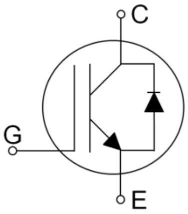
TGH30N60FDRSH
Field Stop Trench IGBT

Features

- 600V Field Stop Trench Technology
- High Speed Switching
- Low Conduction Loss
- Positive Temperature Coefficient
- Easy Parallel Operation
- Short Circuit Withstanding Time 5 s
- 175℃ Operating Temperature
- RoHS Compliant
- JEDEC Qualification

TO-247



Applications

Motor Drive, Air Conditioner, Inverter, Solar

Device	Package	Marking	Remark
TGH30N60FDRSH	TO-247	TGH30N60FDRSH	RoHS

Absolute Maximum Ratings

Parameter		Symbol	Value	Unit
Collector-Emitter Voltage		V_{CES}	600	V
Gate-Emitter Voltage		V_{GES}	20	V
Continuous Collector Current	$T_C = 25$ ℃	I_C	60	A
	$T_C = 100$ ℃		30	
Pulsed Collector Current (Note 1)		I_{CM}	90	A
Diode Continuous Forward Current	$T_C = 100$ ℃	I_F	30	A
Power Dissipation	$T_C = 25$ ℃	P_D	230	W
	$T_C = 100$ ℃		115	
Operating Junction Temperature		T_{vj}	-55 ~ 175	℃
Storage Temperature Range		T_{STG}	-55 ~ 150	℃
Maximum lead temperature for soldering purposes,		T_L	300	℃

Notes :

(1) Repetitive rating : Pulse width limited by maximum junction temperature , During production, high current switching capability is 100% verified with the inductive load single-pulse switching test. (Ic=90A)

Thermal Characteristics

Parameter	Symbol	Value	Unit
Maximum Thermal resistance, Junction-to-Case	R $_{JC}$ (IGBT)	0.65	℃/W
Maximum Thermal resistance, Junction-to-Case	R $_{JC}$ (DIODE)	2.00	℃/W
Maximum Thermal resistance, Junction-to-Ambient	R $_{JA}$	40	℃/W

Electrical Characteristics of the IGBT T_{vj}=25℃, unless otherwise noted

Parameter	Symbol	Test condition	Min.	Typ.	Max.	Unit
OFF						
Collector Emitter Breakdown Voltage	BV_{CES}	V_{GE} = 0V, I_C = 1mA	600	--	--	V
Zero Gate Voltage Collector Current	I_{CES}	V_{CE} = 600V, V_{GE} = 0V	--	--	1	mA
Gate Emitter Leakage Current	I_{GES}	V_{CE} = 0V, V_{GE} = ± 20V	--	--	± 250	nA
ON						
Gate Emitter Threshold Voltage	$V_{GE(TH)}$	V_{GE} = V_{CE}, I_C = 30mA	4.5	6.0	7.5	V
Collector Emitter Saturation Voltage	$V_{CE(SAT)}$	V_{GE} = 15V, I_C = 30A, T_{vj} = 25 ℃	--	1.80	2.30	V
		V_{GE} = 15V, I_C = 30A, T_{vj} = 125 ℃	--	2.20	--	
		V_{GE} = 15V, I_C = 30A, T_{vj} = 175 ℃	--	2.40	--	
DYNAMIC						
Input Capacitance	C_{IES}	V_{CE} = 30V, V_{GE} = 0V f = 1MHz	--	1080	--	pF
Output Capacitance	C_{OES}		--	80	--	
Reverse Transfer Capacitance	C_{RES}		--	55	--	
SWITCHING (Note 2)						
Turn-On Delay Time	$t_{d(on)}$	V_{CC} = 400V, I_C = 30A R_G = 10 , V_{GE} = 15V Inductive Load, T_{vj} = 25 ℃	--	26	--	ns
Rise Time	t_r		--	32	--	ns
Turn-Off Delay Time	$t_{d(off)}$		--	130	--	ns
Fall Time	t_f		--	24	36	ns
Turn-On Switching Loss	E_{ON}		--	0.78	1.17	mJ
Turn-Off Switching Loss	E_{OFF}		--	0.56	0.84	mJ
Total Switching Loss	E_{TS}		--	1.34	2.01	mJ
Turn-On Delay Time	$t_{d(on)}$	V_{CC} = 400V, I_C = 30A R_G = 10 , V_{GE} = 15V Inductive Load, T_{vj} = 175 ℃	--	27	--	ns
Rise Time	t_r		--	34	--	ns
Turn-Off Delay Time	$t_{d(off)}$		--	145	--	ns
Fall Time	t_f		--	46	--	ns
Turn-On Switching Loss	E_{ON}		--	1.27	1.90	mJ
Turn-Off Switching Loss	E_{OFF}		--	0.86	1.29	mJ
Total Switching Loss	E_{TS}		--	2.13	3.19	mJ
Total Gate Charge	Q_g	V_{CC} = 400V, I_C = 30A V_{GE} = 15V	--	102	153	nC
Gate-Emitter Charge	Q_{ge}		--	10	15	
Gate-Collector Charge	Q_{gc}		--	61	91	
Short Circuit Withstanding Time	t_{SC}	V_{CC} = 300V, V_{GE} = 15V, T_{vj} = 125℃	5	--	--	s

Notes :
(2) Not subject to production test verified by design/characterization

Electrical Characteristics of the DIODE T_{vj}=25℃, unless otherwise noted

Parameter	Symbol	Test condition	Min.	Typ.	Max.	Unit
Diode Forward Voltage	V_{FM}	I_F = 30A, T_{vj} = 25 ℃	--	2.25	--	V
		I_F = 30A, T_{vj} = 175 ℃	--	2.10	--	V
Reverse Recovery Time	t_{rr}	I_F = 30A, di/dt = 200A/µs, T_{vj} = 25 ℃	--	67	--	ns
Reverse Recovery Current	I_{rr}		--	5.1	--	A
Reverse Recovery Charge	Q_{rr}		--	202	--	nC
Reverse Recovery Time	t_{rr}	I_F = 30A, di/dt = 200A/µs, T_{vj} = 175 ℃	--	150	--	ns
Reverse Recovery Current	I_{rr}		--	8.8	--	A
Reverse Recovery Charge	Q_{rr}		--	904	--	nC

IGBT Characteristics

Figure 1. IGBT Output Characteristics

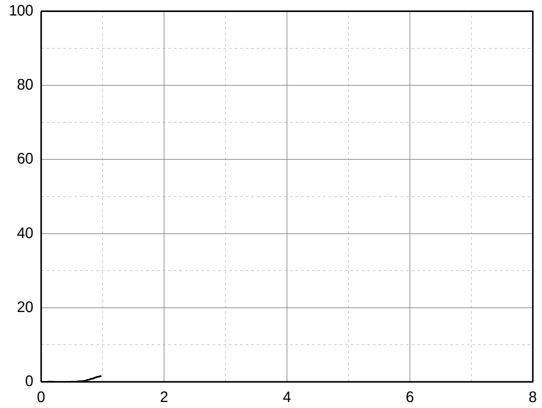


Figure 2. IGBT Output Characteristics

Figure 3. IGBT Saturation Voltage vs. Junction Temperature

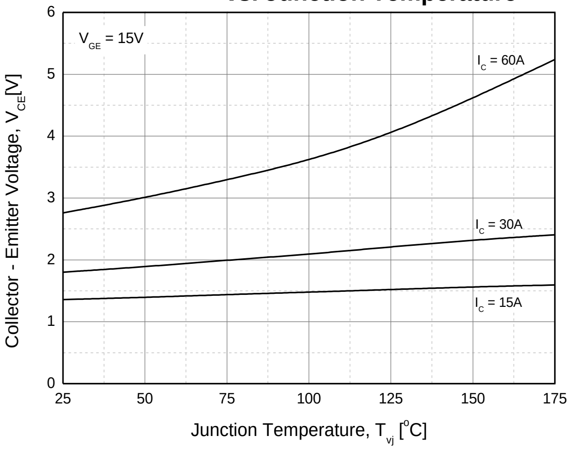


Figure 4. IGBT Saturation Voltage vs. Gate Bias

Figure 5. IGBT Saturation Voltage vs. Gate Bias

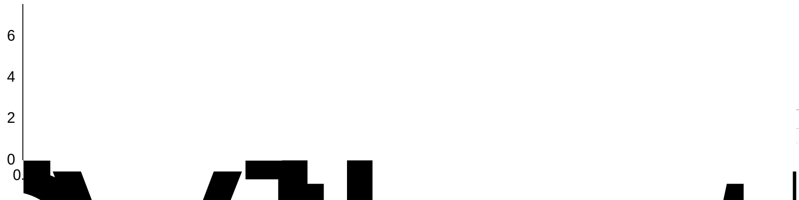
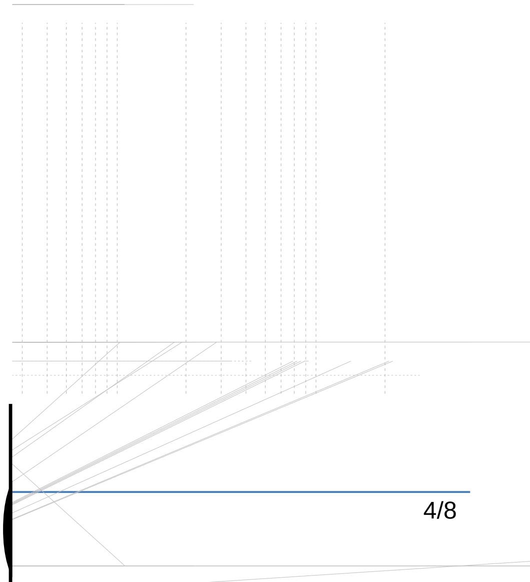


Figure 6. IGBT Capacitance Characteristics



IGBT Characteristics

Figure 7. Turn-on Time vs. Gate Resistor

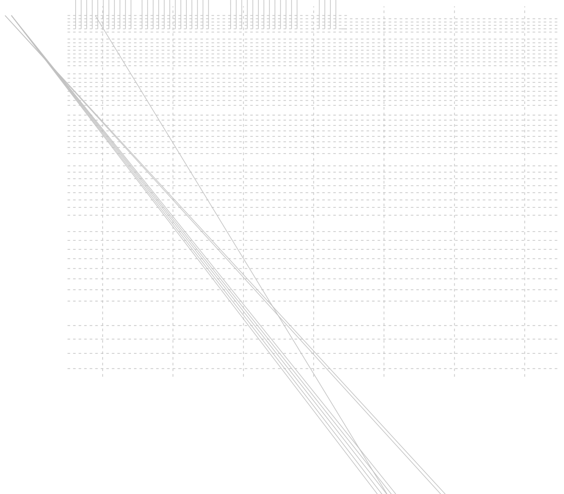


Figure 8. Turn-off Time vs. Gate Resistor

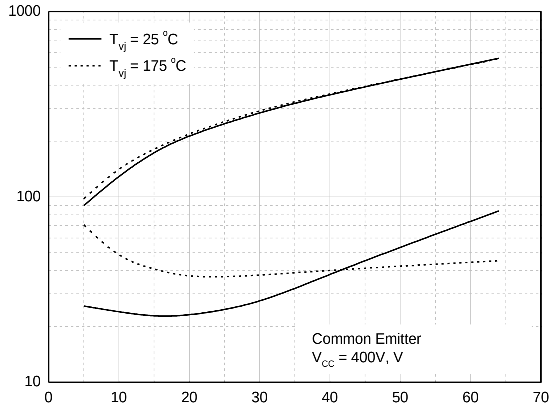


Figure 9. Switching Loss vs. Gate Resistor

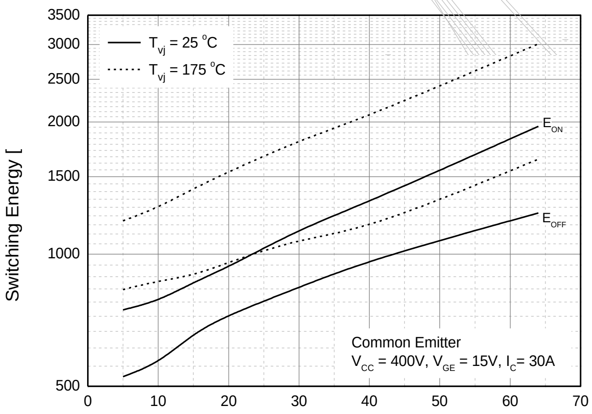


Figure 10. Turn-on Time vs. Collector Curren

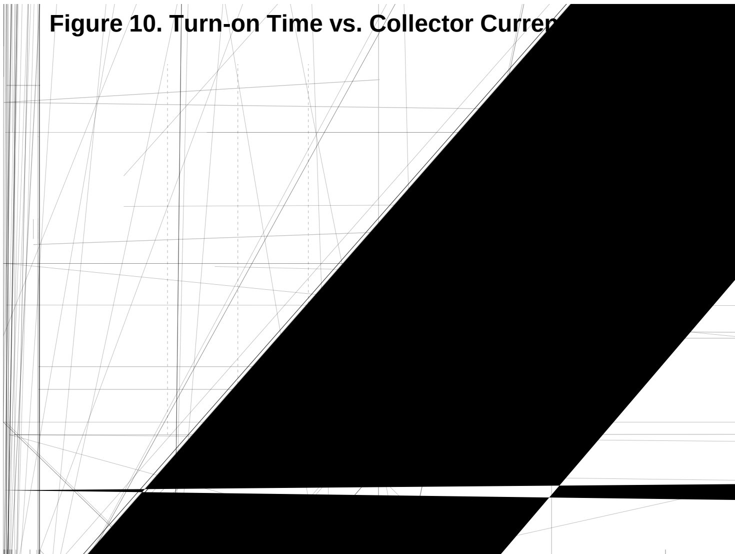
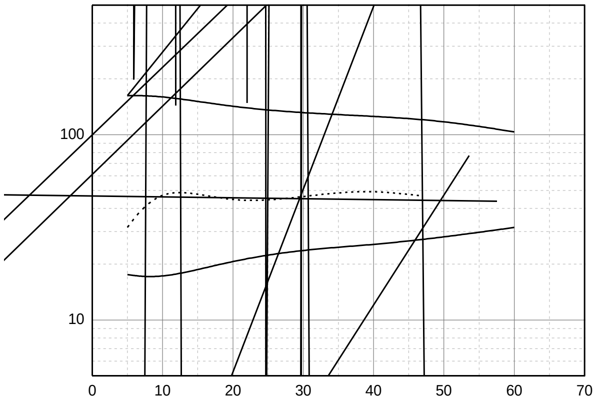
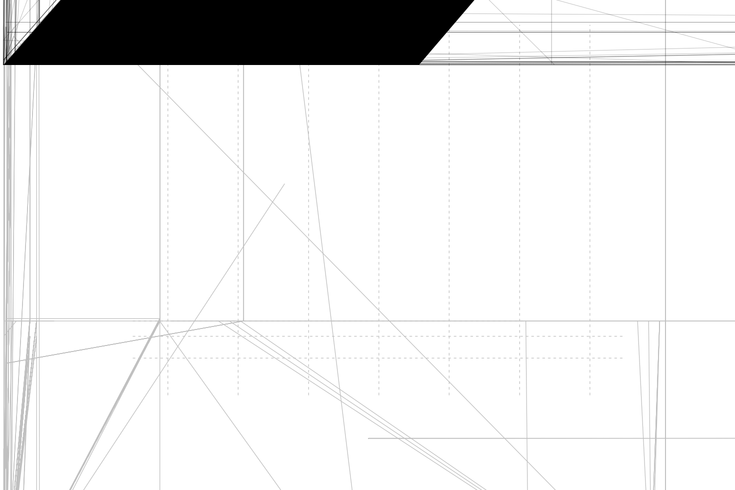


Figure 11. Turn-off Time vs. Collector Current



Fi r Current



IGBT Characteristics

Figure 13. Gate Charge Characteristics

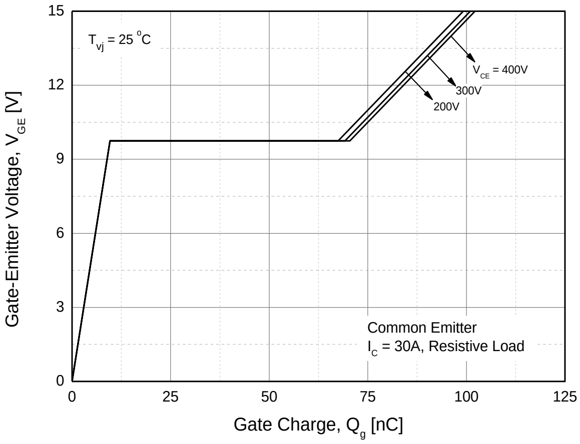


Figure 14. SOA

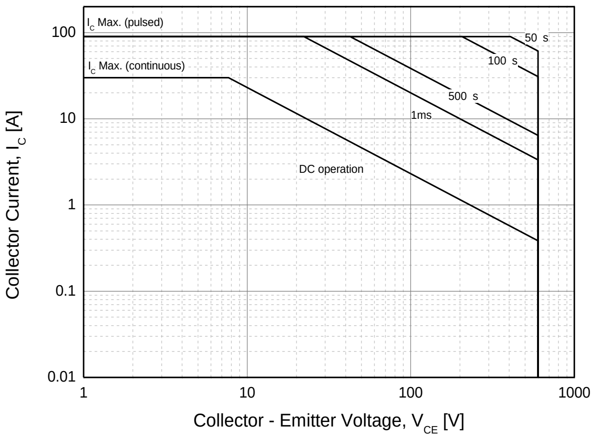


Figure 15. RBSOA

Figure 16. Transient Thermal Impedance of IGBT

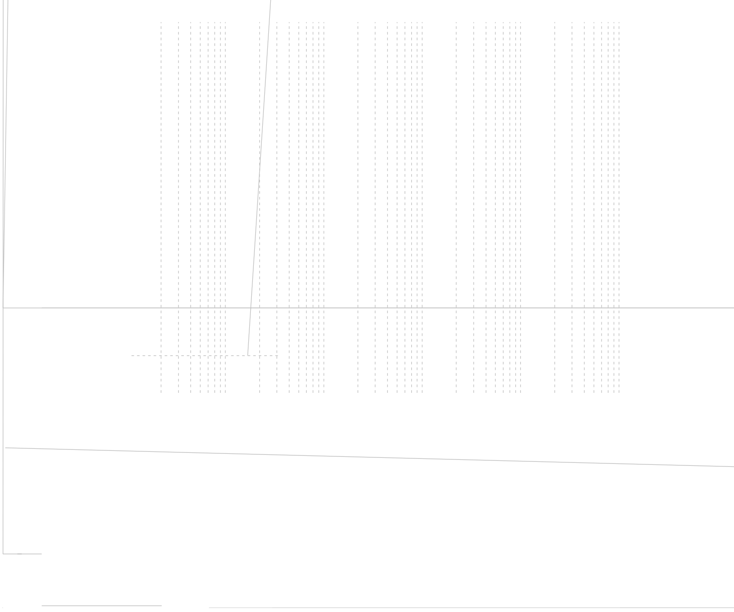
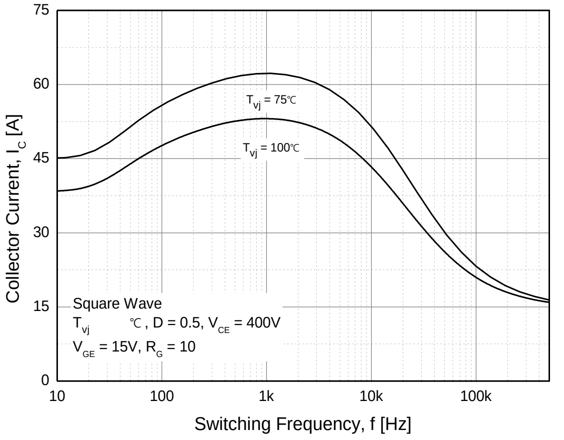


Figure 17. Load Current vs. Frequency



DIODE Characteristics

Figure 18. Diode Conduction Characteristics

Figure 19. Reverse Recovery Current vs. Forward Current

Figure 20. Reverse Recovery Charge vs. Forward Current

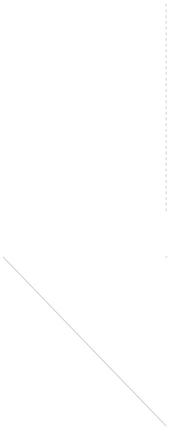


Figure 21. Reverse Recovery Time vs. Forward Current