

Enhancement Mode N-Channel IGBT

Features

- ◆ Advanced TGBT™ technology
- ◆ Monolithically integrated diode
- ◆ Excellent conduction and switching loss
- ◆ Excellent stability and uniformity

Applications

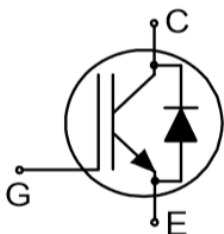
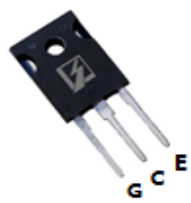
- ◆ Induction heating
- ◆ Soft switching applications

■ General Description

OST20N135HRF 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 resonant induction heating applications.

◆ $V_{CES, min}$	1350 V
◆ $I_{C, pulse}$	60 A
◆ $V_{CE(sat), typ@V_{GE}=15 V}$	1.6 V
◆ Q_g	71.5 nC

■ Schematic and Package Information

Schematic Diagram 	Pin Assignment-Top View  TO247 OST20N135HRF
--	---

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

Parameter	Symbol	Value	Unit
Collector emitter voltage	V_{CES}	1350	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	40	A
Continuous collector current ¹⁾ , $T_C=100^{\circ}\text{C}$		20	
Pulsed collector current ²⁾ , $T_C=25^{\circ}\text{C}$	$I_{C, pulse}$	60	A
Diode forward current ¹⁾ , $T_C=25^{\circ}\text{C}$	I_F	40	A
Diode forward current ¹⁾ , $T_C=100^{\circ}\text{C}$		20	
Diode pulsed current ²⁾ , $T_C=25^{\circ}\text{C}$	$I_{F, pulse}$	60	A
Power dissipation ³⁾ , $T_C=25^{\circ}\text{C}$	P_D	290	W
Power dissipation ³⁾ , $T_C=100^{\circ}\text{C}$		145	W
Operation and storage temperature	T_{stg}, T_j	-55 to 150	$^{\circ}\text{C}$

■ Thermal Characteristics

Parameter	Symbol	Value	Unit
IGBT thermal resistance, junction-case	$R_{\theta JC}$	0.43	$^{\circ}\text{C}/\text{W}$
Diode thermal resistance, junction-case	$R_{\theta JC}$	0.43	$^{\circ}\text{C}/\text{W}$
Thermal resistance, junction-ambient ⁴⁾	$R_{\theta JA}$	40	$^{\circ}\text{C}/\text{W}$

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

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Collector-emitter breakdown voltage	$V_{(BR)CES}$	1350			V	$V_{GE}=0\text{ V}, I_C=0.5\text{ mA}$
Collector-emitter saturation voltage	$V_{CE(sat)}$		1.6	1.8	V	$V_{GE}=15\text{ V}, I_C=20\text{ A}$
			1.8	2.2	V	$V_{GE}=15\text{ V}, I_C=25\text{ A}$
			1.9		V	$V_{GE}=15\text{ V}, I_C=20\text{ A}, T_j=150^{\circ}\text{C}$
Gate-emitter threshold voltage	$V_{GE(th)}$	5.1	5.8	6.4	V	$V_{CE}=V_{GE}, I_D=0.5\text{ mA}$
Diode forward voltage	V_F		1.5	1.7	V	$V_{GE}=0\text{ V}, I_F=20\text{ A}$
			1.9			$V_{GE}=0\text{ V}, I_F=20\text{ A}, T_j=150^{\circ}\text{C}$
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	$V_{CE}=1350\text{ V}, V_{GE}=0\text{ V}$

■ Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Input capacitance	C_{ies}		3907		pF	$V_{CE}=25\text{ V}, V_{GE}=0\text{ V}, f=100\text{ KHz}$
Output capacitance	C_{oes}		51.3		pF	
Reverse transfer capacitance	C_{res}		2.6		pF	
Turn-on delay time	$t_{d(on)}$		48		ns	$V_{CC}=600\text{ V}, I_C=20\text{ A}, V_{GE}=15\text{ V}, R_G=10\ \Omega$
Turn-off delay time	$t_{d(off)}$		144		ns	
Fall time	t_f		235		ns	
Turn-off energy	E_{off}		1.0		mJ	

■ Gate Charge Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Total gate charge	Q_g		71.5		nC	$I_C=20\text{ A}$, $V_{CC}=1080\text{ V}$, $V_{GE}=15\text{ V}$
Gate-emitter charge	Q_{ge}		15.4		nC	
Gate-collector charge	Q_{gc}		32.8		nC	

■ Note

- 1) Calculated continuous current based on maximum allowable junction temperature.
- 2) Repetitive rating, pulse width limited by maximum junction temperature.
- 3) P_d is based on maximum junction temperature, using junction-case thermal resistance.
- 4) The value of $R_{\theta JA}$ is measured with the device mounted on 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with $T_a=25\text{ }^\circ\text{C}$.

■ **Electrical Characteristics Diagrams**

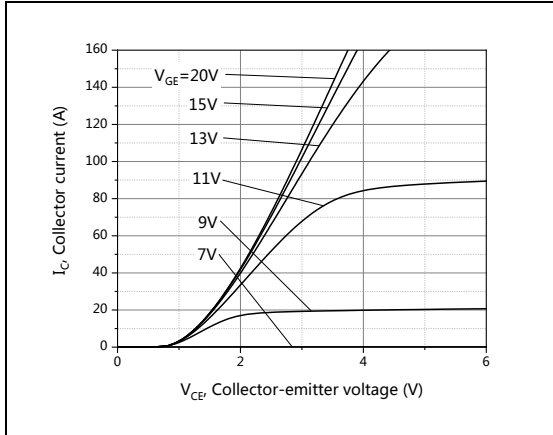


Figure 1. Typical output characteristics
($T_{vj}=25^{\circ}\text{C}$)

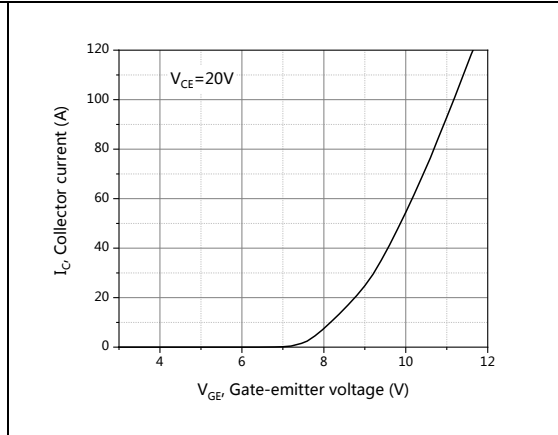


Figure 2. Typical transfer characteristics
($T_{vj}=25^{\circ}\text{C}$)

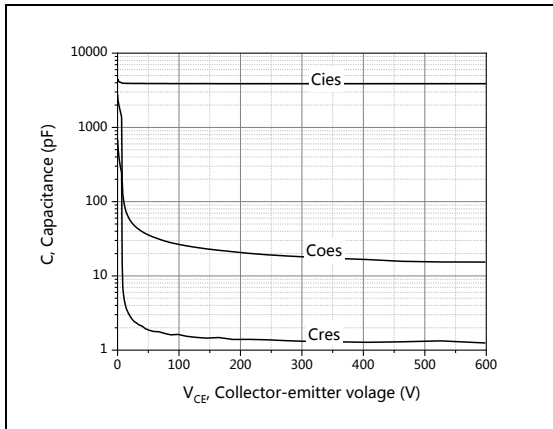


Figure 3. Typical capacitance
($V_{GE}=0\text{V}$, $f=1\text{MHz}$)

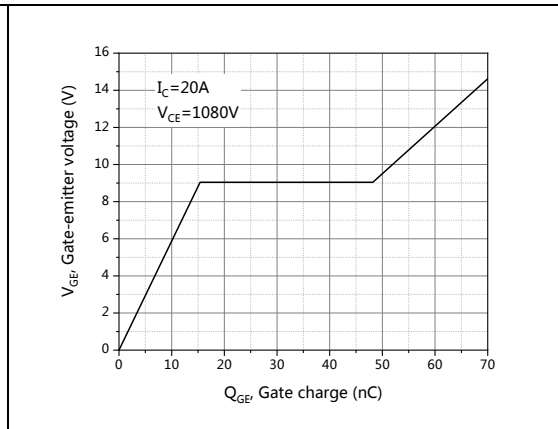


Figure 4. Typical gate charge

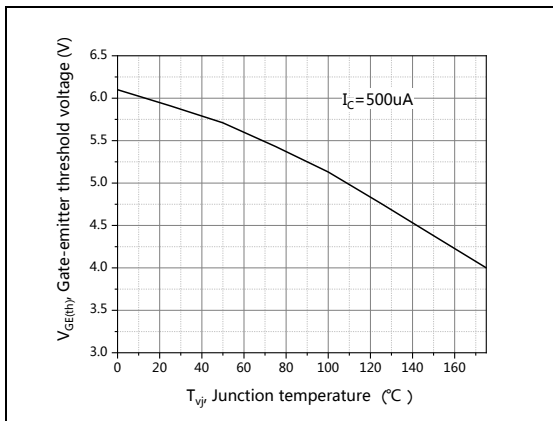


Figure 5. Gate-emitter threshold voltage

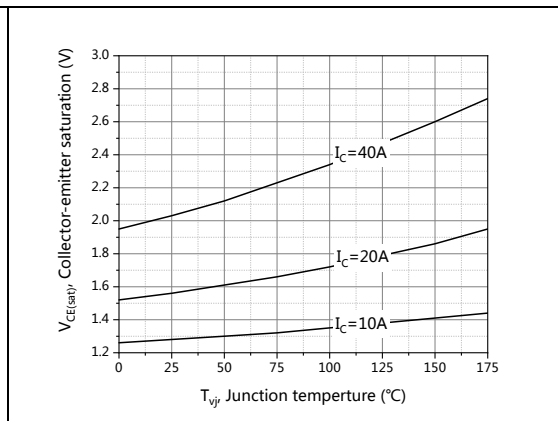


Figure 6. Typical collector-emitter voltage

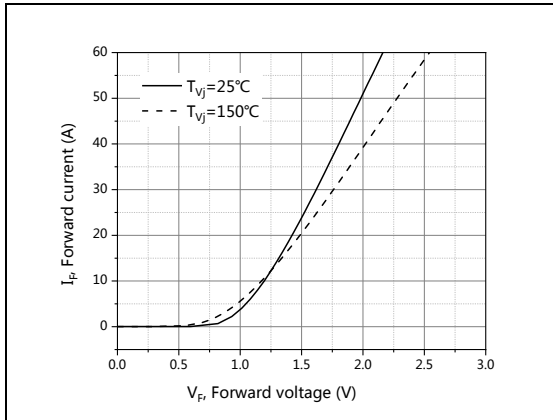


Figure 7. Forward characteristic of body diode

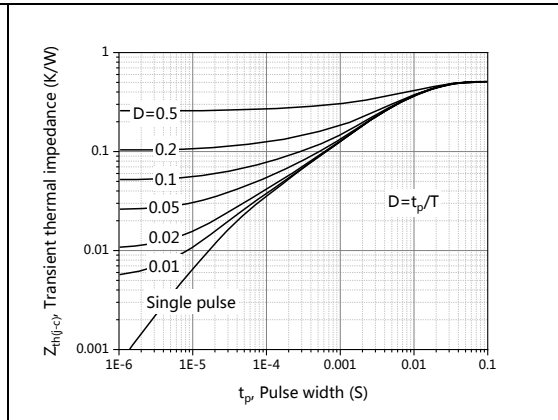
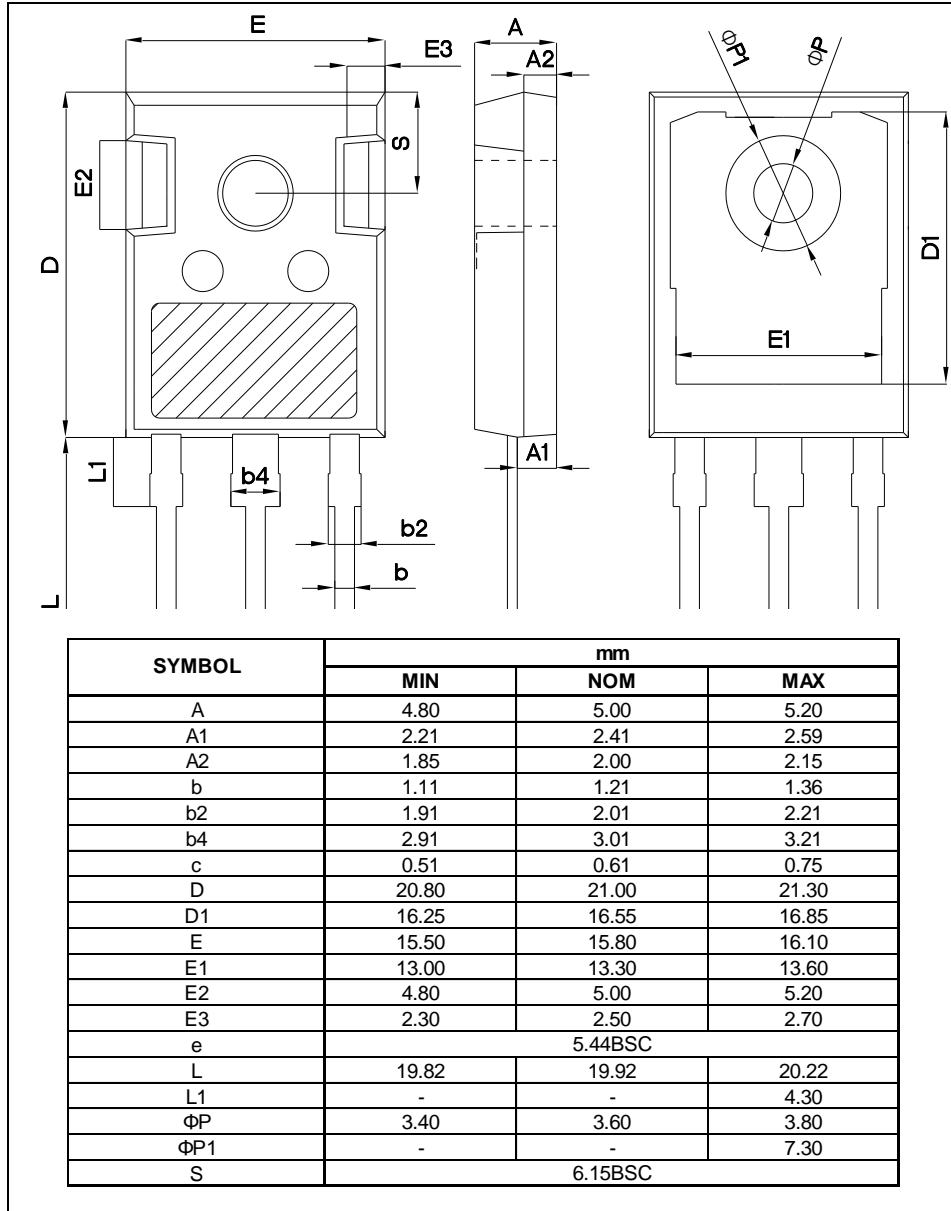


Figure 8. IGBT transient thermal impedance

■ Package Information
Outside view: TO247 package


■ Ordering Information

Package	Units/Tube	Tubes/Inner Box	Units/Inner Box	Inner Box/Carton Box	Units/Carton Box
TO247	30	11	330	6	1980

■ Product Information

Product	Package	Pb Free	RoHS	Halogen Free
OST20N135HRF	TO247	yes	yes	yes