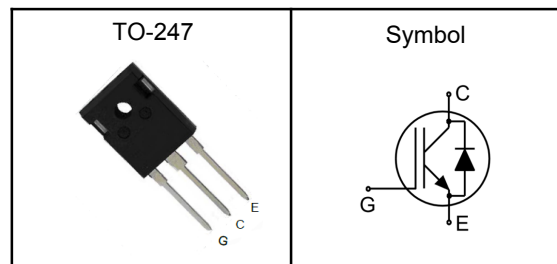


**600V/40A Trench FS II Fast IGBT**
**Features**

- Trench FS II Technology
- Very low  $V_{CE(sat)}$
- High speed switching
- ROHS Compliant

**Applications**

- Inverter welding machine
- Motor drives
- UPS

**Pin Description**


$V_{CES}$	600	V
$V_{CE(sat)-Typ}$	1.7	V
$I_C$	40	A

**Absolute Maximum Ratings** ( $T_C=25^\circ\text{C}$ , Unless Otherwise Noted)

Parameter	Symbol	Rating	Units
Collector-Emitter Voltage	$V_{CES}$	600	V
Gate- Emitter Voltage	$V_{GES}$	$\pm 30$	V
Collector Current <sup>1</sup>	$I_C$	80	A
Collector Current <sup>1</sup>	$I_C$	40	A
Pulsed Collector Current <sup>2</sup>	$I_{CM}$	160	A
Diode Continuous Forward Current	$I_F$	40	A
Diode Pulsed Forward Current	$I_{FM}$	160	A
Power Dissipation	$P_D$	286	W
Power Dissipation	$P_D$	143	W
Storage Temperature Range	$T_{STG}$	-55 to 150	$^\circ\text{C}$
Operating Junction Temperature Range	$T_J$	-55 to 150	$^\circ\text{C}$

**Thermal Characteristics**

Parameter	Symbol	Typ	Max	Unit
Thermal Resistance Junction-Ambient	$R_{\theta JA}$	---	40	$^\circ\text{C/W}$
Thermal Resistance Junction to case for IGBT	$R_{\theta JC}$	---	0.52	$^\circ\text{C/W}$
Thermal Resistance Junction to case for Diode	$R_{\theta JCD}$	---	0.79	$^\circ\text{C/W}$



**600V/40A Trench FS II Fast IGBT**

**Electrical Characteristics** ( $T_J=25^{\circ}\text{C}$ , Unless Otherwise Noted)

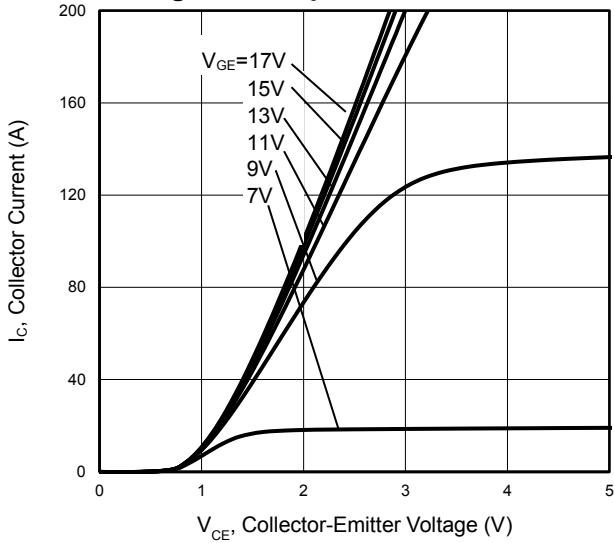
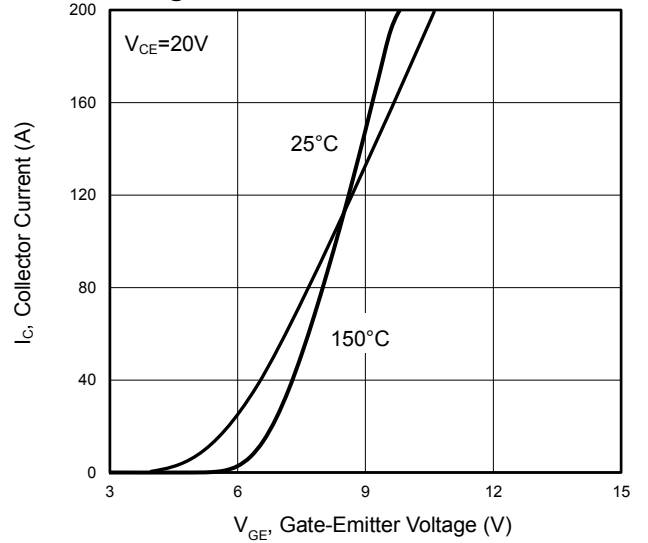
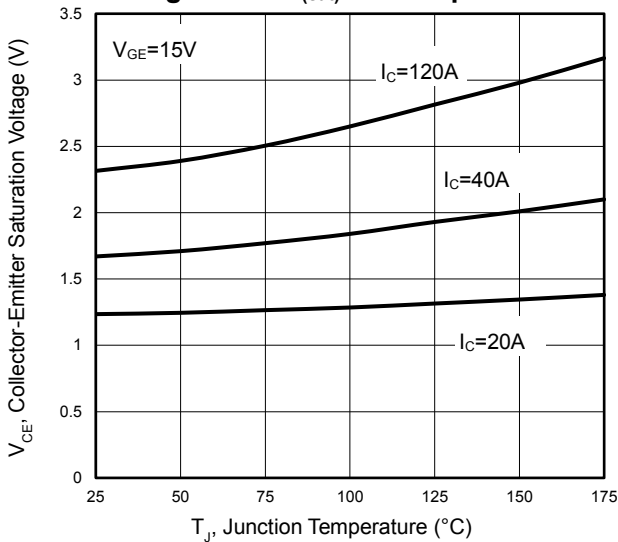
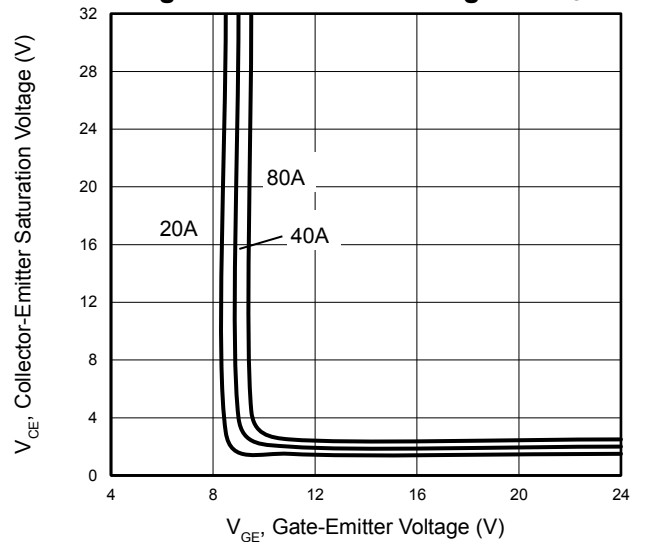
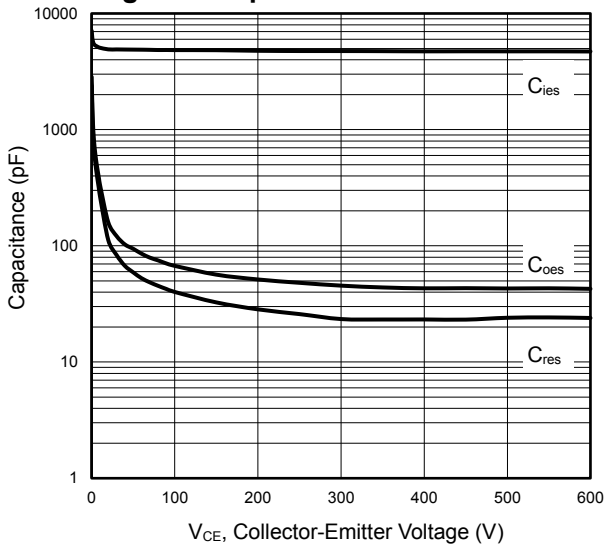
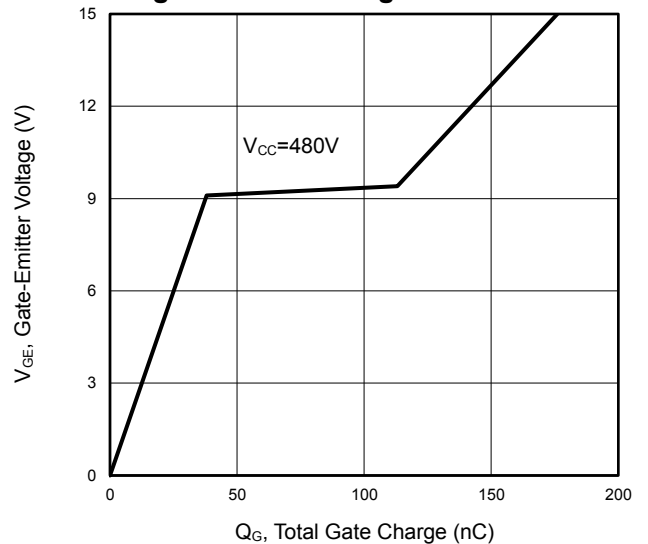
Parameter	Symbol	Conditions	Min	Typ	Max	Unit	
Collector-Emitter Breakdown Voltage	$BV_{CES}$	$V_{GE}=0V, I_D=1mA$	600	---	---	V	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE}=15V, I_C=40A,$	$T_J=25^{\circ}\text{C}$	---	1.7	2.0	V
			$T_J=150^{\circ}\text{C}$	---	1.9	---	V
Gate Threshold Voltage	$V_{GE(th)}$	$V_{CE}=V_{GE}, I_C=1mA$	4.0	5.0	6.5	V	
Collector-Emitter Leakage Current	$I_{CES}$	$V_{CE}=650V, V_{GE}=0V$	---	---	40	$\mu\text{A}$	
Gate to Emitter Leakage Current	$I_{GES}$	$V_{GE}=\pm 30V, V_{CE}=0V$	---	---	$\pm 200$	nA	
Total Gate Charge	$Q_g$	$V_{CC}=480V, V_{GE}=15V, I_C=40A$	---	176	---	nC	
Gate to Emitter Charge	$Q_{ge}$		---	38	---	nC	
Gate to Collector Charge	$Q_{gc}$		---	73	---	nC	
Turn-On Delay Time	$t_{d(ON)}$	$V_{CC}=400V, I_C=40A, V_{GE}=15V, R_g=5\Omega, \text{Inductive Load}$	---	19	---	ns	
Rise Time	$t_r$		---	17	---		
Turn-Off Delay Time	$t_{d(off)}$		---	168	---		
Fall Time	$t_f$		---	16	---	mJ	
Turn-On Switching Loss	$E_{on}$		---	0.58	---		
Turn-Off Switching Loss	$E_{off}$		---	0.48	---		
Total Switching Loss	$E_{ts}$	---	1.06	---			
Input Capacitance	$C_{ies}$	$V_{CE}=25V, V_{GE}=0V, f=1\text{MHz}$	---	4894	---	pF	
Output Capacitance	$C_{oes}$		---	136	---		
Reverse Transfer Capacitance	$C_{res}$		---	94	---		

**Drain-Source Diode Characteristics**

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Diode Forward Voltage	$V_F$	$I_F=40A, T_C=25^{\circ}\text{C}$	---	1.7	2.0	V
Reverse Recovery Time	$t_{rr}$	$I_F=40A, di/dt=200A/\mu\text{s}, T_C=25^{\circ}\text{C}$	---	242	---	nS
Reverse Recovery Charge	$Q_{rr}$		---	0.44	---	$\mu\text{C}$
Diode Peak Reverse Recovery Current	$I_{rrm}$		---	3.9	---	A

**Note:**

- 1.The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.
- 2.The data tested by pulsed , pulse width  $\leq 300\mu\text{s}$  , duty cycle  $\leq 2\%$

**600V/40A Trench FS II Fast IGBT**
**Typical Characteristics**
**Figure 1 Output Characteristics**

**Figure 2 Transfer Characteristics**

**Figure 3  $V_{CE(sat)}$  vs. Temperature**

**Figure 4 Saturation Voltage vs.  $V_{GE}$** 

**Figure 5 Capacitance Characteristics**

**Figure 6 Gate Charge Wave Form**




600V/40A Trench FS II Fast IGBT

Figure 7 Forward Characteristics

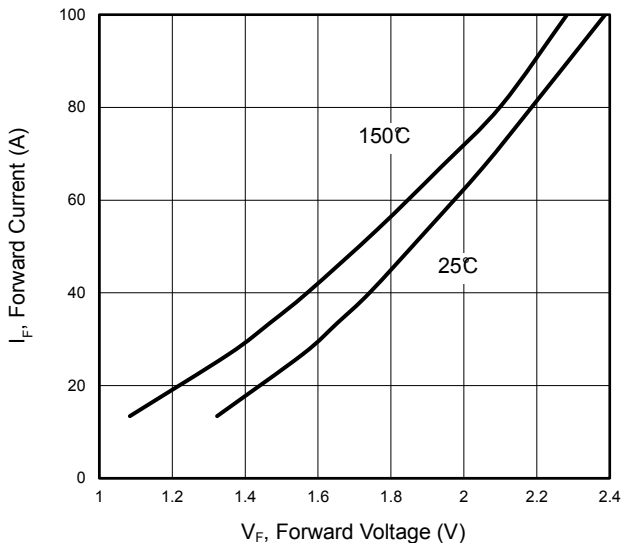


Figure 8 Forward Bias Safe Operating Area

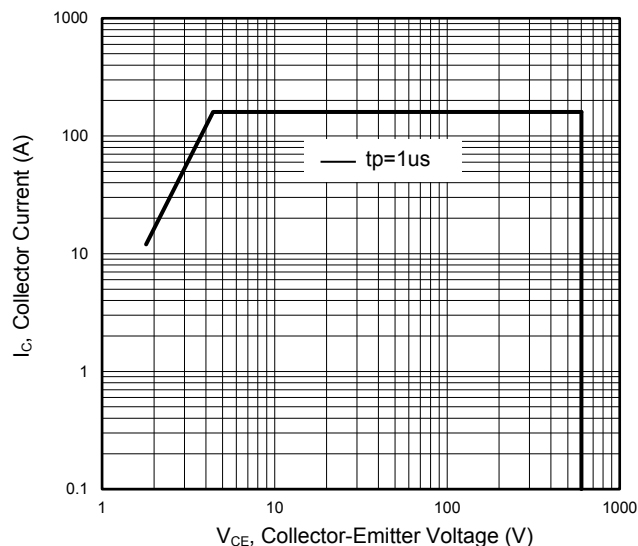


Figure 9 Switching Loss vs.  $R_G$

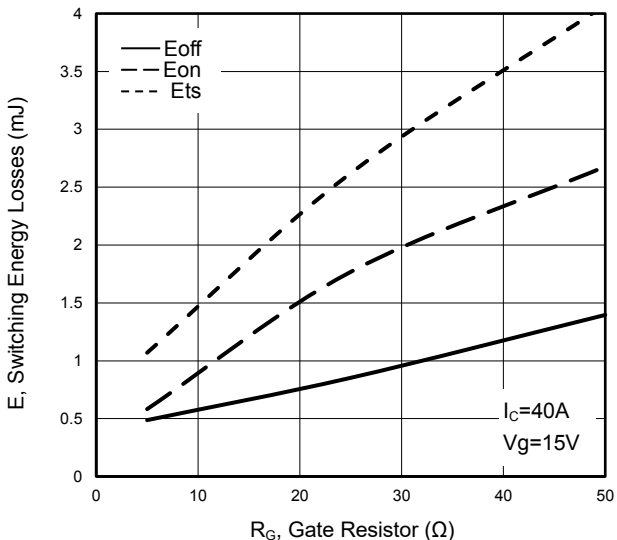


Figure 10  $V_{CE(SAT)}$  vs. Collector Current

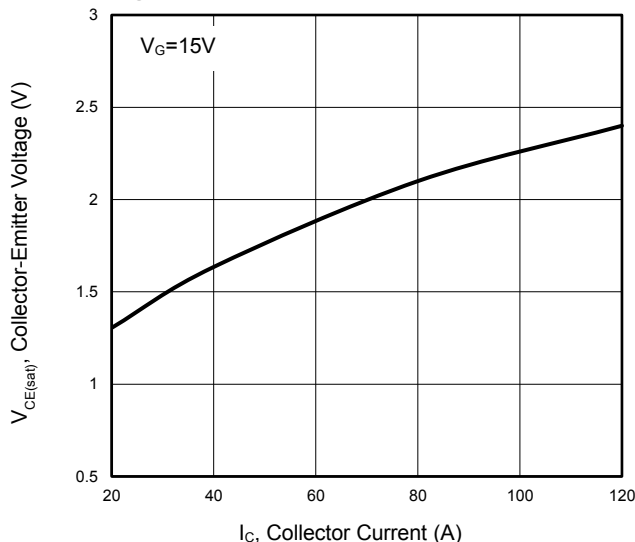


Figure 11 Switching Loss vs. Collector Current

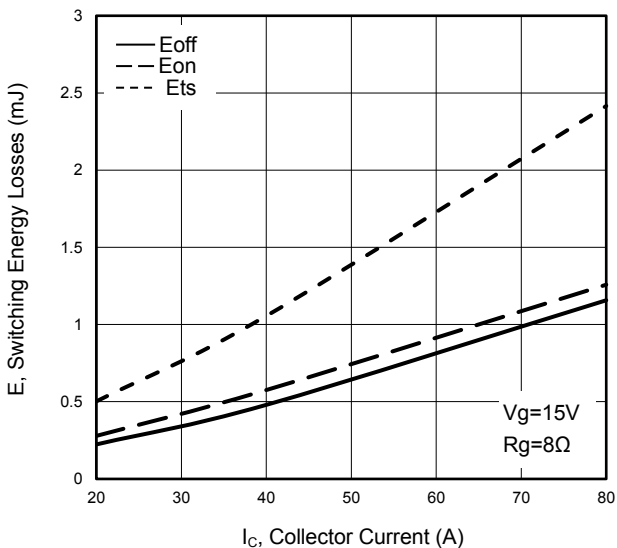
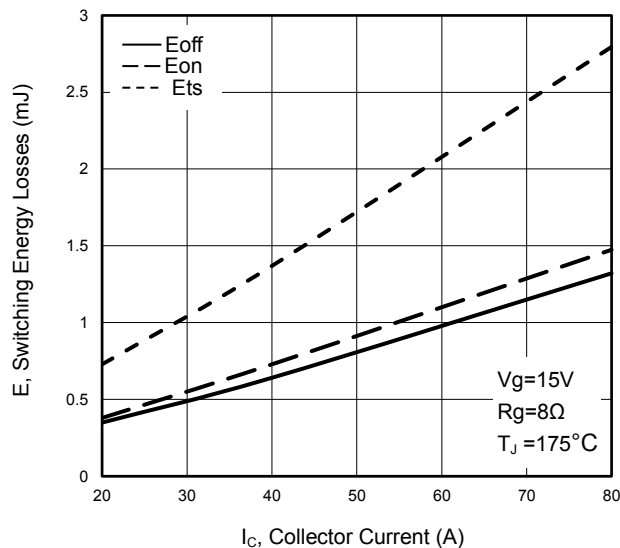
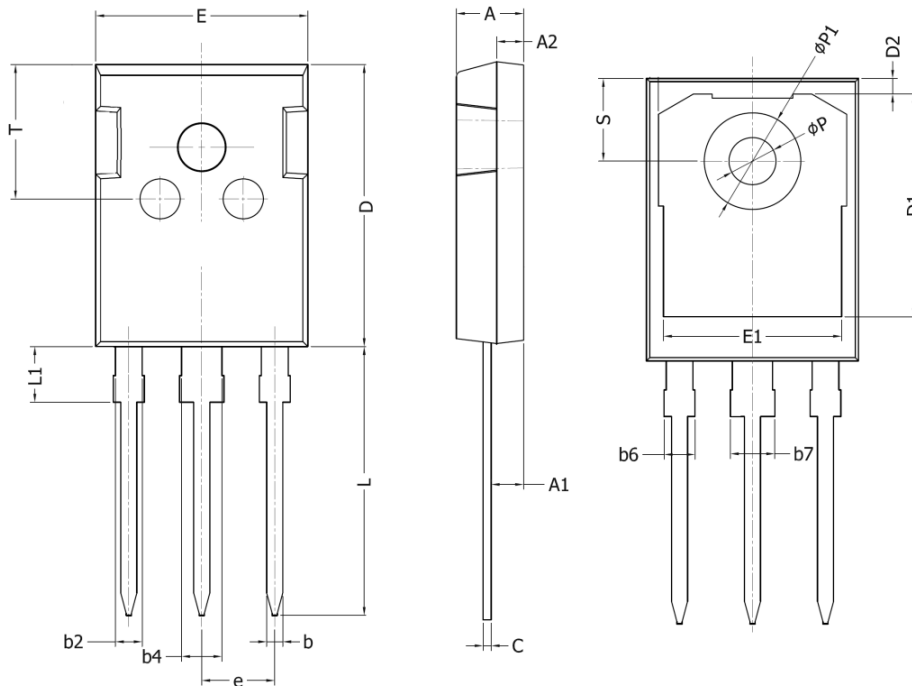


Figure 12 Switching Loss vs. Collector Current



**600V/40A Trench FS II Fast IGBT**
**TO-247 Package Outline Dimensions**


Symbol	Dimensions In Millimeters	
	Min.	Max.
A	4.90	5.20
A1	2.31	2.51
A2	1.9	2.1
b	1.16	1.26
b2	1.96	2.06
b4	2.96	3.06
b6	-	2.25
b7	-	3.25
C	0.59	0.66
D	20.90	21.20
D1	16.25	16.85
D2	1.05	1.35
E	15.75	16.10
E1	13.00	13.60
e	5.436 BSC	
L	19.80	20.20
L1	-	4.30
P	3.40	3.60
P1	7.00	7.40
S	6.05	6.25
T	9.80	10.20