



General Description

OST40N65FMF uses advanced Oriental-Semi's patented Trident-Gate Bipolar Transistor (TGBT™) technology to provide extremely low $V_{CE(sat)}$, low gate charge, and excellent switching performance. This device is suitable for mid to high range switching frequency converters.

Features

- Advanced TGBT™ technology
- Excellent conduction and switching loss
- Excellent stability and uniformity
- Fast and soft antiparallel diode



Applications

- Induction converters
- Uninterruptible power supplies

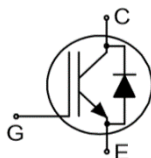
Key Performance Parameters

Parameter	Value	Unit
$V_{CES, min} @ 25^{\circ}C$	650	V
Maximum junction temperature	175	$^{\circ}C$
$I_C, pulse$	160	A
$V_{CE(sat), typ} @ V_{GE}=15V$	1.6	V
Q_g	80	nC

Marking Information

Product Name	Package	Marking
OST40N65FMF	TO220F	OST40N65FM

Package & Pin Information



Absolute Maximum Ratings at $T_{vj}=25^{\circ}\text{C}$ unless otherwise noted

Parameter	Symbol	Value	Unit
Collector emitter voltage	V_{CES}	650	V
Gate emitter voltage	V_{GES}	± 20	V
Transient gate emitter voltage, $T_P \leq 10\mu\text{s}$, $D < 0.01$		± 30	V
Continuous collector current ¹⁾ , $T_C = 25^{\circ}\text{C}$	I_C	68	A
Continuous collector current ¹⁾ , $T_C = 100^{\circ}\text{C}$		40	A
Pulsed collector current ²⁾ , $T_C = 25^{\circ}\text{C}$	$I_{C, \text{pulse}}$	160	A
Diode forward current ¹⁾ , $T_C = 25^{\circ}\text{C}$	I_F	68	A
Diode forward current ¹⁾ , $T_C = 100^{\circ}\text{C}$		40	A
Diode pulsed current ²⁾ , $T_C = 25^{\circ}\text{C}$	$I_{F, \text{pulse}}$	160	A
Power dissipation ³⁾ , $T_C = 25^{\circ}\text{C}$	P_D	83	W
Power dissipation ³⁾ , $T_C = 100^{\circ}\text{C}$		42	W
Operation and storage temperature	T_{stg}, T_{vj}	-55 to 175	$^{\circ}\text{C}$
Short circuit withstand time $V_{GE} = 15\text{ V}$, $V_{CC} \leq 400\text{ V}$ Allowed number of short circuits < 1000 Time between short circuits: $\geq 1.0\text{ S}$ $T_{vj} = 25^{\circ}\text{C}$	t_{sc}	10	μs

Thermal Characteristics

Parameter	Symbol	Value	Unit
IGBT thermal resistance, junction-case	$R_{\theta JC}$	1.8	$^{\circ}\text{C/W}$
Diode thermal resistance, junction-case	$R_{\theta JC}$	2.3	$^{\circ}\text{C/W}$
Thermal resistance, junction-ambient ⁴⁾	$R_{\theta JA}$	40	$^{\circ}\text{C/W}$

Electrical Characteristics at $T_{vj}=25^{\circ}\text{C}$ unless otherwise specified

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Collector-emitter breakdown voltage	$V_{(BR)CES}$	650			V	$V_{GE}=0\text{ V}$, $I_C=0.5\text{ mA}$
Collector-emitter saturation voltage	$V_{CE(sat)}$		1.6	2.0	V	$V_{GE}=15\text{ V}$, $I_C=40\text{ A}$, $T_{vj}=25^{\circ}\text{C}$
			1.8		V	$V_{GE}=15\text{ V}$, $I_C=40\text{ A}$, $T_{vj}=125^{\circ}\text{C}$
			1.9			$V_{GE}=15\text{ V}$, $I_C=40\text{ A}$, $T_{vj}=175^{\circ}\text{C}$
Gate-emitter threshold voltage	$V_{GE(th)}$	4.2	5.2	6.2	V	$V_{CE}=V_{GE}$, $I_C=0.5\text{ mA}$
Diode forward voltage	V_F		1.70	2.0	V	$V_{GE}=0\text{ V}$, $I_F=40\text{ A}$, $T_{vj}=25^{\circ}\text{C}$
			1.55			$V_{GE}=0\text{ V}$, $I_F=40\text{ A}$, $T_{vj}=125^{\circ}\text{C}$
			1.50			$V_{GE}=0\text{ V}$, $I_F=40\text{ A}$, $T_{vj}=175^{\circ}\text{C}$
Gate-emitter leakage current	I_{GES}			100	nA	$V_{CE}=0\text{ V}$, $V_{GE}=20\text{ V}$
Zero gate voltage collector current	I_{CES}			10	μA	$V_{CE}=650\text{ V}$, $V_{GE}=0\text{ V}$

Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Input capacitance	C_{ies}		4204		pF	$V_{GE}=0\text{ V}$, $V_{CE}=25\text{ V}$, $f=100\text{ kHz}$
Output capacitance	C_{oes}		119		pF	
Reverse transfer capacitance	C_{res}		6		pF	
Turn-on delay time	$t_{d(on)}$		52		ns	$V_{GE}=15\text{ V}$, $V_{CC}=400\text{ V}$, $R_G=10\ \Omega$, $I_C=40\text{ A}$
Rise time	t_r		78		ns	
Turn-off delay time	$t_{d(off)}$		110		ns	
Fall time	t_f		42		ns	
Turn-on energy	E_{on}		1.40		mJ	
Turn-off energy	E_{off}		0.42		mJ	
Turn-on delay time	$t_{d(on)}$		50		ns	$V_{GE}=15\text{ V}$, $V_{CC}=400\text{ V}$, $R_G=10\ \Omega$, $I_C=20\text{ A}$
Rise time	t_r		35		ns	
Turn-off delay time	$t_{d(off)}$		137		ns	
Fall time	t_f		26		ns	
Turn-on energy	E_{on}		0.46		mJ	
Turn-off energy	E_{off}		0.22		mJ	

Gate Charge Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Total gate charge	Q_g		80		nC	$V_{GE}=15\text{ V}$, $V_{CC}=520\text{ V}$, $I_C=40\text{ A}$
Gate-emitter charge	Q_{ge}		45		nC	
Gate-collector charge	Q_{gc}		15		nC	

Body Diode Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Diode reverse recovery time	t_{rr}		98		ns	$V_R=400\text{ V}$, $I_F=40\text{ A}$, $di_F/dt=500\text{ A}/\mu\text{s}$ $T_{vj} = 25^\circ\text{C}$
Diode reverse recovery charge	Q_{rr}		0.84		μC	
Diode peak reverse recovery current	I_{rrm}		16		A	

Note

- 1) Calculated continuous current based on maximum allowable junction temperature.
- 2) Repetitive rating; pulse width limited by max. junction temperature.
- 3) P_d is based on max. junction temperature, using junction-case thermal resistance.

Electrical Characteristics Diagrams

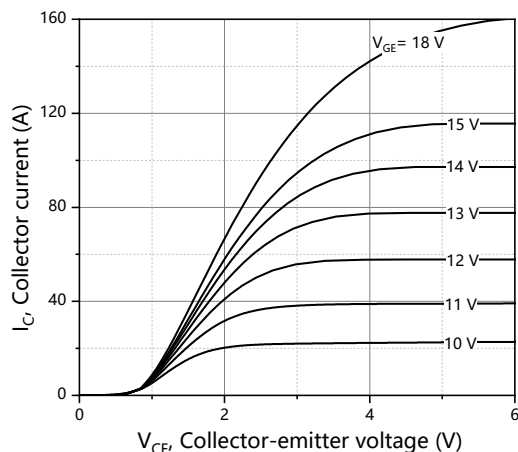


Figure 1. Typical output characteristics
($T_{vj}=25^{\circ}\text{C}$)

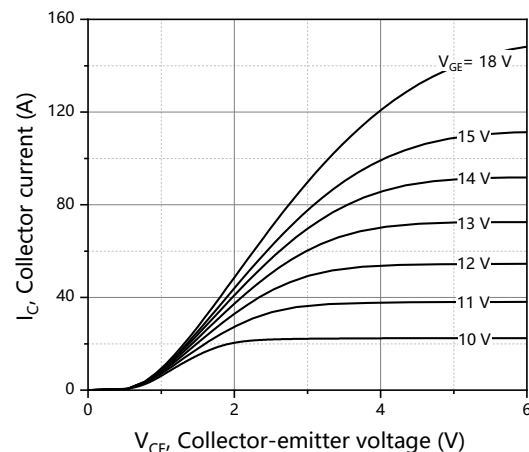


Figure 2. Typical output characteristics
($T_{vj}=150^{\circ}\text{C}$)

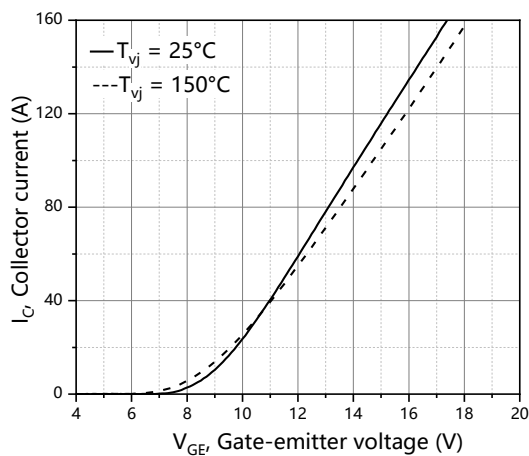


Figure 3. Typical transfer characteristics
($V_{CE}=20\text{V}$)

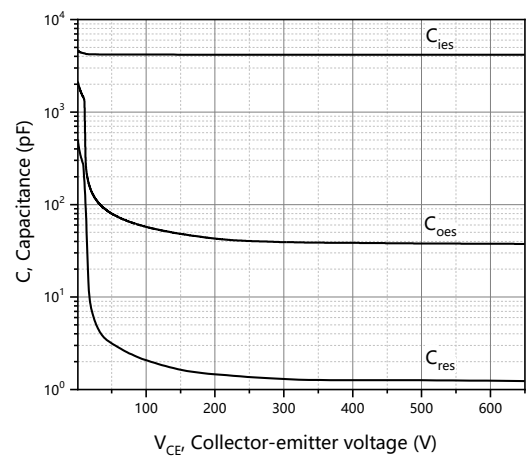


Figure 4. Typical capacitance
($V_{GE}=0\text{V}$, $f=100\text{ kHz}$)

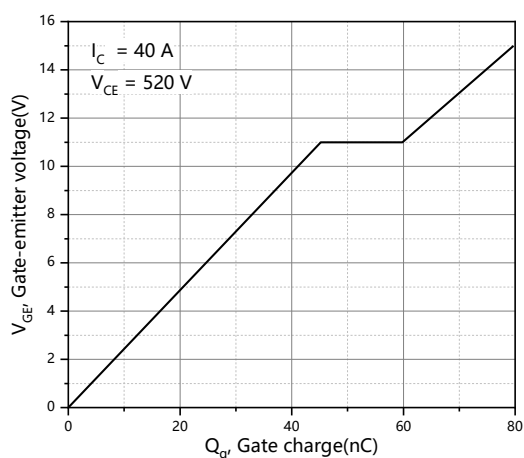


Figure 5. Typical gate charge

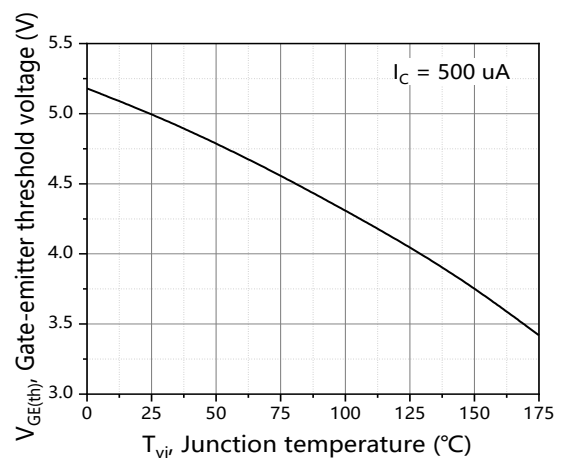


Figure 6. Gate-emitter threshold voltage

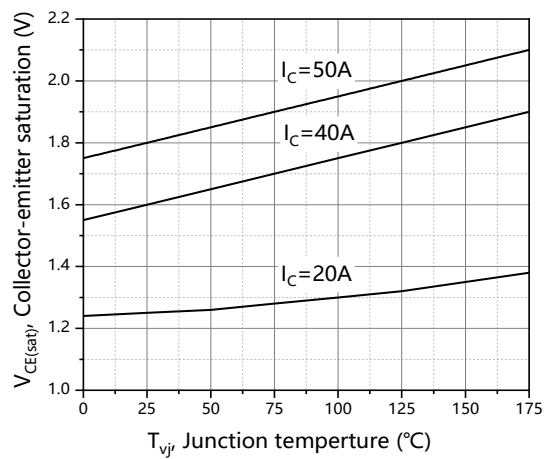


Figure 7. Typical collector-emitter voltage

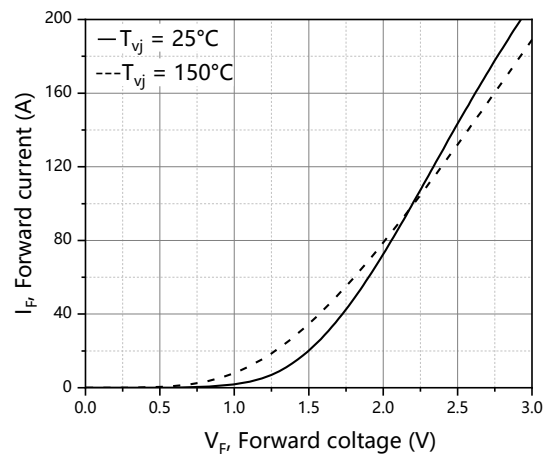


Figure 8. Forward characteristic of diode

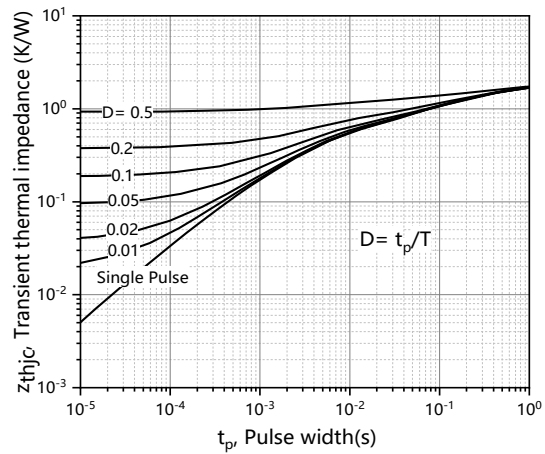


Figure 9. IGBT transient thermal impedance

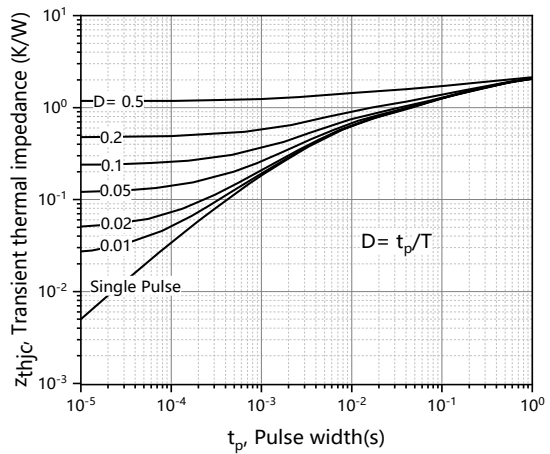
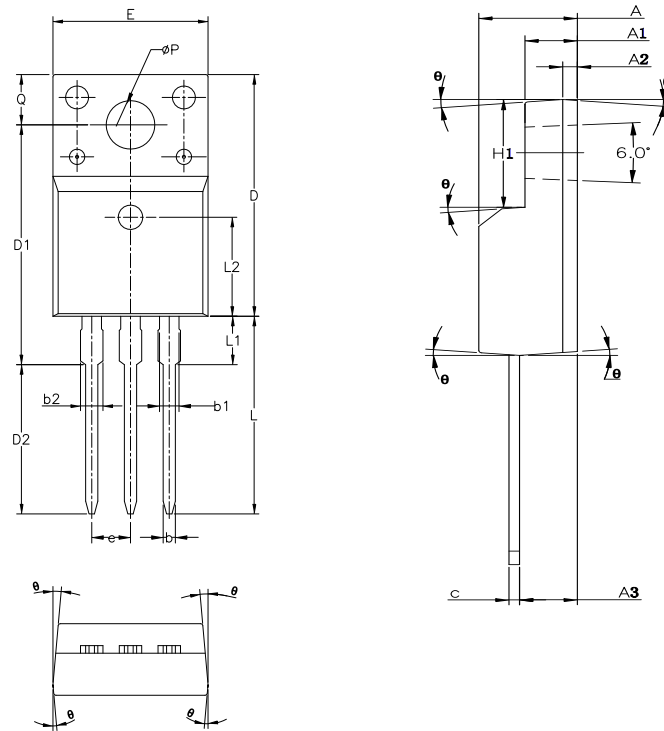


Figure 10. Diode transient thermal impedance

Package Information



Symbol	mm		
	Min	Nom	Max
A	4.50	4.70	4.83
A1	2.34	2.54	2.74
A2	0.70 REF		
A3	2.56	2.76	2.93
b	0.70	-	0.90
b1	1.18	-	1.38
b2	-	-	1.47
c	0.45	0.50	0.60
D	15.67	15.87	16.07
D1	15.55	15.75	15.95
D2	9.60	9.80	10.00
E	9.96	10.16	10.36
e	2.54 BSC		
H1	6.48	6.68	6.88
L	12.68	12.98	13.28
L1	-	-	3.50
L2	6.50 REF		
ϕP	3.08	3.18	3.28
Q	3.20	-	3.40
θ	1°	3°	5°

Version 1: TO220F-J package outline dimension

Ordering Information

Package Type	Units/ Tube	Tubes/ Inner Box	Units/ Inner Box	Inner Boxes/ Carton Box	Units/ Carton Box
TO220F-J	50	20	1000	5	5000

Product Information

Product	Package	Pb Free	RoHS	Halogen Free
OST40N65FMF	TO220F	yes	yes	yes

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