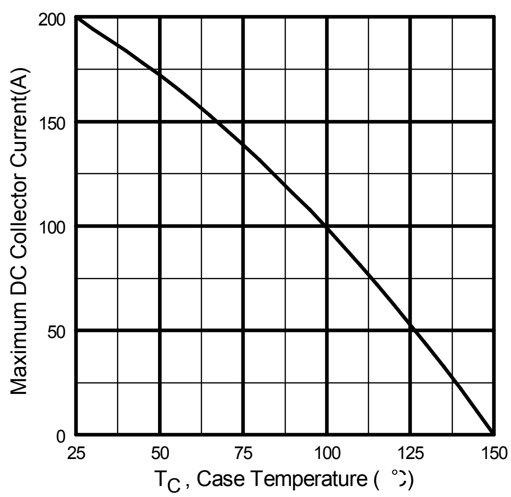


Fig. 4 - Maximum Collector Current vs. Case Temperature

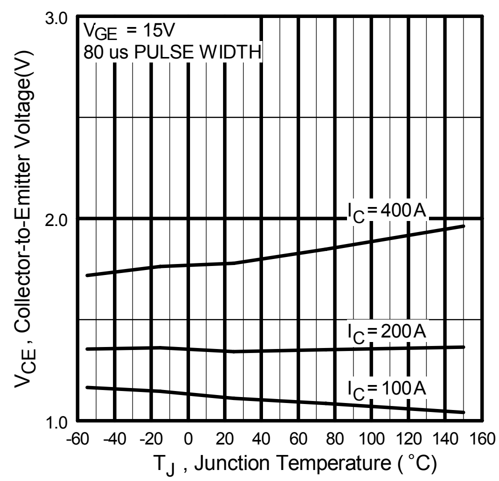


Fig. 5 - Typical Collector-to-Emitter Voltage vs. Junction Temperature

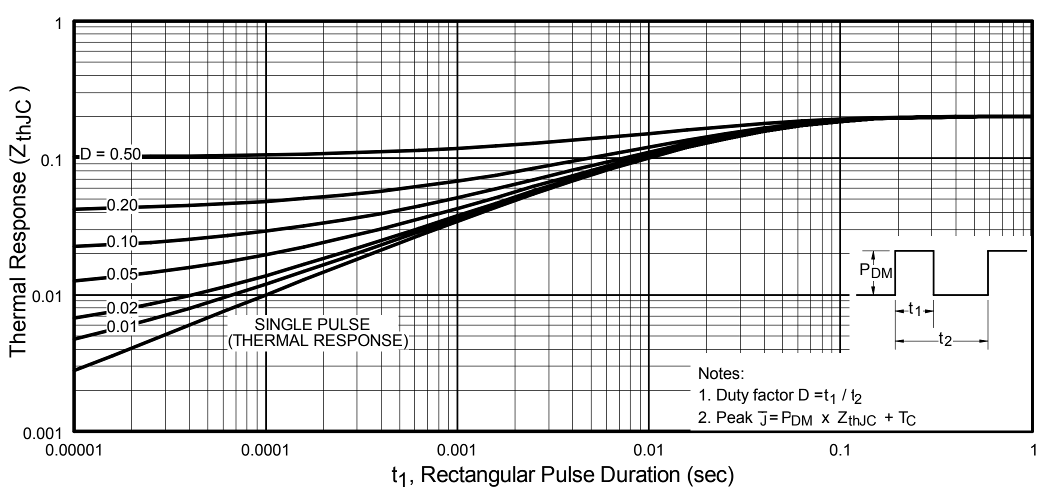


Fig. 6 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

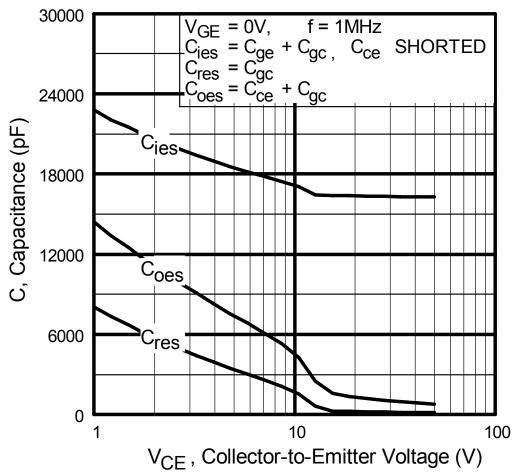


Fig. 7 - Typical Capacitance vs. Collector-to-Emitter Voltage

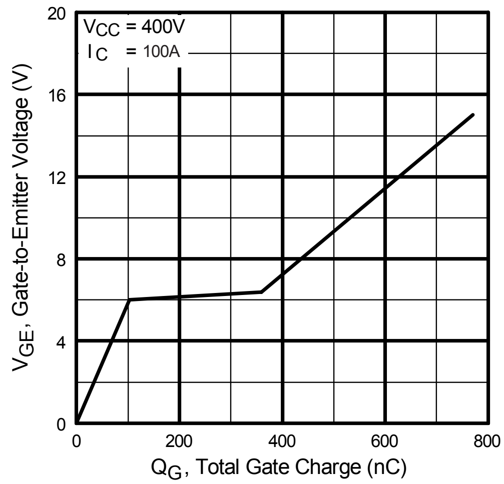


Fig. 8 - Typical Gate Charge vs. Gate-to-Emitter Voltage

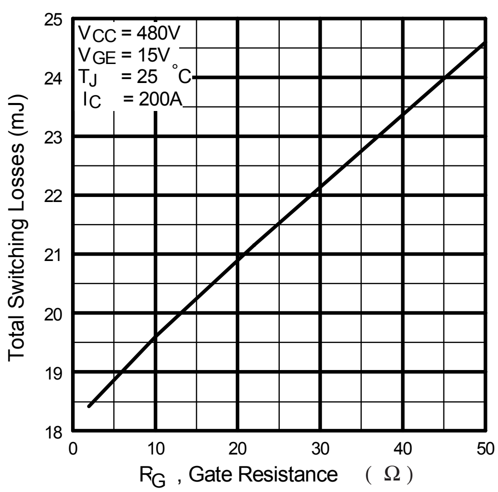


Fig. 9 - Typical Switching Losses vs. Gate Resistance

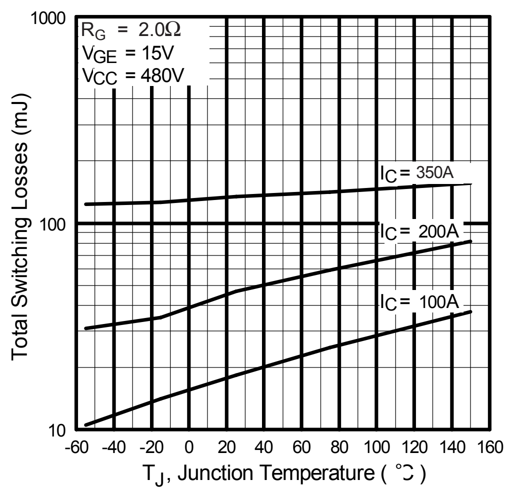


Fig. 10 - Typical Switching Losses vs. Junction Temperature

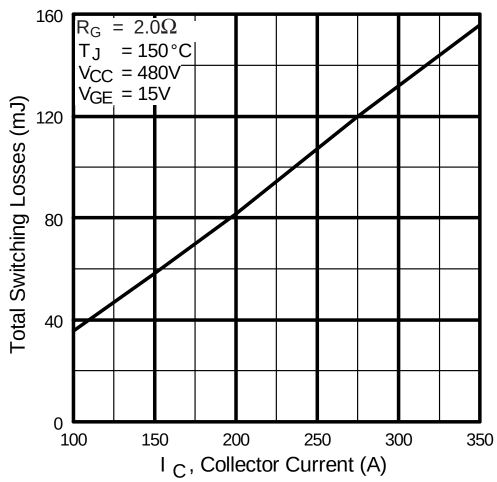


Fig. 11 - Typical Switching Losses vs. Collector Current

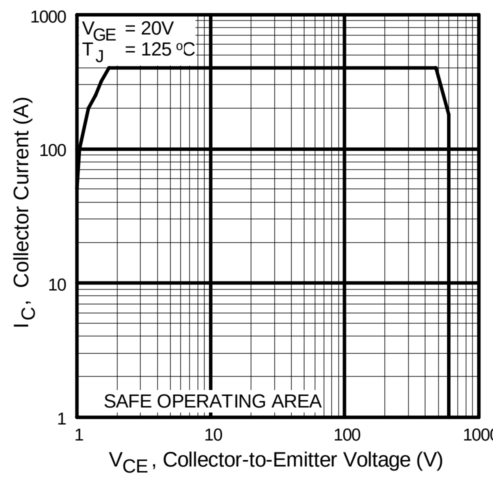
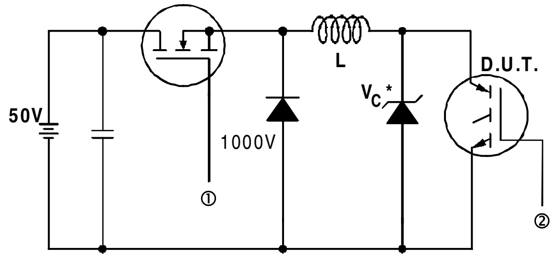


Fig. 12 - Turn-Off SOA



* Driver same type as D.U.T.; Vc = 80% of Vce(max)
* Note: Due to the 50V power supply, pulse width and inductor will increase to obtain rated Id.

Fig. 13a - Clamped Inductive Load Test Circuit

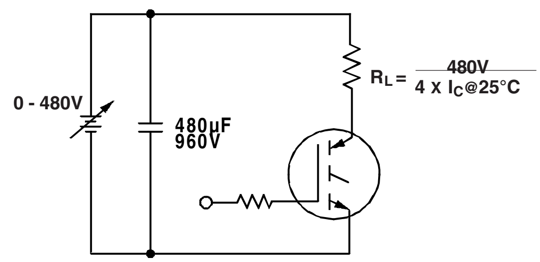


Fig. 13b - Pulsed Collector Current Test Circuit

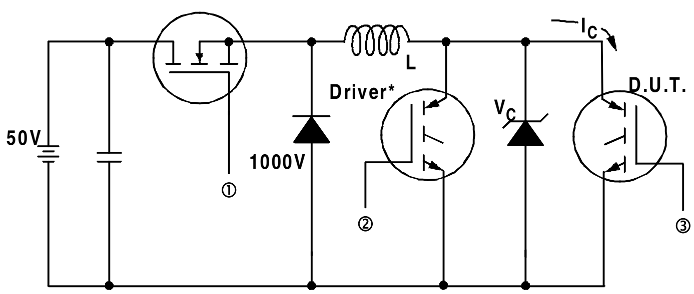


Fig. 14a - Switching Loss Test Circuit

* Driver same type as D.U.T., VC = 480V

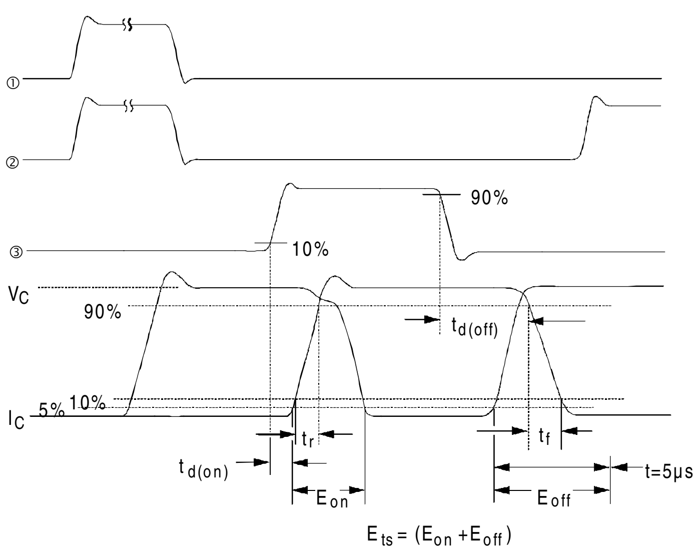
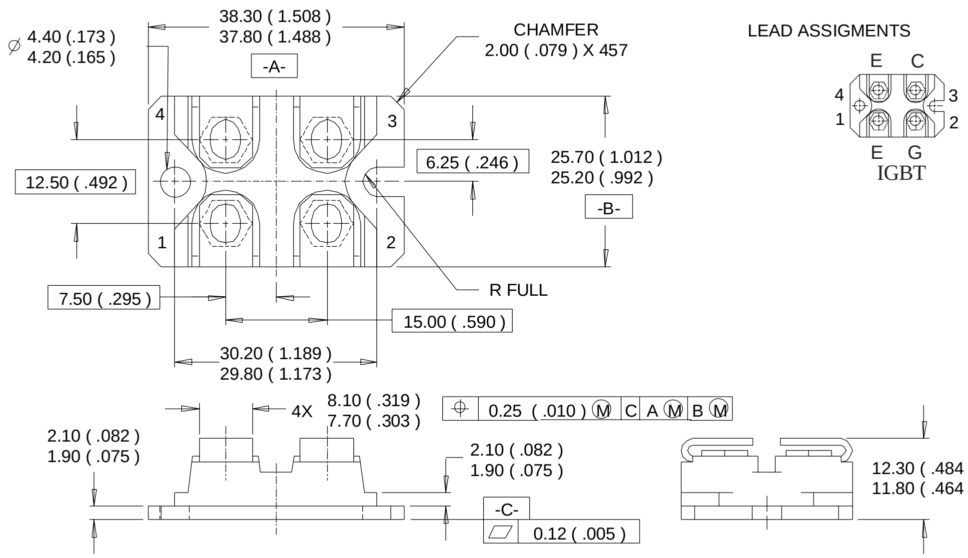


Fig. 14b - Switching Loss Waveforms

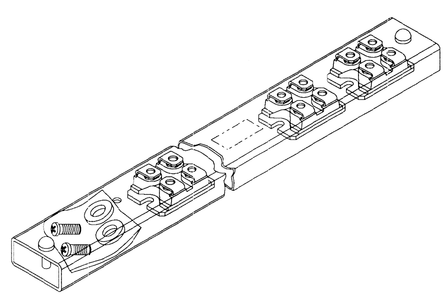
SOT-227 Package Details

Dimensions are shown in millimeters (inches)



Tube

QUANTITIES PER TUBE IS 10
M4 SREW AND WASHER INCLUDED



Ordering Information Table

Device Code

G	A	200	S	A	60	S	P
1	2	3	4	5	6	7	8

1 - Insulated Gate Bipolar Transistor (IGBT)
2 - Gen. 4, IGBT Sicilon, DBC Construction
3 - Current Rating (200 = 200A)
4 - Single switch, no diode
5 - SOT-227
6 - Voltage Rating (60 = 600V)
7 - Speed/ Type (S = Standard Speed)
8 -
- none = Standard Production
- P = Lead-Free

Data and specifications subject to change without notice.
This product has been designed for Industrial Level and Lead-Free.
Qualification Standards can be found on IR's Web site.

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