



General Description

OST140N120H7EM2F 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

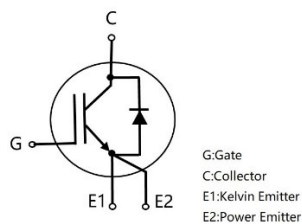
Key Performance Parameters

Parameter	Value	Unit
$V_{CES, min} @ 25\text{ }^{\circ}\text{C}$	1200	V
Maximum junction temperature	175	$^{\circ}\text{C}$
$I_C, pulse$	560	A
$V_{CE(sat), typ} @ V_{GE}=15\text{ V}$	1.73	V
Q_g	422	nC

Marking Information

Product Name	Package	Marking
OST140N120H7EM2F	TO247-plus-4L	OST140N120H7EM2

Package & Pin Information



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

Parameter	Symbol	Value	Unit
Collector emitter voltage	V_{CES}	1200	V
Gate emitter voltage	V_{GES}	± 20	V
Transient gate emitter voltage, $T_P \leq 10\text{ }\mu\text{s}$, $D < 0.01$		± 30	V
Continuous collector current ¹⁾ , $T_C = 25\text{ }^{\circ}\text{C}$	I_C	230	A
Continuous collector current ¹⁾ , $T_C = 100\text{ }^{\circ}\text{C}$		190	A
Pulsed collector current ²⁾ , $T_C = 25\text{ }^{\circ}\text{C}$	$I_{C, \text{ pulse}}$	560	A
Diode forward current ¹⁾ , $T_C = 25\text{ }^{\circ}\text{C}$	I_F	170	A
Diode forward current ¹⁾ , $T_C = 100\text{ }^{\circ}\text{C}$		140	A
Diode pulsed current ²⁾ , $T_C = 25\text{ }^{\circ}\text{C}$	$I_{F, \text{ pulse}}$	560	A
Power dissipation ³⁾ , $T_C = 25\text{ }^{\circ}\text{C}$	P_D	934	W
Power dissipation ³⁾ , $T_C = 100\text{ }^{\circ}\text{C}$		467	W
Operation and storage temperature	T_{stg}, T_{vj}	-55 to 175	$^{\circ}\text{C}$

Thermal Characteristics

Parameter	Symbol	Value	Unit
IGBT thermal resistance, junction-case	$R_{\theta JC}$	0.16	$^{\circ}\text{C/W}$
Diode thermal resistance, junction-case	$R_{\theta JC}$	0.45	$^{\circ}\text{C/W}$
Thermal resistance, junction-ambient	$R_{\theta JA}$	40	$^{\circ}\text{C/W}$

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

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Collector-emitter breakdown voltage	$V_{(BR)CES}$	1200			V	$V_{GE}=0\text{ V}$, $I_C=0.5\text{ mA}$
Collector-emitter saturation voltage	$V_{CE(sat)}$		1.73	2.15	V	$V_{GE}=15\text{ V}$, $I_C=140\text{ A}$, $T_{vj}=25\text{ }^{\circ}\text{C}$
			2.29		V	$V_{GE}=15\text{ V}$, $I_C=140\text{ A}$, $T_{vj}=125\text{ }^{\circ}\text{C}$
			2.60		V	$V_{GE}=15\text{ V}$, $I_C=140\text{ A}$, $T_{vj}=175\text{ }^{\circ}\text{C}$
Gate-emitter threshold voltage	$V_{GE(th)}$	4.8	5.3	6.0	V	$V_{CE}=V_{GE}$, $I_C=0.5\text{ mA}$
Diode forward voltage	V_F		3.10	3.5	V	$V_{GE}=0\text{ V}$, $I_F=140\text{ A}$, $T_{vj}=25\text{ }^{\circ}\text{C}$
			2.83		V	$V_{GE}=0\text{ V}$, $I_F=140\text{ A}$, $T_{vj}=125\text{ }^{\circ}\text{C}$
			2.63		V	$V_{GE}=0\text{ V}$, $I_F=140\text{ A}$, $T_{vj}=175\text{ }^{\circ}\text{C}$
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	$V_{CE}=1200\text{ V}$, $V_{GE}=0\text{ V}$

Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Input capacitance	C_{ies}		23659		pF	$V_{GE}=0\text{ V}$, $V_{CE}=25\text{ V}$, $f=100\text{ kHz}$
Output capacitance	C_{oes}		344		pF	
Reverse transfer capacitance	C_{res}		10		pF	
Turn-on delay time	$t_{d(on)}$		95		ns	$V_{GE}=15\text{ V}$, $V_{CC}=600\text{ V}$, $R_G=5\ \Omega$, $I_C=140\text{ A}$
Rise time	t_r		41		ns	
Turn-off delay time	$t_{d(off)}$		211		ns	
Fall time	t_f		50		ns	
Turn-on energy	E_{on}		3.46		mJ	
Turn-off energy	E_{off}		3.64		mJ	
Turn-on delay time	$t_{d(on)}$		90		ns	$V_{GE}=15\text{ V}$, $V_{CC}=600\text{ V}$, $R_G=5\ \Omega$, $I_C=70\text{ A}$
Rise time	t_r		24		ns	
Turn-off delay time	$t_{d(off)}$		246		ns	
Fall time	t_f		28		ns	
Turn-on energy	E_{on}		1.96		mJ	
Turn-off energy	E_{off}		1.90		mJ	

Gate Charge Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Total gate charge	Q_g		422		nC	$V_{GE}=15\text{ V}$, $V_{CC}=960\text{ V}$, $I_C=140\text{ A}$
Gate-emitter charge	Q_{ge}		199		nC	
Gate-collector charge	Q_{gc}		68		nC	

Body Diode Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Diode reverse recovery time	t_{rr}		220		ns	$V_R=600\text{ V}$, $I_F=140\text{ A}$, $di_F/dt=1000\text{ A}/\mu\text{s}$, $T_{vj}=25\text{ }^\circ\text{C}$
Diode reverse recovery charge	Q_{rr}		3.27		μC	
Diode peak reverse recovery current	I_{rrm}		31.4		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

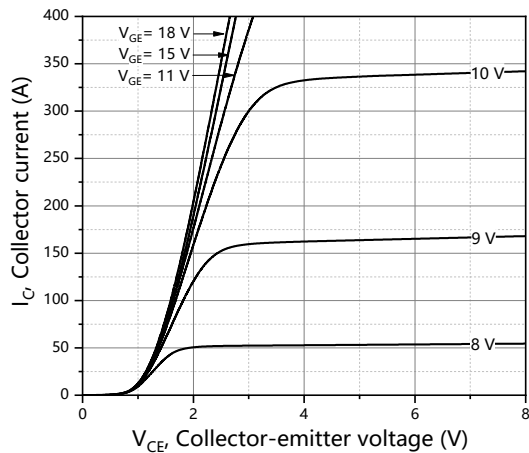


Figure 1. Typical output characteristics
 ($T_{vj}=25\text{ }^{\circ}\text{C}$)

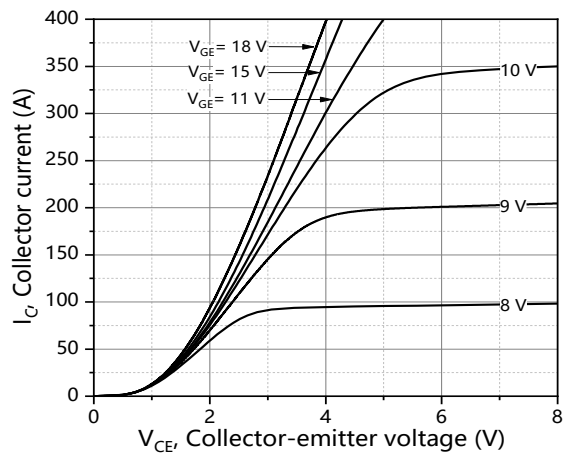


Figure 2. Typical output characteristics
 ($T_{vj}=150\text{ }^{\circ}\text{C}$)

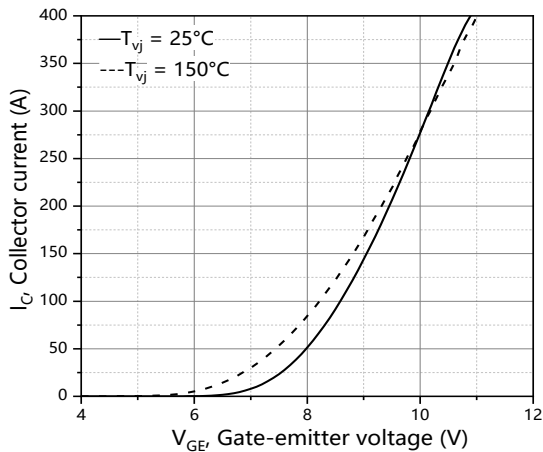


Figure 3. Typical transfer characteristics
 ($V_{CE}=20\text{ V}$)

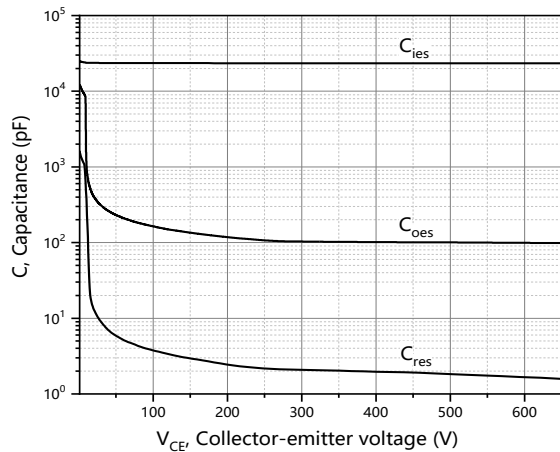


Figure 4. Typical capacitance
 ($V_{GE}=0\text{ V}$, $f=100\text{ kHz}$)

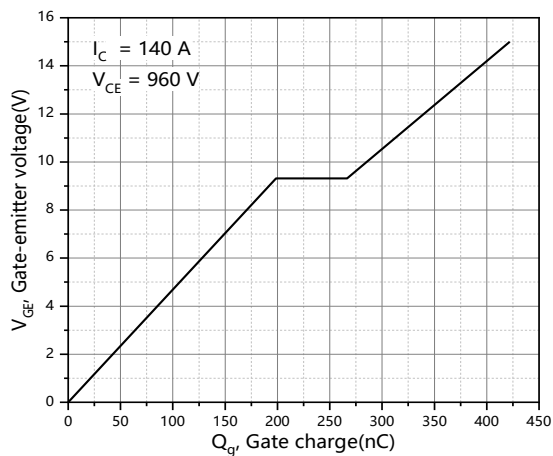


Figure 5. Typical gate charge

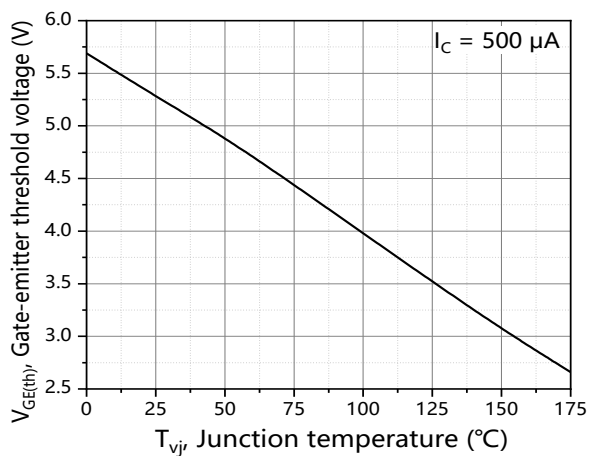


Figure 6. Gate-emitter threshold voltage

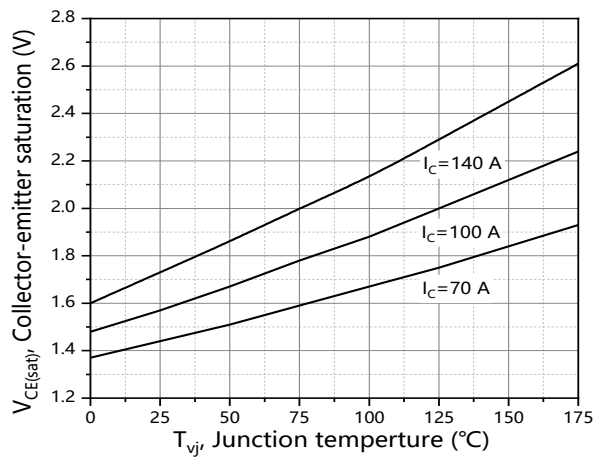


Figure 7. Typical collector-emitter voltage

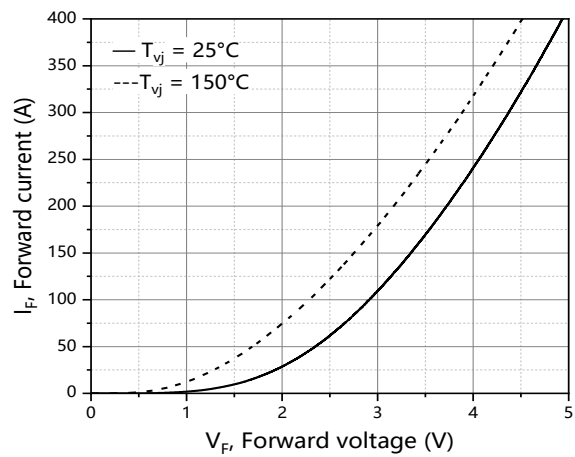


Figure 8. Forward characteristic of diode

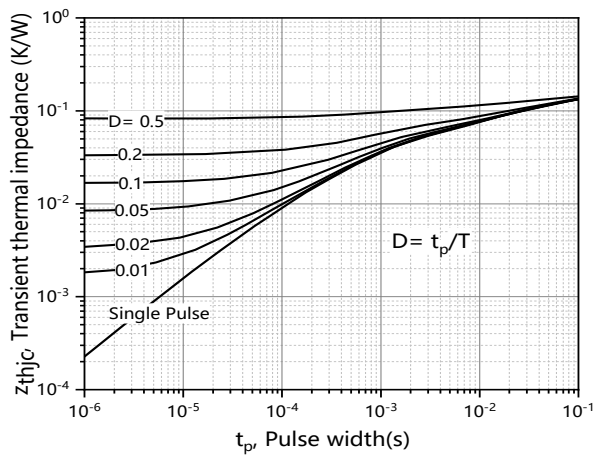


Figure 9. IGBT transient thermal impedance

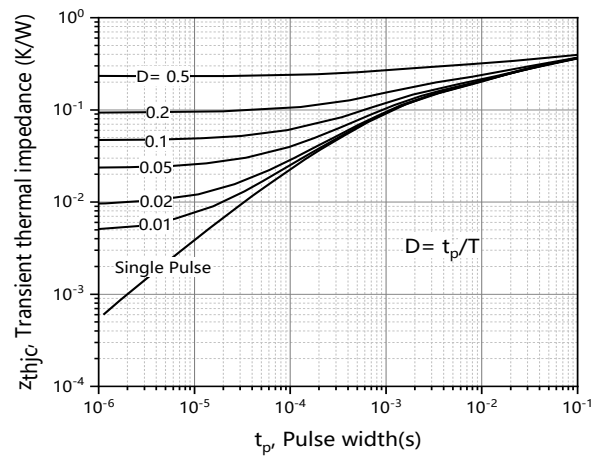


Figure 10. Diode transient thermal impedance

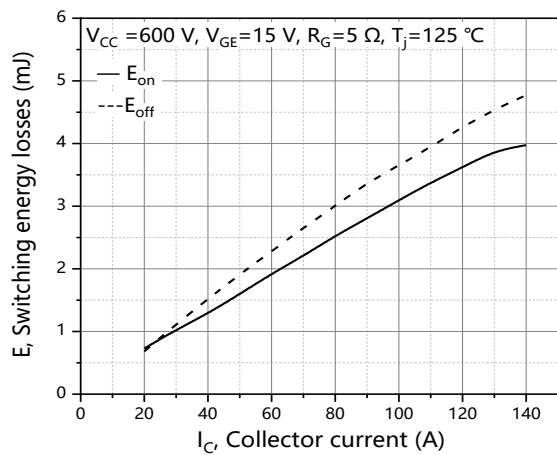
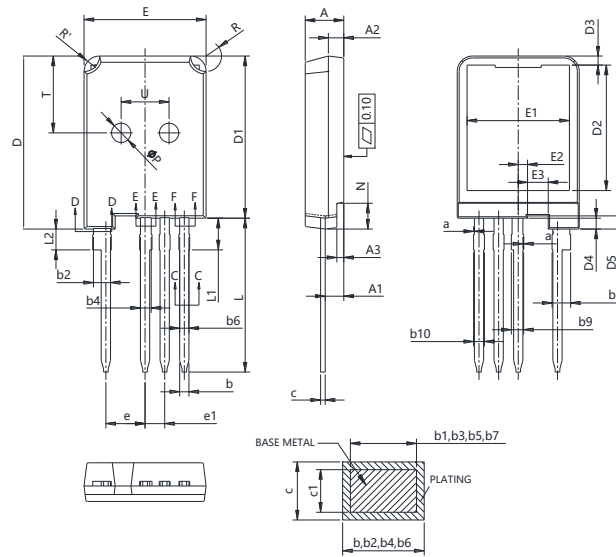


Figure 11. Switching energy vs. collector current

Package Information



SECTION C-C, D-D & E-E&F-F

Symbol	mm			Symbol	mm		
	Min	Nom	Max		Min	Nom	Max
A	4.90	5.00	5.10	D1	20.90	21.00	21.10
A1	2.31	2.41	2.51	D2	16.05	16.25	16.45
A2	1.90	2.00	2.10	D3	1.02	1.17	1.32
A3	0.80	0.90	1.00	D4	1.30	1.40	1.50
a	0.00	—	0.15	D5	1.60	1.70	1.80
a'	0.00	—	0.15	E	15.70	15.80	15.90
b	1.16	—	1.26	E1	13.06	13.26	13.46
b1	1.15	1.20	1.22	E2	1.10	1.20	1.30
b2	2.16	—	2.26	E3	2.58	2.68	2.78
b3	2.15	2.20	2.22	e	5.080 BSC		
b4	1.36	—	1.46	e1	2.540 BSC		
b5	1.35	1.40	1.42	L	19.80	19.92	21.00
b6	1.16	—	1.26	L1	3.90	4.10	4.30
b7	1.15	1.20	1.22	L2	2.55	2.70	2.85
b8	—	—	2.40	P	2.40	2.50	2.60
b9	—	—	1.60	R	1.90	2.00	2.10
b10	—	—	1.40	R'	1.90	2.00	2.10
c	0.59	0.625	0.66	T	9.75	9.95	10.15
c1	0.59	0.60	0.66	U	6.00	6.20	6.40
D	22.30	22.40	22.50	N	3.24	3.34	3.44

Version 1: TO247-plus-4L-J package outline dimension

Ordering Information

Package Type	Units/ Tube	Tubes/ Inner Box	Units/ Inner Box	Inner Boxes/ Carton Box	Units/ Carton Box
TO247-plus-4L-J	30	20	600	4	2400

Product Information

Product	Package	Pb Free	RoHS	Halogen Free
OST140N120H7EM2F	TO247-plus-4L	yes	yes	yes

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