

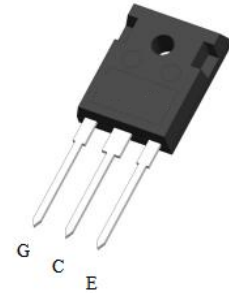
TPGW75N65XN

IGBT Discrete with Anti-Parallel Diode

Package TO-247-3

General Description

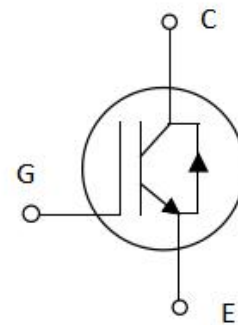
Topdiode TPGW75N65XN 75A 650V IGBT Discrete provides ultra-low conduction loss as well as short circuit ruggedness. They are designed for the applications such as general inverters and UPS.



Features

- High Breakdown Voltage up to 650V for Improved Reliability
- Trench Field Stop Technology
- High Ruggedness, Temperature Stable
- Low switching losses
- Easy Parallel Switching Capability due to Positive Temperature Coefficient in V_{CEsat}
- Maximum junction temperature 175°C

Equivalent Schematic



Applications

- Uninterruptible Power Supply
- Inverter
- Converter with High Switching Frequency

Summary

Symbol	Value
V_{CE}	650V
I_C	75A
$V_{CE(SAT)} \quad I_C=75A$	1.7V

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

Symbol	Description		Value	Unit
V _{CE}	Collector-Emitter Breakdown Voltage		650	V
I _C	DC Collector Current, Limited by T _{jmax}	T _C =25°C	150	A
		T _C =100°C	75	A
I _F	Diode Forward Current, Limited by T _{jmax}	T _C =25°C	150	A
		T _C =100°C	75	A
V _{GE}	Continuous Gate-Emitter voltage		± 20	V
V _{GE}	Transient Gate-Emitter voltage		± 30	V
I _{CRM}	Repetitive peak collector current, t _p = 1ms		150	A
P _{tot}	Power Dissipation , T _j =25°C		394	W
T _j	Operating Junction Temperature		-40 to +175	°C
T _s	Storage Temperature		-55 to +150	°C
-	Soldering Temperature, Wave Soldering 1.6mm (0.063in.) from Case for 10s		260	°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
R_{thJA}	Thermal Resistance, Junction - Ambient	40	K/W

Electrical Characteristics ($T_j = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Description	Conditions	Min	Typ	Max	Unit
Static						
BV_{CES}	Collector-Emitter Breakdown Voltage	$V_{GE}=0\text{V}$, $I_C=250\mu\text{A}$	650			V
		$V_{GE}=0\text{V}$, $I_C=1\text{mA}$	650			V
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE}=V_{CE}$, $I_C=1\text{mA}$	4.0	5.3	6.5	V
$V_{(sat)}$	Collector-Emitter Saturation Voltage	$V_{GE}=15\text{V}$, $T_j=25^\circ\text{C}$		1.7		V
		$I_C=75\text{A}$, $T_j=150^\circ\text{C}$		2.1		V
I_{CES}	Zero Gate Voltage Collector Current	$V_{CE} = 650\text{V}$, $T_j=25^\circ\text{C}$			1000	μA
		$V_{GE} = 0\text{V}$, $T_j=150^\circ\text{C}$			5000	μA
I_{GES}	Gate-Emitter Leakage Current	$V_{CE} = 0\text{V}$, $V_{GE} = \pm 20\text{V}$			100	nA
Dynamic						
C_{ies}	Input Capacitance	$V_{CE} = 25\text{V}$, $V_{GE} = 0\text{V}$, $f=1\text{MHz}$		3930		pF
C_{res}	Reverse Transfer Capacitance			36		pF

Switching Characteristic, Inductive Load

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Unit
Dynamic T _j =25°C						
t _{d(on)}	Turn-on Delay Time	V _{CC} =400V, I _C =75.0A, V _{GE} =-8.0/15.0V, R _g =20Ω		252		ns
t _r	Rise Time			325		ns
t _{d(off)}	Turn-off Delay Time			234		ns
t _f	Fall Time			129		ns
E _{on}	Turn-on Energy			6.61		mJ
E _{off}	Turn-off Energy			3.06		mJ
Dynamic T _j =150°C						
t _{d(on)}	Turn-on Delay Time	V _{CC} =400V, I _C =75.0A, V _{GE} =-8.0/15.0V, R _g =20Ω		202		ns
t _r	Rise Time			326		ns
t _{d(off)}	Turn-off Delay Time			256		ns
t _f	Fall Time			123		ns
E _{on}	Turn-on Energy			7.11		mJ
E _{off}	Turn-off Energy			3.67		mJ

Electrical Characteristics of the DIODE ($T_j=25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Parameter	Test Conditions	Min	Typ.	Max.	Unit
V_{FM}	Diode Forward Voltage	$I_F=75\text{A}$, $T_j=25^{\circ}\text{C}$		1.47	3.0	V
		$I_F=75\text{A}$, $T_j=150^{\circ}\text{C}$		1.27		
T_{rr}	Reverse Recovery Time	$I_F=75\text{A}$, $V_R=400\text{V}$, $V_{GE}=-8.0$ $di/dt=-190\text{A}/\mu\text{s}$, $T_j=25^{\circ}\text{C}$		142		ns
I_{rr}	Reverse Recovery Current			9.6		A
Q_{rr}	Reverse Recovery Charge			0.79		μC
E_{rec}	Reverse Recovery Energy			0.13		mJ
T_{rr}	Reverse Recovery Time	$I_F=75\text{A}$, $V_R=400\text{V}$, $V_{GE}=-8.0$ $di/dt=-190\text{A}/\mu\text{s}$, $T_j=150^{\circ}\text{C}$		259		ns
I_{rr}	Reverse Recovery Current			22.4		A
Q_{rr}	Reverse Recovery Charge			3.52		μC
E_{rec}	Reverse Recovery Energy			0.65		mJ

Typical Performance

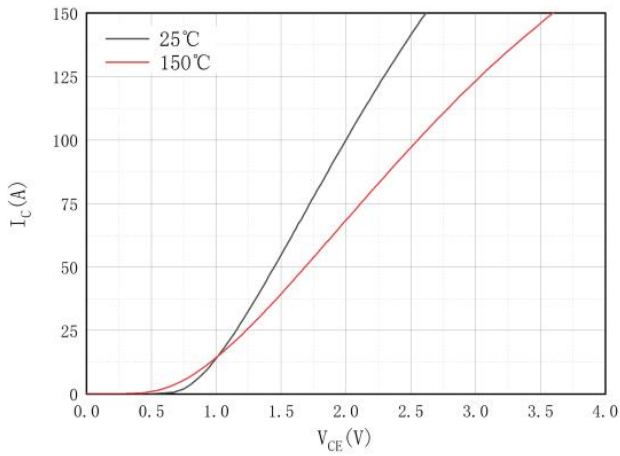


Figure 1. Typical output characteristics (VGE=15V)

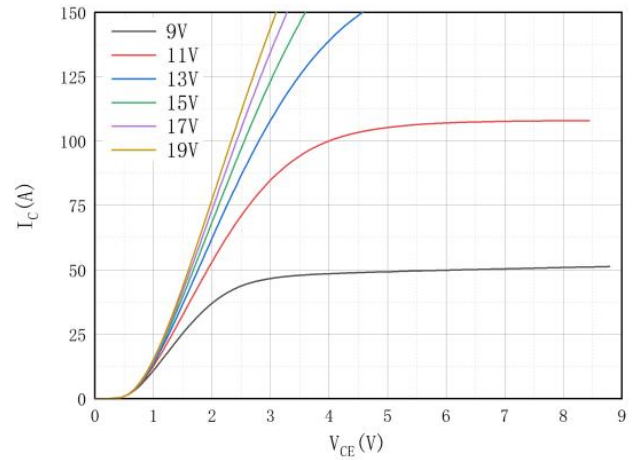


Figure 2. Typical output characteristics (Tvj=150°C)

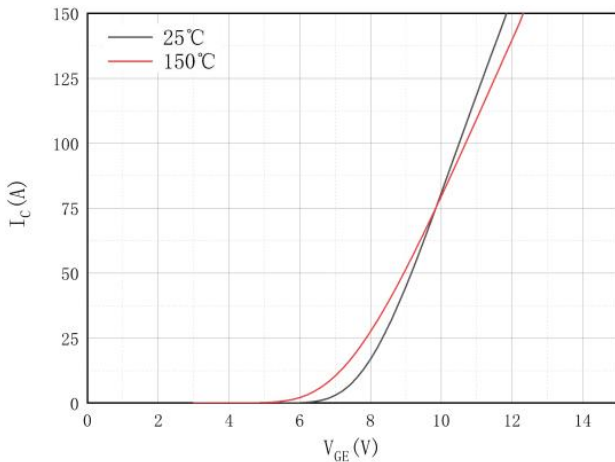


Figure 3. Typical transfer characteristic (VCE=20V)

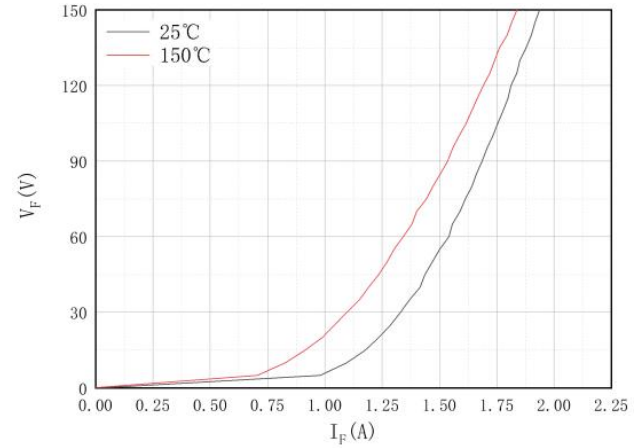


Figure 4. Forward characteristic of Diode

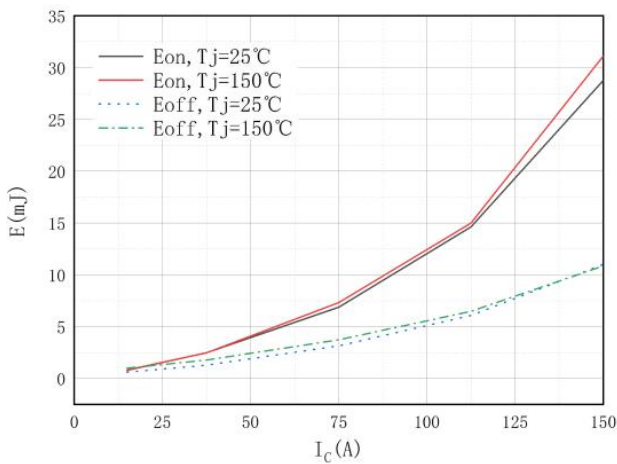


Figure 5. Switching losses of IGBT
(VGE=-8/+15V, RGon=20Ω, RGoff=20Ω,
VCE=400V)

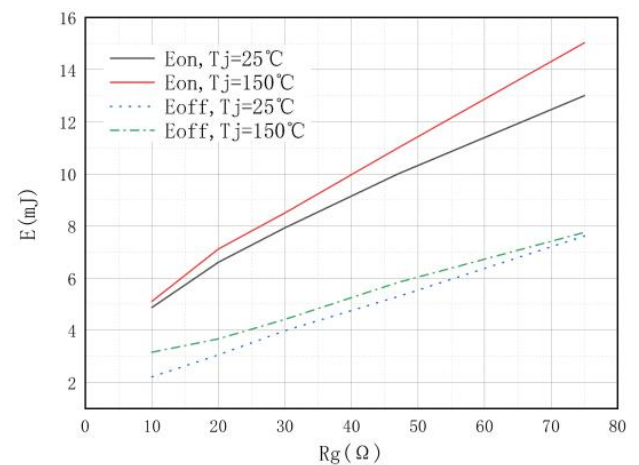


Figure 6. Switching losses of IGBT
(VGE=-8/+15V, IC=75A, VCE=400V)

Typical Performance

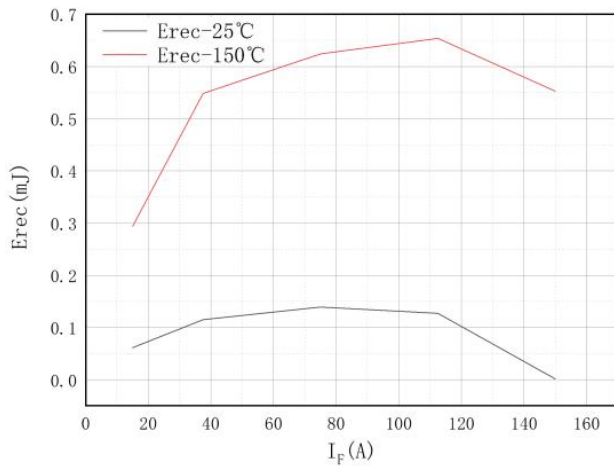


Figure 7. Switching losses of FRD
($V_{GE}=-8V$, $R_{Gon}=20\Omega$, $R_{Goff}=20\Omega$, $V_{CE}=400V$)

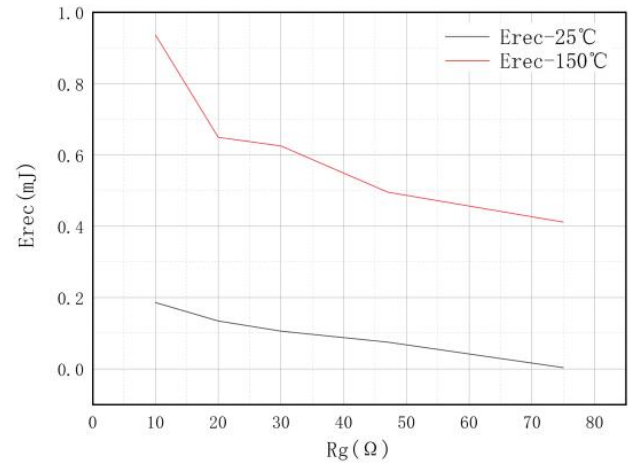


Figure 8. Switching losses of FRD
($V_{GE}=-8V$, $I_C=75A$, $V_{CE}=400V$)

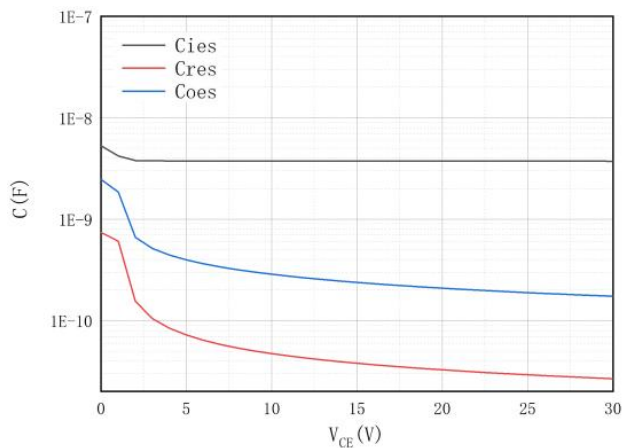
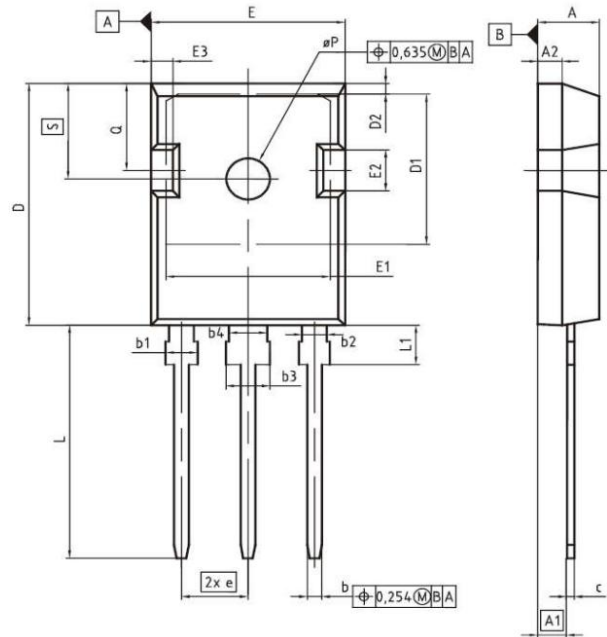


Figure 9. Capacitance characteristic

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