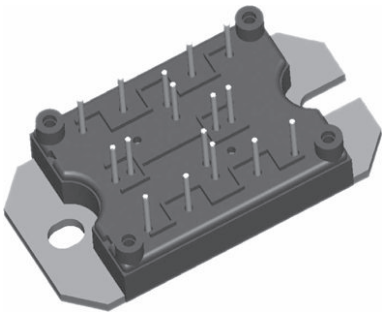
"Full Bridge" IGBT MTP (Warp Speed IGBT), 50 A



MTP

FEATURES

- Gen 4 warp speed IGBT technology
- HEXFRED® antiparallel diodes with ultrasoft reverse recovery
- Very low conduction and switching losses
- Optional SMT thermistor
- Al_2O_3 DBC
- Very low stray inductance design for high speed operation
- Speed 8 kHz to 30 kHz > 20 kHz hard switching, > 200 kHz resonant mode
- UL approved file E78996
- Designed and qualified for industrial level
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

RoHS COMPLIANT

BENEFITS

- Optimized for welding, UPS and SMPS applications
- Low EMI, requires less snubbing
- Direct mounting to heatsink
- PCB solderable terminals
- Very low junction to case thermal resistance

PRODUCT SUMMARY	
V_{CES}	600 V
I_C DC	69 A
$V_{CE(on)}$	2.22 V
Speed	8 kHz to 30 kHz
Package	MTP
Circuit	Full bridge

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Collector to emitter voltage	V_{CES}		600	V
Continuous collector current	I_C	T_C = 25 °C	69	A
		T_C = 80 °C	46	
Pulsed collector current	I_{CM}		200	
Peak switching current	I_{LM}		200	
Diode continuous forward current	I_F	T_C = 100 °C	25	
Peak diode forward current	I_{FM}		200	
Gate to emitter voltage	V_{GE}		± 20	V
RMS isolation voltage	V_{ISOL}	Any terminal to case, t = 1 minute	2500	
Maximum power dissipation per single IGBT	P_D	T_C = 25 °C	195	W
		T_C = 100 °C	78	

ELECTRICAL SPECIFICATIONS (T_J = 25 °C unless otherwise noted)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Collector to emitter breakdown voltage	$V_{(BR)CES}$	V_{GE} = 0 V, I_C = 250 µA	600	-	-	V
Temperature coefficient of breakdown voltage	$\Delta V_{(BR)CES}/\Delta T_J$	V_{GE} = 0 V, I_C = 4 mA (25 °C to 125 °C)	-	+0.6	-	V/°C
Collector to emitter saturation voltage	$V_{CE(on)}$	V_{GE} = 15 V, I_C = 25 A	-	2.22	3.14	V
		V_{GE} = 15 V, I_C = 50 A	-	2.43	3.25	
		V_{GE} = 15 V, I_C = 25 A, T_J = 150 °C	-	1.65	1.93	
		V_{GE} = 15 V, I_C = 50 A, T_J = 150 °C	-	2.08	2.45	
Gate threshold voltage	$V_{GE(th)}$	V_{CE} = V_{GE}, I_C = 250 µA	3	-	6	
Temperature coefficient of threshold voltage	$\Delta V_{GE(th)}/\Delta T_J$	V_{CE} = V_{GE}, I_C = 250 µA (25 °C to 125 °C)	-	- 17	-	mV/°C
Transconductance	g_{fe}	V_{CE} = 100 V, I_C = 25 A, PW = 80 µs	-	43	-	S
Zero gate voltage collector current	I_{CES} (1)	V_{GE} = 0 V, V_{CE} = 600 V, T_J = 25 °C	-	-	250	µA
		V_{GE} = 0 V, V_{CE} = 600 V, T_J = 150 °C	-	-	10	mA
Gate to emitter leakage current	I_{GES}	V_{GE} = ± 20 V	-	-	± 250	nA
Diode forward voltage drop	V_{FM}	I_C = 25 A	-	1.36	1.64	V
		I_C = 50 A	-	1.57	1.93	
		I_C = 25 A; T_J = 150 °C	-	1.19	1.42	
		I_C = 50 A; T_J = 150 °C	-	1.48	1.80	

Note

(1) I_{CES} includes also opposite leg overall leakage

SWITCHING CHARACTERISTICS (T_J = 25 °C unless otherwise specified)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Total gate charge (turn-on)	Q_g	I_C = 25 A V_{CC} = 480 V V_{GE} = 15 V	-	175	263	nC
Gate to emitter charge (turn-on)	Q_{ge}		-	27	41	
Gate to collector charge (turn-on)	Q_{gc}		-	71	107	
Turn-on switching loss	E_{on}	R_g = 5 Ω, I_C = 25 A V_{CC} = 480 V V_{GE} = ± 15 V, T_J = 25 °C	-	0.13	0.20	mJ
Turn-off switching loss	E_{off}		-	0.42	0.62	
Total switching loss	E_{tot}		-	0.55	0.82	
Turn-on switching loss	E_{on}	R_g = 5 Ω, I_C = 25 A V_{CC} = 480 V V_{GE} = ± 15 V, T_J = 125 °C	-	0.39	0.59	
Turn-off switching loss	E_{off}		-	0.49	0.74	
Total switching loss	E_{tot}		-	0.88	1.32	
Input capacitance	C_{ies}	V_{GE} = 0 V V_{CC} = 30 V f = 1.0 MHz	-	3610	5415	pF
Output capacitance	C_{oes}		-	714	1071	
Reverse transfer capacitance	C_{res}		-	58	87	
Diode reverse recovery time	t_{rr}	V_R = 200 V; I_C = 25 A; dI/dt = 200 A/µs	-	50	-	ns
Diode peak reverse current	I_{rr}		-	4.5	-	A
Diode Recovery charge	Q_{rr}		-	112	-	nC
Diode peak rate of fall of recovery during t_b	$dI_{(rec)M}/dt$		-	250	-	A/µs

THERMAL AND MECHANICAL SPECIFICATIONS							
PARAMETER		SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Operating junction temperature range		T_J		-40	-	150	°C
Storage temperature range		T_{Stg}		-40	-	125	
Junction to case	IGBT	R_{thJC}		-	-	0.64	°C/W
	Diode			-	-	0.9	
Case to sink per module		R_{thCS}	Heatsink compound thermal conductivity = 1 W/mK	-	0.06	-	
Clearance (1)			Externel shortest distance in air between 2 terminals	5.5	-	-	mm
Creepage (1)			Shortest distance along external surface of the insulating material between 2 terminals	8	-	-	
Weight				66			g

Note

(1) Standard version only i.e. without optional thermistor

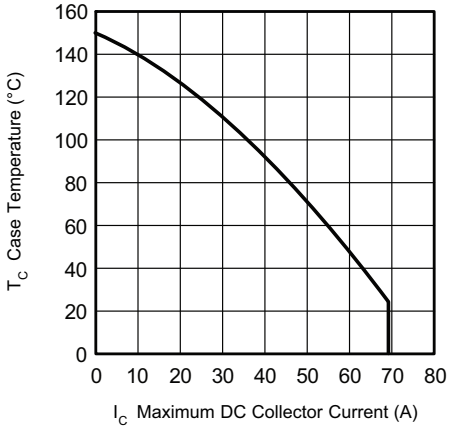


Fig. 1 - Maximum Collector Current vs. Case Temperature

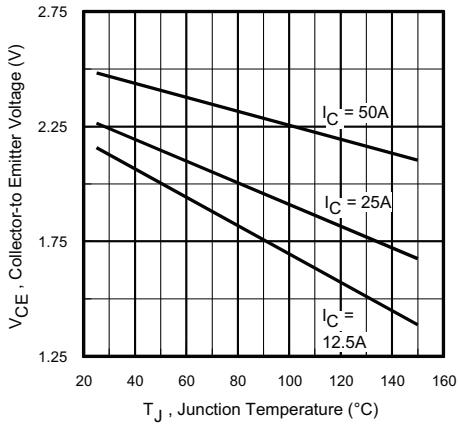


Fig. 2 - Typical Collector to Emitter Voltage vs. Junction Temperature

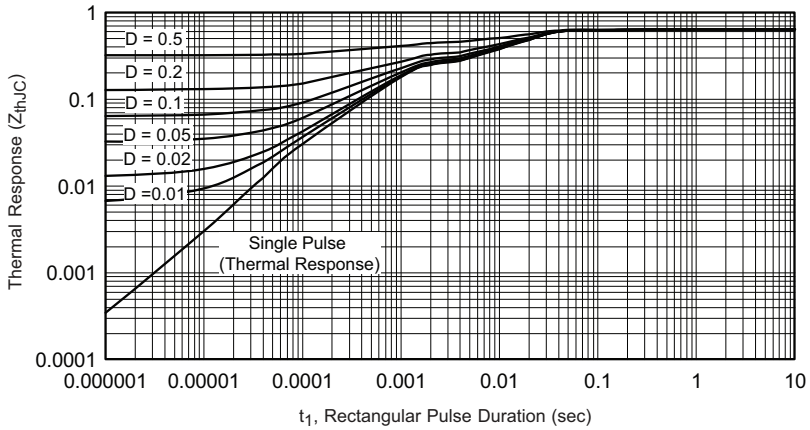


Fig. 3 - Maximum Transient Thermal Impedance, Junction to Case (IGBT)

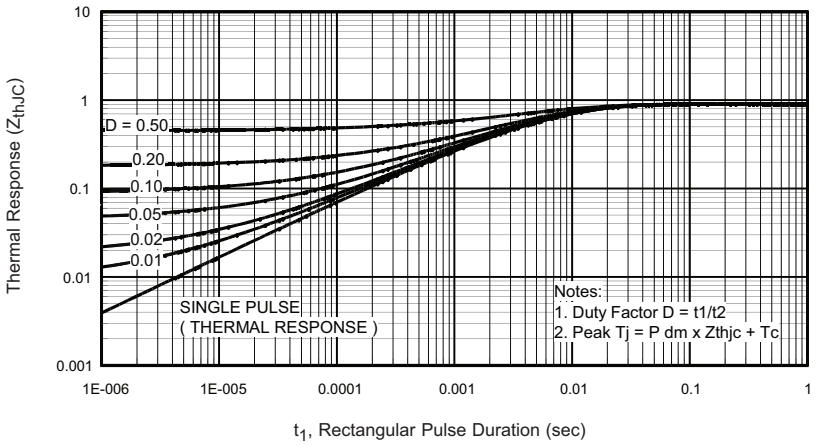


Fig. 4 - Maximum Transient Thermal Impedance, Junction to Case (Diode)

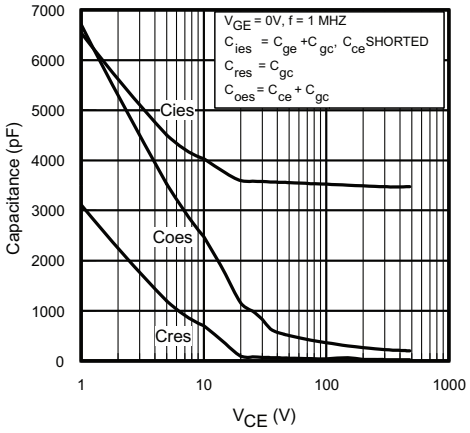


Fig. 5 - Typical Capacitance vs. Collector to Emitter Voltage

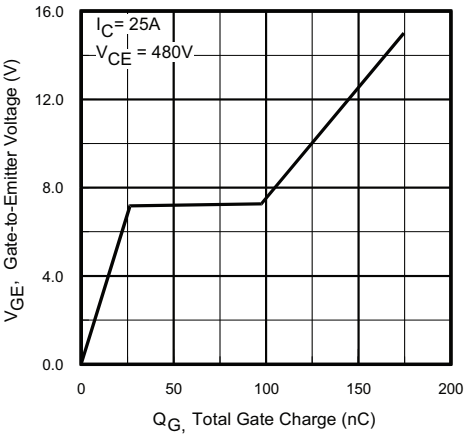


Fig. 6 - Typical Gate Charge vs. Gate to Emitter Voltage

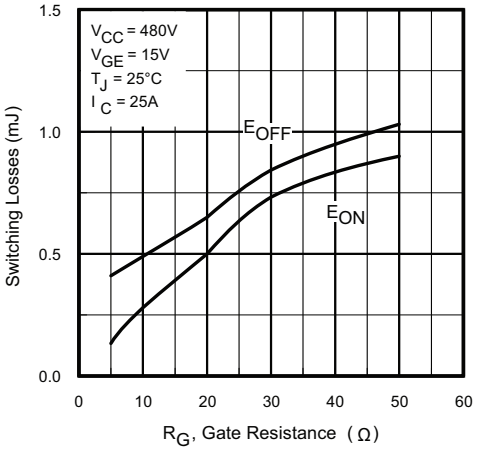


Fig. 7 - Typical Switching Losses vs. Gate Resistance

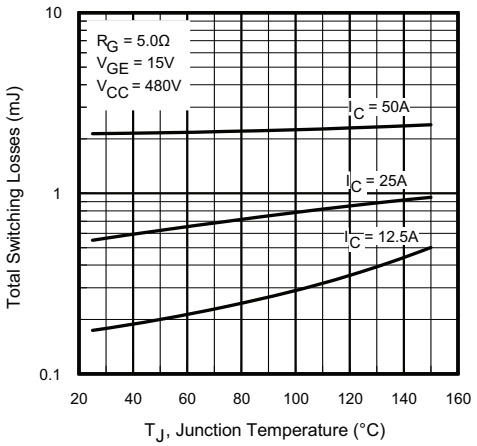


Fig. 8 - Typical Switching Losses vs. Junction Temperature

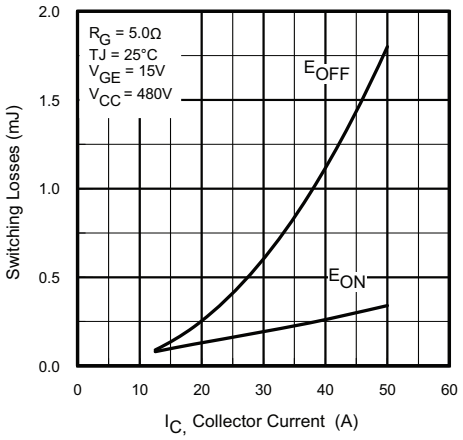


Fig. 9 - Typical Switching Losses vs. Collector to Emitter Current

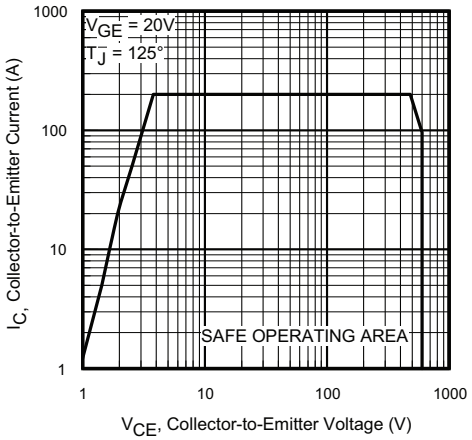


Fig. 10 - Turn-Off SOA

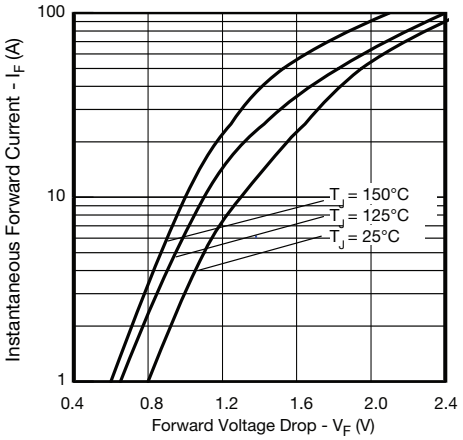


Fig. 11 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current

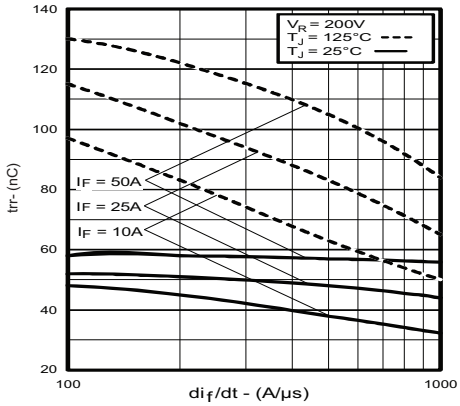


Fig. 12 - Typical Reverse Recovery Time vs. dI_F/dt

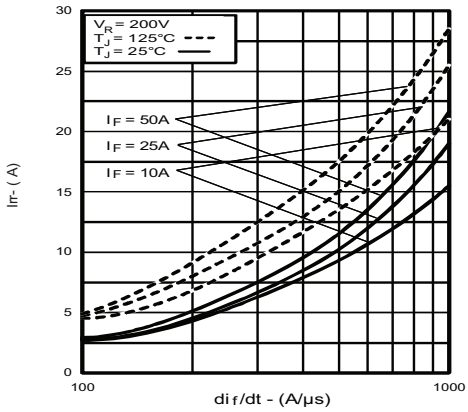


Fig. 13 - Typical Reverse Recovery Current vs. dI_F/dt

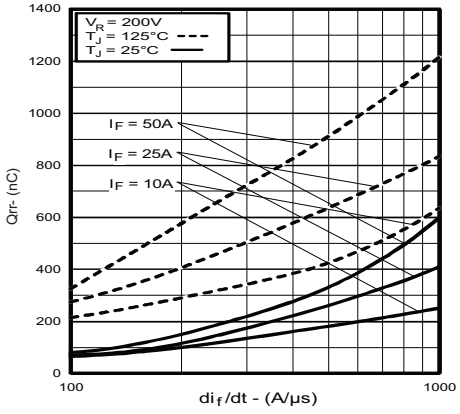


Fig. 14 - Typical Stored Charge vs. dI_F/dt

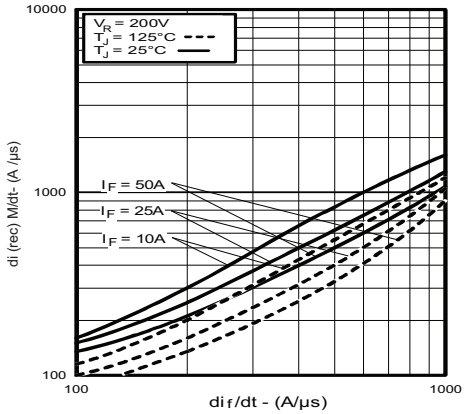


Fig. 15 - Typical $dI_{(rec)M}/dt$ vs. dI_F/dt

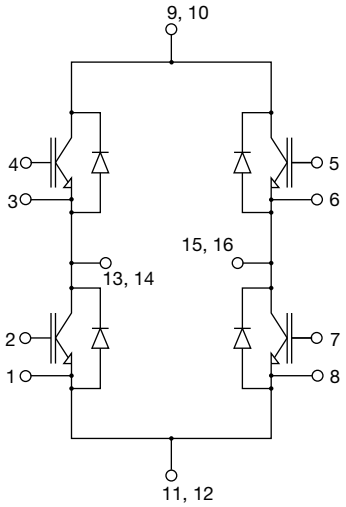


Fig. 16 - Electrical diagram

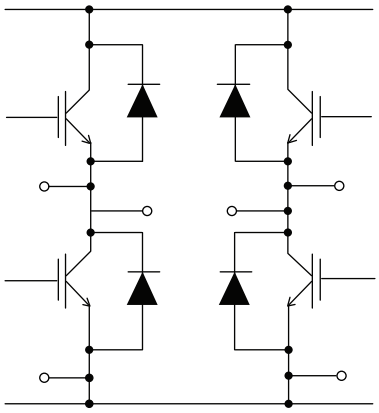
ORDERING INFORMATION TABLE

Device code

VS-	25	MT	060	W	F	A	PbF
1	2	3	4	5	6	7	8

1	-	Vishay Semiconductors product
2	-	Current rating (25 = 25 A)
3	-	Essential part number
4	-	Voltage code (060 = 600 V)
5	-	Speed/type (W = Warp IGBT)
6	-	Circuit configuration (F = Full bridge)
7	-	A = Al_2O_3 DBC substrate
8	-	PbF = Lead (Pb)-free

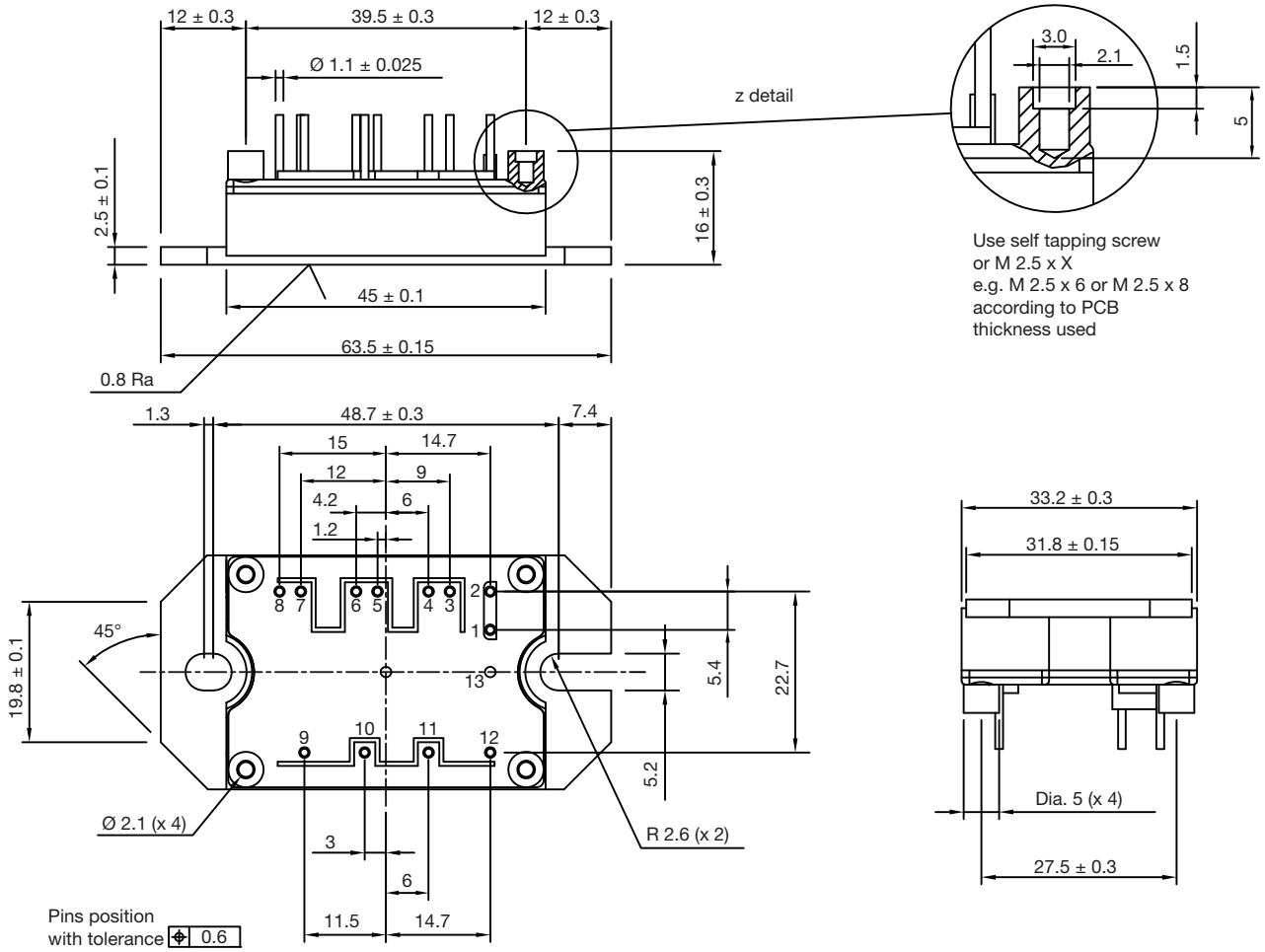
CIRCUIT CONFIGURATION



LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95245

MTP

DIMENSIONS in millimeters



Note

- Unused terminals are not assembled in the package

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