
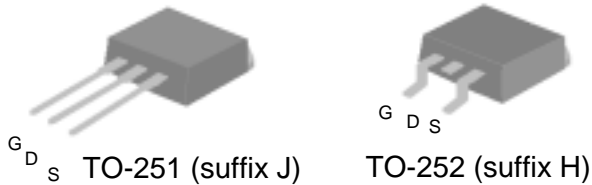


# N-channel Insulated-Gate Bipolar Transistor

## PRODUCT SUMMARY

$V_{CES}$	450V
$V_{CE(sat)}$	5V typ.
$I_{CP}$	130A

 **Pb-free; RoHS-compliant TO-251 (IPAK) and TO-252 (DPAK)**



## DESCRIPTION

The SSM20G45E achieves fast switching performance with low gate charge without a complex drive circuit. It is suitable for use in short-duration, high-current strobe applications, such as still-camera flash.

The SSM20G45EGH is in a TO-252 package, which is widely used for commercial and industrial surface-mount applications.

The through-hole version, the SSM20G45EGJ in TO-251, is available for vertical mounting, where a small footprint is required on the board, and/or an external heatsink is to be attached.

These devices are manufactured with an advanced process, providing improved on-resistance and switching performance.

The gate has internal ESD protection.

## ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Units
$V_{CES}$	Collector-emitter voltage	450	V
$V_{GE}$	Gate-emitter voltage	$\pm 6$	V
$V_{GEP}$	Pulsed gate-emitter voltage	$\pm 8$	V
$I_{CP}$	Pulsed collector current <sup>1</sup>	130	A
$P_D$	Total power dissipation, $T_C = 25^\circ\text{C}$	20	W
$T_{STG}$	Storage temperature range	-55 to 150	$^\circ\text{C}$
$T_J$	Operating junction temperature range	-55 to 150	$^\circ\text{C}$

## THERMAL CHARACTERISTICS

Symbol	Parameter	Value	Units
$R_{\theta JC}$	Maximum thermal resistance, junction-case	6	$^\circ\text{C/W}$

### Notes:

1. Pulse width must be limited to avoid exceeding the safe operating area.
2. Pulse width <300us, duty cycle <2%.

**ELECTRICAL CHARACTERISTICS**  $T_j = 25^\circ\text{C}$  (unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$I_{GES}$	Gate-emitter leakage current	$V_{GE}=6\text{V}, V_{CE}=0\text{V}$	-	-	10	$\mu\text{A}$
$I_{CES}$	Collector-emitter leakage current	$V_{CE}=450\text{V}, V_{GE}=0\text{V}$	-	-	10	$\mu\text{A}$
$V_{CE(sate)}$	Collector-emitter saturation voltage	$V_{GE}=4.5\text{V}, I_{CP}=130\text{A}$ (Pulsed)	-	5	8	V
$V_{GE(th)}$	Gate threshold voltage	$V_{CE}=V_{GE}, I_C=250\mu\text{A}$	-	-	1.2	V
$Q_g$	Total gate charge	$I_C=40\text{A}$	-	51	-	nC
$Q_{ge}$	Gate-emitter charge	$V_{CE}=300\text{V}$	-	2	-	nC
$Q_{gc}$	Gate-collector charge	$V_{GE}=5\text{V}$	-	5.4	-	nC
$t_{d(on)}$	Turn-on delay time	$V_{CC}=200\text{V}$	-	5.5	-	ns
$t_r$	Rise time	$I_C=40\text{A}$	-	72	-	ns
$t_{d(off)}$	Turn-off delay time	$R_G=25\Omega$	-	640	-	ns
$t_f$	Fall time	$V_{GE}=5\text{V}$	-	2.6	-	us
$C_{ies}$	Input capacitance	$V_{GE}=0\text{V}$	-	2095	-	pF
$C_{oes}$	Output capacitance	$V_{CE}=25\text{V}$	-	145	-	pF
$C_{res}$	Reverse transfer capacitance	$f=1.0\text{MHz}$	-	35	-	pF

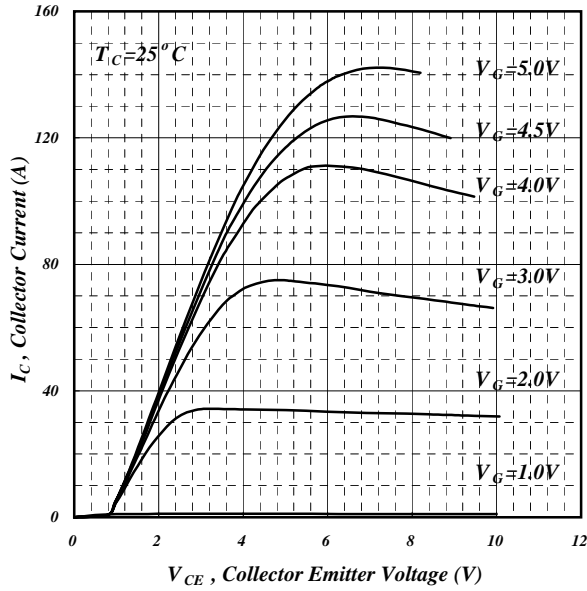


Fig 1. Typical Output Characteristics

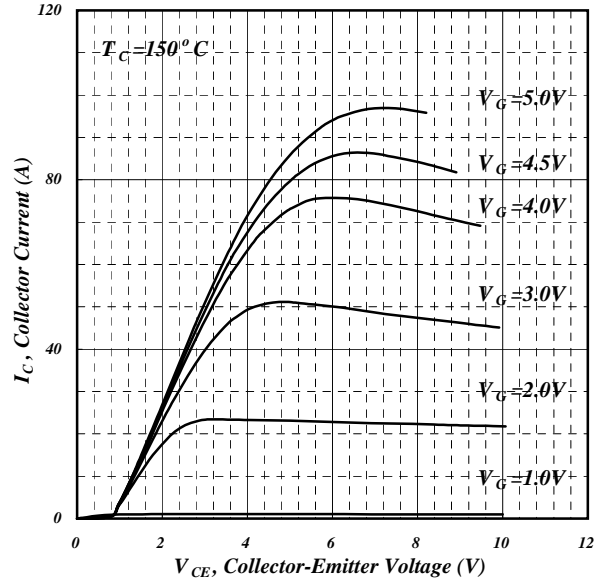


Fig 2. Typical Output Characteristics

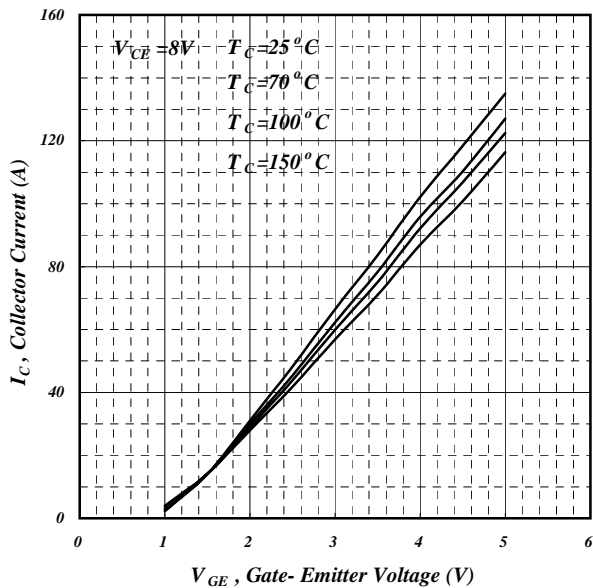


Fig 3. Collector Current vs. Gate-Emitter Voltage

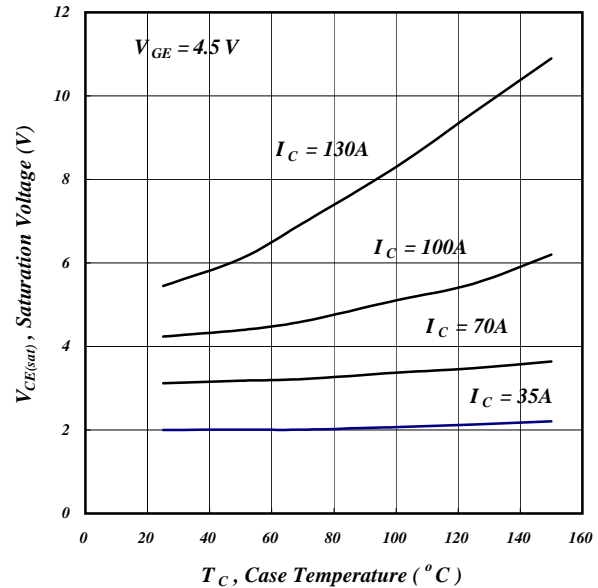


Fig 4. Collector-Emitter Saturation Voltage vs. Case Temperature

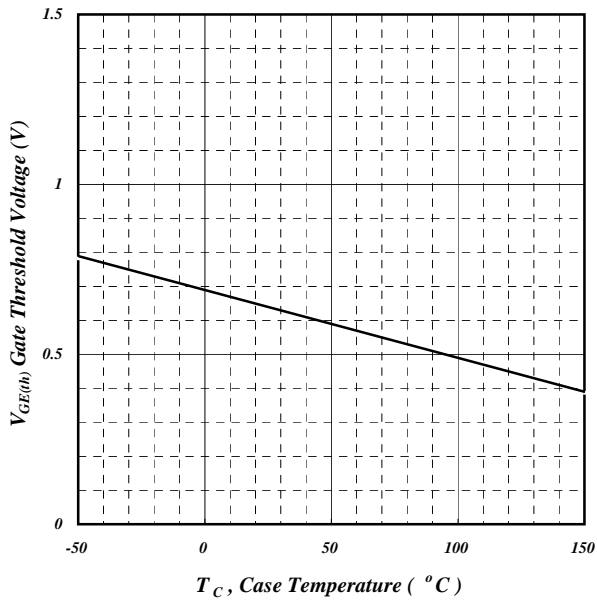


Fig 5. Gate-Emitter Cut-Off Voltage vs. Case Temperature

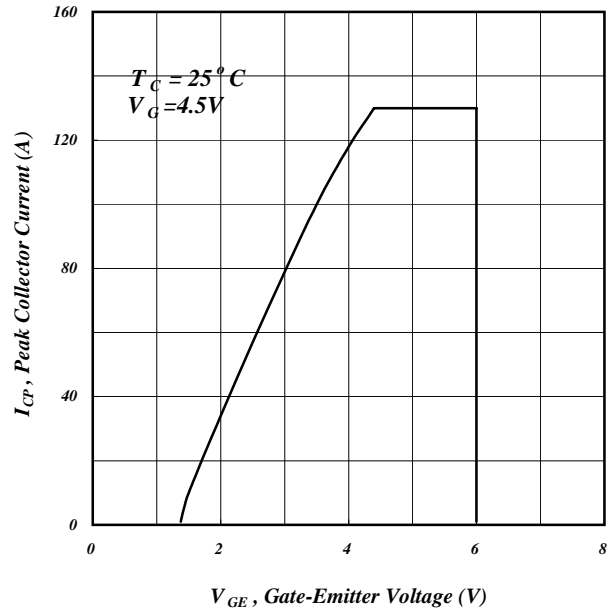


Fig 6. Safe Operating Area

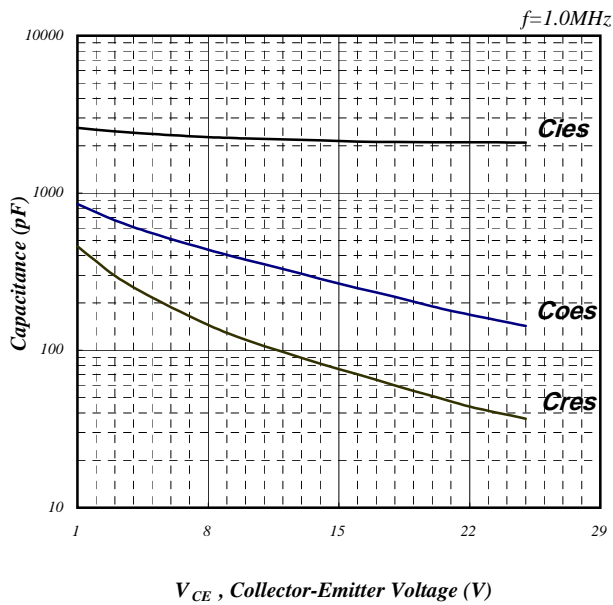


Fig 7. Collector vs. Collector-Emmitter Voltage

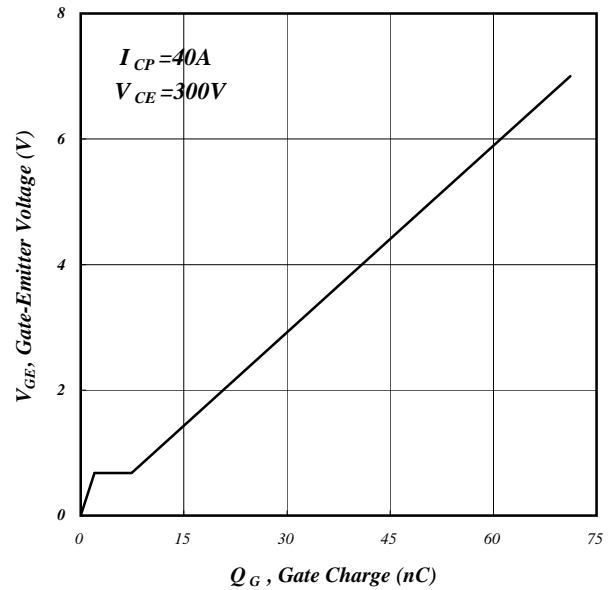


Fig 8. Gate Charge Waveform

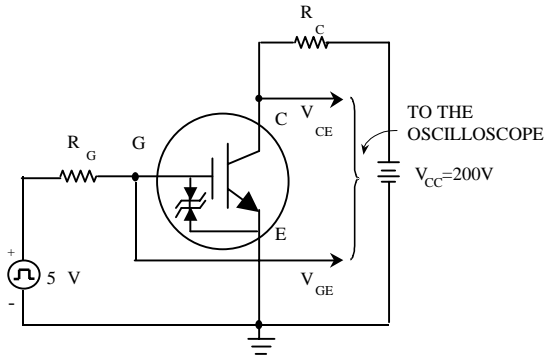


Fig 9. Switching Time Test Circuit

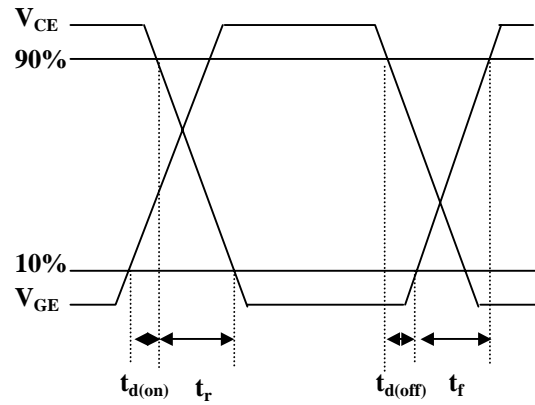


Fig 10. Switching Time Waveform

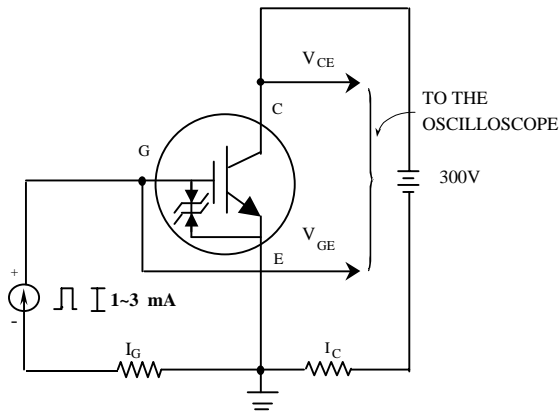


Fig 11. Gate Charge Test Circuit

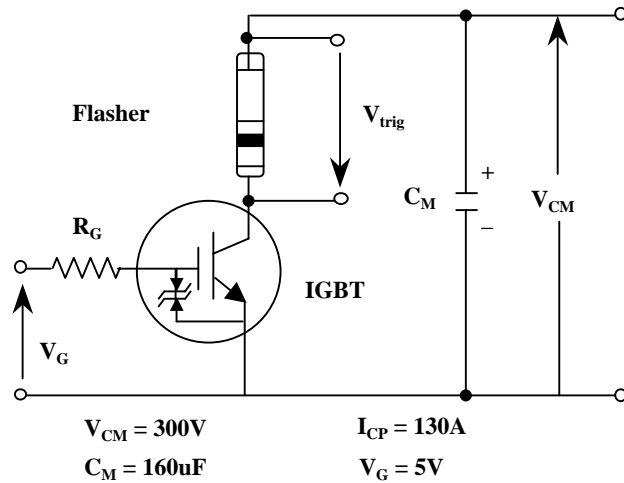
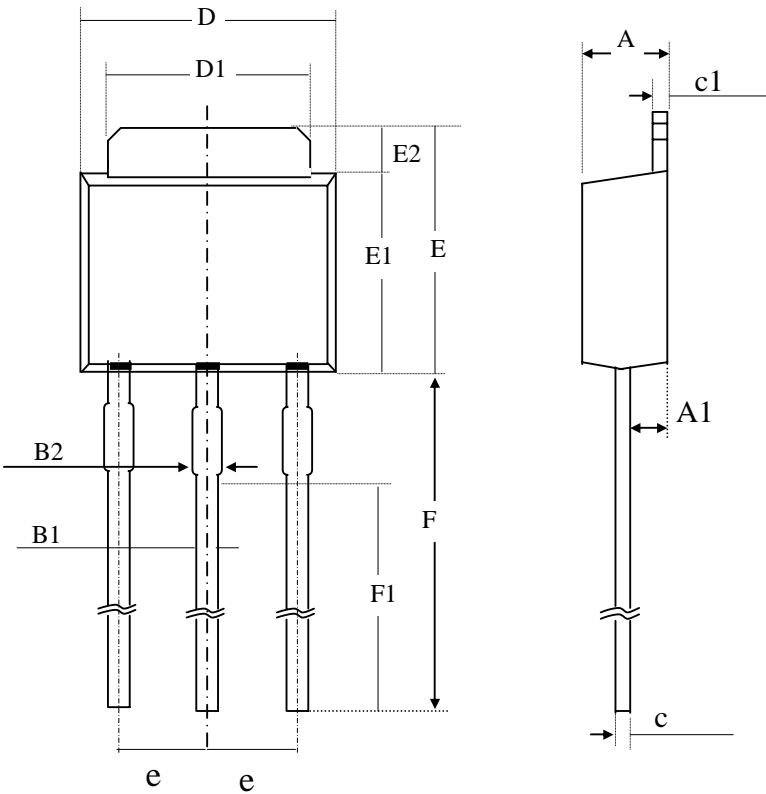


Fig 12. Application Test Circuit

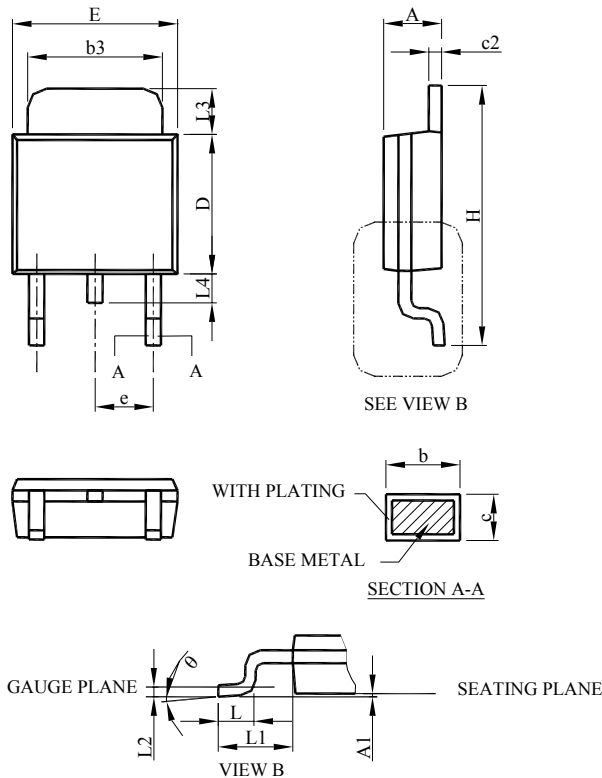
## PHYSICAL DIMENSIONS: TO-251 (I-PAK)



SYMBOLS	Millimeters		
	MIN	NOM	MAX
A	2.20	2.30	2.40
A1	0.90	1.20	1.50
B1	0.50	0.60	0.70
B2	0.60	0.72	0.90
c	0.45	0.50	0.60
c1	0.45	0.50	0.55
D	6.40	6.60	6.80
D1	5.20	5.35	5.50
E	6.80	7.00	7.20
E1	5.40	5.60	5.80
E2	1.40	1.50	1.60
e	--	2.30	--
F	7.20	7.50	7.80
F1	1.50	1.60	1.80

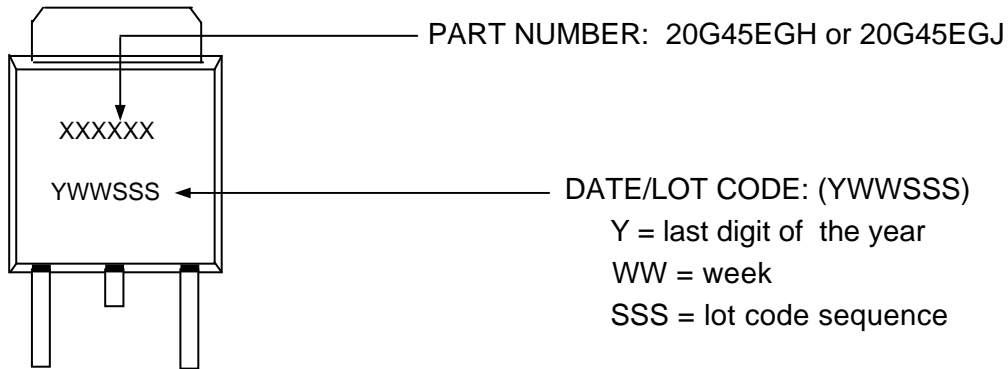
1. All dimensions are in millimeters.
2. Dimensions do not include mold protrusions.

## PHYSICAL DIMENSIONS: TO-252 (D-PAK)



SYMBOL	TO-252-3L	
	MILLIMETERS	
	MIN.	MAX.
A	1.80	2.80
A1	0.00	0.13
b	0.40	1.00
b3	4.80	5.90
c	0.35	0.65
c2	0.40	0.89
D	5.10	6.30
E	6.00	7.00
e	2.30 BSC	
H	7.80	11.05
L	1.00	2.55
L1	2.20	3.05
L2	0.35	0.65
L3	0.50	2.03
L4	0.50	1.20
θ	0°	8°

## PART MARKING



## PACKING: Moisture sensitivity level MSL3

TO-252: 3000 pcs in antistatic tape on a reel packed inside a moisture barrier bag (MBB).

TO-251: 1000pcs in tubes packed inside a moisture barrier bag (MBB).

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