

TPGW50N65NS

IGBT Discrete with Anti-Parallel Diode

General Description

Topdiode TPGW50N65NS 50A, 650V IGBT Discrete provides ultra-low conduction loss as well as short circuit ruggedness. They are designed for the applications such as general inverters and UPS.

Features

High Breakdown Voltage up to 650V for Improved Reliability

Trench-Stop Technology Offering

High Ruggedness, Temperature Stable

Low V_{CEsat}

Easy Parallel Switching Capability due to Positive

Temperature Coefficient in V_{CEsat}

Enhanced Avalanche Capability

Applications

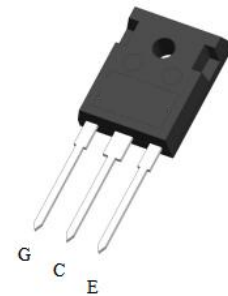
Uninterruptible Power Supplies

Inverter

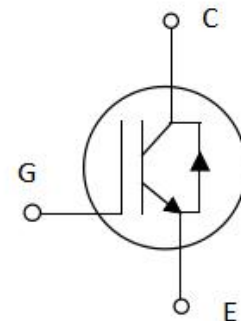
Welding Converters

PFC Applications

Package TO-247-3



Equivalent Schematic



Summary

Symbol	Value
V_{CE}	650V
I_C	50A
$V_{CE(SAT)} \quad I_C=50A$	1.58V

Maximum Ratings ($T_C = 25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Description	Value	Unit
IGBT Ratings			
V_{CES}	Collector-Emitter Voltage, $T_{vj}=25^{\circ}\text{C}$	650	V
V_{GE}	Gate-Emitter Voltage	± 20	V
$I_{C\text{ nom}}$	Continuous DC Collector Current, $T_C = 100^{\circ}\text{C}$, $T_{vj\text{ max}}=175^{\circ}\text{C}$	50	A
I_{CRM}	Repetitive Peak Collector Current, $t_p=1\text{ms}$	100	A
P_{tot}	Total Power Dissipation, $T_C = 25^{\circ}\text{C}$, $T_{vj\text{ max}}=175^{\circ}\text{C}$	275	W
Diode Ratings			
V_{RRM}	Repetitive Peak Reverse Voltage, $T_{vj}=25^{\circ}\text{C}$	650	V
I_F	Continuous DC Forward Current, $T_C = 100^{\circ}\text{C}$, $T_{vj\text{ max}}=175^{\circ}\text{C}$	50	A
I_{FRM}	Repetitive Peak Forward Current, $t_p=1\text{ms}$	100	A
T_{vjop}	Temperature under Switching Conditions	-40 to +175	$^{\circ}\text{C}$

Thermal Characteristics

Symbol	Description	Max.	Unit
R_{thJC}	IGBT Thermal Resistance, Junction - Case	0.38	K/W
R_{thJC}	Diode Thermal Resistance, Junction - Case	0.45	K/W

Electrical Characteristics (T_j= 25°C unless otherwise specified)

Symbol	Description	Conditions	Min	Typ	Max	Unit
IGBT Characteristics						
V _{CEsat}	Collector-Emitter Saturation Voltage	V _{GE} =15V, I _C =50A, T _{vj} =25°C		1.58	2.10	V
		V _{GE} =15V, I _C =50A, T _{vj} =125°C		1.87		
		V _{GE} =15V, I _C =50A, T _{vj} =150°C		1.95		
V _{GE(th)}	Gate Threshold Voltage	V _{GE} =V _{CE} , I _C =0.5mA, T _{vj} =25°C	4.2	5.0	5.8	V
G _{fs}	Transfer Conductance	V _{CE} =20V, I _C =50A		77		S
C _{ies}	Input Capacitance	F=1MHz, V _{CE} =25V, V _{GE} =0V, T _{vj} =25°C		5.46		nF
C _{oes}	Output Capacitance			0.24		
C _{res}	Reverse Transfer Capacitance			0.1		
I _{CES}	Collector-Emitter cut-off Current	V _{CE} =650V, V _{GE} =0V, T _{vj} =25°C			1	mA
I _{GES}	Collector-Emitter Leakage Current	V _{CE} =0V, V _{GE} =20V, T _{vj} =25°C			200	nA
T _{don}	Turn-on Delay Time	I _C =50A, V _{CE} =400V V _{GE} =±15V, R _g =8Ω Inductive load	T _{vj} =25°C	33		ns
			T _{vj} =125°C	21		
			T _{vj} =150°C	19		
T _r	Rise Time	I _C =50A, V _{CE} =400V V _{GE} =±15V, R _g =8Ω Inductive load	T _{vj} =25°C	75		ns
			T _{vj} =125°C	67		
			T _{vj} =150°C	65		
T _{doff}	Turn-off Delay Time	I _C =50A, V _{CE} =400V V _{GE} =±15V, R _g =8Ω Inductive load	T _{vj} =25°C	21		ns
			T _{vj} =125°C	32		
			T _{vj} =150°C	38		
T _f	Fall Time	I _C =50A, V _{CE} =400V V _{GE} =±15V, R _g =8Ω Inductive load	T _{vj} =25°C	41		ns
			T _{vj} =125°C	62		
			T _{vj} =150°C	62		
E _{on}	Turn-on Energy Loss Per Pulse	I _C =50A, V _{CE} =400V V _{GE} =±15V, R _g =8Ω Inductive load	T _{vj} =25°C	2.37		mJ
			T _{vj} =125°C	2.88		
			T _{vj} =150°C	3.10		
E _{off}	Turn-off Energy Loss Per Pulse	I _C =50A, V _{CE} =400V V _{GE} =±15V, R _g =8Ω Inductive load	T _{vj} =25°C	0.60		mJ
			T _{vj} =125°C	0.73		
			T _{vj} =150°C	0.76		

Diode Characteristics							
V_F	Forward Voltage	$V_{GE}=0V, I_F=50A, T_{vj}=25^{\circ}C$			1.63		V
		$V_{GE}=0V, I_F=50A, T_{vj}=125^{\circ}C$			1.42		
		$V_{GE}=0V, I_F=50A, T_{vj}=150^{\circ}C$			1.37		
I_{RM}	Peak Reverse Recovered Current	$I_F=50A$ $-dif/dt=411A/us$ $V_R=400V, V_{GE}=-15V$	$T_{vj}=25^{\circ}C$		21		A
			$T_{vj}=125^{\circ}C$		29		
			$T_{vj}=150^{\circ}C$		32		
Q_{rr}	Peak Reverse Recovered Charge	$I_F=50A$ $-dif/dt=411A/us$ $V_R=400V, V_{GE}=-15V$	$T_{vj}=25^{\circ}C$		1.48		μC
			$T_{vj}=125^{\circ}C$		3.26		
			$T_{vj}=150^{\circ}C$		3.95		
t_{rr}	Reverse Recovery Time	$I_F=50A$ $-dif/dt=411A/us$ $V_R=400V, V_{GE}=-15V$	$T_{vj}=25^{\circ}C$		133		ns
			$T_{vj}=125^{\circ}C$		199		
			$T_{vj}=150^{\circ}C$		218		
E_{rec}	Reverse Recovered Energy	$I_F=50A$ $-dif/dt=411A/us$ $V_R=400V, V_{GE}=-15V$	$T_{vj}=25^{\circ}C$		0.34		mJ
			$T_{vj}=125^{\circ}C$		0.66		
			$T_{vj}=150^{\circ}C$		0.78		

Typical Performance

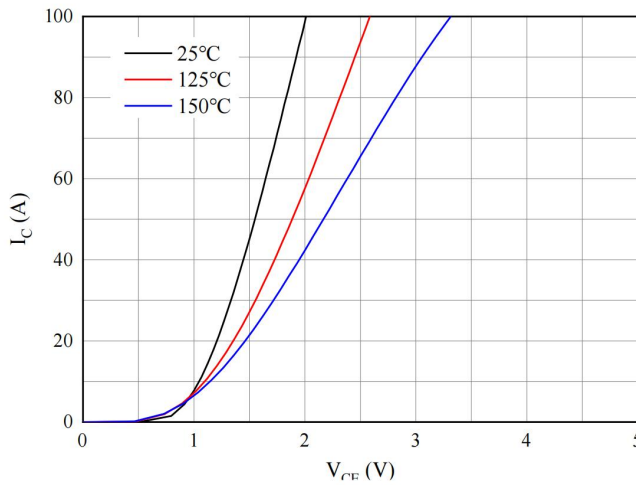


Figure 1: Typical Output Characteristics($V_{GE}=15V$)

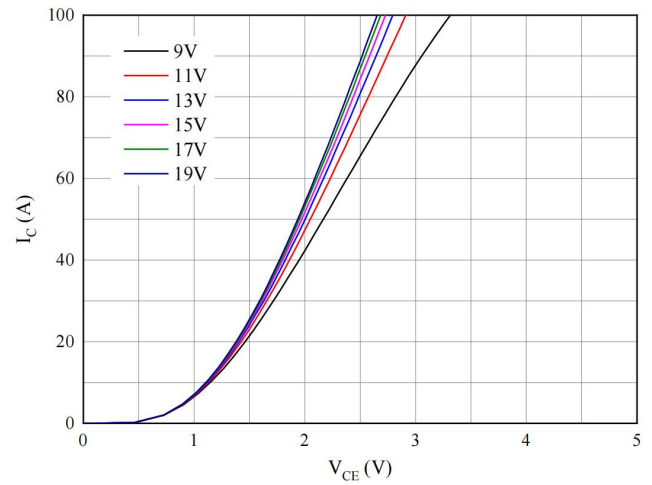


Figure 2: Typical Output Characteristics($T_{vj}=150^{\circ}C$)

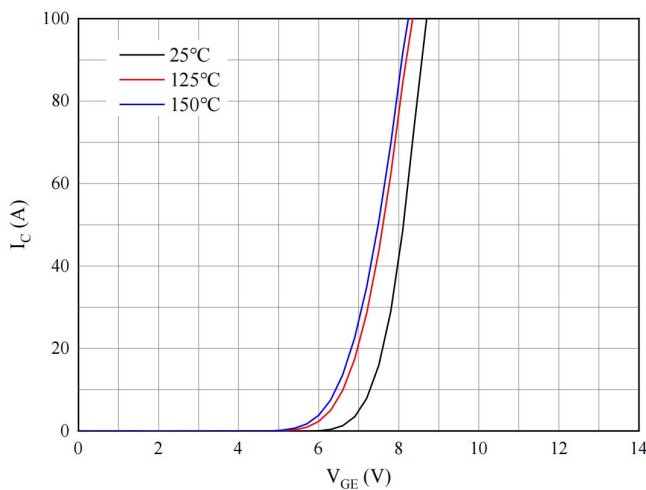


Figure 3: Typical Output Characteristics($V_{GE}=15V$)

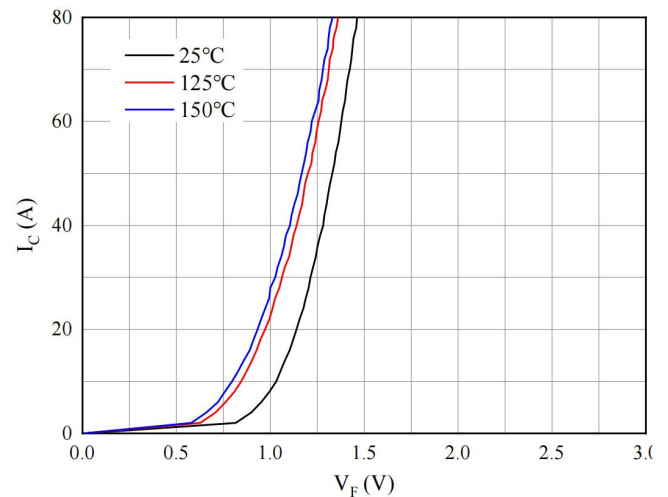


Figure 4: Forward Characteristic of Diode

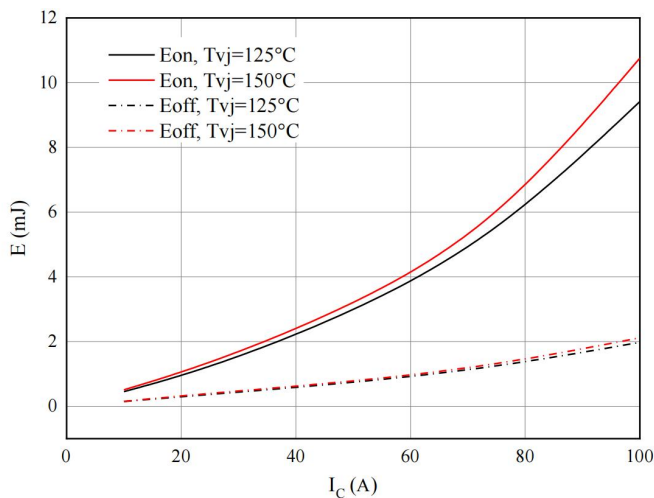


Figure 5: Switching Losses of IGBT
 $V_{GE}=\pm 15V, R_g=8\Omega, V_{CE}=400V$

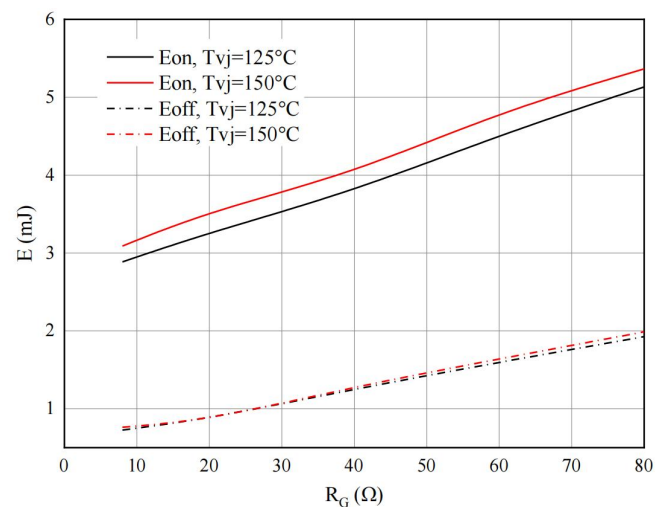


Figure 6: Switching Losses of IGBT
 $V_{GE}=\pm 15V, I_C=50A, V_{CE}=400V$

Typical Performance

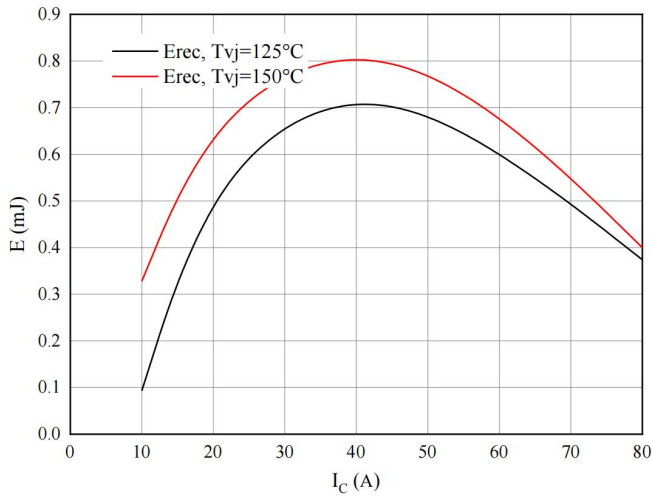


Figure 7: Switching Losses of Diode
 $R_g=8\Omega, V_{CE}=400V$

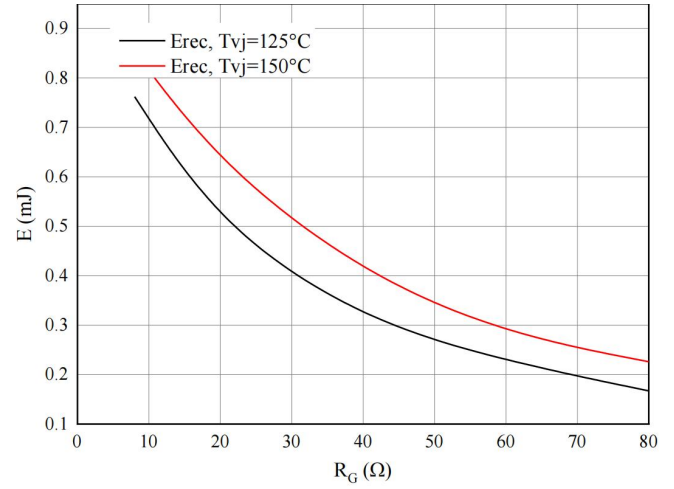


Figure 8: Switching Losses of Diode
 $I_C=50A, V_{CE}=400V$

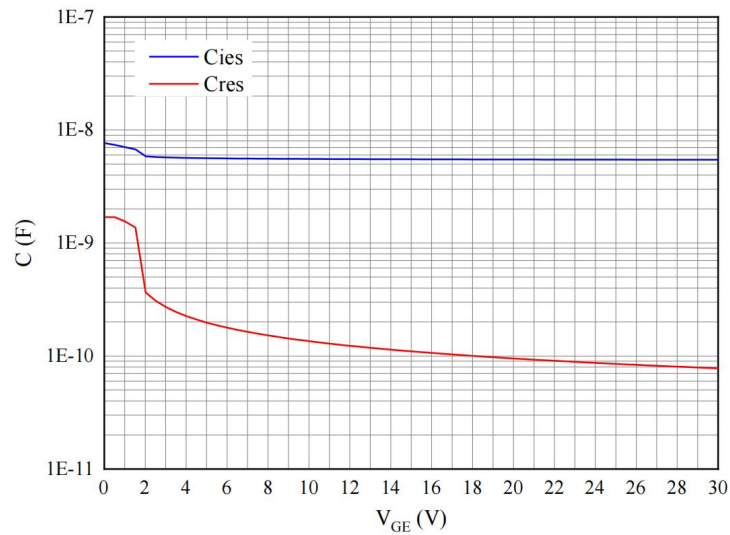
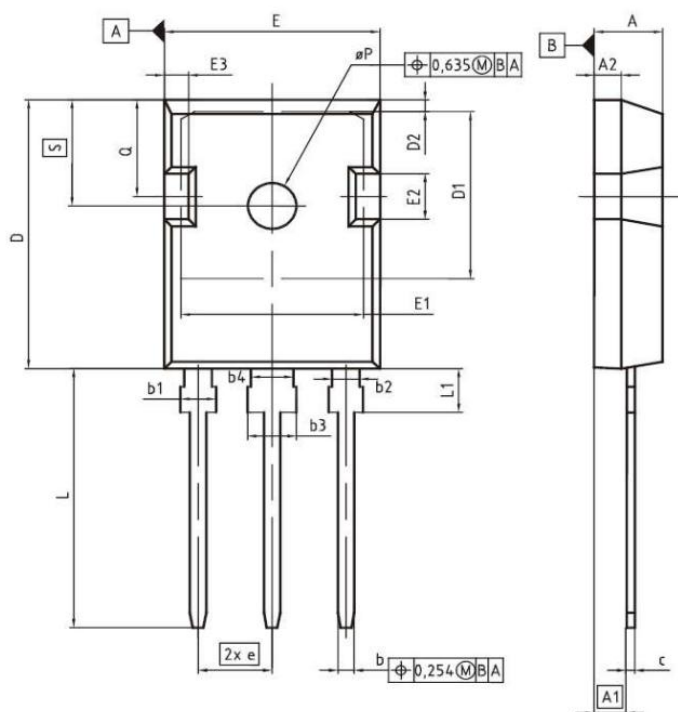


Figure 9: Capacitance Characteristics

Package Dimensions

TO-247-3



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.83	5.21	0.190	0.205
A1	2.27	2.54	0.089	0.100
A2	1.85	2.16	0.073	0.085
b	1.07	1.33	0.042	0.052
b1	1.90	2.41	0.075	0.095
b2	1.90	2.16	0.075	0.085
b3	2.87	3.38	0.113	0.133
b4	2.87	3.13	0.113	0.123
c	0.55	0.68	0.022	0.027
D	20.80	21.10	0.819	0.831
D1	16.25	17.65	0.640	0.695
D2	0.95	1.35	0.037	0.053
E	15.70	16.13	0.618	0.635
E1	13.10	14.15	0.516	0.557
E2	3.68	5.10	0.145	0.201
E3	1.00	2.60	0.039	0.102
e	5.44(BSC)		0.214(BSC)	
N	3		3	
L	19.80	20.32	0.780	0.800
L1	4.10	4.47	0.161	0.176
ΦP	3.50	3.70	0.138	0.146
Q	5.49	6.00	0.216	0.236
S	6.04	6.30	0.238	0.248

UNIT:mm