

# 600V Trench and Fieldstop IGBT

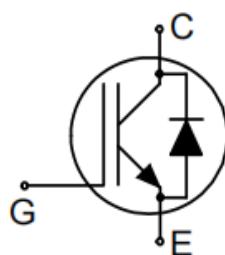
PRODUCT SUMMARY		
V <sub>CE</sub> (V)	600	
I <sub>C</sub> (A)	90 (TC=25 °C)	75 (TC=100 °C)
V <sub>CE (sat)</sub> (V)	1.7	
Q <sub>g(nC)</sub>	175	
I <sub>CM</sub> (A)	225	

## FEATURES

- Very Low VCEsat
- Low turn-off losses
- High speed switching
- Maximum junction temperature 175°C
- Ultra low gate charge (Q<sub>g</sub>)
- Avalanche energy rated (UIS)



TO-247



Top View

## APPLICATIONS

- Telecommunications
  - Server and telecom power supplies
- Lighting
  - High-intensity discharge (HID)
  - Fluorescent ballast lighting
- Consumer and computing
  - ATX power supplies
- Industrial
  - Welding
  - Battery chargers
- Renewable energy
  - Solar (PV inverters)
- Switch mode power supplies (SMPS)

## Package pin definition

- Pin1 G - Gate
- Pin2 C & backside - Collector
- Pin3 E - Emitter

ABSOLUTE MAXIMUM RATINGS (T <sub>C</sub> = 25 °C, unless otherwise noted)				
PARAMETER		SYMBOL	LIMIT	UNIT
Collector-Emitter Voltage	V <sub>GE</sub> at 15 V	V <sub>CE</sub>	600	V
Gate-Emitter Voltage		V <sub>GE</sub>	±30	
Continuous Collector Current (T <sub>J</sub> = 150 °C)		I <sub>C</sub>	150	A
V <sub>GE</sub> at 15 V	T <sub>C</sub> = 25 °C		75	
Pulsed Collector Current <sup>a</sup>	T <sub>C</sub> = 100 °C			
Diode Forward Current <sup>b</sup>		I <sub>CM</sub>	225	
Maximum Power Dissipation	T <sub>C</sub> = 25 °C	P <sub>D</sub>	400	W
	T <sub>C</sub> = 100 °C		220	
Operating Junction and Storage Temperature Range		T <sub>J</sub> , T <sub>stg</sub>	-55 to +175	°C
Short Circuit Withstand Time T <sub>C</sub> =150	V <sub>GE</sub> = 15V, V <sub>CE</sub> 400V	t <sub>sc</sub>	3	μs
Short Circuit Withstand Time T <sub>C</sub> =100	V <sub>GE</sub> = 15V, V <sub>CE</sub> 330V		5	
Soldering Recommendations (Peak Temperature) <sup>c</sup>	for 10 s		260	°C

### Notes

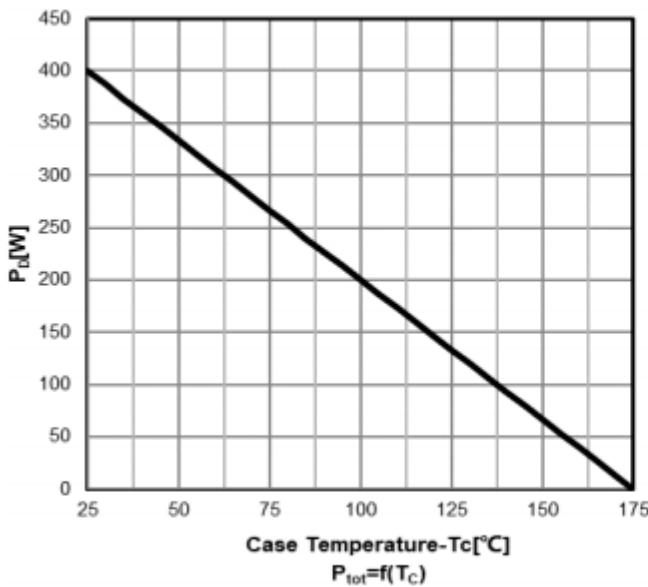
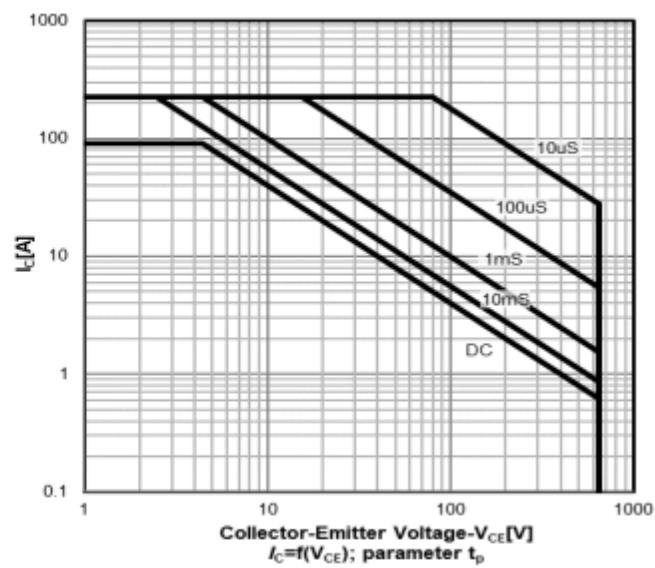
- Repetitive rating; pulse width limited by maximum junction temperature.
- Current limited by maximum junction temperature.
- 1.6 mm from case.

<b>THERMAL RESISTANCE RATINGS</b>				
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	$R_{thJA}$	-	40	
Maximum Junction-to-Case	$R_{thJC}$	-	0.5	°C/W

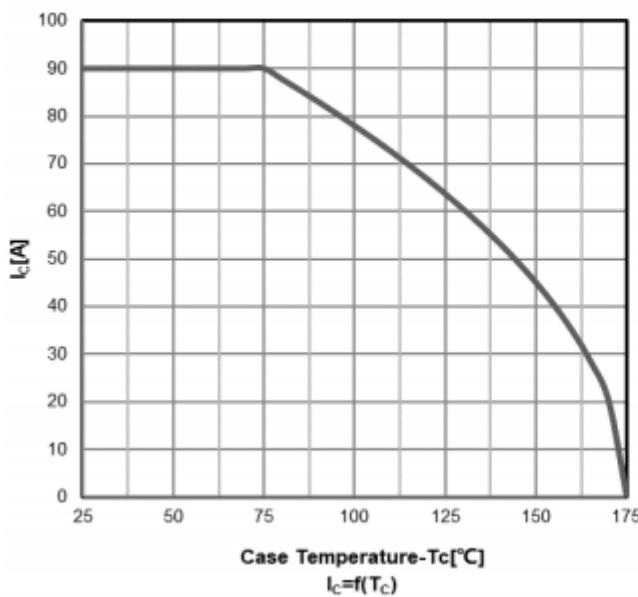
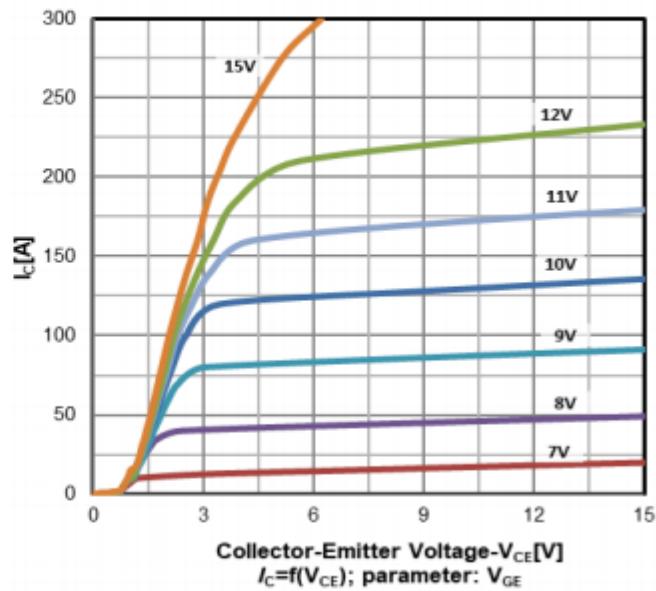
<b>SPECIFICATIONS</b> ( $T_J = 25$ °C, unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
<b>Static</b>							
Collector-Emitter Breakdown Voltage	$BV_{CE}$	$V_{GE} = 0$ V, $I_C = 250$ µA	$V_{GE} = 0$ V, $I_C = 1$ mA	600	-	-	V
Gate-Source Threshold Voltage (N)	$V_{GE(th)}$	$V_{CE} = V_{GE}$ , $I_D = 250$ µA		4	5	6	V
Zero Gate Voltage Collector Current	$I_{CES}$	$V_{CE} = 480$ V, $V_{GE} = 0$ V, $T_J = 25$ °C		-	1	20	µA
		$V_{CE} = 480$ V, $V_{GE} = 0$ V, $T_J = 150$ °C		-	1000	-	µA
Gate-Emitter Leakage Current	$I_{GES}$	$V_{CE} = 0$ V, $V_{GS} = \pm 2$ V		-	-	100	nA
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE} = 15$ V	$I_C = 75$ A	-	1.7	2.1	V
Forward Transconductance	$g_{fs}$	$V_{CE} = 20$ V, $I_C = 75$ A		-	40	-	S
<b>Dynamic</b>							
Input Capacitance	$C_{ies}$	$V_{GE} = 0$ V, $V_{CE} = 25$ V, $f = 500$ KHz		-	4600	-	pF
Output Capacitance	$C_{oes}$			-	235	-	
Reverse Transfer Capacitance	$C_{res}$			-	72	-	
Turn-on Energy	$E_{on}$	$V_{CE} = 480$ V, $V_{GE} = 0 / 15$ V, $I_C = 75$ A, $R_g = 10\Omega$		-	0.62	-	ns
Turn-off Energy	$E_{off}$			-	0.31	-	
Total Gate Charge	$Q_g$	$V_{GE} = 15$ V	$I_C = 75$ A, $V_{CE} = 480$ V	-	175	-	nC
Gate-Emitter Charge	$Q_{ge}$			-	14	-	
Gate to Collector Charge	$Q_{gc}$			-	33	-	
Turn-On Delay Time	$t_{d(on)}$	$V_{CE} = 480$ V, $V_{GE} = 0 / 15$ V, $I_C = 75$ A, $R_g = 10\Omega$		-	60	-	ns
Rise Time	$t_r$			-	43	-	
Turn-Off Delay Time	$t_{d(off)}$			-	184	-	
Fall Time	$t_f$			-	30	-	
Internal emitter inductance measured 5 mm	$L_E$			-	13	-	nH
<b>Diode Characteristics</b>							
Diode Forward Current	$I_F$	IGBT symbol showing the integral reverse junction diode		-	-	75	A
Pulsed Diode Forward Current	$I_{FM}$			-	-	225	
Diode Forward Voltage	$V_F$	$I_F = 30$ A		-	1.65	2.0	V
Reverse Recovery Time	$t_{rr}$	$T_J = 25$ °C, $I_F = 30$ A, $dI_F/dt = 200$ A/µs, $V_R = 480$ V		-	73	-	ns
Reverse Recovery Charge	$Q_{rr}$			-	85	-	µC
Reverse Recovery Current	$I_{RRM}$			-	13	-	A

**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)

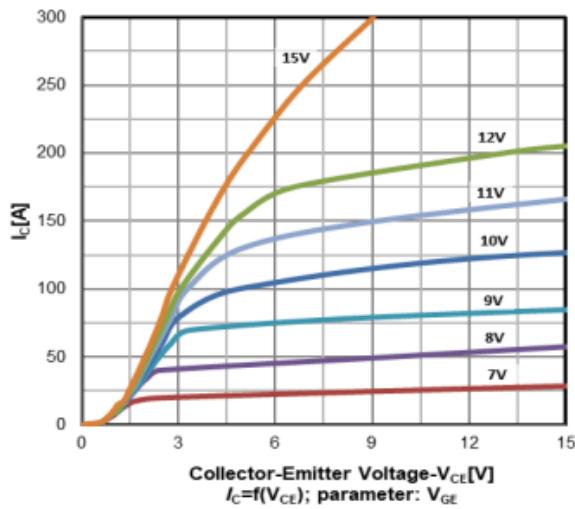
Power dissipation

Safe operating area  $T_a=25$  °C

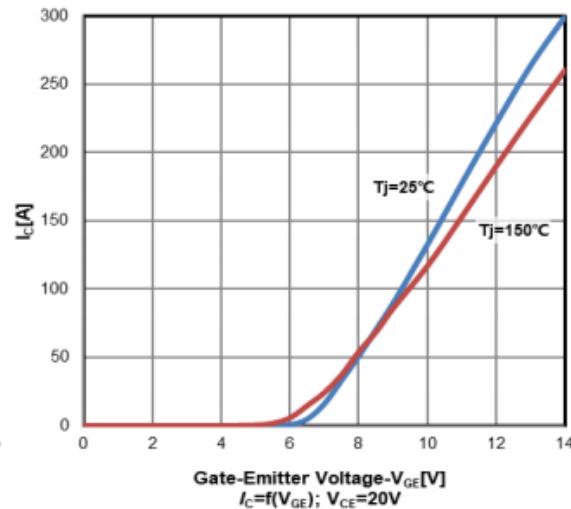
Collector current as a function of Case temperature

Typ. Output characteristics  $T_j=25$  °C

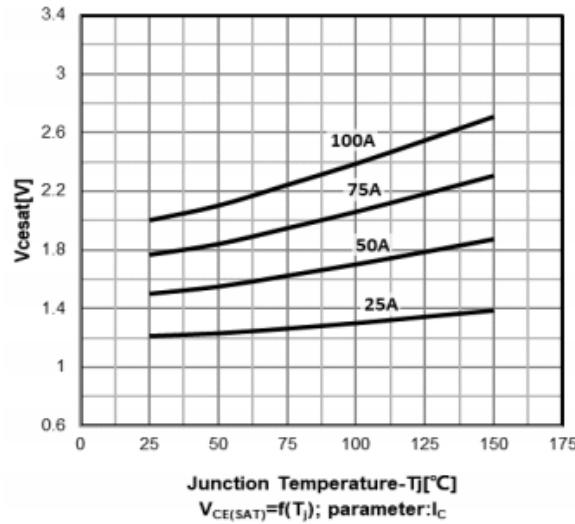
Typ. Output characteristics  
 $T_j=150\text{ }^\circ\text{C}$



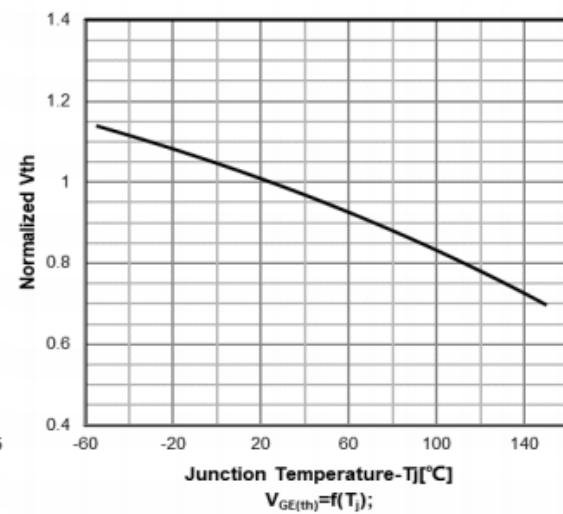
Typ. Transfer characteristics



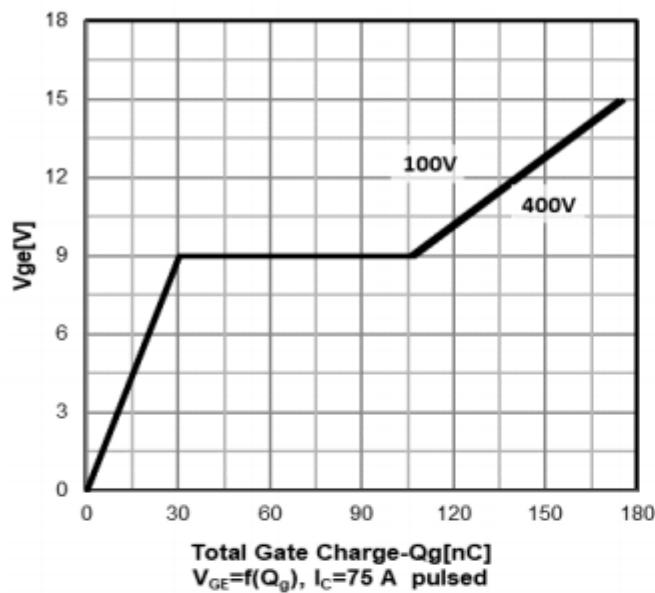
Typ. Collector-emitter saturation voltage as a function of junction temperature ( $V_{GE}=15\text{V}$ )



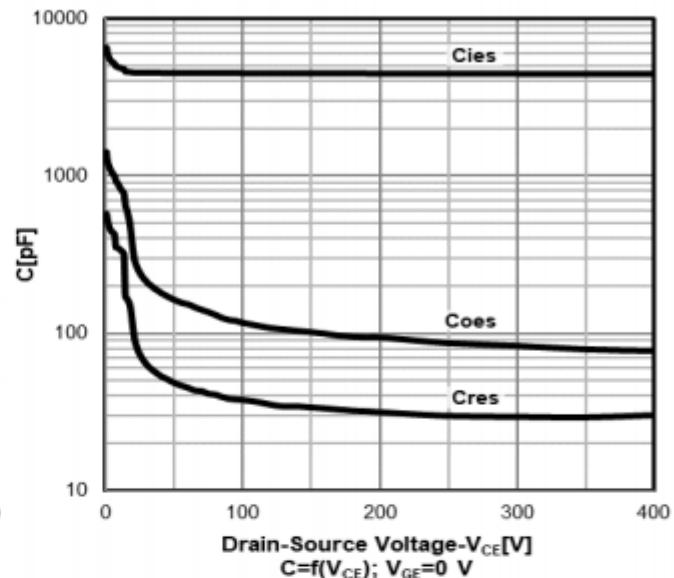
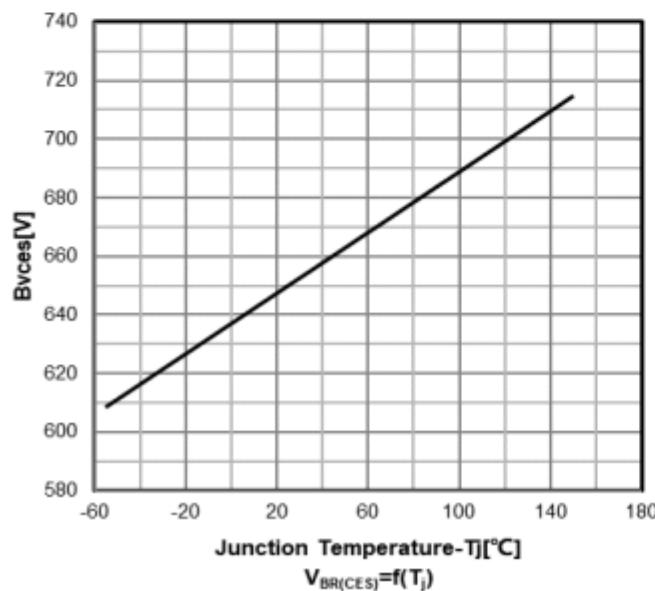
Normalized  $V_{GE(\text{th})}$  vs. temperature



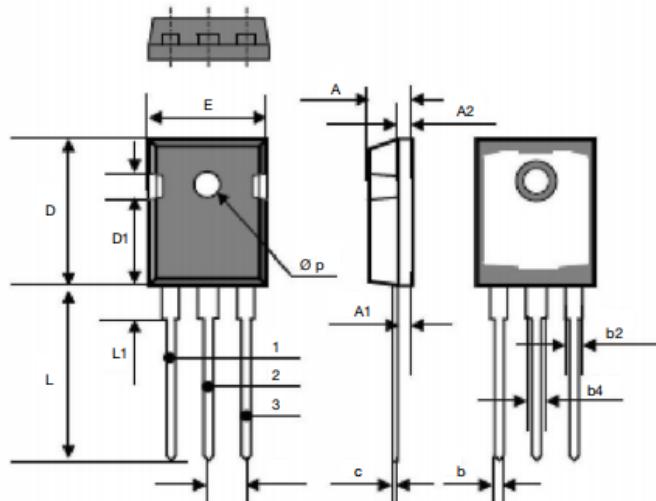
Gate charge characteristics



Capacitance characteristics

Collector-emitter breakdown voltage  
vs. temperature

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DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.70	5.31	0.185	0.209
A1	2.21	2.59	0.087	0.102
A2	1.50	2.49	0.059	0.098
b	0.99	1.40	0.039	0.055
b2	1.65	2.41	0.065	0.095
b4	2.59	3.43	0.102	0.135
c	0.61 BSC		0.024 BSC	
D	20.80	21.46	0.819	0.845
D1	3.68	5.49	0.145	0.216
(e)	5.46 BSC		0.215 BSC	
E	15.49	16.26	0.610	0.640
L	19.81	20.32	0.780	0.800
L1	4.06	4.50	0.160	0.177
Øp	3.51	3.66	0.138	0.144

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