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November 2013

SGL50N60RUFD 600 V, 50 A Short Circuit Rated IGBT

General Description

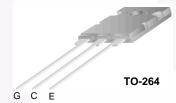
Fairchild's RUFD series of Insulated Gate Bipolar Transistors (IGBTs) provide low conduction and switching losses as well as short circuit ruggedness. The RUFD series is designed for applications such as motor control, uninterrupted power supplies (UPS) and general inverters where short circuit ruggedness is a required feature.

Features

- 50 A, 600 V, T_C = 100°C
- Low Saturation Voltage: V_{CE}(sat) = 2.2 V @ I_C = 50 A
- High Speed Switching
- · High Input Impedance
- · Short Circuit Rating

Applications

Motor Control, UPS, General Inverter.





Absolute Maximum Ratings T_C = 25°C unless otherwise noted

Symbol	Description	Ratings	Unit	
V _{CES}	Collector-Emitter Voltage		600	V
V _{GES}	Gate-Emitter Voltage		± 20	V
	Collector Current	@ T _C = 25°C	80	Α
IC	Collector Current	@ T _C = 100°C	50	Α
I _{CM (1)}	Pulsed Collector Current		150	Α
	Diode Continuous Forward Current	@ T _C = 25°C	60	Α
IF	Diode Continuous Forward Current	@ T _C = 100°C	30	Α
I _{FM}	Diode Maximum Forward Current		90	Α
T _{SC}	Short Circuit Withstand Time	@ T _C = 100°C	10	us
P _D	Maximum Power Dissipation	@ T _C = 25°C	250	W
	Maximum Power Dissipation	@ T _C = 100°C	100	W
TJ	Operating Junction Temperature		-55 to +150	°C
T _{stg}	Storage Temperature Range	-55 to +150	°C	
T ₁	Maximum Lead Temp. for Soldering		300	°C
'L	Purposes, 1/8" from Case for 5 Second	ds	300	<u> </u>

Notes :

(1) Repetitive rating : Pulse width limited by max. junction temperature

Thermal Characteristics

Symbol	Parameter	Тур.	Max.	Unit
R _{θJC} (IGBT)	Thermal Resistance, Junction-to-Case		0.5	°C/W
$R_{\theta JC}(DIODE)$	Thermal Resistance, Junction-to-Case		1.0	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	1	25	°C/W

Electrical Characteristics of the IGBT $T_C = 25^{\circ}C$ unless otherwise noted

Symbol	Parameter Test Conditions		Min.	Тур.	Max.	Unit
Off Chai	racteristics					
BV _{CES}	Collector-Emitter Breakdown Voltage	$V_{GE} = 0 \text{ V, } I_{C} = 250 \text{ uA}$	600			V
$\Delta B_{VCES}/$ ΔT_J	Temperature Coefficient of Breakdown Voltage	V _{GE} = 0 V, I _C = 1 mA		0.6		V/°C
I _{CES}	Collector Cut-Off Current	$V_{CE} = V_{CES}, V_{GE} = 0 V$			250	uA
I _{GES}	G-E Leakage Current	$V_{GE} = V_{GES}, V_{CE} = 0 V$			± 100	nA
	racteristics					
V _{GE(th)}	G-E Threshold Voltage	$Ic = 50 \text{ mA}, V_{CE} = V_{GE}$	5.0	6.0	8.5	V
	Collector to Emitter	I _C = 50 A, V _{GE} = 15 V		2.2	2.8	V
V _{CE(sat)}	Saturation Voltage	I _C = 80 A, V _{GE} = 15 V		2.5		V
•	c Characteristics					
C _{ies}	Input Capacitance	V -30 V V - 0 V		3311		pF
C _{oes}	Output Capacitance	$V_{CE}=30 \text{ V}, V_{GE}=0 \text{ V},$ f = 1 MHz		399	-	рF
C _{res}	Reverse Transfer Capacitance	1 – 1 1011 12		139		pF
Switchir	ng Characteristics					
t _{d(on)}	Turn-On Delay Time			26		ns
t _r	Rise Time			89		ns
t _{d(off)}	Turn-Off Delay Time	$V_{CC} = 300 \text{ V}, I_C = 50 \text{ A},$		66	100	ns
t _f	Fall Time	$R_G = 5.9 \Omega$, $V_{GE} = 15 V$,		118	200	ns
E _{on}	Turn-On Switching Loss	Inductive Load, $T_C = 25^{\circ}C$		1.68		mJ
E _{off}	Turn-Off Switching Loss			1.03		mJ
E _{ts}	Total Switching Loss			2.71	3.8	mJ
t _{d(on)}	Turn-On Delay Time	-		28		ns
t _r	Rise Time	.,		91	440	ns
t _{d(off)}	Turn-Off Delay Time	$V_{CC} = 300 \text{ V}, I_{C} = 50 \text{ A},$		68	110 400	ns
t _f	Fall Time	$R_G = 5.9 \Omega$, $V_{GE} = 15 V$, Inductive Load, $T_C = 125^{\circ}C$	/	261 1.7	400	ns
E _{on}	Turn-On Switching Loss	illudelive Load, 1°C = 123 C				mJ
E _{off}	Turn-Off Switching Loss			2.31 4.01	5.62	mJ
E _{ts}	Total Switching Loss	V - 300 V V - 15 V		4.01	5.02	mJ
T _{sc}	Short Circuit Withstand Time	V _{CC} = 300 V, V _{GE} = 15 V @ T _C = 100°C	10			us
Qg	Total Gate Charge	$V_{CE} = 300 \text{ V}, I_{C} = 50 \text{ A},$		145	210	nC
Q _{ge}	Gate-Emitter Charge	V _{GE} = 15 V		25	35	nC
Q _{gc}	Gate-Collector Charge			70	100	nC
L _e	Internal Emitter Inductance	Measured 5mm from PKG		18		nΗ

Electrical Characteristics of DIODE $T_C = 25^{\circ}C$ unless otherwise noted

Symbol	Parameter	Test Conditions		Min.	Тур.	Max.	Unit
V_{FM}	Diode Forward Voltage	I _F = 30 A	$T_C = 25^{\circ}C$		1.9	2.8	2.8 V
		IF = 30 A	T _C = 100°C	-	1.8		V
t _{rr}	$I_{rr} \qquad \begin{array}{c} \text{Diode Reverse Recovery Time} \\ \\ I_{rr} \qquad \begin{array}{c} \text{Diode Peak Reverse Recovery} \\ \text{Current} \end{array} \qquad \begin{array}{c} I_{F}{=}~30~\text{A}, \\ \text{dig/dt}{=}~200~\text{A/us} \end{array}$		$T_C = 25^{\circ}C$		70	100	no
			T _C = 100°C		140		ns
1		I _F = 30 A,	$T_C = 25^{\circ}C$		6	7.8	Α
'rr		$di_F/dt = 200 A/us$	T _C = 100°C	-	8		^
Q _{rr}	Diode Reverse Recovery Charge		$T_C = 25^{\circ}C$		200	360	nC
	Blode Reverse Recovery Charge		$T_C = 100^{\circ}C$	İ	580		110

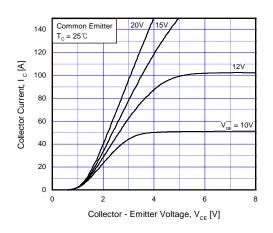


Fig 1. Typical Output Characteristics

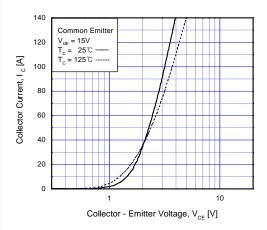


Fig 2. Typical Saturation Voltage Characteristics

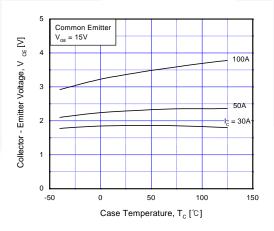


Fig 3. Saturation Voltage vs. Case
Temperature at Variant Current Level

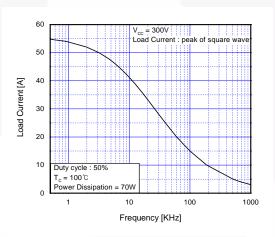


Fig 4. Load Current vs. Frequency

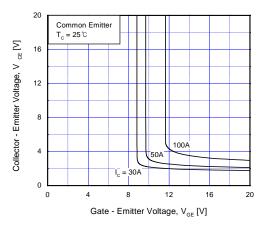


Fig 5. Saturation Voltage vs. V_{GE}

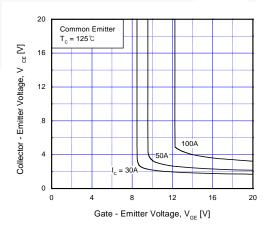


Fig 6. Saturation Voltage vs. V_{GE}

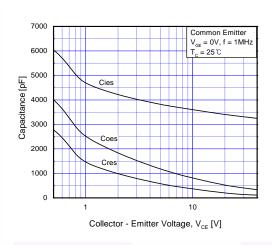


Fig 7. Capacitance Characteristics

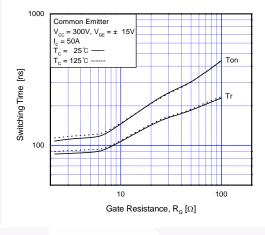


Fig 8. Turn-On Characteristics vs.
Gate Resistance

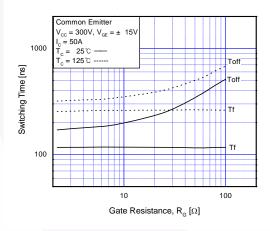


Fig 9. Turn-Off Characteristics vs.
Gate Resistance

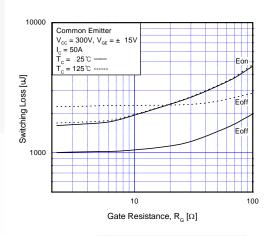


Fig 10. Switching Loss vs. Gate Resistance

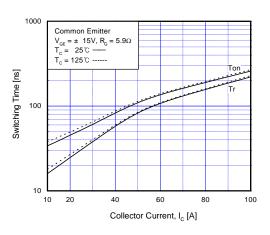


Fig 11. Turn-On Characteristics vs.
Collector Current

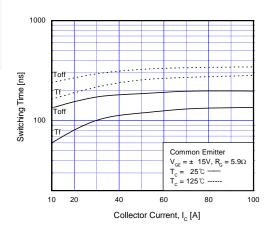
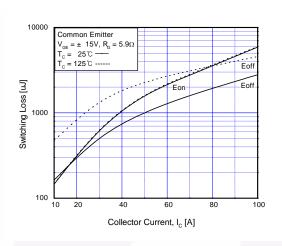


Fig 12. Turn-Off Characteristics vs. Collector Current



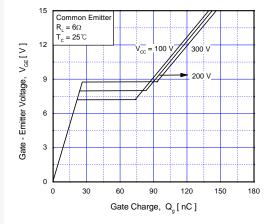
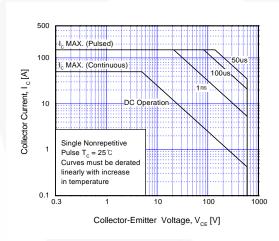


Fig 13. Switching Loss vs. Collector Current

Fig 14. Gate Charge Characteristics



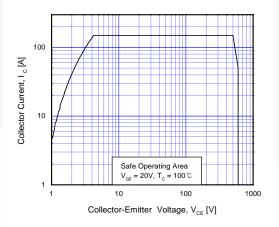


Fig 15. SOA Characteristics

Fig 16. Turn-Off SOA Characteristics

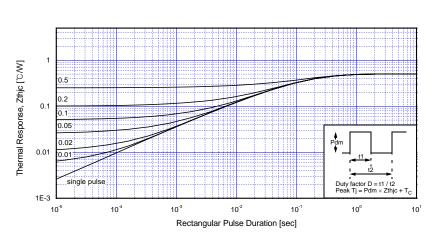
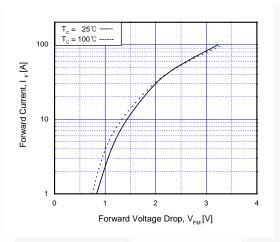


Fig 17. Transient Thermal Impedance of IGBT



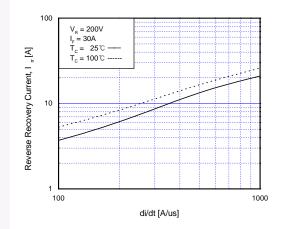
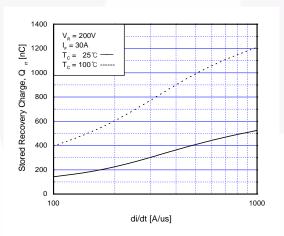


Fig 18. Forward Characteristics

Fig 19. Reverse Recovery Current



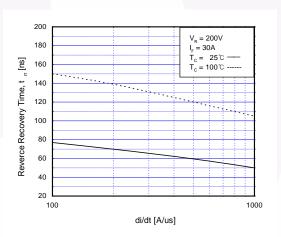


Fig 20. Stored Charge

Fig 21. Reverse Recovery Time

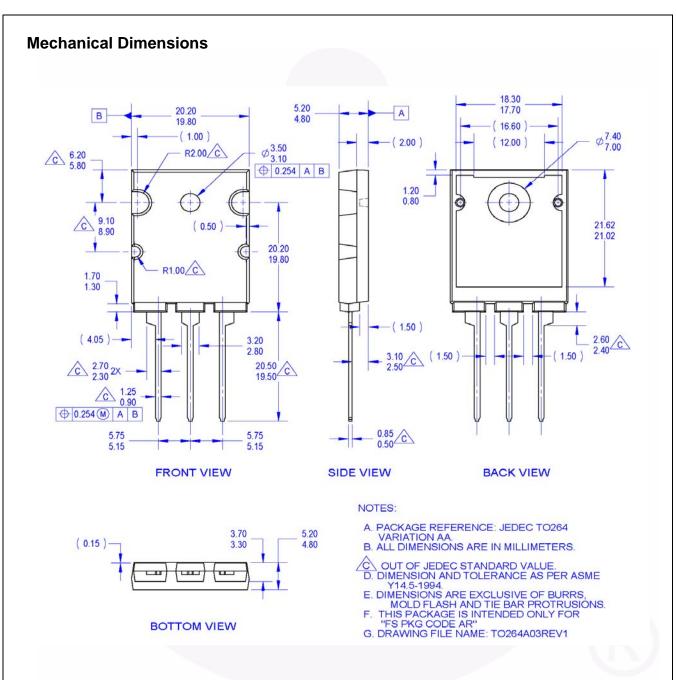


Figure 22. TO-264 3L - 3LD; TO264; MOLDED; JEDEC VARIATION AA

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 IHW20N120R5XKSA1
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