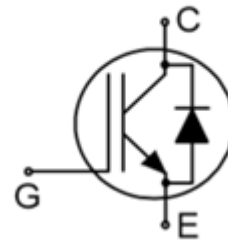


## Trench Field-Stop Technology IGBT

### Features

- 650V, 50A
- $V_{CE(sat)(typ.)} = 1.43V @ V_{GE}=15V, I_C=50A$
- Low Switching Losses
- $V_{CE(sat)}$  with Positive Temperature Coefficient
- Pb-free Lead Plating; RoHS Compliant



### Applications

- Frequency Converters
- Uninterrupted Power Supply
- Air Conditioning
- Motor Drives

Order codes	$V_{CE}$	$I_C$	$V_{CEsat}, T_{vj}=25^{\circ}C$	$T_{vjmax}$	Marking	Package
XD050H065AT1S3	650V	50A	1.43V	175 $^{\circ}C$	D50H65AT1	TO247-3

### Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
$V_{CES}$	Collector-Emitter Voltage	650	V
$V_{GES}$	Gate-Emitter Voltage	$\pm 20$	V
$I_C$	Continuous Collector Current ( $T_C=25^{\circ}C$ )	50	A
$I_{CM}$	Pulsed Collector Current (Note 1)	100	A
$I_F$	Diode Continuous Forward Current ( $T_C=100^{\circ}C$ )	50	A
$I_{FM}$	Diode Maximum Forward Current (Note 1)	100	A
$t_{sc}$	Short Circuit Withstand Time	10	us
$P_D$	Maximum Power Dissipation ( $T_C=25^{\circ}C$ )	395	W
$T_J$	Operating Junction Temperature Range	-55 to 175	$^{\circ}C$
$T_{STG}$	Storage Temperature Range	-55 to 150	$^{\circ}C$

### Thermal Data

Symbol	Parameter	Max.	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case for IGBT	0.38	$^{\circ}C/W$

**Electrical Characteristics** ( $T_c=25^\circ\text{C}$  unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$BV_{CES}$	Collector-Emitter Breakdown Voltage	$V_{GE}=0V, I_C=200\mu A$	650	---	---	V
$I_{CES}$	Collector-Emitter Leakage Current	$V_{CE}=650V, V_{GE}=0V$	---	---	1	mA
$I_{GES}$	Gate Leakage Current, Forward	$V_{GE}=20V, V_{CE}=0V$	---	---	600	nA
	Gate Leakage Current, Reverse	$V_{GE}=-20V, V_{CE}=0V$	---	---	-600	nA
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE}=V_{CE}, I_C=750\mu A$	4.2	---	6.0	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$V_{GE}=15V, I_C=50A$	---	1.43	---	V
$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=400V$ $V_{GE}=\pm 15V$ $I_C=50A$ $R_G=8\Omega$ Inductive Load $T_c=25^\circ\text{C}$	---	35	---	ns
$t_r$	Turn-on Rise Time		---	155	---	ns
$t_{d(off)}$	Turn-off Delay Time		---	188	---	ns
$t_f$	Turn-off Fall Time		---	69	---	ns
$E_{on}$	Turn-on Switching Loss		---	4.35	---	mJ
$E_{off}$	Turn-off Switching Loss		---	1.11	---	mJ
$E_{ts}$	Total Switching Loss		---	4.00	---	mJ
$C_{ies}$	Input Capacitance		$V_{CE}=25V$	---	7435	---
$C_{oes}$	Output Capacitance	$V_{GE}=0V$	---	237	---	pF
$C_{res}$	Reverse Transfer Capacitance	$f=1\text{MHz}$	---	128	---	pF

**Diode Characteristics** ( $T_c=25^\circ\text{C}$  unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$V_F$	Diode Forward Voltage	$I_F=50A$	---	1.37	---	V
$t_{rr}$	Diode Reverse Recovery Time	$V_{CE}=400V$ $I_F=50A$ $V_{GE}=-15V$	---	201	---	ns
$I_{rr}$	Diode Peak Reverse Recovery Current		---	19	---	A
$Q_{rr}$	Diode Reverse Recovery Charge		---	2.45	---	$\mu\text{C}$

Note 1: Repetitive Rating: Pulse width limited by maximum junction temperature

## Typical Characteristics

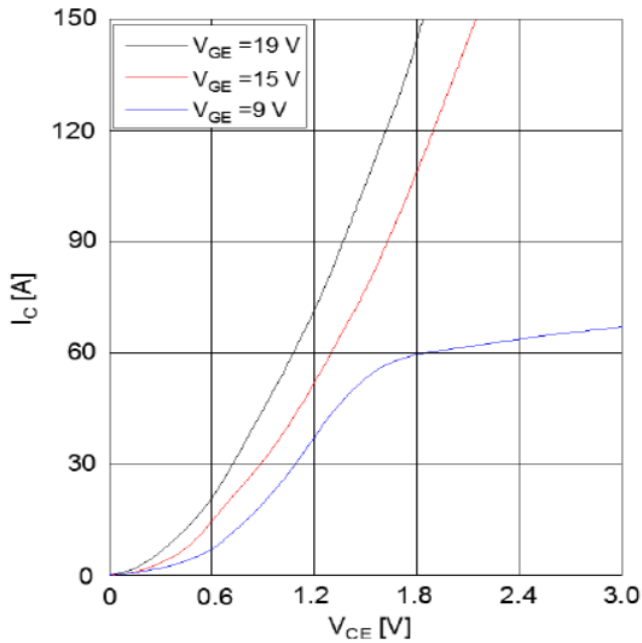


Fig. 1 Typical IGBT Output Characteristics at  $T_J=25^{\circ}\text{C}$

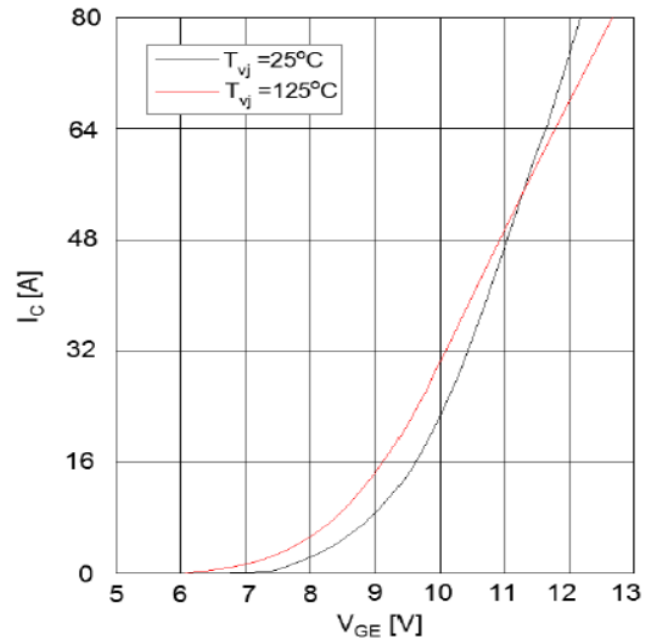


Fig. 2 Typical Transfer Characteristics at  $V_{CE}=20\text{V}$

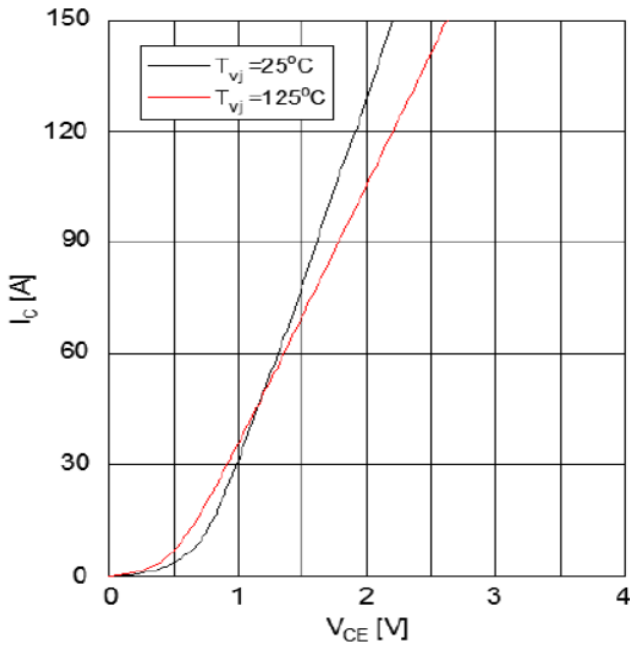


Fig. 3 Typical Transfer Characteristics at  $V_{GE}=15\text{V}$

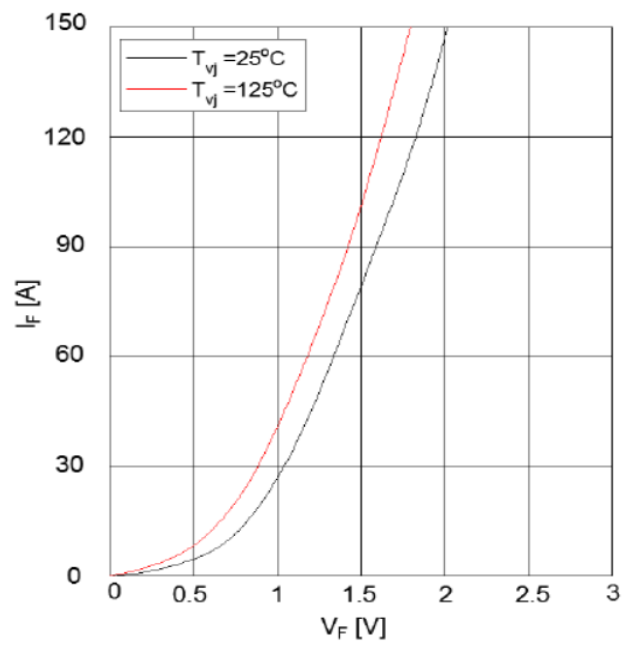


Fig. 4 Forward characteristic of Diode-Inverter

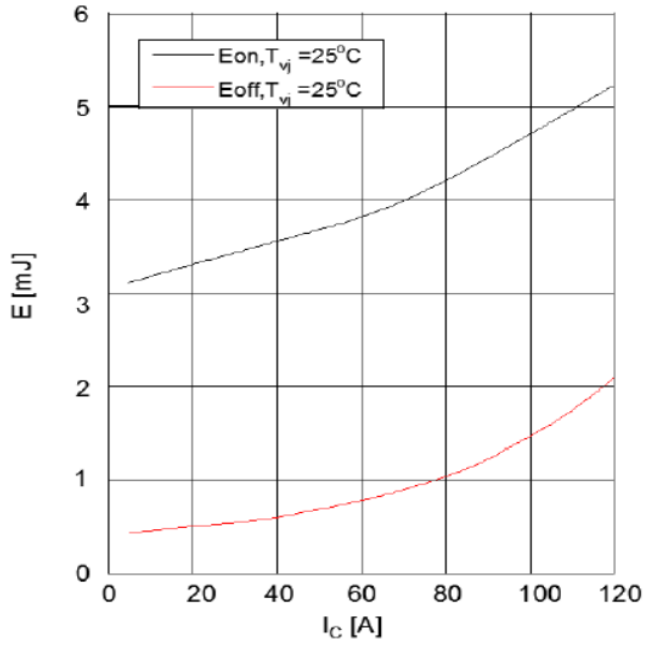


Fig. 5 Typical Energy Loss vs.  $I_C$  at  $T_C=25^\circ\text{C}$ ,  $V_{CE}=400\text{V}$ ,  $V_{GE}=15\text{V}$ ,  $R_G=8\ \Omega$

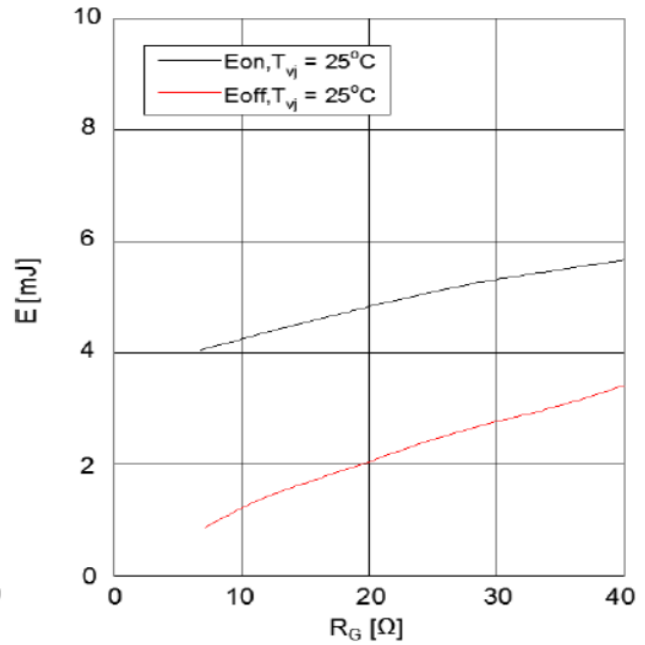


Fig. 6 Typical Switching Time vs.  $R_G$  at  $T_C=25^\circ\text{C}$ ,  $V_{CE}=400\text{V}$ ,  $V_{GE}=15\text{V}$ ,  $I_C=50\text{A}$

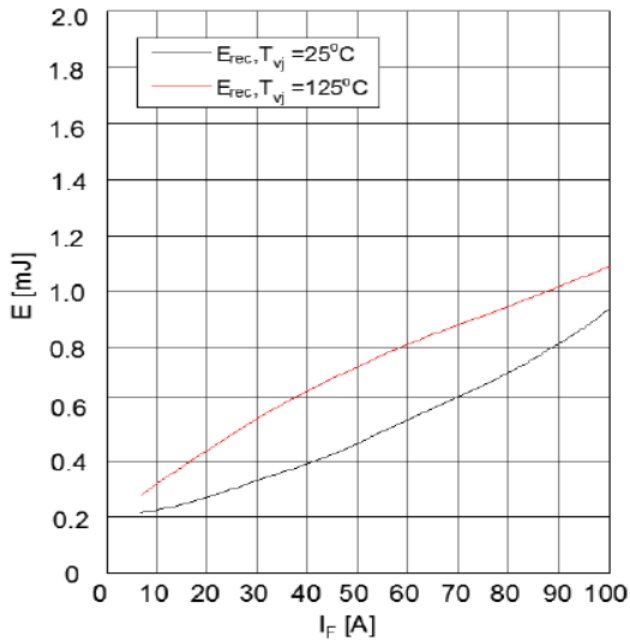


Fig. 7 Typical Diode Energy Loss vs.  $I_C$  at  $V_{CC}=400\text{V}$  and  $R_G=8\ \Omega$

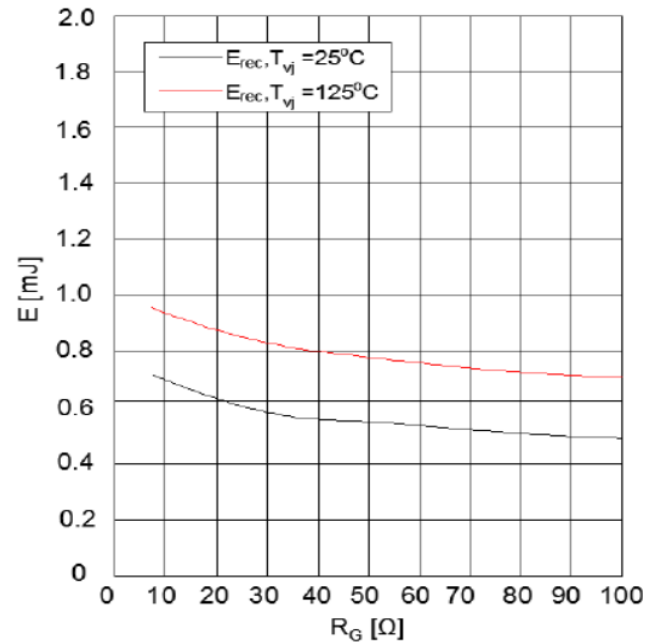
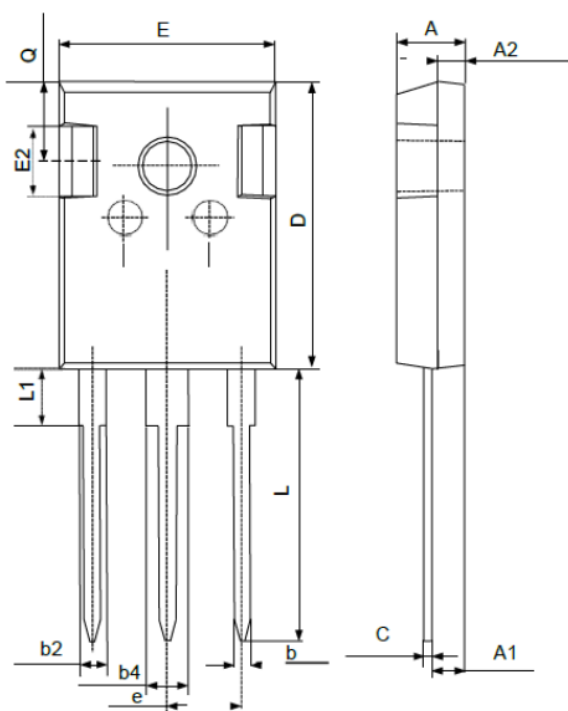


Fig. 8 Typical Diode Energy Loss vs.  $R_G$  at  $V_{CC}=400\text{V}$  and  $I_F=50\text{A}$

# Package Information

TO-247



SYMBOL	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.21	2.41	2.59
A2	1.85	2.00	2.15
b	1.11	----	1.36
b2	1.91	----	2.25
b4	2.91	----	3.25
c	0.51	----	0.75
D	20.80	21.00	21.30
E	15.50	15.80	16.10
E2	4.40	5.00	5.20
e	5.44 BSC		
L	19.72	19.92	20.22
L1	----	----	4.30
Q	5.60	5.80	6.00